

# Current Challenges in Gamification Identified in Empirical Studies

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**Abstract:** For about ten years gamification has been a buzzword in business, and for about 20 years a topic of research in academia. Despite much commercial interest in and a potentially huge market for successful products, for instance, in the areas of education and health, much excitement is still based on speculation, reception in parts of the academic community remains sceptical, and a pervasive application in many areas of everyday life is arguably yet to happen. It might be time to take stock: By collating observations from multiple empirical studies and meta-studies, this survey identifies, briefly presents and discusses definitions, aims, applications, strategies and specifically challenges of gamification. While gamification is far from being the first or the only notion to describe attempts to connect play with purposes beyond itself, this study is based on research that identifies itself as being focused on gamification. This study does not aim to exhaustively list experiences or results of gamification, or to carry out a systematic review of the field, but to collect and highlight issues that need to be resolved or mitigated for gamification to progress. It finds problematic definitions, unclear strategies, a low number of empirical studies, methodological problems, mixed and partial results, non-uniform user behaviours, a predominant focus of studies on low-level behavioural effects and short-term effects, as well as undesirable side-effects of gamification.

**Keywords:** challenge, education, empirical survey, gamification, health

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## 1. Introduction

The idea to fit play with purposes beyond itself, to 'leverage aspects of games to achieve something beyond playfulness' (Richter, Raban, Rafaeli, 2015), has been proposed and implemented many times, before and after the 'digitalisation of society or the massive economic success of computer games' (Fuchs, 2014)<sup>1</sup>, under a plethora of monikers. This study is based on research that identifies itself as being focused on gamification.

Regardless of when and by whom the notion of gamification was first proposed (Tulloch, 2014; Hägglund, 2012), 'only around the beginning' of the 2010s (Fuchs, 2014) it 'gained widespread usage' (Tulloch, 2014), and 'has become a favoured buzzword of marketers, online strategists, start-up gurus, venture capitalists and digital consultants' (ibid.). But despite much commercial interest in and a potentially huge market for successful gamification products (critically discussed by Fuchs, 2014), for instance, in the areas of education and health, much excitement is still based on speculation, reception by 'many games studies academics and game designers' remains sceptical (Tulloch, 2014; see e.g. Fizek, 2014; Raczkowski, 2014), and a pervasive application in many areas of everyday life is arguably yet to happen. It might be time to take stock: By collating observations from multiple empirical studies and meta-studies, this study identifies, briefly presents and discusses definitions, aims, applications, strategies and specifically challenges of gamification. This study does not aim to exhaustively list experiences or results of gamification, but to collect and highlight issues that need to be resolved or mitigated for gamification to progress. The survey is not systematic, but includes empirical gamification studies and meta-studies that are identified through online searches using various search engines such as *Google Scholar* (in April and May 2018), and surveys of empirical studies this author is aware of such as Hamari et al. (2014), Seaborn and Fels (2015), and Johnson et al. (2016).

## 2. Definitions of gamification

Gamification is often defined as the process of transforming a non-play and usually purposeful activity in some way and to some degree into a play activity, that is, usually, a game (Deterding, 2015)<sup>2</sup>, while keeping the purpose intact; the resulting artefact is said to have been *gamified*. Full-fledged so-called serious games that incorporate some e.g. educational elements are thus not addressed by this notion (Seaborn, Fels, 2015).

Gamification is taken here to be a *motivational method*; 'an attempt to afford for the emergence of intrinsic motivations' (Hamari, Koivisto, Sarsa, 2014) by harnessing the intrinsic motivation that drives play, 'by getting

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<sup>1</sup> Fuchs (2014) 'present[s] examples' of 'predigital gamification' from the areas of 'religious practice, music, magic, education, lifestyle, and styles for killing'.

<sup>2</sup> For a critical account of which qualities are usually recognized by gamification attempts in games and thus reproduced outside and independent of them see Raczkowski (2014).

close as much as possible to the enjoyable and fun experience found in games' (Rapp, 2017; see Deterding, 2015). In the area of education, 'applying game mechanics to the classroom should increase students' *intrinsic motivation* to learn' (Hanus, Fox, 2015, *emph. added*). Gamification can thus be seen as a turn away from a reliance on traditional methods of extrinsic motivation such as 'rewards or punishments' (Johnson et al., 2016). The findings of Seaborn and Fels' (2015) meta-study 'suggest an emerging consensus' in gamification to focus on 'intrinsic, or internally-driven, motivation above and beyond a reliance on extrinsic, or externally mandated, motivators'.

One early and still prominent (Rapp, 2017) definition of gamification in the academic discourse is Deterding et al.'s (2011) definition, which focuses on the use of game design elements and game mechanics (Seaborn, Fels, 2015) in non-game contexts. It assumes that 'single design elements, such as points, badges and leaderboards' can be extracted 'from their original gaming context' and implanted 'in other environments', with 'their effects on players' intact (Rapp, 2017). Kapp (2012 *qtd. in* Seaborn, Fels, 2015) similarly names 'game-based mechanics, esthetics and game thinking' as elements to employ in gamification.

An alternative perspective for gamification is offered by Huotari and Hamari (2012) who propose to focus on 'invoking the same psychological experiences as games (generally) do' (Hamari, Koivisto, Sarsa, 2014). Very similarly, Werbach defines gamification as 'the process of making activities more game-like' (2014 *qtd. in* Sailer et al., 2017) and aims to 'elicit user experiences typical of games' (Sailer et al., 2017). Werbach and Hunter's (2012) definition of gamification appears to aim to combine the approaches of Huotari and Hamari (2012) and Hamari et al. (2014); they posit to use game elements such as 'dynamics, mechanics, [and] components' (Seaborn, Fels, 2015) but not to create game-like systems (*ibid.*), but to 'take advantage of human psychology in the same way that games do' (*ibid.*). Sailer et al. (2017) appear to employ a very similar notion; they propose a 'definition that combines both views', that is, Deterdings et al. (2011) and Werbach's (2014), to 'define gamification as the process of making activities in non-game contexts more game-like by using game design elements'.

These definitions are not unproblematic. For instance, it is often unclear what a game design element is, which psychological effect it has on players/users (Seaborn, Fels, 2015) and how it interacts with other elements, and that many game elements are actually not unique to games (Hamari, Koivisto, Sarsa, 2014). A majority of 'reviewed methods' (Deterding, 2015) of gamification appear to centre around the same, relatively small set of popular 'design elements' (*ibid.*). These 'largely consist [of] [...] points, achievements, leader boards, levels, virtual items, quests/missions, avatars, collections, unlocking, engagement loops, onboarding, competition, cooperation, or feedback' (*ibid.*). Mekler et al. (2017) observe that typical gamification implementations most often use '[p]oints, levels and leaderboards, [...] the poster children of gamification [...], due to their apparent connection to digital games [...] and due to them being readily applicable to various non-game contexts'.<sup>3</sup> While Deterding et al. (2011) 'propose to define game design elements as those elements that are characteristic of games, i.e. that can be found in many games, and that are significant to the meaning of the game' (Sailer et al., 2017), Sailer et al. note that it 'is often somewhat arbitrary and subjective' (*ibid.*), 'which building blocks should be identified as characteristic game design elements' (*ibid.*); they also point out that the use of 'many different game design elements [...] can result in very diverse applications' (*ibid.*). It is also often unclear which particular experiences are facilitated by games, and how these can be brought about.

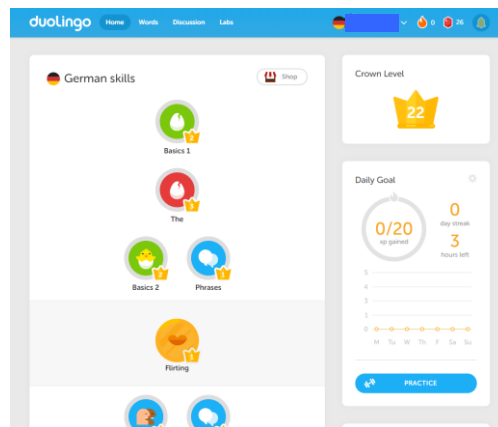
Attempts to mitigate the issues are undertaken. Deterding (2015) addresses the gap between game design elements and player experience by proposing a design framework. Sailer et al. (2017) investigate how a set of game design elements correlates with the satisfaction of psychological needs of players; they find 'that specific game design elements have specific psychological effects' (*ibid.*). Mekler et al. set out to 'experimentally investigate the effects of individual game elements' on 'both behavioral outcomes and users' intrinsic motivation' to address the problem that 'most empirical gamification studies investigate the impact of multiple game elements [at the same time], making it difficult to pinpoint how and to what extent these game elements contribute to user motivation and behavior' (2017). Their study examines 'specifically [...] how points, leaderboards, and levels, – three of the most commonly employed game elements [...], – affect need satisfaction, intrinsic motivation and performance' (*ibid.*). They find that 'in this particular study context, points, levels and

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<sup>3</sup> Sailer et al. posit that '[g]ame design elements', that is, 'the basic building blocks of gamification applications [...] are largely equivalent with game design patterns' (2017) – a position that appears not to be pervasively represented in the discourse; certainly it is absent from Deterding et al.'s 2011 definition.

leaderboards may have functioned as (effective) extrinsic incentives' (ibid.), leading to neither 'more feelings of competence' nor to increased 'intrinsic motivation compared to the plain condition' (ibid.).

Depending on notion and method or framework, 'the specific designs and realizations of gamification environments can be quite diverse' (Sailer et al., 2017). Examples of gamification include applications as different as *FourSquare*, *Stack Overflow*, *CAPTCHAs* and *Duolingo* (Richter, Raban, Rafaeli, 2015; Figure 1), the *Khan Academy* and *Codecademy* (Hägglund, 2012), an in-house currency at Google, a carpooling game at SAP, the *Foldit* campaign for participants to playfully solve scientific problems, recycling initiatives by Recycle Bank, Opowerl and the Halton Borough Council, a response-time leaderboard at Engine Yard, and gamified annual reviews at Spotify and Living Social (Dale, 2014).



**Figure 1:** Example – *Duolingo* user home page interface with gamification elements

### **3. Aims of gamification**

Gamification may aim to facilitate engagement and motivation (Raczkowski, 2014) e.g. in educational situations (Seaborn, Fels, 2015; Hanus, Fox, 2015; Sailer et al., 2017; Mekler et al., 2017), to sweeten or 'to inject a little fun into mundane activities' (Sardi, Idri, Fernández-Alemán, 2017) or into otherwise tedious or boring tasks (Seaborn, Fels, 2015; Hanus, Fox, 2015; Sardi, Idri, Fernández-Alemán, 2017); 'to promote participation, persistence and achievements' (Richter, Raban, Rafaeli, 2015); to change behaviour (Aparicio et al., 2012; Nicholson, 2012; Blohm, Leimeister, 2013; Sakamoto, Nakajima, Alexandrova, 2012 in Seaborn, Fels, 2015; Rapp, 2017) which might include 'increased participation, improved performance, or greater compliance' (Seaborn, Fels, 2015; Rapp, 2017); to function 'as an analytical strategy to capture and track data in a system' (Seaborn, Fels, 2015); 'to create engaging workplaces [...]; facilitate mass-collaboration [...] or encourage knowledge contribution' (Richter, Raban, Rafaeli, 2015); 'to incentivize repeat usage, increase contributions, and establish user reputations' (ibid.); and to 'solve problems' (Kapp, 2012 qtd. in Seaborn, Fels, 2015).

### **4. Applications of gamification**

Popular application contexts for gamification include commerce, education/learning, self-optimisation (health/exercise/wellness and 'healthy food habits' (Raczkowski, 2014; Rapp, 2017)), 'control on patients' diseases' (ibid.), intra-organizational systems and sharing, environmentally sustainable consumption and 'environmental protection' (Sailer et al., 2017), work/workplace, innovation/ideation, data gathering (Hamari, Koivisto, Sarsa, 2014; Richter, Raban, Rafaeli, 2015; Hanus, Fox, 2015); consulting (Raczkowski, 2014); marketing/customer loyalty, politics, interactive systems (Richter, Raban, Rafaeli, 2015; Herzig, Ameling, Schill, 2012 in Sardi, Idri, Fernández-Alemán, 2017); online communities and social networks, as well as crowdsourcing (Seaborn, Fels, 2015).

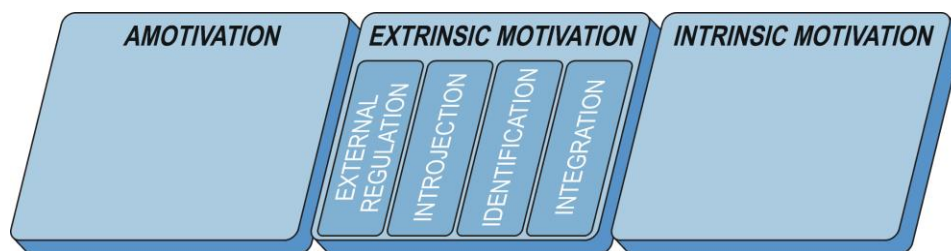
In their 'review of applied gamification research' Seaborn and Fels (ibid.) observe 'a wide range of interest but a largely limited playing field'. The focus appears to lie 'largely' within 'the domain of education, and to a lesser extent [within] health and wellness, online communities, crowdsourcing, and sustainability'; Sardi et al. (2017) see 'considerable interest in applying gamification to the digital healthcare industry'.

## 5. Strategies for gamification

While one could plausibly assume that to introduce external incentives generally increases participants' motivations for an activity, this is not necessarily the case. On the contrary, they might even compromise participants' intrinsic motivations. According to Cognitive Determination Theory (CET), intrinsic motivation is sustained by 'the innate psychological needs for competence and self-determination' (Deci et al. 2001). People's 'perceptions of competence and self-determination' are impacted by 'external events such as the offering of rewards, the delivery of evaluations, the setting of deadlines, and other motivational inputs' (ibid.). Events 'that lead to a more external perceived locus of causality' decrease people's perceived self-determination and 'undermine [their] intrinsic motivation'; whereas events 'that increase [people's] perceived self-determination (i.e., that lead to a more internal perceived locus of causality) will enhance [their] intrinsic motivation' (ibid.). Similarly, 'events that increase perceived competence will enhance intrinsic motivation so long as they are accompanied by perceived self-determination [...], and those that decrease perceived competence will diminish intrinsic motivation' (ibid.).

Deci et al. posit that incentives such as rewards 'have two aspects' (2001), that can lead to people to feel either 'feel competent and in control' or to 'feel powerless and incompetent' (Hanus, Fox, 2015). CET explains that '[t]he *informational* aspect conveys self-determined competence and thus enhances intrinsic motivation', while 'the *controlling* aspect prompts an external perceived locus of causality (i.e., low perceived self-determination) and thus undermines intrinsic motivation' (Deci, Koestner, Ryan, 2001). The use of desirable, 'tangible rewards (including material rewards, such as money and prizes, and symbolic rewards, such as trophies and good player awards)' decreases intrinsic motivation, 'because tangible rewards are frequently used to persuade people to do things they would not otherwise do, that is, to control their behavior' (ibid.).

Several gamification strategies can be identified that thus aim to facilitate the emergence of intrinsic motivations. Nicholson (2012) subscribes to the idea for gamification 'to buil[d] upon intrinsic, or internal, motivation rather than [on] extrinsic, or external, motivation' (Seaborn, Fels, 2015). He 'outlines a number of core theories that could inform a more intrinsic gamified strategy for meaningful engagement' (ibid.). Based on '*o*rganismic integration theory [Ryan, Kuhl, Deci, 1997], a sub-theory of self-determination theory' (Seaborn, Fels, 2015), he 'proposes a user-centred framework for *meaningful gamification*' (ibid.), which 'articulates useful design values (user centricity, transparency, personalization)' (Deterding, 2015). The main mechanic appears to be to move the external motivators for the desired outcomes of the intervention along the 'continuum of motivation intentionality mediated by internal and external methods of control' from 'extrinsic motivation' towards 'internally-controlled or autonomous intrinsic motivation' (Seaborn, Fels, 2015; Figure 2).<sup>4</sup> Sakamoto et al. (2012) develop a similar 'value-based gamification framework for designers aiming to encourage and harness intrinsic motivation' (Seaborn, Fels, 2015). Zichermann (apparently Zichermann, Linder, 2010) propose 'to craft extrinsic motivators – external controllers of behavior – such that they feel like or become internalized as intrinsic motivators' (Seaborn, Fels, 2015).<sup>5</sup>



**Figure 2:** Regulatory styles in human motivation (after Ryan, Deci, 2000)

Zichermann (2011) judges the appeal to 'specific intrinsic motivators' (Seaborn, Fels, 2015) in gamification as too unreliable, 'given [the] individual variability in what is intrinsically motivating' (ibid.). Linderoth (2014) similarly observes that 'there is no one-size-fits-all relationship between game design and intrinsic interest and enjoyment'. Zicherman thus 'argue[s] that extrinsic motivators should be designed with the goal of addressing intrinsic factors' (Seaborn, Fels, 2015). However, addressing generic intrinsic motivators may not simply be a (technical) question of picking and using certain (game) design elements – how a system or 'a given motivator –

<sup>4</sup> Deterding (2015) criticizes Nicholson's model for failing to articulate an 'actual method'.

<sup>5</sup> Rapp (2017) identifies and outlines an internalising strategy in *World of Warcraft* that stimulates players 'to interiorize new habits' based on 'the norms of the guild which they belong to'.

game element, feedback, piece of information' (ibid.) is read by its users 'depends on individual and contextual factors' (ibid.; see Deterding, 2015). Nonetheless, a number of models are proposed of how to represent external motives 'in concrete game elements' (ibid.) which then translate those into intrinsic motivations. Seaborn and Fels comment that 'more research on how to design for intrinsic motivation using extrinsic motivators as well as the effects of non-monetary incentives on motivation is needed to validate this approach' (ibid.).

A complementary approach is to use specific, individualized implementations targeted at particular target audiences, rather than an 'ideal gamified system – an optimal combination of game elements, mechanics, and dynamics that always works' (Seaborn, Fels, 2015). Seaborn and Fels propose that the design of gamified systems would negotiate the 'individual differences in *what* is intrinsically motivating' with 'the objectives, requirements, and restrictions of the designer (or client)' (ibid.; see Deterding, 2015). Such 'gamified systems may need to be selectively designed given the individual makeup of the end-user population or even be designed flexibly and inclusively, allowing for personalization and customization, to accommodate individual users' (ibid.).

## **6. Challenges of gamification**

Many expectations are expressed about effects of gamification, for instance, in the area of education. Researchers speculate 'that the incorporation of certain game mechanics with clear learning objectives in mind can create an engaging and meaningful experience' (Hanus, Fox, 2015), and that '– provided a non-controlling setting, – the well-thought out implementation of game elements may indeed improve intrinsic motivation by satisfying users' innate psychological needs for autonomy, competence and relatedness' (Mekler et al., 2017).

A number of meta-studies or literature reviews attempt to establish empirical results of gamification. But the number of empirical studies of gamification is relatively low yet (Johnson et al., 2016; Hanus, Fox, 2015; Lieberoth, 2014); Richter et al. (2015) note that while an increasing number of 'applications use game design elements to motivate user behavior in non-game contexts [...] there is to date little empirical research on how gamification works and whether it succeeds in promoting user motivation'. Johnson et al.'s review (2016) only 'identifie[s] 19 papers that report empirical evidence on the effect of gamification on health and well-being'; Seaborn and Fels (2015) review 30 papers which investigate 31 instances of gamification; and Hamari et al. (2014) find '24 empirical studies' that respond to the question, 'Does gamification work?'

So far, the results appear to be mixed or inconclusive (Hanus, Fox, 2015; Seaborn, Fels, 2015), 'with mostly moderate or lower quality of evidence provided' (Johnson et al., 2016). Many studies 'suffer from methodological problems' (Hanus, Fox, 2015) such as small sample sizes, missing control groups, gamification variously applied to initially boring or interesting tasks (Hamari, Koivisto, Sarsa, 2014; Johnson et al. 2016). Johnson et al. (2016) report 59% positive and '41% mixed effects'; of the 24 studies Hamari et al. (2014) review, two are fully positive and 13 are partly positive; and Seaborn and Fels emphasize that the '[f]indings concerning the effectiveness of gamification were mostly positive (61%), but there were a fair amount (39%) of mixed results' (2015). They posit that '[m]ore research is necessary to determine if these results are significant and reproducible' (ibid.).<sup>6</sup>

Empirical of gamification studies usually test combinations of multiple elements. Hamari et al. (2014) find in their 'literature review' that '[t]he majority of the reviewed studies did yield positive effects/results from gamification' but that 'most of the quantitative studies concluded positive effects to exist only in part of the considered relationships between the gamification elements and studied outcomes'. Hanus and Fox (2015) observe that 'the effectiveness of various gamification elements ha[s] not been sufficiently tested'.

Many studies report non-uniform or even erratic user behaviours, and significant variances across application contexts (Hamari, Koivisto, Sarsa, 2014). For instance, while their 'review indicates that gamification provides positive effects', Hamari et al. (ibid.) report that 'the effects are greatly dependent on the context in which the gamification is being implemented, as well as on the users using it'. While 'in all of the studies', users of gamified applications experienced 'engagement and enjoyment', the 'same aspects were most often disliked by some respondents in the study' (ibid.). A study by Denny (2013) of 'an online multiple-choice question (MCQ)-based learning system [...] investigate[s] how badges could be used to motivate participation' (Seaborn, Fels, 2015). He finds that the use of badges 'motivated the number of answers submitted and [the] duration of [the]

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<sup>6</sup> Seaborn and Fels also offer that 'the file-drawer effect – where null or negative results are not considered or published – may also be at play' (2015), that is, explain reports of positive results of gamification.

engagement, without impacting response quality' (ibid.). However, unaffected by the badges were 'the number of questions authored or [the] perceived quality of the learning environment'; and 'students who did not use badges submitted four times the amount of answers required, indicating that the activity was intrinsically motivating regardless of the gamification features employed' (ibid.). An 'interest in viewing, if not collecting, badges was not uniform across students, suggesting that students were motivated for different reasons' (ibid.). Hamari et al. offer as an explanation of the variances across users that 'people in fact interact with game-like systems in different manners, and for different reasons' (2014), and with different experiential results (ibid.). Seaborn and Fels (2015) share a similar observation from their meta-study, that '[i]n some cases', for instance, Gåsland (2011), Passos et al. (2011) and Witt et al. (2011), 'the effects of gamification varied among individuals'. They report that several studies such as Bagley (2012) show 'an impact' of 'demographic variables and the expectations attached to those variables [...] on the effectiveness of gamification factors'. Context exhibits a decisive influence on the effects of gamification. Seaborn and Fels (2015) find that 'similar implementations of gamification in different domains did not necessary impact participants in the same way'.

The results reported for gamification centre on behavioural effects, rather than on cognitive or motivational. Mekler et al. find that 'the majority of currently available gamification literature focuses predominantly on studying the effectiveness of game design elements in promoting certain behavioral outcomes [...], largely ignoring the underlying psychological mechanisms that may actually account for these effects' (2017; cf. Lieberoth, 2014). Given the focus of and interest in creating, maintaining and increasing intrinsic motivations, it might surprise that what can be observed in empirical studies so far is rote reinforcement learning (Johnson et al., 2016). In their meta-review of '19 papers', Johnson et al. (2016) find that results 'were largely positive for behavioural impacts (13 positive, 6 mixed or neutral)' (ibid.) such as 'physical activity' (ibid.), 'whereas the evidence for cognitive outcomes is less clear-cut, with an approximately equal number of reported positive (n=8) and mixed/neutral (n=9) impacts' (ibid.). They find that '[a] notable 84% of all individual studies involved rewards in some form (16 out of 19 studies)' (ibid.). Johnson et al. do not find 'a single included study' which 'capture[s] effects of game design elements on intrinsic motivation as a direct outcome'; they take this to indicate, 'together with the fact that the majority of studies focused purely behavioral outcomes [...] that the dominant theoretical and practical logic of the studied health and wellbeing gamification interventions is positive reinforcement' (ibid.). Thus, 'the promise of intrinsically motivating health behavior by taking learnings from game design is currently neither explored nor tested' (ibid.).

Not all effects of gamification are desirable. Hamari et al. (2014) note that while '[a]ll of the studies in education/learning contexts considered the learning outcomes of gamification as mostly positive [...] at the same time, the studies pointed to negative outcomes which need to be paid attention to', such as increased competition. Hanus and Fox identify as 'potential areas for concern' in education gamification 'increased social comparison, competition, and reward systems [which] might have detrimental effects over the long term for students' motivation, satisfaction, enjoyment, and engagement with class material' (2015). Specifically, they identify 'some common mechanics used in classroom gamification' such as 'leaderboards, badges, and competition mechanics' that 'may harm' intrinsic motivation, 'satisfaction, and empowerment' and lead to 'lower final exam scores' (ibid.).<sup>7</sup> Tohidi and Jabbari posit that competition 'in general' is a factor in extrinsic motivation, 'because it encourages the performer to win and beat others, not to enjoy the intrinsic rewards of the activity' (2012; cf. Hanus, Fox, 2015); they list as examples of extrinsic incentives '[a] crowd cheering on the individual and trophies' (Tohidi, Jabbari, 2012). An empirical study by Mekler et al. supports this view; it finds that 'in this particular study context, points, levels and leaderboards functioned as extrinsic incentives, effective only for promoting performance quantity' (2017). Schunk notes that competitive in-game performance can be a motivating goal for a player; watching competent players or read a highscore list provides models for self-efficacy (2014). But competition can increase as well as decrease users' (extrinsic) motivations. The same 'social features [...] designed to create a competitive environment' which positively and effectively encourage 'self-improvement' (Sardi, Idri, Fernández-Alemán, 2017), might also act as demotivating factors when 'users may actually feel disheartened if they are not able to surpass their fellows or [when] they realize that they do not have in-app friends to connect with' (ibid.).

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<sup>7</sup> Hanus and Fox (2015) maintain that their 'findings [...] align with existing literature on the negative effects of rewards on motivation (Deci, Koestner, Ryan, 2001; Lepper, Greene, Nisbett, 1973; Tang, Hall, 1995) as well as the negative effects of social comparison on motivation and performance in educational settings'.

Many studies of gamification measure only short-term effects while long-term effects remain unclear. One specific short-term effect that may interfere with the assessment of empirical effects of gamification is the novelty effect (Hamari, Koivisto, Sarsa, 2014; Lieberoth, 2014). Seaborn and Fels (2015) speculate that 'early positive results may be subject to the phenomenon of regression to the mean due to the novelty factor associated with gamified systems'. They observe a specific 'lack of comparative and longitudinal study designs, despite the literature suggesting that gamification effects, especially if they rely on extrinsic motivation, may be temporary or even damaging over time [...] unless participants never stop engaging with the gamified system'. Wu (2011) explains that 'when the external incentives can no longer keep pace with the users' expectation, they will lose all their motivation to perform the gamified behavior'.<sup>8</sup> Koivisto and Hamari's (2014) study 'show[s] that the appeal of a gamified system might be due to a novelty effect, and that positive effects such as engagement and interest decrease over time' (Hanus, Fox, 2015). Hanus and Fox (ibid.) speculate that '[i]f all of a student's classes were gamified', gamification 'might lose its appeal even faster'; and Wu (2011) predicts that 'at some point, consumers must get tired of gamification' and 'start to resent any type of gamified activity'. Sardi et al. (2017) acknowledge the hope that gamified systems in e-Health 'may positively affect users' emotional experiences and foster their satisfaction and self-esteem' and 'highly motivate users to change their health behaviors and stay engaged with the application', and that gamification 'can be of great assistance in yielding a regular use of the application'. But they also find 'still a dearth of valid empirical evidence' in the area of 'gamification in e-Health'; this is specifically apparent because 'most of the e-Health applications and serious games investigated have been proven to yield solely short-term engagement through extrinsic rewards' (2017). Hamari et al. (2014) report that '[t]he main results' from a study on intra-organizational systems by Farzan et al. (2008) 'indicate that gamification has a positive effect on some users for a short time'. Hanus and Fox's study of educational gamification is a rare example of a longitudinal study of a full '16-week semester' (2015) and compares two instances of a university course; one of which is gamified. While 'students from each course started at the same levels of intrinsic motivation, satisfaction, effort, social comparison, and empowerment' (ibid.) they report a decrease in 'motivation, satisfaction, and empowerment over time' for the 'students in the gamified course' compared to the students 'in the non-gamified class' (ibid.).

## **7. Conclusion**

This survey set out to identify, to briefly present and to discuss definitions, aims, applications, strategies and specifically challenges of gamification. By collating observations from multiple empirical studies and meta-studies, it found problematic definitions, unclear strategies, a low number of empirical studies, methodological problems, mixed and partial results, non-uniform user behaviours, a predominant focus of studies on low-level behavioural effects and short-term effects, as well as undesirable side-effects of gamification. If gamification is to progress and mature, these issues need to be resolved or mitigated. This author speculates that the most significant handicaps of these are the pervasive reliance on an outdated behavioural understanding of human motivation and the predominance of research on short-term effects.

Not addressed in this study is the question if the challenges pointed out are indicative of shortcomings or faults of the implementations of gamification in particular projects or of conceptual problems. If a conceptual incompatibility between play and purpose exists (see, for instance, Raczkowski, 2014), the identified challenges might be symptoms rather than causes of the mixed practical results and sceptical academic reception of gamification so far. After approximately ten years of practical application and 20 years of academic research it cannot be long before gamification conclusively validates itself as a concept and practice, finds its niche application where it excels, or is abandoned.

## **References**

- Aparicio, A.F., Vela, F.L.G., Sánchez, J.L.G. and Montes, J.L.I. (2012) Analysis and application of gamification, *Proceedings of the 13th International Conference on Interacción Persona-Ordenador*. Paper presented at INTERACCION'12, ACM, Elche, Spain, p 17.
- Abt, C.C. (1970) *Serious Games*. Viking Pr., New York.
- Bagley, K.S. (2012) *Conceptual Mile Markers to Improve Time-to-value for Exploratory Search Sessions*. PhD thesis. Univ. of Massachusetts Lowell, Ann Arbor.
- Blohm, I. and Leimeister, J.M. (2013) Gamification: Design of IT-based enhancing services for motivational support and behavioral change, *Bus. Inf. Syst. Eng.*, Vol 5, pp 275–8.
- Bogost, I. (2007) *Persuasive Games. The Expressive Power of Videogames*. MIT Pr., Cambridge.

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<sup>8</sup> However, Wu outlines 'two effective strategies that can lengthen the effective window of your gamification' (2011).

- Dale, S. (2014) Gamification: Making work fun, or making fun of work?, *Business Information Review*, Vol 31, No 2, pp 82–90.
- Deci, E.L., Koestner, R. and Ryan, R.M. (2001) Extrinsic rewards and intrinsic motivation in education: Reconsidered once again, *Rev. Educ. Res.*, Vol 71, No 1, pp 1–27.
- Denny, P. (2013) The effect of virtual achievements on student engagement, *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. Presented at CHI13'. ACM, pp 763–72.
- Deterding, S. (2015) The lens of intrinsic Skill Atoms: A method for gameful design, *Human-Computer Interaction*, Vol 30, pp 294–335.
- Deterding, S., Sicart, M., Nacke, L., O'Hara, K. and Dixon, D. (2011) Gamification: Using game-design elements in non-gaming contexts, *Proceedings of the 2011 Annual Conference Extended Abstracts on Human Factors in Computing Systems*. ACM, Vancouver, BC, pp 2425–8.
- Farzan, R., DiMicco, J.M., Millen, D.R., Brownholtz, B., Geyer, W. and Dugan, C. (2008) Results from deploying a participation incentive mechanism within the enterprise, *Proceedings of the Twenty-Sixth Annual SIGCHI Conference on Human Factors in Computing Systems*, April 5–10, Florence, Italy, ACM, pp 563–72.
- Fizek, S. (2014) Why fun matters: In search for emergent playful experiences. In: Fuchs, M., Fizek, S., Ruffino, P. and Schrape N. (Eds.). *Rethinking Gamification*. Lüneburg, Meson Pr., pp 273–84.
- Fuchs, M. (2014) Predigital Precursors of Gamification. In: Fuchs, M., Fizek, S., Ruffino, P. and Schrape N. (Eds.). *Rethinking Gamification*. Lüneburg, Meson Pr., pp 119–40.
- Gåsland, M. (2011) *Game Mechanic Based E-Learning*, Master's thesis. Norwegian University of Science and Technology, Trondheim, Norway.
- Hägglund, P. (2012) *Taking gamification to the next level - A detailed overview of the past, the present and a possible future of gamification*, Master's thesis. Umeå, Umeå University, Sweden.
- Hamari, J., Koivisto, J. and Sarsa, H. (2014) Does gamification work? A literature review of empirical studies on gamification, *Proceedings 2014 47th Hawaii International Conference on System Science*, pp 3025–34.
- Hanus, M.D. and Fox, J. (2015) Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance, *Computers & Education*, Vol 80, 2015, pp 152–61.
- Herzig, P., Ameling, M. and Schill, A. (2012) A generic platform for enterprise gamification, *Proceedings of the 2012 Joint Working Conference on Software Architecture (WICSA) and European Conference on Software Architecture (ECSA)*, IEEE, 2012, pp 219–23.
- Huotari, K. and Hamari, J. (2012) Defining gamification: A service marketing perspective, *Proceedings of the 16th International Academic MindTrek Conference*, October 3–5, 2012, Tampere, Finland, ACM, pp 17–22.
- Johnson, D., Deterding, S., Kuhn, K.-A., Staneva, A., Stoyanov, S. and Hides, L. (2016) Gamification for Health and Wellbeing: A Systematic Review of the Literature. *Internet Interventions*, pp 89–106, pre-print manuscript accepted for publication.
- Kapp, K.M. (2012) *The Gamification of Learning and Instruction: Game-based Methods and Strategies for Training and Education*. Pfeiffer, San Francisco.
- Koivisto, J., Hamari, J. (2014) Demographic differences in perceived benefit from gamification, *Computers in Human Behavior*, Vol 35, pp 179–88.
- Lepper, M.R., Greene, D. and Nisbett, R.E. (1973) Undermining children's intrinsic interest with extrinsic reward: A test of the 'overjustification' hypothesis, *Journal of Personality & Social Psychology*, Vol 28, pp 129–37.
- Lieberoth, A. (2014) Shallow gamification: Testing psychological effects of framing an activity as a game, *Games and Culture*, Dec 1, 2014, pp 1–20.
- Marczewski, A. (2012) *Gamification: A Simple Introduction & a Bit More*. Self Publishing.
- Mekler, E.D., Brühlmann, F., Tuch, A.N. and Opwis, K. (2017) Towards understanding the effects of individual gamification elements on intrinsic motivation and performance, *Computers in Human Behavior*, Vol 71, pp 525–34.
- Nicholson, S. (2012) A user-centered theoretical framework for meaningful gamification, paper presented at *Proceedings of Games + Learning + Society 8.0*, Madison, WI.
- Passos, E.B., Medeiros, D.B., Neto, P.A.S. and Clua, E.W.G. (2011) Turning real-world software development into a game, *Proceedings of SBGames 2011*. Paper presented at SBGames 2011. Salvador, pp 260–9.
- Raczkowski, F. (2014) Making points the point: Towards a history of ideas of gamification. In: Fuchs, M., Fizek, S., Ruffino, P. and Schrape, N. (Eds.). *Rethinking Gamification*. Lüneburg, Meson Pr., pp 141–60.
- Rapp, A. (2017) Drawing inspiration from World of Warcraft: Gamification design elements for behavior change technologies, *Interacting With Computers*, Vol 29, No 5, pp 648–78.
- Ryan, R.M., Kuhl, J. and Deci, E.L. (1997) Nature and autonomy: An organizational view of social and neurobiological aspects of self-regulation in behavior and development, *Dev. Psychopathol.*, Vol 9, pp 701–28.
- Richter, G., Raban, D.R., Rafaeli, S. (2015) Studying gamification: The effect of rewards and incentives on motivation. In: Reiners, T., Wood, L.C. (Eds.). *Gamification in Education and Business*, Springer, Cham, pp 21–46.
- Ryan, R. M. and Deci, E.L. (2000) Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions, *Contemporary Educational Psychology*, Vol 25, pp 54–67.
- Sailer, M., Hense, J.U., Mayr, S.K. and Mandl, H. (2017) How gamification motivates: An experimental study of the effects of specific game design elements on psychological need satisfaction, *Computers in Human Behavior*, Vol 69, pp 371–80.



- Sakamoto, M., Nakajima, T. and Alexandrova, T. (2012) Value-based design for gamifying daily activities. In: Errlich, M., Malaka, R. and Masuch, M. (Eds.). *Entertainment Computing – ICEC 2012*, Lecture Notes in Computer Science. Springer, New York, pp 421–4.
- Sardi, L., Idri, A., Fernández-Alemán, J.L. (2017) A systematic review of gamification in e-Health. *Journal of Biomedical Informatics*, Vol 71, pp 31–48.
- Schunk, D.H. (2014) *Learning Theories – An Educational Perspective*, 6th ed. Pearson, Harlow.
- Seaborn, K. and Fels, D.I. (2015) Gamification in theory and action: A survey. *Int. J. Human-Computer Studies*, Vol 74, pp 14–31.
- Tang, S.H. and Hall, V.C. (1995) The overjustification effect: A meta-analysis. *Applied Cognitive Psychology*, Vol 9, pp 365–404.
- Tohidi, H. and Jabbari, M.M. (2012) The effects of motivation in education. *Procedia – Social and Behavioral Sciences*, Vol 31, pp 820–4.
- Tulloch, R. (2014) Reconceptualising gamification: Play and pedagogy, *Digital Culture & Education*, Vol 6, No 4, pp 317–33.
- Werbach, K. (2014) (Re)defining gamification: A process approach. In Spagnolli, A., Chittaro, L., Gamberini, L. (Eds.). *Persuasive Technology*, Vol 8462, pp 266–72.
- Werbach, K. and Hunter, D. (2012) *For the Win: How Game Thinking Can Revolutionize Your Business*. Wharton Digital Press, Philadelphia.
- Witt, M., Scheiner, C. and Robra-Bissantz, S. (2011) Gamification of online idea competitions: Insights from an explorative case. *Proceedings of INFORMATIK 2011 – Informatik schafft Communities*. Lecture Notes in Informatics. Paper presented at INFORMATIK 2011. Berlin, p 192.
- Wu, M. (2011) "The gamification backlash + two long term business strategies", [online], [community.lithium.com/t5/Science-of-Social-Blog/The-Gamification-Backlash-Two-Long-Term-Business-Strategies/ba-p/30891](http://community.lithium.com/t5/Science-of-Social-Blog/The-Gamification-Backlash-Two-Long-Term-Business-Strategies/ba-p/30891).
- Zichermann, G. (2011) "Intrinsic and Extrinsic Motivation in Gamification", [online], Gamification Co., [www.gamification.co/2011/10/27/intrinsic-and-extrinsic-motivation-in-gamification](http://www.gamification.co/2011/10/27/intrinsic-and-extrinsic-motivation-in-gamification).
- Zichermann, G. and Linder, J. (2010) *Game-based Marketing: Inspire Customer Loyalty through Rewards, Challenges, and Contests*. Wiley, Hoboken.