**Information Systems:
Transforming the Future**

**24th Australasian Conference on Information
Systems, 4-6 December 2013, Melbourne**

Proudly sponsored by

Gamification – A New Phenomenon in Information Systems Research?

Jan Broer
University of Bremen
Email: jbroer@uni-bremen.de

Jens Poeppelbuss
University of Bremen
Email: jepo@uni-bremen.de

Abstract

In recent years, gamification, the use of game design elements in non-game contexts, has found widespread adoption in online-communities and social media applications with the aim to enhance brand awareness and loyalty, innovation, and online user engagement. Information Systems (IS) research seems to have just started to pay attention to gamification as a phenomenon that is worth to be studied, although the interaction of technological and social systems is at the core of the discipline. By means of a thorough literature review, we investigate whether gamification is actually a new phenomenon in IS research or if it has already been researched previously, but simply using a terminology that is different from current gamification research in other disciplines. Through this study, we identify the overlap between IS and gamification research, identify specific research needs, and suggest avenues for future research on gamification from an IS perspective.

Keywords

Gamification, IS Research, Literature Review, Research Agenda

INTRODUCTION

Gamification, the use of game design elements in non-game contexts (Deterding et al. 2011), is an approach that has found widespread adoption in online communities und social media applications recently. It is used to enhance brand awareness and loyalty, innovation, and online user engagement (Kankanhalli et al. 2012). Common examples of gamified information systems include the location-based social networking service Foursquare and the physical activity tracking and sharing service Nike+. In each case, certain elements known from (computer) games are included in non-game applications in order to encourage participation and engagement. Gamification is not limited to social media, marketing initiatives, and sporting gadgets but plays an increasing role in business applications as well. Gamification offers the opportunity to encourage user engagement in the utilization of information systems that are only of value to organizations if they are collectively used by employees, e.g., groupware, knowledge management systems, and enterprise wikis. Accordingly, industry analysts predict that "Business spending on what has become known as 'gamification' will increase from an estimated $242 million this year to $2.8 billion in 2016" (Snider 2012).

Participation, user engagement, and information system adoption are hardly new topics within the field of information systems research. However, we have just started to include the notion of gamification in our research portfolio. The Americas Conference on Information Systems 2012 and 2013 held in Seattle and Chicago, for example, featured workshops on gamification. At last year's International Conference on Information Systems in Orlando we also witnessed the first two research-in-progress papers on gamification topics (Kankanhalli et al. 2012; Li et al. 2012). A recent study published in the MIS Quarterly also mentions that digital games can be integrated "within organizational activities as serious components, with the anticipation that they can improve employees' motivation and performance." (Liu et al. 2013) Apart from this, a search for "gamification" within the accepted IS journals and conference proceedings currently yields hardly any results. As IS is the discipline that examines both technological and social systems and analyses how these two interact, we would expect the phenomenon of gamification to be at the core of the discipline.

This opens up the question of whether gamification is actually a new topic within IS research or if it has already been researched in IS, but simply using a terminology that is different from that in other research communities like human-computer interaction where gamification has been a prominent subject to books, journal publications, and conference tracks for a few years. We answer this question with the help of a thorough review of literature available from the Senior Scholars' Basket of Journals and the proceedings of the AIS conferences, using a variety of search terms which we consider to cover much of the potential overlap of gamification and IS. Thereby, we relate past IS research to the topic of gamification and contribute an agenda for future research on this topic from an IS perspective.

RESEARCH BACKGROUND

The amount of time players spend doing – often repetitive – tasks in various games (e.g., Farmville) is so enormous that developers and researchers have started looking into the question of how to utilize this combined workforce for non-game applications. A prominent example is the application Foldit which allows users to help scientists in predicting protein structures in a game-like way (Cooper et al. 2010). This process of using game design elements is often called "gamification", described as "the use of game design elements in non-game contexts" (Deterding et al. 2011) but has recently also been dubbed "gameful design". Li et al. (2012) give behaviour change, deeper inspiration, and engagement as reasons for gamification, while Zichermann and Cunningham (2011 p. xiv) write that it is used to "engage users and solve problems."

When situating the term gamification, Deterding et al. (2011) distinguish between playful and gameful design in one dimension and whole games and parts of games in the other. The game side of the scale is characterized by clear rules and outcomes as opposed to more freeform play (Caillois 1979 p. 27ff; Juul 2003). Deterding et al.'s other dimension (whole vs. parts) explains the difference between gamification and the similar, but often incorrectly used, term serious games. A serious game is a complete game that follows some non-entertainment purpose (such as educational games or human computation games) while gamification only uses game elements.

Academic research on the topic of gamification has exploded within the past two years. Search results for "gamification" on Google Scholar (hardly a reliable source due to many non-peer-reviewed sources and duplicates, but a good indicator of scope nevertheless) have grown from 67 for 2010 and 351 in 2011 to 1480 in 2012 and already 962 in the first half of 2013. Only few of these sources include actual results, however, but are mostly descriptions of projects and frameworks or theoretical recapitulations of the topic. Deterding et al. (2011) still provide the most commonly used definition for the term, though many authors use slightly modified versions. Results of experiments with gamification are reported, for example, by Herzig et al. (2012) who find positive effects on user acceptance constructs in an attempt of gamifying an ERP system. Other researchers introduced gamification to IBM's internal social network Beehive and monitored the user traffic and social interactions (Farzan et al. 2009). Many consulting companies (such as Gartner and M2 Research) and gamification providers (such as Badgeville or dopamine) report on their own experiences in articles, blogs, and books.

Potential Ends of Gamification in Information Systems Research

We see a potential of gamification in encouraging user engagement in the utilization of information systems. Many of the information systems that we know today are only of value to organizations and people if individuals and communities actively engage in using them. This is especially true for groupware, knowledge management systems and social software, including, e.g., wikis, social bookmarking and social networks. Motivating people to actively and continuously use such systems is often hard to accomplish as seen in failure rates of more than 80% for knowledge management systems (Storey and Barnett 2000). We believe that gamification can improve employees' commitment to use such systems and to execute tasks that do not create a direct value them (e.g., externalizing experiences and knowledge gained into a knowledge management system). As Kankanhalli et al. (2012 p. 2) put it, "Gamification has the potential to positively impact performance, productivity, and engagement of employees, users, or customers." Zichermann and Cunningham (2011 p. 67ff) specifically mention the use of social engagement loops to create intrinsic virality in a gamified system.

Previous IS research has analyzed factors that influence the attitude of users towards adopting and continuously using information systems. Enjoyment and playfulness reflecting intrinsic motivation have been identified as some of the promoting factors. These have also been studied intensively in the adoption and use of digital games. Therefore, we tie in with pertinent works from the IS discipline in order to identify ends for which gamification means are potentially helpful, possibly discussed in previous IS publications:

- *Engagement* refers to the behavior of users, typically interpreted as the users' active participation, e.g., in online communities (Kankanhalli et al. 2012). Engagement is typically considered a desirable and often even essential human response to computer-mediated activities (O'Brien and Toms 2008). The ability of games to engage users is one of the key drivers behind gamification (Deterding et al. 2011).

- *Flow desc*ribes a mental state where a person is fully immersed in an activity (Csíkszentmihályi 2008). To promote flow in a game, a challenge needs to be provided that is appropriate for the skill level of the player (Chen 2007). Csíkszentmihályi (2008) states that hard challenges lead to anxiety while easy tasks lead to boredom. Liu et al. (2013) found similar effects in digital games. Games lend themselves especially well to being designed around flow as they happen in a safe and controlled environment (Juul 2003) and the challenge can be adapted on the fly.

- *Motivation* refers to the question why humans do what they do. A typical distinction is made between extrinsic and intrinsic motivation. Davis et al. (1992 p. 1112) describe extrinsic motivation as referring to "the performance of an activity because it is perceived to be instrumental in achieving valued

outcomes that are distinct from the activity itself", while "intrinsic motivation refers to the performance of an activity for no apparent reinforcement other than the process of performing the activity per se." It is relatively simple to add a layer of extrinsic reward to an existing system but much harder to make using the system itself more motivating. There is an ongoing argument in both the gamification community and among motivational psychologists as to whether intrinsic motivation is inherently better to have than extrinsic motivation. Deci and Ryan (2000) argue that extrinsic motivation can even be harmful and reduce intrinsic motivation. Zichermann and Cunningham (2011) argue that extrinsic motivation leads to intrinsic motivation if properly aligned.

- *Learning* in IS research refers to either individual or organizational learning. Individual learning happens when people accumulate knowledge, understand something new, or enhance their level of competence. Organizational learning, on the other hand, can be interpreted as "an organizational [and not individual] process, both intentional and unintentional, enabling the acquisition of, access to, and revision of organizational memory, thereby providing direction to organizational action." (Robey et al. 2000, p. 130) The use of game-based methods to achieve an individual learning impact has a long tradition (Kapp 2012). IS research has discussed how information technology can be utilized for organizational learning and we see a potential positive impact of gamification on user engagement here.

- *Adoption* refers to the decision by people to make (continuous) use of an information system. Similar to learning, we can also distinguish between individual and organizational adoption. Organizational adoption means that "most, or all, of the individual members of the adopting organization must adopt the innovation" (Kishore and McLean 1998, p. 732). We assume that gamification can facilitate the individual adoption process, e.g., through only slowly (level by level) revealing the complexity of a system to a new user. Zichermann and Cunningham (2011 p. 59ff) term this approach onboarding. Furthermore, we expect the positive effect on user engagement to also positively affect system adoption.

- *User experience* refers to "a person's perceptions and responses that result from the use or anticipated use of a product, system or service" (International Standards Organization 2010) and has become a focus in software development over the past two decades. No longer does an application simply have to be functional, but it is important to include the user's reaction to it in the design process. Game design, having no goal of productivity, has always been about designing better user experiences.

- *User satisfaction* reflects the extent to which users of IS products and services (e.g., systems, reports, web sites) believe that their requirements are met. It is a multidimensional and subjective construct that has been widely used as an indicator for IS success (Delone and McLean 2003). Satisfaction is central to game design with automated systems that adapt to players' needs (Yannakakis and Hallam 2009).

This list of potential ends of gamification in IS research and practice is not meant to be complete or exclusive. Some of the presented concepts are also closely linked to each other. Nevertheless, we believe that, first, these concepts give a good overview about the potentials of gamification, and, second, that these concepts are likely to have already been subject in existing pieces of IS research that discuss game design elements, i.e., means of gamification.

Potential Means of Gamification in Information Systems Research

Several lists of game elements have been published that may serve as components for gamified information systems. Reeves and Read (2009), for instance, compiled a set of ten ingredients of great games: self-representation with avatars, three-dimensional environments, narrative context, feedback, reputations, ranks, and levels, marketplaces and economies, competition under rules that are explicit and enforced, teams, parallel communication systems that can be easily reconfigured, and time pressure. Kankanhalli et al. (2012) adopted a list by Zichermann and Cunningham (2011) with seven design elements for gamification: points, virtual badges, leaderboards, level & status, quests & challenges, progression, and viral loops. Kapp (2012) also provides such a list, comprised of goals, rules, conflict, competition, or cooperation, time, reward structures, feedback, levels, storytelling, curve of interest, aesthetics, and replay or do over. While there is some overlap in these lists, even overlapping features are described with varying terms. In order to find as many articles as possible from the IS discipline that include means of gamification during our literature search, we only present rather general concepts. These comprise the following:

- *Games or game elements* are the key concepts used to gamify information systems. Complete digital games are often researched in IS but deliberately excluded from the discussion of gamification (Deterding et al. 2011). Instead, gamified information systems just make use of selected game elements.

- *Playful design*, as described above, deals with designing systems that do not include the clear structure of games but other characteristics, such as the safety to experiment.

- *Rewards* are often offered to users of gamified applications (Kankanhalli et al. 2012). Rewards can simply be a means to stimulate user engagement and motivation (e.g., status, badges, monetary rewards) but can in some cases also represent the actual ends of gamification (e.g., individual learning if this is perceived as rewarding). Rewards in the form of badges, points, or coupons seem to be the most common form of gamification currently in use. Since rewards are also commonly found outside of games, we believe that this term warrants individual treatment although it could be subsumed under game elements.

- *Incentives* are very similar to rewards, except for a temporal distinction. An incentive is given (or promised) before the action in question, while a reward is given on completion. Expected rewards, however, can act as incentives.

- *Scores or scoreboards* are commonly used in competitions of many kinds. Competition has been shown to have an effect on both motivation and satisfaction, though different types of users seem to react differently (even negatively) to such a measure (Tauer and Harackiewicz 1999). Like rewards, scores are not always used in the context of games and are therefore also included individually.

METHODOLOGY

Literature Search

In order to examine the use of gamification-like concepts in IS literature, we performed an exhaustive search in the Senior Scholars' Basket of Journals (EJIS, ISJ, ISR, JAIS, JIT, JMIS, JSIS, MISQ) through EBSCOhost and Thomson Reuters Web of Knowledge, as well as the major conferences (ACIS, AMCIS, ECIS, ICIS, MCIS, PACIS) hosted by the Association for Information Systems through the AIS Electronic library. As our first step, we conducted an initial search for "gamification" in the titles and abstracts of papers within these sources that yielded very few results at the time of this writing. On the other hand, a search for simple related terms (such as "game", "engagement", or "incentive") led to thousands of hits, almost all of which seemed irrelevant to the topic. We therefore decided to focus our literature search and analysis on concepts that reflect the means and ends of gamification – as described above – from which we expected that they have already been subject to IS research in the past:

- Ends: user satisfaction, user experience, engagement, flow, motivation, learning, adoption;

- Means: gam*, scor*, incentive*, reward*, playful.

In order to achieve a manageable set of hits with a high probability of relevance, we searched for combinations of terms from the two lists of concepts. Each term in the list of ends above was combined with each term in list of means through the use of an AND operator (e.g., user satisfaction AND gam*, user satisfaction AND scor* etc.). These term pairs were then combined with OR operators, meaning that any combination of terms points to a potentially relevant paper. The search, which we conducted in March 2013, resulted in a list of 174 papers. These papers were then screened for relevance by the two authors of this manuscript. Each one individually rated the papers as relevant or non relevant pertaining the use of gamification in IS research. We decided about a paper's relevance based on abstract and title where possible, in cases where the abstract did not provide enough information, the full text was accessed. We concurred on 85% of the screened papers and conferred on the remaining 26 papers with disagreements regarding their relevance, eventually including 19 of them in the final literature analysis. In addition, we eliminated those papers that only contained an abstract (e.g., poster presentations on conferences). The screening process resulted in a total set of 53 papers to be reviewed, about 30% of the original set.
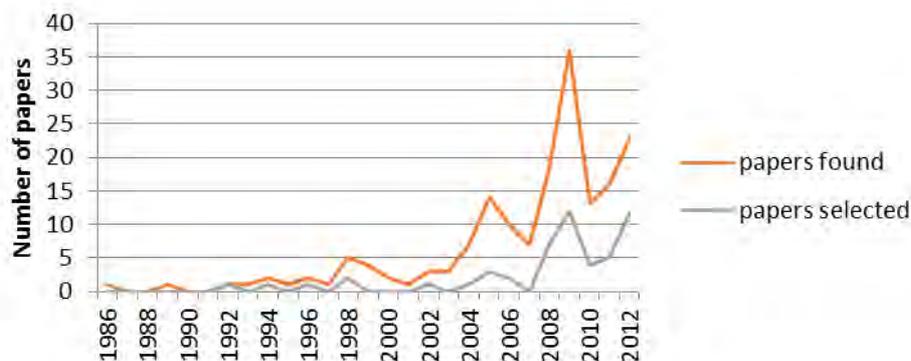

Figure 1: Temporal distribution of papers

Figure 1 shows a temporal distribution of the papers found and selected in the process detailed above. Both curves show a positive trend in the adoption of gamification-related principles in IS research, with a peak in 2009. We did not chart the numbers for 2013 (2 papers found, 1 paper selected) as the year had just started when we performed our literature search. Table 1 gives an overview about the distribution of papers across the different publication outlets that we searched.

Table 1. Papers found and selected to be relevant by publication

Journal or Conference	Papers found	Papers selected
European Journal of Information Systems	2	1
Information Systems Journal	1	0
Information Systems Research	10	1
Journal of Information Technology	2	1
Journal of Management Information Systems	20	4
Journal of Strategic Information Systems	1	0
Journal of the Association for Information Systems	3	1
MIS Quarterly	10	1
ACIS	10	3
AMCIS	46	12
ECIS	17	8
ICIS	27	10
MCIS	9	5
PACIS	16	6
Total	*174*	*53*

Literature Analysis

The 53 selected papers were reviewed and summarized according to the following criteria. We gathered the research question, scope, and methodological approach as given in the articles. We analyzed in detail which of the previously mentioned ends and means of gamification were present in these papers. Where possible, we had a closer look at the game elements discussed in the papers, the intention of their use and whether the objective was to leverage intrinsic or extrinsic motivation. The resulting notes were then categorized and the individual papers clustered according to those categories in order to identify different types of IS research that pertain to the topic of gamification. Again both authors resolved deviating categorizations of papers through discussions. The full list of all 53 papers can be found at http://bit.ly/16a4zcq.

RESULTS

First, we present excerpts from a quantitative analysis of our sample of 53 relevant papers. We tracked which of our search terms were present in the abstract or title of the papers (Table 2). For each paper, there is at least one search term referring to an end (e.g., 'engagement') and at least one search term referring to a means (e.g., 'reward*'). Some papers also mention multiple ends or means in their abstract or title. As for the ends, we see a peak for the search term 'learning' which is present in 33 of the 53 relevant papers. In contrast, there is no paper with the term 'user experience' in its abstract or title at all. As for the means, we have 38 papers with the search term 'gam*'; and 'reward*' is the second most search term occurring in 11 papers.

If we look for combinations of ends and means, we have a peak at 'learning' combined with 'gam*' which seems quite natural as both are also by far the most frequent search terms in the two separate lists. This specific combination is present in the abstract and title of 24 out of the 53 papers. However, there are also other notable combinations. For instance, we find the combination of 'motivation' and 'reward*' in seven papers.

In the following, we continue with the in-depth, qualitative analysis of the 53 papers. We structure this analysis according to the popularity of ends in our sample, starting with learning. For each end, we will briefly look at the means that are typically employed to support it as observable from our sample of papers.

Table 2. Occurrences of search terms combinations in the set of 53 papers (one end and one means)

	gam*	reward*	scor*	incentiv*	playful
learning	24	5	3	1	1
motivation	6	7	1	2	0
adoption	4	2	1	0	1
flow	6	0	0	1	0
engagement	4	2	1	1	0
user satisfaction	1	0	0	0	0
user experience	0	0	0	0	0

Learning

The dominant end in our sample of papers is to support collaborative and experiential learning with technology and/or digital games. Here, collaborative learning means that individuals achieve personal learning in a collaborative setting, i.e., while interacting with peers. Schmeil et al. (2012) as well as Robbins and Butler (2010) argue that virtual worlds provide great possibilities to generate collaborative and engaging learning experiences. Robbins and Butler (2010 p. 1) put it the following way: "In a virtual teaching case, students can experience the challenges of discovering problems; collaboratively creating, judging, and transforming resolutions; and reacting to changing circumstances." Even massively multiplayer online games are now considered "as a new generation of educational platform, allowing players to interact and to learn together." (Kong and Kwok 2009) Romero et al. (2012) develop technological requirements for collaborative game based learning and pay specific attention to the use of cooperation and competition mechanisms for ensuring that educational objectives are met.

Many IS scholars also present their innovative strategies in teaching. Zhu and Hongwei (2012) report on computing courses in which they engage students to develop financial literacy games, leading to both enjoyment in developing computer games and improved financial literacy. Hall et al. (2005) describe that the use of student response systems (devices that allow students to give immediate feedback) has made a course more engaging and motivational, increased learning, and led to improved test scores.

As for the means aiming at improving learning and teaching, the use of virtual worlds is frequently discussed (Robbins and Butler 2010). The game elements of self-representation with avatars and three-dimensional environments as identified by Reeves and Read (2009) are commonly found there (Kong and Kwok 2012; Schmeil et al. 2012). In order to develop virtual learning environments, Schmeil et al. (2012) make use of an avatar-based collaboration framework which "supports the design of novel collaboration patterns and the realization of innovative ideas in terms of collaboration activities, settings, or technological support.". Miller et al. (2012) discuss technological platforms for developing 3D applications that support exploratory learning in a detailed manner. However, comparisons of virtual worlds against less resource-intensive media indicate that "that simply using a virtual world is not sufficient to improve cognitive learning outcomes." (Jestice and Kahai 2010).

Motivation and Engagement

Analyzing our sample of papers from IS outlets, the two ends of motivation and engagement are often found in combination. Frequently, articles analyze the motivations for user engagement in virtual communities. In a work context, organizations use such virtual communities as media for knowledge sharing, e.g., utilizing web forums, wikis, blogs, email or internal social networks (e.g. Palmisano 2009). Warne et al. (2006) report how they support knowledge sharing within a single organization using a micro world simulation called Go*Team. Their intention is to "enculture the importance of collaborative processes that are at the heart of a knowledge sharing culture." (Warne et al. 2006 p. 1). Lu et al. (2011) study knowledge sharing on social media platforms used by both customers and employees providing customer support. In contrast, Lou et al. (2011) examine the motivational factors that influence the quantity and quality of knowledge contribution in a question and answer community. They identify three types of motivations: rewards for quantity and quality, learning, and the enjoyment of helping others. We also found two articles in which the motivations of people to share photos are examined (Nov and Ye 2009; Soliman and Tuunainen 2012).

With regard to motivation, the distinction between extrinsic and intrinsic motivation is a common theme in the papers that we analyzed (e.g., Lou et al. 2011; Nov and Ye 2009; Palmisano 2009). In this context, the self-determination theory by Ryan and Deci (2000) is frequently cited to characterize extrinsic and intrinsic motivation and generally considered as a "valuable approach for explanation" (Palmisano 2009). Nov and Ye (2009) refer to Lakhani and Wolf (2003) to distinguish between enjoyment-based intrinsic motivations, obligation/community-based intrinsic motivations, and extrinsic motivations/expected rewards. The discussion of

extrinsic motivation is sometimes limited to monetary rewards (Sun et al. 2010), whereas others also include a variety of potential instrumental motivations like learning or enhancement of status within a community (Nov and Ye 2009). Intrinsic motivations are reflected by tasks that suit personal interests, pleasant participation and personal achievement (Nov and Ye 2009; Sun et al. 2010). Task complexity and competition conditions are found to have an influence on the intrinsic motivation of users (Liu et al. 2013; Sun et al. 2010). Intrinsic and extrinsic motivations, in turn, are found to have an influence on the quality and quantity of content shared in a virtual community (Nov and Ye 2009). The interdependency of extrinsic and intrinsic rewards is researched by Liu et al. (2011) in context of virtual communities for knowledge sharing. They confirm a crowding effect, i.e., intrinsic motivation for knowledge sharing intention was significantly lower after providing monetary incentives.

Among the means for achieving motivation and engagement that are discussed in our sample, rewards dominate. As previously mentioned, some studies have focused on monetary rewards (e.g., Sanghani, 2009; Sun et al., 2010; Soliman and Tuunainen, 2012), but we are also able to identify the use of other reward categories (e.g., status/reputation or learning (Lou et al. 2011; Nov and Ye 2009)). Reputation systems (Jercic et al. 2012) and ranks and levels are mentioned in only a few of the papers, even though especially the latter play a large role in gamification literature (Zichermann and Cunningham 2011 p. 45ff). None of the papers that deals with rewards regards them as an element taken from games, and, moreover, no paper discussed the success and failure of certain types of rewards in gaming situations.

We also find competition as a game element that can impact motivation. Competition is a concept that is absolutely integral to many games. In the IS literature that we analyzed, competition is used as a tool to increase participation and motivate users to achieve better results (Teschner and Weinhardt 2012). Also, there are studies that examine the effect of different levels or conditions of competition (Liu et al. 2013; Reinig et al. 1995). In contrast to competition, we were also able to identify papers on the topic of cooperation and teamwork in order to engage users or players (Kong and Kwok 2012; Manzoni and Angehrn 1997). Parallel communication systems, another of Reeves And Read's (2009) game elements, can be used to support cooperation in virtual settings; but these are only discussed in a few of the papers (Lattemann and Stieglitz 2012; Warne et al. 2006). Some approaches also include both cooperation and competition as means to engage users, meaning that users cooperate in groups in order to compete against other groups (e.g., Warne et al. 2006).

Adoption

There are a few studies in our sample that apply theories pertinent to the IS discipline in order to explain the adoption of digital games. Fang et al. (2006) apply and extend the popular technology acceptance model (TAM) in order to analyze the adoption of different task types on wireless handhelds. Among other findings, their study shows that playfulness influences user intention to play games using wireless technology. In some research-in-progress papers, research models are developed that make use of established theories. Hou and Ma (2011) develop a research model that extends the Unified Theory of Acceptance and Use Technology (UTAUT) in order to explain post-adoption of online social games. Also in the context of online social games, Weiss and Loebbecke (2008) suggest a model of online gaming adoption in competitive social networks, combining the Theory of Planned Behavior with Social Network Theory.

One study analyzes the motivations or mechanisms behind IS adoption. Ke et al. (2008) examine the possible organizational mechanisms (e.g., rewards) that arouse users' intrinsic, extrinsic and normative motivation to explore features of an enterprise system. One of their findings is that users need to achieve positive affective outcomes in order to remain engaged and continuously explore the system.

Flow

Within our sample, flow has exclusively been researched in the context of digital games. In this context, Liu and Chang (2012) report that social interactivity in online games is more crucial than human-machine interaction to support flow experience. Other researchers have worked on a better understanding of flow. Aderud (2005) reports on his work-in-progress to develop a new model for measuring flow experience of computer game players. Similarly, Zagal et al. (2010) developed a new instrument for measuring flow experience in computer games and also suggest appropriate data collection methods. All these works mainly focus on the measurement of flow but do not mention any game elements explicitly that can be employed to generate a flow experience.

User Satisfaction and User Experience

The concepts of user satisfaction and user experience have hardly been mentioned in our sample. There is no occurrence of the search term 'user experience' in either abstract or title within our sample. The one study that mentions the search term 'user satisfaction' investigates factors affecting user involvement in, and satisfaction with, information seeking activities, but does not point to any game element as a relevant means to improve user satisfaction (Santosa et al. 2005).

DISCUSSION AND RESEARCH AGENDA

The analysis of our set of papers shows that there is indeed an overlap between research in IS and research on gamification, both regarding the means used as well as the ends intended. Rarely are the results completely congruent, however, and most research that we have analyzed either deals with means similar to those of gamification but for different reasons, or targets ends that could also be reached through gamification but used means separate from it. We will therefore discuss means and ends separately below and point to specific research needs related to them. Finally, we set up a broader agenda for future research on gamification from an IS perspective.

Ends of Gamification

While we are able to identify only a few means of gamification that are used in IS research, many ends that are targeted with those means coexist in both fields. Our literature research has proven the assumption that both areas have a large subset of congruent objectives. The most frequently mentioned ends are learning, motivation, and engagement. Learning covers by far the largest part of the analyzed literature, which can partly be explained with the fact that there has been a lot of research done on learning through games that has also been published in IS outlets. However, most papers on learning report on full digital games and not on the use of game elements for non-game purposes. Still, the facilitation of learning is an important objective in IS research and at the same time often targeted through game-related means. Both organizational and individual learning play a large role, but have to be considered individually, as they may require different means. Playful design and serious games seem more suited for the area of individual learning, while organizational learning can particularly benefit from gamification and its means for motivating and engaging groups of people.

Motivation and engagement are by far the most important objectives of gamification. Most approaches to gamification deal with the question of how to motivate users and much research focuses on the issue of extrinsic and intrinsic motivation. The fact that this discussion is also prominent in IS research and many of the same authors (e.g., from Psychology) are referenced in papers from both fields shows a direct overlap in ends as assumed. While the means currently used in IS may be different from those discussed in gamification, the end of motivation and the questions that arise from it appear identical.

Our sample yields no study on the use of gamification means for supporting IS adoption but quite a few studies on the adoption of games. The latter may offer some potential for adoption studies apart from games and support the identification of game elements that can be used to gamify information systems with the aim to facilitate their adoption.

Means of Gamification

Our sample of papers includes a variety of game-related concepts that are already used in IS research for various purposes. The most common means of gamification we found was that of rewards or incentives. The ubiquity of this concept in IS shows great potential for the use of gamification. Monetary rewards have the highly relevant drawback of increasing costs, a problem that is largely eliminated through the use of virtual rewards such as points and badges. Positive effects on motivation and participation have been shown and are assumed as given by many practitioners. While the impact of such extrinsic rewards on intrinsic motivation has been questioned and may well be negative, this holds true for both monetary rewards and virtual ones. We therefore highly recommend further research into the use of virtual rewards adapted from games as motivating and engaging elements in information systems.

Competition is another major means used in gamification that seems promising for use in IS. Research from both game studies and psychology shows clearly that a subset of users can be highly motivated by comparing their own achievements to those of others. Competition is commonly used as a motivator in many sectors of business, but only rarely so as an integral part of information systems. Top contributor lists, articles of the month, and similar means should be studied in more detail to see where elements and lessons from game design can be applied profitably.

Many other means of gamification exist that could be of potential use to reach desirable outcomes in the field of IS, yet our literature review shows little to no use of those. This could be related to a difference in terminology that was not covered by our selection of search terms. We believe, however, that the very broad selector gam* should have detected at least a subset of such papers. Especially more sophisticated means such as the social engagement loop have been shown to be very powerful in other contexts and we can identify no reasons as to why they should not be of equal effectiveness in IS.

The widespread use of full games and game-like environments in IS research is a sign that the importance of games is well understood. The creation of full-fledged games is often expensive and difficult, and limited budgets tend to reduce the allure and overall quality of games used in research. Using individual game elements only is

very low-cost in comparison and might lead to similar results. Only very few non-game activities lend themselves to be turned into full-fledged games, but there are hardly any that could not be gamified in one form or another.

Directions for Future Research

Gamification seems very relevant to the field of IS and should be supported by further research. Following our literature review, we see the following directions as particularly fruitful for future research in the IS discipline:

- *Identification of game elements:* There is no common understanding about a set of game elements that can be applied to gamify information systems (cf. Deterding et al. 2011; Kankanhalli et al. 2012; Kapp 2012; Reeves and Read 2009). Future IS research may contribute in consolidating existing perspectives on game elements from various fields and extending or advancing these to an acceptable generic set of game elements.

- *Transfer of game elements to areas not yet covered by IS research:* We are able to identify game-related research in the area of learning, knowledge sharing and IS adoption. Further research opportunities may lie in areas apart from that, e.g., gamification of business process management.

- *Inclusion of the gamification phenomenon into the rich tradition of IS research on the adoption, acceptance and success of information systems:* Previous research has contributed various well accepted research frameworks and models in this area including TAM and UTAUT. We also see first studies that extend these frameworks to analyze the adoption of digital games (Fang et al. 2006; Hou and Ma 2011; Weiss and Loebbecke 2008). Information system adoption represents a core aspect of IS research and we believe that the phenomenon of gamification can have an influence on our current understanding of the adoption and continuous use of information technology.

- *Design-oriented IS research:* So far, the gamification of applications is driven by practice. Design-oriented research may want to complement these practical initiatives with design research projects that follow accepted and rigorous guidelines (cf. Hevner et al. 2004; Peffers et al. 2007). In addition to that, the development of a generic design theory for gamified information systems could provide a valuable contribution for our discipline and inform application development in both practice and research.

- *Leveraging the overlap:* We have identified many areas in which IS and gamification research overlap but are being developed separately. We believe that it is worthwhile to include significant results from either field into the other's research. Virtual rewards, for example, should be examined more closely in IS while gamification may profit from existing research on monetary rewards on user engagement (e.g., in the area of knowledge sharing) in IS.

CONCLUSION

With this paper, we have presented a literature review on gamification in IS research. Triggered by the current popularity of the concept of gamification, we set out to answer the question whether gamification is actually a new topic within IS research or if it has already been researched previously in IS, but simply using a different terminology. We searched the Senior Scholars' Basket of Journals and the proceedings of the AIS conferences for potential means and ends of gamifying information systems. From 174 hits, we analyzed 53 in detail. The analysis of these papers showed that there is an overlap between research in IS and research on gamification, both regarding the means used as well as the ends intended. However, the analysis also highlighted differences and needs for further research. The description of the relationship of gamification and IS research is the main contribution of this review, along with a research agenda that offers five directions for future research that we consider to be promising from an IS perspective.

REFERENCES

Aderud, J. 2005. "Flow and Playing Computer Mediated Games - Conceptualization and Methods for Data Collection," *AMCIS 2005 Proceedings*.

Caillois, R. 1979. *Man, Play, and Games*, New York: Schocken Books.

Chen, J. 2007. "Flow in games (and everything else)," *Communications of the ACM* (50:4), pp. 31.

Cooper, S., Khatib, F., Treuille, A., Barbero, J., Lee, J., Beenen, M., Leaver-Fay, A., Baker, D., and Popovic, Z. 2010. "Predicting protein structures with a multiplayer online game," *Nature*, pp. 756–760.

Csíkszentmihályi, M. 2008. *Flow: The Psychology of Optimal Experience*, New York: Harper Perennial Modern Classics.

Davis, F. D., Bagozzi, R. P., and Warshaw, P. R. 1992. "Extrinsic and Intrinsic Motivation to Use Computers in the Workplace," *Journal of Applied Social Psychology*, pp. 1111–1132.

Delone, W. H., and McLean, E. 2003. "The DeLone and McLean model of information systems success: a ten-year update," *Journal of management information systems* (19:4), pp. 9–30.

Deterding, S., Dixon, D., Khaled, R., and Nacke, L. 2011. "From game design elements to gamefulness: defining 'gamification'," *MindTrek '11 Proceedings*, pp. 9–15.

Fang, X., Chan, S., Brzezinski, J., and Shuang Xu. 2006. "Moderating Effects of Task Type on Wireless Technology Acceptance," *Journal of Management Information Systems* (22:3), pp. 123–157.

Farzan, R., DiMicco, J. M., and Brownholtz, B. 2009. "Spreading the honey: a system for maintaining an online community," *Proceedings of the ACM 2009 international conference on Supporting group work*, pp. 31–40.

Hall, R., Collier, H., Thomas, M., and Hilgers, M. 2005. "A Student Response System for Increasing Engagement, Motivation, and Learning in High Enrollment Lectures," *AMCIS 2005 Proceedings*.

Herzig, P., Strahringer, S., and Ameling, M. 2012. "Gamification of ERP Systems-Exploring Gamification Effects on User Acceptance Constructs," *Multikonferenz Wirtschaftsinformatik*, pp. 793–804.

Hevner, A. R., March, S. T., Park, J., and Ram, S. 2004. "Design science in information systems research," *MIS Q.* (28:1), pp. 75–105.

Hou, J., and Ma, X. 2011. "A Longitudinal Model of Post-Adoption Phenomena and Its Empirical Test in the Context of Social Games," *ICIS 2011 Proceedings*.

International Standards Organization. 2010. "ISO 9241-210:2010 - Ergonomics of human-system interaction -- Part 210: Human-centred design for interactive systems,".

Jercic, P., Astor, P. J., Adam, M. T. P., and Hilborn, O. 2012. "A Serious Game Using Physiological Interfaces for Emotion Regulation Training in the Context of Financial Decision-making," *ECIS 2012 Proceedings*.

Jestice, R. J., and Kahai, S. 2010. "The Effectiveness of Virtual Worlds for Education: An Empirical Study," *AMCIS 2010 Proceedings*.

Juul, J. 2003. "The Game, the Player, the World: Looking for a Heart of Gamesness," *Level Up: Digital Games Research Conference Proceedings*, pp. 30–45.

Kankanhalli, A., Taher, M., Cavusoglu, H., and Kim, S. 2012. "Gamification: A New Paradigm for Online User Engagement," *ICIS 2012 Proceedings*.

Kapp, K. M. 2012. *The Gamification of Learning and Instruction: Game-based Methods and Strategies for Training and Education*, Pfeiffer.

Ke, W., Wang, X., and Wei, K. 2008. "User Motivation to Explore Enterprise System Features: An Exploratory Study of Its Organizational Antecedents and Consequences," *ICIS 2008 Proceedings*.

Kishore, R., and McLean, E. 1998. "Diffusion and Infusion: Two Dimensions of 'Success of Adoption' of IS Innovations," *AMCIS 1998 Proceedings*.

Kong, J., and Kwok, R. 2009. "Service scenarios - A socio-technical approach to business service modeling," *ECIS 2009 Proceedings*.

Kong, J. S.-L., and Kwok, R. C.-W. 2012. "MMOG Game-Based Knowledge Conversion: An Ecological View Of Mutualistic Co-Presence," *PACIS 2012 Proceedings*.

Lakhani, K., and Wolf, R. 2003. *Why Hackers Do What They Do: Understanding Motivation and Effort in Free/Open Source Software Projects* (SSRN Scholarly Paper No. ID 443040), .

Lattemann, C., and Stieglitz, S. 2012. "Challenges for Lecturers in Virtual Worlds," *ECIS 2012 Proceedings*.

Li, Z., Huang, K., and Cavusoglu, H. 2012. "Quantifying the Impact of Badges on User Engagement in Online Q&A Communities," *ICIS 2012 Proceedings*.

Liu, D., Li, X., and Santhanam, R. 2013. "Digital Games and Beyond: What Happens when Players Compete?," *Management Information Systems Quarterly* (37:1), pp. 111–124.

Liu, Chih-Chung, Liang, Ting-Peng, Rajagopalan, Balaji, and Sambamurthy, Vallabh. 2011. "The Crowding Effect Of Rewards On Knowledge-Sharing Behavior In Virtual Communities," *PACIS 2011 Proceedings*.

Liu, Chuang-Chun, and Chang, I-Cheng. 2012. "Measuring The Flow Experience Of Players Playing Online Games," *PACIS 2012 Proceedings*.

Lou, J., Lim, K. H., Fang, Y., and Peng, Z. 2011. "Drivers Of Knowledge Contribution Quality And Quantity In Online Question And Answering Communities," *PACIS 2011 Proceedings*.

Lu, Y., Singh, P., and Sun, B. 2011. "Learning from Peers on Social Media Platforms," *ICIS 2011 Proceedings*.

Manzoni, J.-F., and Angehrn, A. A. 1997. "Understanding Organizational Dynamics of IT-Enabled Change: A Multimedia Simulation Approach," *Journal of Management Information Systems* (14:3), pp. 109–140.

Miller, A., Allison, C., and Getchell, K. 2012. "Open Virtual Worlds: A Serious platform for Experiential and Game Based Learning," *MCIS 2012 Proceedings*.

Nov, O., and Ye, C. 2009. "Why Do People Share Photos Online? Antecedents of Photos' Quality and Quantity," *AMCIS 2009 Proceedings*.

O'Brien, H. L., and Toms, E. G. 2008. "What is user engagement? A conceptual framework for defining user engagement with technology," *Journal of the American Society for Information Science and Technology* (59:6), pp. 938–955.

Palmisano, J. 2009. "Motivating Knowledge Contribution in Virtual Communities of Practice: Roots, Progress and Needs," *AMCIS 2009 Proceedings*.

Peffers, K., Tuunanen, T., Rothenberger, M. A., and Chatterjee, S. 2007. "A Design Science Research Methodology for Information Systems Research," *Journal of Management Information Systems* (24:3), pp. 45–77.

Reeves, B., and Read, J. L. 2009. *Total Engagement: Using Games and Virtual Worlds to Change the Way People Work and Businesses Compete*, Boston: Harvard Business Press.

Reinig, B. A., Briggs, R. O., Nunamaker, J., Shepherd, M. M., and Yen, J. 1995. "Affective Reward and the Adoption of Group Support Systems: Productivity Is Not Always Enough," *Journal of Management Information Systems* (12:3), pp. 171–185.

Robbins, R., and Butler, B. S. 2010. "Virtual Teaching Cases? An Exploratory Study," *ICIS 2010 Proceedings*.

Robey, D., Boudreau, M.-C., and Rose, G. M. 2000. "Information technology and organizational learning: a review and assessment of research," *Accounting, Management and Information Technologies* (10:2), pp. 125–155.

Romero, M., Usart, M., Ott, M., and Earp, J. 2012. "Learning Through Playing for or Against Each Other? Promoting Collaborative Learning in Digital Game Based Learning," *ECIS 2012 Proceedings*.

Ryan, R. M., and Deci, E. L. 2000. "Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being," *American Psychologist* (55:1), pp. 68–78.

Sanghani, P. 2009. "Knowledge Management Implementation: Holistic Framework Based on Indian Study," *PACIS 2009 Proceedings*.

Santosa, P. I., Wei, K. K., and Chan, H. C. 2005. "User involvement and user satisfaction with information-seeking activity," *European Journal of Information Systems* (14:4), pp. 361–370.

Schmeil, A., Eppler, M., and Freitas, S. de. 2012. "A Structured Approach for Designing Collaboration Experiences for Virtual Worlds," *Journal of the Association for Information Systems* (13:10).

Snider, M. 2012. "More businesses getting their game on," Retrieved December 7, 2012, from http://www.usatoday.com/MONEY/usaedition/2012-07-30-Efficient-Small-Biz-Gamification_CV_U.htm.

Soliman, W., and Tuunainen, V. 2012. "Crowdsourcing as a Mobile Service - Case Study: Publishing Photography," *ECIS 2012 Proceedings*.

Storey, J., and Barnett, E. 2000. "Knowledge management initiatives: learning from failure," *Journal of Knowledge Management* (4:2), pp. 145–156.

Sun, Y., Fang, Y., and Lim, K. 2010. "Understanding Sustained Participation in Transactional Virtual Communities," *ICIS 2010 Proceedings*.

Tauer, J. M., and Harackiewicz, J. M. 1999. "Winning Isn't Everything: Competition, Achievement Orientation, and Intrinsic Motivation," *Journal of Experimental Social Psychology* (35:3), pp. 209–238.

Teschner, F., and Weinhardt, C. 2012. "Learning by Trading in a Macro-Economic Forecasting Game," *ECIS 2012 Proceedings*.

Warne, L., Hasan, H., and Hart, D. 2006. "Go*Team: A new approach to developing a knowledge sharing culture," *ACIS 2006 Proceedings*.

Weiss, T., and Loebbecke, C. 2008. "Online Gaming Adoption in Competitive Social Networks: Combining the Theory of Planned Behavior and Social Network Theory," *AMCIS 2008 Proceedings*.

Yannakakis, G. N., and Hallam, J. 2009. "Real-Time Game Adaptation for Optimizing Player Satisfaction," *IEEE Transactions on Computational Intelligence and AI in Games* (1:2), pp. 121–133.

Zagal, J., Chan, Susy S., and Zhang, Jingli. 2010. "Measuring Flow Experience of Computer Game Players," *AMCIS 2010 Proceedings*.

Zhu, H. 2012. "A Game Based, Financial Literacy Oriented Approach to Improving Programming Education," *AMCIS 2012 Proceedings*.

Zichermann, G., and Cunningham, C. 2011. *Gamification by Design: Implementing Game Mechanics in Web and Mobile Apps*, Sebastopol: O'Reilly Media.

COPYRIGHT