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PII: S1071-5819(18)30454-3
DOI: https://doi.org/10.1016/j.ijhcs.2018.08.003
Reference: YIJHC 2234

To appear in: *International Journal of Human-Computer Studies*

Received date: 1 October 2017
Revised date: 5 May 2018
Accepted date: 10 August 2018

Please cite this article as: Richard N. Landers , Gustavo F. Tondello , Dennis L. Kappen , Andrew B. Collmus , Elisa D. Mekler , Lennart E. Nacke , Defining Gameful Experience as a Psychological State Caused by Gameplay: Replacing the Term 'Gamefulness' with Three Distinct Constructs , *International Journal of Human-Computer Studies* (2018), doi: https://doi.org/10.1016/j.ijhcs.2018.08.003

Highlights

- A multilevel process theory of gameful experience is developed and presented
- The term gamefulness is replaced with three more precisely defined constructs
- Gameful design, gameful systems, and gameful experiences are carefully defined
- This theory links these constructs causally whereas previously they were confounded
- This theory thus serves as a unifying foundation for future work on gamification

Defining Gameful Experience as a Psychological State Caused by Gameplay: Replacing the Term 'Gamefulness' with Three Distinct Constructs

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Abstract

Background and Aim. Gamefulness is commonly cited as the primary goal of gamification, a family of approaches employed in education, business, healthcare, government, and elsewhere. However, *gamefulness* is defined imprecisely across the literature. To address this, we present a theory of gamefulness that splits *gamefulness* into more specific constructs and outlines their effects in a process model.

Method. We integrate extant literature from psychology, human-computer interaction, and other fields to define gameful design, systems, and experiences. Most critically, we argue that *gameful experience* is the core focal construct of this theory and define it as an interactive state occurring when a person perceives non-trivial achievable goals created externally, is motivated to pursue them under an arbitrary set of behavioral rules, and evaluates that motivation as voluntary.

Results. We present six resulting propositions: (1) gameful systems lead to gameful experiences, (2) gameful systems impact psychological characteristics, (3) effective gameful design leads to a gameful system, (4) gameful systems lead to behavioral change, (5) behavioral change causes the distal outcomes gamification designers target, and (6) individual differences moderate the effectiveness of gameful systems.

Conclusion. Gameful experience theory provides researchers with a unified foundation to study gamification from any social scientific lens.

1. Introduction

Gamefulness, a term originally introduced by McGonigal (2011), has since been included as a component of many academic conceptual presentations of gamification. For example, in the most cited definitional paper on gamification, Deterding, Dixon, Khaled and Nacke (2011) present gamefulness as the goal of gamification; in their approach, *gameful design* utilizes *gameful interaction* to create *gamefulness.* Gamefulness, in this view, is the primary outcome of successful gamification. We could interpret this to imply that for gamification to be successful, a gamified intervention must be experienced by its subjects similarly to how those subjects experience games. From this view, any gamification interventions that do not successfully create gamefulness are by definition unsuccessful, or more broadly interpreted, perhaps even "not gamification."

Unfortunately, gamefulness is itself typically only loosely defined, relying on researchers applying their own intuitive understanding of games to understand it. McGonigal (2011), despite introducing the term broadly, never defined it explicitly in her original book on gamification. Instead, she primarily defined gamefulness by what supposedly could possess it, naming gameful work, gameful school, gameful interactions with others, gameful activities, and gameful people, among many others. Although "gameful" was also left ambiguous, McGonigal (2015a) did later define gameful "experiences and systems [as those that] effectively integrate some of the key structural and aesthetic elements of games" (p. 655). In contrast, Deterding and colleagues (2011) defined gamefulness as "the experiential and behavioral qualities" of gaming, distinguishing it from playfulness, which they defined similarly but with regards to play. Thus, McGonigal used "gameful" as a generic label for human activities, humans themselves, and later systems that affect humans, whereas Deterding and colleagues defined gamefulness more specifically as a quality of a non-game system intended to be game-like. In contrast to both of these views, Huotari and Hamari (2012, 2016) defined gamefulness in terms of a target person's perceptions, calling it "an experiential condition unique to games." The inferences that

can be drawn from these definitions, as well as others appearing throughout the literature, are 1) that a person playing a game typically enters a particular psychological state during gameplay, 2) that this state is common across all experiences that could be defined as *games*, and 3) that gamification is intended to bring about that state outside the context of a game. Unfortunately, there is little clarity in the extant literature as to what this state might be. In short, researchers agree that people experience *something* unique when playing games but there is no clarity about what psychologically is actually occurring. Thus, the purpose of the present paper is to fill this gap by replacing the omnibus, unspecific term *gamefulness* with more specific, clearly-defined terms. We do this in response to calls to build the theoretical foundation necessary to support gamification research moving forward (Werbach, 2014).

Creating simple definitions for terms in this domain is difficult because people experience distinct types of games in different ways. A fast-paced first-person action game played on a television using a games console can lead to different affective and attitudinal states than a puzzle game played on a smartphone or than following the rules created by a demanding toddler, yet players of all three will be aware that they are in a *game*. To accomplish our goal with this restriction, we must also explore a related concept, similarly ill-defined, commonly discussed in the context of games research: *play*. Play is most often studied in the context of children. The psychological basis for this has its origins with Piaget (1951), who suggested that play was the most fundamental way children learn about the world. In short, play is an instinctive way that children experiment with their environment (Gray, 2013). Play is thus defined by its fluidity and lack of specific goals, behaviors which can also be but are less frequently exhibited by adults (McGonigal, 2011). With that foundation, games can be conceptualized as an externally structured, goal-directed type of play (Caillois, 2011). In short, if a person adopts a structured set of rules specifying how to play, they are no longer simply *playing* – they are instead *playing a game*.

Assuming this distinction between play and gameplay, we develop and present here three construct definitions to replace *gamefulness.* First, we contend that the fundamental psychological state of gameplay suggested by Huotari and Hamari (2012) is also the fundamental psychological state that many games and gamification designers are attempting to create. We label this state *gameful experience* and place it as the foundational variable in our theory. Second, we define *gameful systems* in terms of the qualities of interventions and environments that create gameful experiences, following the conceptual model suggested by Deterding and colleagues (2011; see Deterding et al.'s Figure 1). Thus, a *gameful system* is one that successfully creates for its users a *gameful experience*. Third, we define *gameful design* as the design process employed to create *gameful systems*. Importantly, these three definitions suggest that standalone games most often are completely gameful systems; for example, few players would claim that they are not "playing a game" while physically engaged in playing Tetris. Gamification, in contrast, varies in the degree and type of gameful system it creates, and furthermore, such systems may vary in their effectiveness at creating gameful experiences across people. Within this framework, the term *gamefulness* on its own is a highly ambiguous term that could be used to refer to any of those three contexts: designer actions, system characteristics, or the user's psychological experience. Given this, we recommend dropping the term *gamefulness* in the research literature and replacing it with these more specific terms. To maximize clarity, we follow this recommendation ourselves in the remainder of this article.

In presenting these arguments and those below, we develop a new theory describing the interplay between gameful design, gameful systems and gameful experiences, the result of integrating the psychological research literature on affect, motivation, and other psychological characteristics with the human-computer interaction (HCI) literature on game design and its outcomes. This theory is depicted in Figure 1. The remainder of this paper will focus on situating, explaining, and supporting this model.

2. The Centrality of Gameful Systems and Experiences to Gamification and Games

Although poorly defined before now, gameful systems and gameful experience sit at the heart of games and gamification research. As far back as the 1980's, scholars in the field of HCI suggested that designers extract and test the specific techniques used in games to influence player motivation (Carroll, 1982), better understand the qualities that make gameplay an enjoyable interaction (Malone, 1982), and consider how to incorporate such findings into non-game systems (Carroll & Thomas, 1988). With the emergence of user experience (UX) research in the last decade, HCI expanded its traditional focus on instrumental, task-centered aspects of use, such as the utility and usability. Modern HCI includes UX aspects that go "beyond the instrumental" (Hassenzahl & Tractinsky, 2006, p. 92), such as affect, beauty, or fun (Blythe, Overbeeke, Monk, & Wright, 2004). Following this, interest in digital games as an ideal for how to design interfaces that facilitate positive experiences (Calvillo Gàmez, Cairns, & Cox, 2009) was also rekindled, and many researchers and practitioners have attempted to apply game design to enhance the user experience of non-game applications and services – an approach that is now

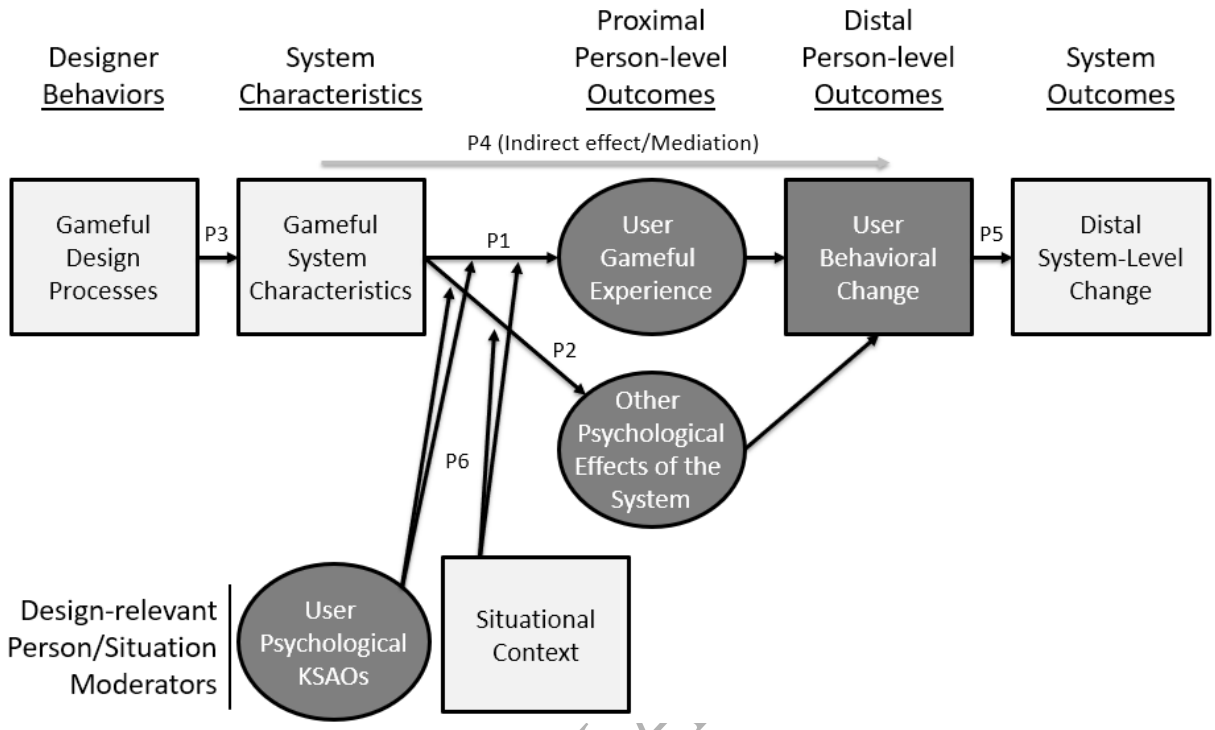

Figure 1. A theoretical model of gameful experience. Shapes containing black text and dark grey background represent system-level characteristics; shapes containing white text and light grey backgrounds represent person-level observations or constructs. Rectangles indicate observable characteristics; ovals indicate unobservable constructs. Lines pointing from shapes to other shapes indicate causal direct effects of one variable on another; lines pointing from shapes to other lines indicate causal moderation. "P#" indicates a theoretical proposition as numbered in text; the numbers themselves have no additional meaning.

commonly known as *gamification* and *gameful design* (Deterding et al., 2011; Huotari & Hamari, 2012, 2016).

Although various definitions have been brought forward to describe the characteristics inherent to games (see Salen & Zimmerman, 2004, chapter 7 and Huotari & Hamari, 2016 for an overview), in contrast, Calvillo Gàmez and colleagues (2009) argued that ultimately "games are not really defined in terms of their physicality, but in terms of the experience they provide" (p. 520). Common to all game definitions, however, is that they feature a systemic component referring to how the game is constructed (e.g., rules, goals), as well as an experiential component requiring the involvement of at least one player (Huotari & Hamari, 2016). With respect to defining gamification, Deterding et al. (2011) distinguished gamification from gameful design by stating that the former describes the design *strategy* of using game design elements, whereas the latter refers to the design *goal* of designing gameful systems. Huotari and Hamari (2016) critiqued Deterding and colleagues' (2011) definition as emphasizing only the systemic component of games (i.e., "using game design elements", Deterding et al., 2011, p. 11), while neglecting their experiential component, and Deterding later shifted the focus toward experience design (Deterding, 2015). Werbach (2014) in turn defined gamification as "the process of making activities more game-like". Although Werbach remained vague on what characterizes a "more game-like" activity, this definition includes aspects of both gameful systems and gameful experiences. Finally, Huotari and Hamari (2016) defined gamification as "a process of enhancing a service with affordances for gameful experience", emphasizing that gameful experience is a state that *may* (but must not forcibly so) emerge from interacting with a gamified service. In contrast to Deterding and colleagues' (2011) definition, Huotari and Hamari (2016) argued that it is impossible to objectively distinguish a game and a non-game context because gameful experience is subjective. Despite this assertion, Huotari and Hamari also stated that gameful experience relates to an experiential condition that is both unique and common to all rule-based games and further argued that "if there were no such condition, how could anyone

recognize a game?“ (Huotari & Hamari, 2016, p. 2). Ultimately, they acknowledged that there is no clear consensus as to which kinds of experiences can arise from games.

We agree with Huotari and Hamari (2016) that if people do not experience a game uniquely in comparison to other situations, there is no functional difference between a general psychological intervention (such as goal-setting; see Locke & Latham, 2002), a gameful system, and a game. Since games are often expensive to produce, this would significantly diminish the practical value of games in many contexts that they tend to be applied. In short, if identical psychological effects can be created without a game, whether regarding persuasion, learning, or any other practical outcome, then the creation of a game is a waste of resources. If gameful design is functionally identical to existing interventions used to change behavior, there is no reason to study gameful design either.

However, the popularity of games and research implies games are more compelling than non-games across a wide variety of game and application contexts (e.g., regarding health behaviors, Baranowski, Buday, Thompson, & Baranowski, 2008; McCallum, 2012; Edwards, Lumsden, Rivas, Steed, Edwards, Thiyagarajan et al., 2016; Johnson, Deterding, Kuhn, et al., 2016; learning outcomes, Barata, Gama, Jorge & Gonçalves, 2017; Connolly, Boyle, MacArthur, Hainey, & Boyle, 2012; Landers & Armstrong, 2017; Mitchell & Savill-Smith, 2004; enterprise development, Raftopoulos, Walz & Greuter, 2015; Mollick & Werbach, 2015; science and research, Cooper, 2015; urbanization and environment, Alfrink, 2015; Froehlich, 2015; broadly, Hamari, Koivisto, & Sarsa, 2014; Seaborn & Fels, 2015). These applications in diverse contexts suggest that there is something unique to the experience of games that cannot be achieved with other methods. By clearly defining this unique experience, researchers can consider and measure this construct explicitly, which better theoretically situates it alongside other constructs and better frames all future gamification research. For example, researchers could empirically determine to what extent gameful experience is vital to achieving other more distal outcomes (i.e., the extent to which the effects of gameful design on learning or behavioral change are

indirect via the mediating influence of gameful experience). This also has practical value in that specific gamification systems can be compared concerning the degree to which they are gameful, and thus such systems can be calibrated and compared for effectiveness in a way that is currently impossible.

3. Conceptualizing Gameful Experiences

To develop the definitions of *gameful experience, gameful systems*, and *gameful design* provided above, we first reviewed the literature that described or referenced these or similar constructs to identify areas of overlap and conflict. As stated earlier, the emergence of the terms *gameful* and *gamefulness* occurred during the past decade as game and HCI researchers intensified efforts to identify the unique characteristics of games and the experience of playing games that could potentially be applied to non-game contexts and systems. One consistent theme was challenge, difficulty, and clarity of purpose. For example, Deterding (2015) stated that “a game’s challenge is at the heart of its gameplay experience” (p. 299). McGonigal (2015a) posited that playing a game usually focuses on a particular outcome and that this experience imbues the player with purpose, motivated by clear goals, requiring the player to develop resilience in the face of obstacles (p. 654). Huotari and Hamari (2012) classified the gameful experience as “hedonic, challenging, and suspenseful” (p. 19). Salen and Zimmerman (2004) defined a game as “a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome” (p. 80). Juul (2005) suggested that the rules of a game provide the player with challenges that are not trivial to overcome, and that “playing a game is an activity of improving skills in order to overcome these challenges” (p. 5). Suits (1978) stated that to “play a game is to attempt to achieve a specific state of affairs [prelusory goal], using only means permitted by rules [lusory means], where the rules prohibit use of more efficient in favour of less efficient means [constitutive rules], and where the rules are accepted just because they make possible such activity [lusory attitude]” (p. 43). Finally, Avedon and Sutton-Smith

(1971) defined games as “an exercise of voluntary control systems, in which there is a contest between powers, confined by rules to produce a disequilibrial outcome.” (p. 405)

Through content analysis, we determined that three primary characteristics of gameful experiences are typically either implied or made explicit in stated definitions, and these characteristics are summarized in Table 1. First, players must perceive non-trivial and achievable goals, which create some degree of challenge and conflict, ultimately leading them to a final, typically quantifiable outcome. Second, the players are motivated to pursue these goals under arbitrary externally-imposed constraints, defined by the rules of the game. Third, the players’ decision to pursue the goals under the constraints is assumed to be voluntary, something that the player chooses to do.

Table 1

Components of a gameful experience, summarized from a review of the extant literature.

	Components of a gameful experience		
Authors	**Perception of non-trivial and achievable goals**	**Motivation to pursue goals under arbitrary externally-imposed constraints**	**Voluntary decision to pursue goals under given constraints**
Avedon and Sutton-Smith (1971)	A game is a contest between powers that produces a disequilibrial outcome (the goal)	A game is confined by rules (constraints)	A game is an “exercise of voluntary control systems”
Suits (1978)	“to play a game is to attempt to achieve a specific state of affairs” (goals)	“the rules prohibit use of more efficient in favour of less efficient means” (constraints)	“the rules are accepted just because they make possible such activity” (lusory attitude)
Salen and Zimmerman (2004)	A game is a system in which players engage in an artificial conflict with a quantifiable outcome (the goal)	The game’s conflict is defined by rules (constraints)	(not addressed)
Juul (2005)	The challenges in a game are non-trivial to overcome	The rules of the game provide such challenges	(not addressed)
Huotari and	A gameful experience is	(not addressed)	(not addressed)

Hamari (2012)	challenging and suspenseful (thus, non-trivial)		
McGonigal (2015a)	Playing a game is motivated by clear goals	(implied)	(implied)

Based upon these findings, summarized in Table 1, we defined gameful experience as a psychological state resulting from the interaction of three psychological characteristics: perceiving presented goals to be non-trivial and achievable, being motivated to pursue those goals under arbitrary externally-imposed constraints, and believing that one's actions within these constraints to be volitional. Additionally, this definition is visualized in Figure 2 and the term and its definition appear alongside other key terms for their theory in Table 2. We define gameful experience as an interaction to emphasize that a person must possess all three characteristics over time to maintain a gameful experience throughout the experience with a system. In short, each characteristic may vary from absent to present; however, if any one characteristic is absent, there is fundamentally no gameful experience. First, a person must perceive a non-trivial goal or goals that can be reasonably pursued. Second, the person must agree to exert effort under an arbitrary set of behavioral rules in pursuit of that goal or goals that differ from the behavioral rules that would normally apply. Third, the decision to pursue that goal within those rules must be evaluated as voluntary. Each of these three characteristics will be described in turn.

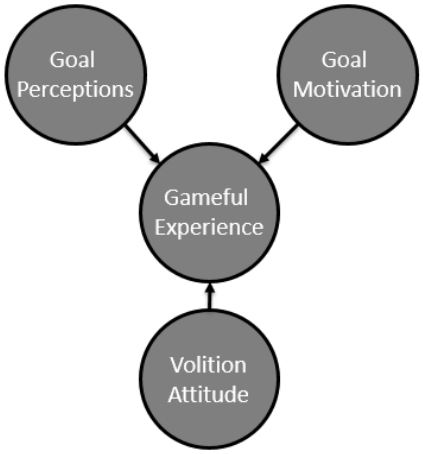

Figure 2. Formative measurement model of gameful experience.

Table 2

Summary of key terms from the presented theory of gameful experience.

Term	Definition
gamefulness	An imprecise label commonly used to refer to *gameful experiences, gameful systems,* and *gameful design*. Deprecation of this term when not tied explicitly to one of these three contexts is recommended.
gameful experience	A psychological state resulting from the interaction of three psychological characteristics: perceiving presented goals to be non-trivial and achievable, being motivated to pursue those goals under arbitrary, externally-imposed constraints, and the belief that their actions within these constraints are volitional.
gameful system	Any system that creates for its users a gameful experience.
gameful system characteristics	The specific game elements and motivational affordances of a gameful system.
gameful design	A design process that affords gameful experience within a designed

	system; alternatively, a design process that creates a gameful system by implementing gameful system characteristics effectively
behavioral change	Behaviors that would not have occurred if a user had not been exposed to a gameful system. These are typically chosen and targeted based upon their links to desired distal changes.
distal change	Desired system-level changes targeted by implementing gamification, such as improved profit or improved graduation rates. These are typically outcomes specified by some external stakeholder, such as a supervisor, business owner, or educational institution, and are thus highly context-dependent.
KSAOs	Knowledge, skills, abilities, and other psychological characteristics of a person that may influence the success of a gameful system in bringing about targeted psychological changes, such as gameful experience. Could include prior experience with games and gamification.
situational context	Any pre-existing system-level characteristic that influences the success of a gameful system in bringing about targeted psychological changes.

The first characteristic is the perception of a non-trivial goal or goals that can be reasonably pursued. Importantly, this characteristic is a perception, and this perception may not correspond to reality. The person must only believe there is a goal to pursue at all times they engage with the system; if the person ceases to perceive any goals, even if the system still provides goals, gameful experience is reduced. This perception has two components. First, goals must be perceived as non-trivial; there must be sufficient difficulty that the person perceives personal challenge in their pursuit. Second, the person must believe that the goal is possible to achieve. If they do not perceive the goal as realistic, they will view the goal as unfair,

further diminishing gameful experience. Thus, if a person believes all goals specified by the system are completely trivial or unachievable, they cannot have a gameful experience.

The second characteristic is a desire to pursue the perceived goal under an arbitrary and at least somewhat limiting set of behavioral rules. In contrast to the first characteristic, this characteristic is motivational, but it also has two components. First, the rules imposed upon the person must be more limiting to their behavior than the rules they normally follow. For example, if a person is told to "drive your car to work," the normal rules of driving apply and the experience is not very gameful. In contrast, if the person is told to "drive your car to work only making right-hand turns," new and arbitrary rules have been imposed. This example highlights the importance of the second characteristic: the person must agree to be limited by the rules provided. If this person is unwilling to make only right-hand turns, no gameful experience can occur.

The third and final characteristic is the belief that the person's participation within the system's constraints is volitional. Psychologically speaking, this can be conceptualized as an attitude. In short, if the person feels compelled to participate yet does so anyway, a concept Deci and Ryan (2011) called *amotivation*, the experience cannot be gameful. Instead, the person must believe that the motivation they feel to participate described by the previous characteristic is driven by their own decision to pursue the challenge placed before them, as a way to in part fulfill their need for autonomy. A similar concept, called psychological contract, appears in the study of industrial/organizational psychology, which concerns the psychology of employee behavior. When a person decides to work for an organization, they create a psychological contract with that organization (Levinson, Price, Munden, Mandl & Solley, 1962). Specifically, they believe the organization that employs them owes them certain outcomes in exchange for their continued effort toward organizational goals. Such beliefs are not necessarily rational; for example, an employee may believe that they are owed a supervisor sympathetic to their desire to come to work late each day. Regardless, when these expectations are not met,

employees experience *psychological contract breach*, which is a state with severely negative consequences; for example, that employee may decide to "get even" with the organization, with a variety of negative outcomes for both the organization and the employee (Restubog, Zagenczyk, Bordia & Tang, 2013; Robbins, Ford & Tetrick, 2012). In the context of games and gameful systems, the response to contract breach is much simpler; the person stops playing. Thus, to have a gameful experience, the person must always believe that they have the freedom to stop playing, even if this may not be true. For example, if an organization requires an employee to participate in a gameful system but manages to hide the truth of this requirement from them, the employee may still have a gameful experience.

4. Conceptualizing Gameful Systems and Their Design

The definitions provided above imply that a gameful experience occurs due to the interaction of two separate entities: a system (which contains goals, rules, and challenges to which the person is responding), and the person who interacts with that system. Much as with the terms *gameful experience* and *gamefulness*, a variety of definitions have been put forward for *gameful system.* McGonigal (2015a) defines *gameful system* as one that integrates key structural and aesthetic elements of games. From the HCI perspective, Deterting et al. (2011) defined "gamified" applications as applications that incorporate elements of games. Huotari and Hamari (2012, 2016) defined "gamified" services as those enhanced with motivational affordances for gameful experiences. Whereas Deterding et al. focus on the methods, Huotari and Hamari focus on the goals; nevertheless, both definitions imply the development of a system capable of creating gameful experiences for its users. The use of the word "gamified" in this context can be understood as a synonym of gameful; in fact, in more recent work, Deterding (2015) has abandoned the term "gamified system" in favor of "gameful system". From an Information Systems perspective, Yohannis, Prabowo and Waworuntu (2014) reviewed the game design literature, creating a list of nine characteristics commonly present in games (i.e., player, environment, rule, challenge, interaction, goal, emotional experience, quantifiable

outcome, negotiable consequence). For Yohannis and colleagues, a gameful system is one that contains at least some of these characteristics. Moreover, they argue that the degree to which a system is gameful can thus be measured: a system that includes a higher number of these characteristics is more gameful than one with a lower number of them.

Based on this literature, we defined a gameful system to be any system that creates for its users a gameful experience, thus making a system's gamefulness contingent upon that systems' success in bringing about this psychological state. In the previous section, we introduced the theory that a gameful experience depends on three psychological states to occur: a perception of non-trivial and achievable goals, the motivation to pursue these goals under arbitrary (and somewhat restrictive) rules, and the belief of voluntary participation. Therefore, a gameful system must be designed with characteristics that afford these three elements of the gameful experience, and this process is what we define in this theory as *gameful design*. To summarize, gameful experience is the fundamental experience of playing a game, caused by gameful systems, which were created using gameful design. For a system to become gameful through gamification, it must be redesigned to provide non-trivial and achievable behavioral goals bound by rules limiting how those goals can be achieved while simultaneously affording the users with motivation to choose to pursue these goals. Thus, gameful systems only carry the *potential* to create a gameful experience; whether this experience will emerge or not for any particular user will depend on the user voluntarily accepting the system's goals and rules and choosing to engage. Thus, gameful systems exist on a continuum ranging from *not gameful* to *completely gameful* as shown in Figure 3, which provides some hypothetical examples of where a few types of gameful systems could fall within this continuum.

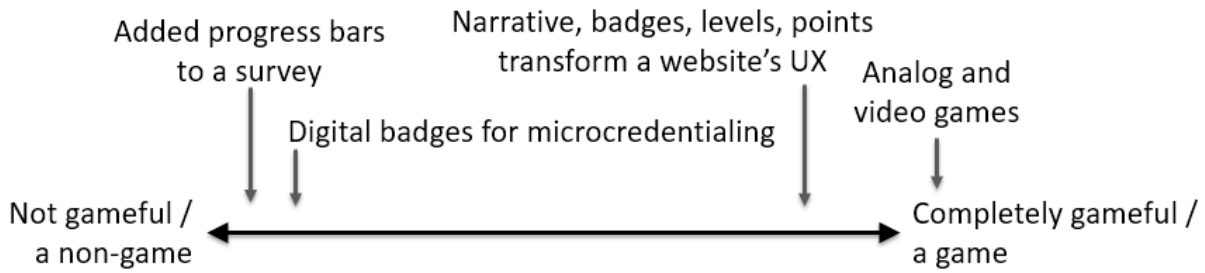

Figure 3. A continuum of gameful systems, with potential locations for various systems.

To enable the study, understanding, and design of such gameful systems, we must be able to differentiate gameful systems from both games and non-gameful systems. As stated before, our definition of gameful systems implies that successful games are completely gameful systems. Nevertheless, the goal of defining gameful systems is to separate them from games, so they can be studied as a different, albeit similar, phenomenon. To accomplish this, we reviewed the fundamental differences between games and non-games, a topic that has already been extensively investigated in the literature. The first clear difference is that games are built with the goal of creating gameful experiences (Schell, 2008), whereas non-game (non-gameful) systems are built with an instrumental goal unrelated to gameful experiences. Another important difference is that the primary purpose of games is not usually to change behavior outside the context of the game, whereas that is the primary purpose of many non-game systems. Juul (2005) provided some additional context for this distinction by stating that games can in fact have negotiable outside-the-game outcomes if players set out to create such outcomes explicitly. However, in games, these outcomes are external and detached from the gameplay itself. For example, players may bet cash over who will win in a board game match, but this outcome is distinct from the game itself. If money is exchanged within the game, that money will still be fake, existing only within the boundaries of the game with no effect on outside-the-game money unless that has also been negotiated.

Most gameful systems, ones created by applying gameful design to non-games, thus sit along the continuum between games and non-games. They are systems that intend to accomplish an instrumental goal that will have concrete consequences in the real world but at the same time create a gameful experience for their users. Because games and less gameful systems are both intended to create a gameful experience for the player or user, the difference lies in their relationship with outside-the-game outcomes: games are self-contained whereas gameful systems are not. For example, even in persuasive and serious games, which have a clear external purpose beyond within-game outcomes (Bogost, 2007; Fogg, 2002; Connolly, Boyle, MacArthur, Hainey & Boyle, 2012), gameplay itself occurs in a simulated environment. A player can "win" or "lose" such a game, but this victory state is not necessarily related to the attitude change sought by the creators of the game (Salen & Zimmerman, 2004).

Both gameful and non-gameful systems are designed to change outside-the-game outcomes; therefore, the difference between them is that gameful systems are intended to create a gameful experience for the user whereas non-gameful systems are not. To be able to accurately measure how gameful any system is, it would be necessary to reliably and validly quantify how many game elements are present, how those game elements interact with non-game elements, how effectively those game elements lead to gameful experiences, and likely a variety of heretofore unconsidered dimensions to gameful system. Currently, there are no standardized scales for measuring how gameful a system is. As stated above, Yohannis et al. (2014) suggested that this could be measured through nine common characteristics of games; however, their idea still lacks a specific measurement procedure and empirical validation. Therefore, the distinction between gameful and non-gameful systems is currently a subjective judgment, but we encourage the development of theory to describe the nature of gameful systems and the creation of psychometrically valid measures to quantify how gameful such systems are.

5. Gameful Experience as a Type of Playful Experience

With gameful design, gameful systems, and gameful experience defined, we next turn to the precise nature of the relationship between playfulness and gameful design, systems, and experience. In contrast to all three, the term *playfulness* has most often been framed as an individual difference construct, indicating a person characterized by tendencies toward improvisation, expressiveness, spontaneity, and joy in everyday life (Lucero, Karapanos, Arrasvuori, & Korhonen, 2014). Thus, *playful experiences* result from a playful approach to activities based this character trait. Stenros (2014) provides more information on this trait, framing playfulness as "a mood, an attitude, a force that erupts or something one falls into," devoid of external goals. He further suggests that playfulness is a characteristic experienced by a participant and is not an attribute of a system or an artifact. Wosczynski, Roth and Segars (2002) explored these ideas empirically, observing that playfulness in relation to computer use could be measured as a trait (i.e., microcomputer playfulness) and also as a state. They thus encouraged researchers to better understand playfulness in terms of its trait, state, and behavioral aspects.

This highlights the core difference between playful systems and gameful systems. Both describe characteristics of a system that creates play; however, in the case of playful systems, this system is the self. A playful person chooses to engage in playful experience based upon their own internal drives and motivations. In contrast, gameful systems are external. A gameful experience is triggered by rules or other constraints being placed upon the player's behavior. This external cause could be another person. For example, a toddler may command, "Now you're going to be a princess!" Although the toddler may be having a playful experience, changing the parameters of play at will, the target of this order is primarily having a gameful experience, because that subject has less power to change the parameters of play. If such power is obtained, which among children is a common reaction to threats of "I'm not playing!," the gameful experience may become a playful experience. Thus, people can have playful and

gameful experiences simultaneously or shift between them over time. For example, the external cause triggering a gameful experience could still be the self; during play, a person could decide on a firm set of rules to follow for the immediate future, creating a gameful experience out of a playful experience. Even within the context of an existing gameful system, a person may decide to engage in play within the boundaries of the existing set of rules. However, in the case of digital games and other gameful systems, the player typically has no control over game rules; in such cases, play will thus be gameful in nature.

6. A Theoretical Model of Gameful Design, Systems and Experiences

To provide guidelines for how researchers can best understand gameful experience and its causes and effects, we have laid out below a theory to serve as a basis for research in this area. We have based this theory in the epistemological foundations of gamification science described by Landers, Auer, Collmus and Armstrong (*in press*). This theory is also graphically depicted in Figure 1 as a process model using structural equation modeling notation (i.e., rectangles, ovals, and arrows all have pre-determined meanings, as described in the figure caption). Process models are central to both social scientific research and practice, because they provide a precisely specified causal ordering to observed phenomena. Perhaps even more critically, they specify which relationships do *not* exist among those phenomena. For example, in Figure 1, there is no direct path between gameful design and distal change; this model therefore states that game designers can only bring about the distal changes they desire, such as improved organizational profitability, by first creating a system that brings about psychological change, which in turn creates behavioral change, which in turn creates those desired distal changes.

Additionally, the model is multilevel in nature. Multilevel models are those which propose effects at distinct levels of analysis (Klein, Dansereau & Hall, 1994). Because effects at one level can be easily mistaken for different effects that in fact occur at different levels, theories that incorporate multiple levels of analysis should specify those levels explicitly (Bliese,

2000). In the present case, there are two levels: at the higher level where gameful systems exist, and at the lower level where users of those systems exist. For example, consider a gameful designer that wants to test differences between the effectiveness of various gameful systems. The research design required to do so will differ based upon whether the researcher is studying processes and outcomes at the system level, the user level, or both. If a researcher wanted to study the effects of two gameful systems on behavioral change, this only requires random assignment to the two systems and a sample of behaviors from people exposed to each system. If a researcher wanted to study the interaction between two gameful systems and organizational climate for games, this would require a sample of both behaviors and climates; in other words, multiple organizations or organizational units would be required. The most common multilevel model in human-computer interaction is the two-group experimental design in which groups exist at a higher level than observations (i.e., groups contain people); however, multilevel models can be much more complex, as this one is.

It is with this epistemological foundation and terminology that we developed the following propositions.

6.1. Proposition 1: More gameful systems lead to more gameful experiences.

Proposition 1, which describes the effect of a system on a person, forms the core of this theoretical model and has been extensively discussed in this paper already. To recap, gameful experience refers to the fundamental psychological experience of playing any game, and a gameful system is a system designed with the intent of creating this experience for its users outside the context of a game. Importantly, Proposition 1 represents a cross-level effect. More plainly, a gameful system is a set of game objects in relationships constituting and exchanging variables of play among one another, whereas gameful experience refers to an individual's psychological state. The term "cross-level" is used to indicate that when statistically modeling this relationship, it should be considered a multi-level problem (Klein et al., 2000). A highly

gameful system is more likely to facilitate the emergence of gameful experience than a less gameful system, but this is not guaranteed (Huotari & Hamari, 2016).

As noted earlier, there are currently no methodological tools that can classify how gameful a system is or how gameful the user experience is. The development of such tools in future research will open new perspectives to gamification designers, because they will be able to predict how gameful a system's user experience will be based upon system characteristics (i.e., the degree to which the system itself is gameful). Such tools will be able to identify situations where the system lacks sufficient potential to afford a gameful experience, and suggest a reason. Information from such tools could then be used to inform posterior design iterations, enabling designers to focus on the areas of the system that are lacking potential to afford one or more of the psychological characteristics of a gameful experience identified by our theory: the perception of non-trivial goals, the motivation to pursue them under the imposed constraints, and the voluntariness to accept the goals and the constraints.

6.2. Proposition 2: Gameful systems impact psychological mediators other than gameful experience.

In the gamification literature, there is ample empirical evidence to suggest that adding game characteristics to a system results in psychological changes in addition to the development of a gameful experience. For example, gamification has been found to increase student engagement (Barata, Gama, Jorge, & Gonçalves, 2017) and enjoyment (Fitz-Walter, Johnson, Wyeth, Tjondronegoro, & Scott-Parker, 2017). Another study (Mekler, Brühlmann, Tuch and Opwis, 2017) found that although gamification did not increase intrinsic motivation during an image annotation task, participants still performed better in the gamified conditions. There is also evidence that gamification leads to behavioral changes. For example, it has been shown that gamification interventions can increase user activity with online services (Hamari, 2017; Looyestyn, Kernot, Boshoff, Ryan, Edney, & Maher, 2017) or physical exercise (Goh & Razikin, 2015; Koivisto & Hamari, 2014; Johnson, Deterding, Kuhn, Staneva, Stoyanov, &

Hides, 2016). Hamari, Koivisto and Sarsa (2014) provide a review of additional psychological and behavioral outcomes of gameful systems. Johnson et al. (2016) reviewed several publications related to gamification of health and wellbeing and identified additional behavioral outcomes, such as increased individual utilization of healthcare, reduction of medication misuse, and increase in blood glucose monitoring. Thus, Proposition 2, like Proposition 1, focuses upon the effects of systems upon people, but through person-level changes other than gameful experience.

Of note in discussion of this effect is the concept of flow, which Csikszentmihalyi (1975) defined as a "state of peak enjoyment, energetic focus, and creative concentration." Flow is often considered one of the primary outcomes sought by game designers (Procci, Singer, Levy, & Bowers, 2012); however, it is not experienced consistently within games (Jackson, 1992). Players enter and leave flow states throughout play, depending on how engaging the game is for that player at any moment (Nakamura & Csikszentmihalyi, 2014). In contrast, gameful experience is achieved throughout gameplay, whether flow has been achieved or not. Thus, flow is a state that is likely complimentary to gameful experience, but it is not synonymous.

Although many kinds of psychological and behavioral impacts of gameful systems have been identified, there is yet no agreed upon way of predicting of the strength of the effects based on the characteristics of the system or even of the gameful experience. Moreover, there are many other psychological impacts that could result from gamifying a system, both positive, such as improved perceived value of the system, or negative, such as decreased perceptions of the importance or value of the system. A better understanding of these effects simultaneously with effects on gameful experience, and the development of models to predict them, will strongly benefit gamification designers. First, when designing for a specific psychological outcome, designers will be able to employ the best known strategies to produce desired impacts, instead of relying on subjective inspiration or trial-and-error iterative approaches that are currently common in gameful design (Morschheuser, Werder, Hamari, & Abe, 2017). Additionally,

designers would be able to predict which kind of psychological changes would be facilitated for users due to their design choices; therefore, such research would enable designers to target desirable effects while minimizing undesirable side effects.

6.3. Proposition 3: Effective gameful design leads to a more gameful system.

The primary goal of gameful design is to design gameful systems, which afford a gameful experience for their users (Deterding et al., 2011; Deterding, 2015; Huotari & Hamari, 2012, 2016); thus, *effective gameful design* describes a design process that creates a gameful system (Kappen & Nacke, 2013). In this way, Proposition 3 concerns the actions of designers and how those actions influence the characteristics of the systems they are designing. In a general sense, effective design is achieved by creating or changing a system to solve a specified problem; in gameful design, effective design involves adding game elements or motivational affordances that are likely to increase gameful experience. From this perspective, the more prevalent and the more pronounced these game elements or motivational affordances are, the more gameful a system becomes (Huotari & Hamari, 2016). Game elements are the building blocks that are commonly found and are characteristics of games; however, there is no agreed-upon list of what constitutes a game element or not (Deterding et al, 2011), although efforts to create such a list are underway (e.g., Tondello, Mora & Nacke, 2017). Motivational affordances are properties added to an object, which allow its users to experience the satisfaction of their psychological needs (Deterding, 2011; Zhang, 2008). Again, these definitions focus either on the structure (game elements) or the goals (affording motivation); however, in gameful design these two concepts overlap and can be used to identify the same set of tools to build a more gameful system. Thus, the main challenge of gameful design is deciding which game elements or motivational affordances are appropriate for each case (Deterding, 2015; Morschheuser, Werder, Hamari, & Abe, 2017).

Importantly, this proposition keeps gameful experience as the foundation of this model. In short, gameful experience as previously defined is caused by gameful system characteristics,

and the specific process a designer uses to implement such characteristics is gameful design. This distinction and the causal pathway it implies are critical to the theory and have important practical implications. For example, if the use of compelling narrative (a gameful system characteristic) is found to cause users to have gameful experiences, the success of gamification is still contingent upon the designer's ability to create a system with compelling narrative (i.e., to implement gameful design processes). Thus, this disentangles three concepts commonly confounded in existing gamification literature: the designer's actions (gameful design), the system itself (gameful system), and the direct psychological impacts of participation in that system (gameful experience and other psychological outcomes).

The evaluation of gameful design projects should involve measuring how much more gameful a system becomes after the intervention. Thus, it will require precise means of measuring how gameful a system is. Currently, no agreed-upon method is available although there have been some initial attempts that have not yet been empirically validated, such as the Octalysis framework (Chou, 2015) and Gameful Design Heuristics (Tondello, Kappen, Mekler, Ganaba & Nacke, 2016). Furthermore, since gameful experience is only achieved with the participation of a user, a comprehensive evaluation of gameful design interventions will only be possible with a better understanding of how a more gameful system leads to more gameful experiences (see Proposition 1).

Nevertheless, initial qualitative evidence has shown that effective gameful design can potentially lead to a more gameful system, providing initial support for this proposition. For example, Deterding (2015) reported two case studies where employing a gameful design method appeared to create a more gameful system, observed after prototyping and user testing the proposed gameful solutions. Hamari and Koivisto (2014) successfully measured flow in the context of a gamified system, which as previously discussed is potentially an outcome of gameful experience. Barata, Gama, Jorge, and Gonçalves (2017) provided some evidence of a more gameful experience after adding gameful elements to a university level course, based on

the students' answers to the question: "How much did you feel you were playing a game, instead of just attending a regular course?" Elm, Kappen, Tondello, and Nacke (2016) also provide some evidence of increased gameful experience after implementing a gameful knowledge management system, by conducting a deductive analysis of participants' responses to open-ended interview questions on enjoyment and motivation. Future studies will need to employ more precise methods of measuring gameful experience to provide further evidence.

Additional studies regarding this proposition are needed because currently there is no agreed upon method for gameful design (Deterding, 2015; Mora, Riera, Gonzalez, & Arnedo-Moreno, 2017). Although various methods have been suggested in the literature from both academics (e.g., Werbach and Linden, 2012; Deterding, 2015; Morschheuser, Werder, Hamari, & Abe, 2017) and practitioners (e.g., Chou, 2015; Marczewski, 2015; Zichermann and Cunningham, 2011), yet we still lack evidence of how effective each one of these methods are in making a system more gameful. Currently, designers most typically follow one method, a combination, or their own personal inspiration to design gameful systems, and measure if the intended psychological and behavioral changes occur. However, when these changes do not occur as expected, there is no way to precisely relating the characteristics of the system with the expected effects. A better understanding of these mechanisms and the development of more precise gameful design methods will allow designers to be more accurate when designing for specific outcomes.

6.4. Proposition 4: Systems that are more gameful, via the mediating impacts of increased gameful experience and other psychological changes, lead to increased behavioral change.

Although these paths are depicted as direct relationships in Figure 1, they are better described as indirect, mediating effects in a broader system of relationships. Specifically, the mechanism by which a gameful system affects changes in behavior is via the degree to which people experience that system as a game (i.e., gameful experience) and also experience other

key psychological changes. Thus, Proposition 4 describes the effects of system design characteristics on human behavior through intermediary psychological changes. The foundation for this proposition was presented by Hamari, Koivisto and Sarsa (2014), who suggested that all gamification interventions occur because of intermediary effects on psychological states. This has since been empirically tested; a prime example of this effect is found in a study conducted by Landers, Bauer, and Callan (2017). In this study, research participants were randomly assigned to either experience a leaderboard or a goal-setting intervention, finding that specific, difficult goals resulted in approximately the same level of performance as the mere presence of a leaderboard. Goal-setting interventions are well known to improve performance by improving self-efficacy and directing attention to desirable outcomes (Locke & Latham, 2002). Thus, it is likely that the leaderboard intervention was successful not only because it made the performance task feel like a game but also because it had similar effects to goal setting. Specifically, the leaderboard likely also increased self-efficacy and directed attention toward desirable levels of performance, common goal-setting mediators.

Beyond this prior work, we contend here that gameful experience is a common unmeasured mediator of the relationship between how gameful a system is and behavior caused by that system. Testing this proposition is more mathematically complex but will generally involve a mediational test like that employed by Landers and Landers (2014) involving bootstrapping of the confidence interval surrounding an indirect effect estimate. This can be done with either structural equation modeling (Kline, 2015) or simpler approaches (e.g., Preacher & Hayes, 2004). However, the advantages to structural equation modeling in this context is that partial effect estimates can be obtained; specifically, by modeling both gameful experience and other psychological changes simultaneously, the effect of those other psychological changes on behavior control for the effect of gameful experience on behavior (and vice-versa). It is this sort of analysis that is needed to disentangle the true causal pathway responsible for the success of any gameful design effort. Furthermore, the development of such

models will enable researchers to better understand the mechanisms behind gameful interventions and provide improved recommendations to gamification designers regarding the best choice of system characteristics for a particular targeted system-level goal.

6.5. Proposition 5: Behavioral change causes the distal system-level changes designers of gameful experiences hope to create.

Importantly, the ultimate goal held by the creator of a gameful system is unlikely to be individual behavioral change. Instead, designers of interventions more commonly hope for system-level outcomes. For example, increases in individual job performance, whether via gamification or any other intervention, are ultimately intended to increase profitability of the organization (Roth, Bobko and Mabon, 2001). Systems-level outcomes of interest to gameful designers vary greatly but include increased student development in formal and informal settings, increased user engagement in online communities and networks, improved healthcare (both from an individual and a professional perspective), harnessing the power of crowdsourcing and computer-supported cooperative work, supporting and encouraging sustainable behaviors, and improving data collection methods (Johnson, Deterding, Kuhn, Staneva, Stoyanov, & Hides, 2016; Seaborn & Fels, 2015; Walz & Deterding, 2015). For enterprise-level gamification, Raftopoulos, Walz, and Greuter (2015) identified six key areas that represent the typical primary purpose of gamified applications: (a) customer loyalty, (b) marketing, sales and promotions, (c) education, training and recruitment, (d) innovation and problem solving, (e) community good or development, (f) staff morale, motivation and productivity.

We wish to emphasize here that testing these ultimate outcomes simultaneously with the mediating processes in this model is key to advancing the gamification literature. A study that only compares the effect of presence or absence of gamification on a system-level change no longer increases knowledge of gamification. An example of such a study would be the comparison of a “gamified” design versus a “not gamified” design of a consumer-facing website on total sales generated by the website. The literature has clearly established that gamification

can influence such outcomes. The most critical research question now is *how* it does so, which is a necessary shift in research goals in order to provide practical and reliable design advice. This can only be determined via measurement of both outcomes and processes within individual research studies, so that the implied mediational hypotheses can be tested explicitly. Similar to what we have already mentioned regarding individual behavioral outcomes, a better understanding of the relationship between gameful interventions and the system-level behavioral outcomes, as well as the mediating and moderating variables, will enable researchers to and designers to create better interventions, which employ effective gameful system elements and motivational affordances to facilitate the desired system-level behavioral outcomes.

6.6. Proposition 6: User knowledge, skills, abilities, and other characteristics, as well as the situational contexts in which gameful systems are deployed, moderate the effectiveness of those gameful systems in creating gameful experiences and bringing about other psychological effects.

Knowledge, skills, abilities, and other characteristics (KSAOs), where "other" typically includes traits like personality, attitudes and interests, influence how people interact with the world around them (see e.g., Barrick & Mount, 1991; Glasman & Albarracin, 2006; Hines, Hungerford & Tomera, 2010; Kraus, 1995; Robbins, Lauver, Le, Davis, Langley & Carlstrom, 2004; Smith & Blumstein, 2008). In the game design literature, varying KSAOs lead to differences in preferences in regards to sought gameplay (e.g., some people prefer challenge whereas others prefer social experiences; see Johnson, Wyeth, Sweetser & Gardner, 2012; Yee, Ducheneaut & Les Nelson, 2012; Nacke, Bateman & Mandryk, 2014), effectiveness in regards to gameplay performance (i.e., some people may benefit more from gameplay than others; see Bauer, Brusso & Orvis, 2012), and decision-making within game worlds (i.e., people make different choices depending upon their experience and preferences; see McMahon, Wyeth & Johnson, 2012). Similar differences have been observed in the context of gameful

design, which has been captured in a user types model (Marczewski, 2015; Tondello, Wehbe, Diamond, Busch, Marzewski & Nacke, 2016) and a classification of game elements commonly used in gameful systems based upon user preferences (Tondello, Mora & Nacke, 2017).

Growing evidence suggests that KSAOs play a role in how individuals experience gameful systems more broadly. For example, Landers and Armstrong (2017) found that prior experience with games and attitudes towards games affected how valuably a gamified knowledge training program was perceived by research participants. Specifically, those with very poor attitudes and those with very little game experience reported greater perceived value from a PowerPoint presentation than a gamified presentation covering the same content, yet participants with neutral or positive attitudes and participants with moderate game experience perceived the opposite. Several such traits beyond experience and attitudes are likely relevant to the effectiveness of gameful systems at creating gameful experiences and the other outcomes intended by such systems.

Several KSAOs of particular interest appear in the literature, and most are not yet empirically tested. One is adult playfulness, which was described in an earlier section. Those higher in playfulness are likely to be more willing to engage in gameful experiences because of their general tendency to seek experiences they would consider fun (Barnett, 2007). A scale measuring adult playfulness has already been developed (i.e., Glynn & Webster, 1992), making this a particularly easy KSAO to investigate in the context of gameful design, gameful systems, and gameful experience.

A second related construct may be person-oriented gamefulness (i.e., gameful personality). This construct was suggested by McGonigal (2015a, 2015b), who suggested that individuals vary in the degree in which they are likely to engage in gameful activities, mediated by psychological traits such as strong motivation and goal orientation, confidence in one's own capabilities, enjoyment of the pursuit of new challenges, perseverance in the face of obstacles, and passion for learning new skills. McGonigal differentiates gameful personality from

playfulness in an individual following Callois' differentiation between play and games (Callois, 2011), suggesting that a playful person would be more likely to enjoy free-form, improvised, curiosity-driven activities, whereas a gameful person would be more likely to enjoy structured, goal- and challenge-oriented activities. Although this construct currently lacks a measurement method and thus empirical support, we contend it is highly promising to explore in relation to this proposition.

7. Research Agenda and Next Steps

To summarize to this point, the presented model provides a comprehensive multilevel structure of causal relationships that explain precisely how the actions of gamification designers can bring about desired organizational changes. To be clear, much more research is needed to use the model as intended. Thus, to understand its potential use, it is useful to step through a fully worked example, as if such literature already existed. To that end, consider a training designer that has been tasked with improving an existing organizational training and development program that is currently available solely in a PowerPoint format, delivered via an online course management platform. The distal change desired in this example would most likely be defined by the designer's supervisors. Most likely, this would be some variation on an assessment of return on investment (ROI) for training redesign; specifically, the designer's supervisor wants to ensure that the organization is financially benefiting from the designer spending time working on gamification. In this situation, the designer should work backwards through the model. First, what behavioral change should be targeted to maximize ROI (Proposition 5)? Given training literature, this would likely be *training transfer*, a behavioral term that describes the use of skills gained in training to complete workplace tasks (Burke & Hutchins, 2007). Thus, transfer is the targeted distal person-level outcome of interest to this designer. Next, the designer would consult the research literature to determine which psychological characteristics are most closely tied to transfer (Proposition 4). The most obvious of these is learning; a trainee must first increase their knowledge to apply that knowledge to

their work. Other changeable traits might include self-efficacy and perceived utility of the training. If gameful experience had been causally linked to transfer, which is to say if research was available suggesting that having a more gameful experience during training had been found to increase transfer, gameful experience would emerge as a key mediator as well. Next, the designer would consult the research literature to determine which system characteristics had been causally linked to each of these targeted proximal person-level outcomes (Propositions 1 and 2). Even after this full process was identified and mapped, the designer's ability to translate that process map into a specific, usable system would be critical to the system's success (Proposition 3). Thus, the given model describes every key step in the causal pathway between designer actions and ultimate system-level goals, and with adequate research on each link, would serve as a highly practical tool by which to execute such designs.

Given this potential value, the next challenge is to develop a research literature that would support such conclusions, one containing useful practical research on each proposition. Thus, we next provide specific recommendations for future research that will enable this vision of a practical gamification science in relation to gameful experience, gameful design, and gameful systems.

7.1. Proposition 1

Proposition 1 states that more gameful systems lead to more gameful experiences, a concept hinged upon the definition of gameful experience. Thus, the most critical research need in this domain, and for this entire theory, is the developmental of a measure of gameful experience. We have already provided a formative measurement model; the next task is to create psychological items and develop them according to current best practices for psychological scale development (DeVellis, 2016). As described earlier, we have conceptualized gameful experience as a formative, rather than as a reflective, construct. Most psychological traits are conceptualized reflectively; in other words, they are theorized to be a characteristic of a person that is expressed. For example, agreeableness is a trait that might be

expressed through kind actions to others, or by endorsing items describing such behaviors on a survey. Game experience, in contrast, is formative in that it is an emergent state. People do not have a causal "gameful experience;" instead, we have theorized that gameful experience emerges as the formative outcome of increasing the three reflective constructs described in the construct's definition. Thus, a formative scale incorporating (at least) three reflective measures is the next needed step to test Proposition 1.

One a gameful experience scale has been established – one that can be used in the context of games or gamification – the next task becomes to identify specific system characteristics that lead to gameful experiences, so that these characteristics can be distinguished from those that do not. As described above, there have been numerous attempts to define taxonomies of game elements, but none of these are definitive, and more importantly, without a gameful experience scale, there is no way to determine which are more likely to bring about gameful experience when implemented within a given system. Once a gameful experience measure has been developed and validated, these can be sorted more easily; thus, this emerges as the second major research goal related to Proposition 1.

7.2. Proposition 2

Proposition 2, which posits relationships between gameful systems and other psychological mediators, has a great deal of nearby empirical support but is not yet testable given the lack of a gameful experience measure. Instead, available evidence concerns relationships between specific game elements (gameful or not) and various psychological states, such as intrinsic motivation. Thus, it is unclear the degree to which traits are caused by gameful system characteristics versus characteristics that simply appear game-like. For example, the addition of points alone as part of a gamification intervention is unlikely to create a gameful experience; thus, the use of points is likely not by itself a gameful system characteristics. Given that, observed effects of the addition of points on behavior likely occurred via psychological mediators other than gameful experience. However, this hypothesis is as of

yet untested. Thus, the disentanglement of effects that occur via gameful experience versus other mediators emerges as the key research goal related to this proposition.

Once these effects have begun to be observed with trustworthy measures, research can turn to optimization. For example, if there are system characteristics that more consistently elicit both a gameful experience and other desirable psychological changes, those characteristics should be implemented more frequently and studied more intensively than characteristics that affect gameful experience alone. The strength of relative impacts on such mediators, across both Propositions 1 and 2, thus emerges as a key goal.

7.3. Proposition 3

Proposition 3, which is the system-level effect of gameful design upon gameful systems, is first and foremost contingent upon successful identification of gameful systems, as identified in the research agenda for Proposition 1. Once this has been done, specific design methods can be compared to determine which are more likely to result in realized designs containing effective renditions of gameful system characteristics. This enables the development of new, more efficient and empirically supported design methods to support designers in interpreting research literature and implementing them to meet specified goals. It also enables more direct measurement of change in system gamefulness attributable to designer actions versus situational constraints that the designer has no control over. Studying design processes as a topic distinct from system characteristics allows for more practical advice regarding the development of gameful designs. For example, it is unknown currently which design choices increase the system's potential to afford the three parts of a gameful experience (perception of goals, motivation to pursue them, and voluntary participation) most. If a system is found deficient in one area but not the other two, research is needed to determine the ideal design strategy to target that one area.

7.4. Proposition 4

Proposition 4, the mediational impacts of gameful systems, integrates and builds upon both Propositions 1 and 2. Importantly, research on Proposition 4 will be more domain specific due to the nature of behavioral change being studied. For example, the user behaviors that improve learning, such as increased time on task, are quite different from the user behaviors that improve community health outcomes, like reducing medication misuse. However, because of this domain specificity, tests of Proposition 4 will likely emerge as the most practical, because when properly designed, they should give specific clearly actionable advice to designers. For example, behavioral changes in particular domains that are most commonly associated with degree of gameful experience could be identified, as well as system characteristics most commonly associated with gameful experience. This would aid designers in determining in which contexts and using which affordances the greatest impact of gameful design would be expected, reducing testing time and therefore development costs while maximizing impact.

To that end, we provide a prototype description of a “proper research design” to serve as a model for testing aspects of Proposition 4. To be clear, there are many “proper” designs, but we suspect this one will be the most common and easily implemented. First, a target behavior will be chosen and carefully specified based upon a problem to be solved. Second, existing literature will be used to support the link between a psychological mediator (gameful experience or otherwise) and that behavior. Third, existing literature will be used to support the link between that mediator and selected game elements or affordances. Fourth, researchers will ensure high quality measurement of both the mediator and outcomes by exploring reliability and validity both in prior literature and in the data collected. Fifth, gameful systems will be operationalized such that there is a clear, isolated difference in specific game elements or affordances between systems. Sixth, participants will be independently and randomly assigned to experience one of those systems. Finally, the mediational path observed in these data will be tested using a modern approach, such as a bias-corrected bootstrapped confidence interval of

the indirect effect estimate, in a sample whose ideal size was determine before data collection to ensure that sufficient statistical power would be available to detect that indirect effect. This a priori power analysis would either be conducted via Monte Carlo simulation if the mediation was to be tested using structural equation modeling or via literature-established recommendations (e.g., power tables for the SPSS PROCESS macro created by Preacher, Rucker & Hayes, 2007).

7.5. Proposition 5

Proposition 5, which concerns the link between behavioral and system-level changes, implies that it is not enough to change people's behavior; those behaviors must lead to some larger-scale systemic change. For example, in a sales and digital marketing context, gamification should lead to proximal changes in shopping-related behaviors (Proposition 4) but also increased sales (Proposition 5). By confounding these two effects, conclusions may be inaccurate. Imagine a study experimentally concluding that narrativization increases sales with no further measurement. The present theory support that there is an unknown behavioral mediator in that relationship; narrativization might actually increase website attractiveness (psychological) which decreases the website's bounce rate from searches (behavioral) which increases sales (system-level outcome). In such a situation, narrativization could be effectively and successfully designed and found to decrease bounce rate yet sales may not increase due to external factors, such as a poorly designed sale closing experience. This would not be the gamification designer's fault or even responsibility; however, without measuring bounce rate and sales separately, the designer would think that the gamification had failed. Thus, behavioral change (the final person-level effect) must be considered independently from distal change (the final system-level effect).

Like Proposition 4, this proposition is highly context-dependent and should be studied that way. Like Proposition 4, this concern makes studies in this area highly practical but more difficult to conduct in practice. Because this is a cross-level effect, person-level effects must be

aggregated and studied at the higher level of analysis, which increases study complexity even further. In the example above, the path leading up to behavioral change can be studied in the way described under Proposition 4, by randomly assigning visitors to various types of narrativized websites, measuring their perceptions of website attractiveness and whether or not people arriving by search immediately left (i.e., bounced). When expanding that study to include sales, the research question shifts to the higher level. It is uninteresting to ask if individual bounces result in reduced individual sales, because a bounced visitor by definition purchases nothing. Instead, the system-level research question is whether reducing bounce rate via implementation of narrativization results in greater sales system-wide.

In short, these questions are the ones most designers actually want answered in the marketing context: If I implement gameful design, will I make more money? Studies seeking to address such questions must therefore randomly assign (or quasi-experimentally observe) systems, not people. Because of this complexity, most research examining Proposition 5 will likely be meta-analytic in nature. In a meta-analysis, researchers could ask, “Across studies that implemented narrativization systems, which systems were most profitable?” This keeps the core analysis entirely at the systems level but also enables a deeper dive into specific mechanisms if the data are available. Research on Proposition 5 will thus be a lower priority until the primary research literature testing Propositions 1-4 has become more extensive.

7.6. Proposition 6

Proposition 6 states that KSAOs and situations moderate the effectiveness of gameful systems upon focal psychological mediators. Importantly, the variables described by this proposition do not include non-design-relevant moderators, like those described by Landers et al. (*in press*). Although such moderators are also important, they are not unique to gameful design or experience, and are instead a general problem for gamification design more broadly. Thus, in Proposition 6, we focused upon moderators for which gameful experience is uniquely relevant.

As noted earlier, there are already a host of KSAOs commonly studied in the gamification literature, and we recommend that to continue. Specific psychological traits, like experience with games and adult playfulness, commonly appear. Demographic characteristics, like gender or age, are generally not desirable as moderators because these characteristics are better consider proxies for other, more meaningful characteristics. For example, observed differences in performance associated with age might instead by caused by cognitive declines associated with aging, different levels of experience with games, or personality changes across the lifespan. Research on moderators should endeavor to avoid simple demographics and instead focus upon more interpretable characteristics.

In terms of specific research priorities, it is best to consider moderator variables to be "boundary conditions" for the effectiveness of gameful systems and study these conditions. For KSAOs, this suggests exploring what types of users would be more or less responsive to gamification interventions. For example, if experience with games was found to be a key moderator for gamification's success, this would suggest a priori that implementation of a gamification intervention in a population where most people had little or no experience with games would be ineffective.

For situational constraints, the same boundary conditions occur at a higher level. For example, if play climate, which refers to an organization's general level of supervisor and resource support for play during work hours, is poor, then that system characteristics may undercut the success of any gameful interventions to be implemented within that organization. Much like the cross-level effects described as research priorities for Proposition 5, situational moderators must be evaluated as multilevel issues because they are theoretically experienced identically by all users within a higher-level unit. For example, if a company randomly assigned 25 work teams to experience different versions of a gameful system, play climate could be measured within each of those work teams as a system-level effect, and the success of

gamification could be evaluated by considering both changes in individuals within teams (person-level) and existing differences in play climate (system-level).

8. Summary and Conclusion

In summary, we have presented here a comprehensive theory of the causal relationships linking the specific decisions made by system designers to practical outcomes of interest to those considering implementation of gameful design, via relevant mediating processes. Specifically, successful gameful design leads to gameful systems that bring about gameful experiences and other desirable psychological changes among users. These two changes themselves lead to measurable behavioral changes among users that are in turn linked to system-level outcomes of interest. It is only through this causal pathway that the designer of a system can produce the ultimate outcomes they desire. We have furthermore carefully defined the nature of gameful experiences by their three psychological components and provided some early direction on how gameful systems might bring about such experiences. This provides a powerful framework for understanding how all gameful design interventions affect the outcomes they are intended to affect, across fields. We have also outlined a research agenda explaining how this theory should be tested and expanded moving forward.

To provide another illustration as to how this theory could be applied, consider an instructional designer who wishes to improve learning outcomes among his students by converting a learning activity into a gameful system. Using gameful design principles, this designer decides to add a storyline to the activity to improve student engagement, making it a somewhat gameful system. For this system to be successful as an intervention, his learners must have a gameful experience as a result of this addition. They must first perceive that the goals of the activity are non-trivial and achievable, and they must decide that those goals are worth their effort to pursue them. However, most critically to its success as an intervention, his learners must believe that they are engaging with the story by their own volition. If his learners choose to participate in the storyline, perhaps as characters themselves, they will have a

gameful experience. If his learners do not choose to participate in the storyline, or if they feel they have been forced to take on the role of the characters in the story, they will not have a gameful experience. In either case, the inclusion of the activity may still lead to increased participation in class (i.e., a behavioral outcome) and subsequent changes in learning outcomes (i.e., distal changes). This is possible despite varying levels of gameful experience due to other potential psychological effects of the activity. In short, the activity may be successful because it is a gameful system or because of other specific psychological changes brought about by that system. The only way to know is to measure gameful experience and test it as a mediator between the use of the storyline and the learning outcomes it is intended to affect; the designer would expect meaningful variance in the relationship between the use of storyline and increased participation to be explained by variance in gameful experience. If gameful experience does not mediate that relationship, the increased participation should be attributed to other, perhaps unmeasured, intermediary processes. Thus, accurate measurement of gameful experience emerges as the single most important priority for future research emerging from our development of this theory.

To illustrate how the proposed theory would aid the designer's decision-making process, the following scenario explains the propositions from the perspective of an instructional designer. This designer would begin from the end of the model and work backwards (see Figure 1). The first step would be to define what are the intended distal, system-level outcomes. For example, the designer would decide what kind of learning improvements are being sought with the gamification of the system. Next, according to proposition 5, the designer would need to understand what are the person-level individual behavior changes that would lead to the desired system outcomes. As an example, these could be student actions such as interacting more often with the course material, participating of online forums, or completing optional assignments, to mention a few. Then, according to proposition 4, the designer would need to identify what intensity (and perhaps what kind) of gameful experiences or other types of

experiences could facilitate the desired changes in student behavior. Via the models constructed as a result of research on propositions 1, 2, and 6, the designer would then be able to establish what characteristics the gameful learning system should have to afford the desired experiences for students. Finally, using the gameful design methods developed as a result of research on proposition 3, the instructional designer would be able to effectively reference the literature on gameful design elements to build a specific, new system, imbued with the characteristics deemed necessary for its success given the situational constraints imposed upon it and the types of people at which it is targeted. By following all these steps, the designer could ensure that the resulting system design would carry the potential to facilitate the individual and system-level outcomes that were intended in the first place.

Importantly, as described by Proposition 2, intermediary processes other than gameful experience have already been proposed in the gamification literature. Specifically, Huotari and Hamari (2012, 2016) identified several experiential conditions that often occur in games but not necessarily in all games. These include hedonic pleasure, mastery, achievement, relatedness, suspense, competence, flow, and immersion. Because these conditions are not present in all games, we did not include them in our definition of a gameful experience; however, their list serves as an important and compelling starting point to understand what other psychological effects may be common in gameful systems. For example, although a designer may intend to create a gameful system that brings about a gameful experience, that system may in fact only create a sense of immersion. That does not diminish the value of the system if behavioral change is still achieved as intended, but it does situate the effort among immersion interventions instead of gameful design. For example, Howard, Resnick, Kutz, Mahla, Nestor and Bet (2015) tested the effectiveness of virtual reality headsets in employee training by asking research participants to watch a video presentation either on a computer monitor or within virtual reality, finding that learning outcomes were worse with the headset on. Although wearing a virtual headset to complete training might seem game-like and was quite likely immersive, simply

watching a presentation wearing a headset is unlikely to be a gameful experience first because the choice of device was clearly not volitional. If Howard and colleagues had been able to measure both gameful experience and immersion as mediators, they would likely have found that gameful experience did not differ between conditions even if immersion did, suggesting that gameful design had little to do with the reduced learning outcomes they observed. Thus, distinctions between mediators, alongside proper measurement, are critical both theoretically and practically.

Overall, we view two concerns as the most immediate future research directions directly informed by this theory. First, the specific causal mechanisms involved in the effects of gameful systems are critical for the further development of this research literature and the presented theory. Research demonstrating an effect of a gameful system on an outcome of interest does not provide additional theoretical clarity unless its mediational processes are theorized, isolated, measured, and evaluated within a modern casual inference framework (e.g., Pearl, 2009). Second, the measurement and isolation of the focal psychological mediator, gameful experience, is critical to identifying specific value of gameful system characteristics and gameful design beyond existing interventions. To ensure high quality measurement, a formal scale development and construct validation and study is needed to confirm and build upon that aspect of the present theory. Specifically, three scales should be created to capture the three aspects of gameful experience theorized here, and these three scales should be validated both individually and together against theoretically linked outcomes.

Once the measurement of gameful experience has been established, each of the propositions described here is empirically testable, and the most informative gamification research will test them as simultaneously as possible. The characteristics of systems that lead to gameful experiences can be modelled. The design decisions that create those characteristics can be organized. The nomological net of gameful experience can be established, describing the outcomes and correlates of such experiences. The real, practical changes that gamification

designers seek can be predicted to provide a roadmap to effective implementation across a wide variety of contexts. This theory of gameful experiences therefore serves as an effective organizational framework to explore many of the theoretical gaps highlighted across the gamification literature by prominent gamification researchers (Bogost, 2015; Deterding, 2015; Hamari, Koivisto & Sarsa, 2014; Seaborn & Fels, 2015). We thus encourage gamification researchers to utilize this theory as a foundation from which to systematically fill those gaps.

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