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On the Activating Power of Gamification – Empirical Evidence from an Online Community

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2. STUDIES SUBMITTED AS PART OF THE DISSERTATION

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- **Mutter, T. 2014.** "The Impact of Goal Achievement on User Effort," *Working Paper*, University of Paderborn.
- **Mutter, T., and Kundisch, D. 2015a.** "Behavioral Mechanisms Prompted by Virtual Rewards: The Small-Area Hypothesis," in *Proceedings of the European Conference on Information System 2015,* Münster, Germany.
- **Mutter, T., and Kundisch, D. 2014b.** "Don't take away my Status! – Evidence from the Restructuring of a Virtual Reward System," *Computer Networks* (75:B), pp. 477-490.
- **Mutter, T., and Kundisch D. 2015b.** "Goals as Reference Points: Empirical Evidence from a Virtual Reward System," *Working Paper*, University of Paderborn.

On the Activating Power of Gamification – Empirical Evidence from an Online Community

Games are the new normal.
Al Gore

1. Introduction

1.1. Motivation

Gamification – the application of 'game design techniques to non-game contexts to drive user behavior' (Gamification Wiki 2015) – has become one of the fastest growing business trends in recent years (e.g., Gartner 2011, McGonigal 2011, Zichermann and Cunningham 2011, Blohm and Leimeister 2013, Burke 2014). Gartner (2011) predicts that by 2014 'more than 70 percent of Global 2000 organizations will have at least one gamified application'. Today, organizations apply gamification for a variety of purposes: to improve user engagement, to motivate employees, to facilitate innovations, to promote personal development, to support learning, and to encourage people to make healthy choices (e.g., Kumar 2013, Penenberg 2013, Burke 2014). Popular game elements include badges, points, levels, or leaderboards (Hamari et al. 2014). The non-profit education organization, the Khan Academy, for example, uses points and badges to activate its students; Samsung rewards users with badges and levels of achievement for active participation in their community and Q&A discussions with other users; BahnScout, a mobile app, uses points, badges and leaderboards to encourage Metro passengers in Munich to report problems at train stations. It is not surprising therefore that software vendors such as Bunchball and Badgeville have started to take advantage of this new market by offering gamification solutions to businesses.

At the same time, gamification has its critics too. In the view of Burke, for example, gamification raises unrealistic expectations and predicts that it 'will move through the hype cycle from the peak of inflated expectations into the trough of disillusionment' (Burke 2013). In the same vein, Gartner (2012) estimates that '80 percent of current gamified applications will fail to meet business objectives' and diagnoses this as being primarily due to 'poor design'. But rather than dismissing the potential of gamification altogether, these criticisms present an opportunity to researchers as opening up the field for further inquiry. Indeed, the last years have witnessed a steady increase in the number of research articles being published, and one recent literature review (Hamari et al. 2014) documents both positive and negative effects of gamification on user motivation and engagement. While the examined research identifies predominantly positive effects this is found to be contingent on the context and the characteristics of the user group (Hamari et al. 2014). However, most of the reviewed studies are exploratory in nature and lack a proper theoretical foundation, which makes it difficult to identify the underlying key drivers or to generalize existing findings. Hence more systematic and

rigorous research is needed to ensure the comparability of future results and to increase the understanding of the processes involved in gamification's failures and successes – in other words, why and under which conditions it produces effects of one kind or another.

Since the majority of online applications routinely track their users' activities and responses to game design elements, research on gamification offers plenty of opportunities by enabling a data driven evaluation of gamified applications or selected game elements. At the same time, it bears the potential to put to the test and extend established theories within and across the disciplines of, notably, information systems, psychology, economics, and social science.

The main goal of this dissertation is to enhance the understanding of the question of why, when and how gamification works. This thesis comprises five empirical papers that are rooted in theory. Each paper draws on the same research environment but addresses a different research question. The research environment is a popular German Question & Answer community which offers registered and non-registered users the opportunity to ask questions to community members on everyday topics (e.g., beauty, computers, or gardening). To activate its members the platform uses game design elements such as points, badges, and leaderboards. The five papers in this dissertation, presented after the introduction of this thesis, explore different aspects of these implemented game design elements.

The introduction is structured as follows. Section 1.2 discusses the concept of gamification and its competing definitions. As part of exploring the concept, the section describes the potential motivational power of the phenomenon and presents an overview of the current state of the literature. The subsequent section (section 1.3) introduces the research environment. Building on this, an overview of the five papers that are included in this dissertation is given (section 1.4). This section includes a table summarizing for each of the studies the contributions made by the respective authors, and the scientific dissemination of research results to which they gave rise in the form of conference presentations and publications.

1.2. Gamification

1.2.1. Concept of Gamification

The term *gamification* started to proliferate in industry and academia in 2010 (e.g., Deterding et al. 2011, Hamari et al. 2014). Today, there are two competing definitions for gamification which can be found in the literature (Herzig 2014). Deterding et al. (2011) suggest a systematic definition rooted in the literature on *human-and-computer interaction* (HCI), whereas Huotari and Hamari (2012) define gamification from a *service marketing* perspective and emphasize the experiential nature of gamification. In the next paragraph, the definition given by Deterding et al. (2011) is introduced first, followed by a discussion of Huotari and Hamari's (2012) definition.

Deterding et al. (2011, p. 10) define gamification as 'the use of game design elements in non-game contexts'. Their definition is based on the work by Caillois (2001) who distinguishes between *paidia* (playing) and *ludus* (gaming) as two different modes of behavior. More specifically, *paidia* (playing) stands for more free-form, expressive, and improvisational behavior, whereas *ludus* (gaming) describes rule-based and goal-oriented play (Deterding et al. 2011). Caillois' differentiation is widely adopted in classical game research. McGonigal (2011), for instance, identifies four key elements that can be found in almost every game: (1) goals which give players a specific purpose and guide them through the game; (2) rules that impose restrictions on what players can do to accomplish a goal; (3) a feedback system which continuously informs players on their progress toward the next goal and encourages them to carry on; (4) voluntary participation in the sense that every player agrees on the goals, rules, and feedback provided by the system and allows them to enter or exit the game at any point in time. Building on this McGonigal (2011) introduces the term *gamefulness* as a complement to *playfulness.* Gamefulness stands for experiences and behaviors associated with *ludus* (gaming) and playfulness for experiences and behaviors related to *paidia* (playing) (Herzig 2014).

Games are developed for entertainment and non-entertainment purposes (e.g., learning objectives). In the latter case, games are also called *serious games*. The definition by Deterding et al. (2011) separates gamification from games and serious games due to the fact that gamification is about integrating selected game elements into an application instead of developing a game as a whole. Hence, as illustrated in Figure 1, gamification can be distinguished from other related concepts via two dimensions. The horizontal axis distinguishes between *whole* and *parts* and the vertical axis between *gaming* and *playing* (Deterding et al. 2011).

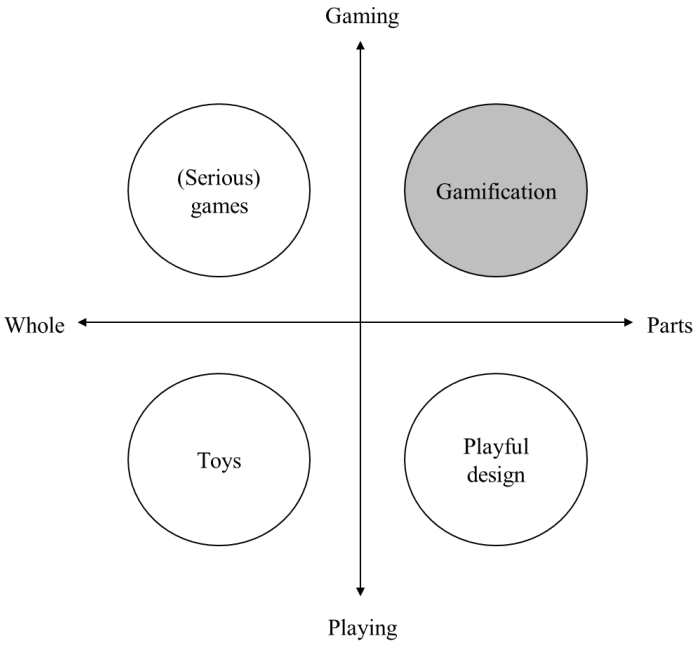

Figure 1: Positioning of Gamification (Based on Deterding et al. 2011, p. 13)

Although Deterding et al. (2011) propose a systematic definition for gamification, the authors do not provide an exhaustive list of game design elements that are specific to games and thus qualify to be used in the context of gamification (Huotari and Hamari 2012). Instead, Deterding et al. (2011) provide a taxonomy which consists of five different levels to facilitate the identification of game design elements. These five levels are ordered from concrete to abstract, as illustrated in Table 1. The *game interface design patterns* (e.g., badges or leaderboards) represent the lowest and the *game design methods* (e.g., playtesting or playcentric design) the highest level. The methods and tools of the higher levels are used to design the lower ones.

Level	Description	Example
Game interface design patterns	Common, successful interaction design components and design solutions for a known problem in a context, including prototypical implementations	Badge, leaderboard, level
Game design patterns and mechanics	Commonly reoccurring parts of the design of a game that concern gameplay	Time constraint, limited resources, turns
Game design principles and heuristics	Evaluative guidelines to approach a design problem or analyze a given design solution	Enduring play, clear goals, variety of game styles
Game models	Conceptual models of the components of games or game experience	MDA; challenge, fantasy, curiosity; game design atoms; CEGE
Game design methods	Game design-specific practices and processes	Playtesting, playcentric design, value conscious game design

Table 1: Levels of Game Design Elements (Deterding et al. 2011, p. 12)

Huotari and Hamari (2012, p. 19) criticize the definition formulated by Deterding et al. (2011) by arguing that it is not sufficient to define gamification solely 'on a set of methods or mechanics' because this implies that once an application comprises at least one game element it automatically qualifies as gamification. Huotari and Hamari (2012, p. 19) instead emphasize the subjective experiences of users in gamification by defining it as 'a process of enhancing a service with affordances for gameful experiences in order to support user's overall value creation'.

In the field of service marketing, the customer is the essential focal point of a service's production process, because the value of a service is created when the customer uses the service (Vargo and Lusch 2008). Huotari and Hamari (2012) transfer this idea to the gaming context by arguing that the player completes the production of the game service by playing the game and the value of the service depends on the players' subjective experiences. From their perspective gamification denotes a process

whereby a core service is enriched by motivational affordances (e.g., points, leaderboards, badges) in order to create *gameful experiences*. These in turn are interpreted as experiential qualities that are specific to games and lead to *gamefulness*. However, Huotari and Hamari (2012) neither explain what they exactly mean by gamefulness nor do they define *games.* In addition, they also do not provide a complete list of motivational affordances that are specific to gamification.

This thesis adopts Deterding et al.'s definition because it is more elaborate and precise than that provided by Huotari and Hamari (2012). The specific research environment of this thesis (see section 1.3 for a detailed description) – a popular German Question & Answer community – represents a non-game context in which game design elements such as points, badges, and leaderboards are implemented to activate the contribution behavior of its members. Hence, in line with the definition given by Deterding et al. (2011) the research environment qualifies as archetype of gamification.

1.2.2. The Potential Motivational Power of Gamification

The concept of gamification promises new ways to promote and sustain user motivation. According to *Self-Determination Theory* – a well-established theory of human motivation – people are motivated by different kinds of motivations (Ryan and Deci 2000b). The two basic types are *intrinsic* and *extrinsic* motivation (Ryan and Deci 2000a). Intrinsic motivation refers to doing an activity for its own sake because it is inherently enjoyable or interesting (Deci and Ryan 1985). The opposite is extrinsic motivation which refers to performing an activity with the purpose of achieving a distinct reward or outcome (Deci and Ryan 2000a). *Self-Determination Theory* presents different factors which either *facilitate* or *undermine* intrinsic and extrinsic motivation. Research from different domains (e.g., health care, education, work) indicates that to enhance and sustain motivation the innate human needs for competence, autonomy, and relatedness need to be satisfied (e.g., Deci and Ryan 2000b).

Deci and Ryan (1985) introduced the *Cognitive Evaluation Theory* (CET) to describe which factors amplify or undermine intrinsic motivation. The 'CET proposes that events and conditions that enhance a person's sense of autonomy and competence support intrinsic motivation, whereas factors that diminish perceived autonomy or competence undermine intrinsic motivation' (Ryan et al. 2006, p. 349). As an example, appropriate challenges combined with positive performance feedback promote feelings of competence. Furthermore, if people have a sense of choice and their behavior is self-determined, the perceived autonomy is high. In contrast, demeaning performance feedback has a negative effect on the experienced competence. Moreover, perceived autonomy is low if people feel controlled while performing a task (e.g., Deci and Ryan 2000a). This implies that external regulations that are perceived as controlling can undermine intrinsic motivation (e.g., Deci 1975, Deci et al. 1999).

However, according to Ryan and Deci (2000b) this does not always have to be the case and depends on the degree to which extrinsic regulations can be *internalized* and *integrated*. 'Internalization is the

process of taking in a value or regulation, and integration is the process by which individuals more fully transform the regulation into their own so that it will emanate from their sense of self' (Deci and Ryan 2000a, p. 60). To explain this in more detail, Ryan and Deci (2000b) developed the *Organismic Integration Theory* (OIT) which describes different forms of extrinsic motivation and factors which facilitate the internalization and integration of external regulations and values. These different forms of extrinsic motivation vary on 'the degree to which the motivations emanate from the self (i.e., are self-determined)' (Deci and Ryan 2000b p. 70). The least autonomous form of extrinsic motivation is present if a task is only performed to satisfy or comply with external regulations and values. In contrast, the most autonomous form is prevalent when they 'have been fully assimilated to the self' and are in 'congruence with one's other values and needs' (Deci and Ryan 2000a, p. 62). This means that even extrinsic motivation can be perceived as autonomous and thus approximate intrinsic motivation. More self-determined forms of extrinsic motivation exhibit – among other outcomes – greater engagement (Connell and Wellborn 1990) and better performance (Miserandino 1996).

The internalization of extrinsic regulations and values can be promoted by enhancing a person's sense of competence, autonomy, and relatedness. Hence, internalization is more likely when people are able to connect with others (i.e., family, peer group, society) and experience a feeling of relatedness (Deci and Ryan 2000b). Moreover, people are more likely to internalize a goal if they are confident in their ability to accomplish it successfully and if the underlying task or activity promotes their feeling of competence. Furthermore, to enable people to internalize external regulations and values, they need to fully grasp their meaning and rationale. If people can embrace the meaningfulness or rationale of a task or activity, they feel more autonomous than they would otherwise (Deci and Ryan 2000a).

Research suggests that *games* are perceived as intriguing because they satisfy the innate human need for competence, autonomy, and relatedness (Deci and Ryan 1985, Ryan et al. 2006, Peng et al. 2012). Games are typically designed to keep the player challenged by adjusting the level of difficulty. Well-designed games can generate a mental state of intense involvement and enjoyment to the extent that players lose their sense of time – a phenomenon called *flow*. According to the *flow theory* it is essential to find the appropriate balance between challenge and skill to generate and maintain the state of flow (Csikszentmihalyi and Czikszentmihalyi 1975, Moneta and Csikszentmihalyi 1996). Besides challenging the player, games usually also provide a feedback system which continuously informs players about their progress (McGonigal 2011). Thus, the combination of positive performance feedback and surmountable challenges are able to promote the player's feeling of competence.

In today's online environment, so-called *massively multiplayer online games* are very popular and successful in attracting players (e.g., Cole and Griffiths 2007, Putzke et al. 2010). These games provide – among many other features – opportunities for social experiences inherent in the game. In particular, players can create their own network with other players (e.g. Chang et al. 2008,

Ducheneaut et al. 2006, Moon et al. 2013). Hence, massively multiplayer online games promote a feeling of relatedness if users play with their peers.

Finally, games also address the need satisfaction for autonomy. Although the degree of autonomy depends on the design of the game and can vary between games, games in general provide many autonomy-supportive design features (e.g., Peng et al. 2012). The players' decision to play a particular game is almost always voluntary. Moreover, in the game itself, players develop individual strategies, choose among a multitude of tasks and goals, and thus control their movement in the game (Ryan et al. 2006).

Research from the gaming industry indicates that when a game is designed appropriately, users experience playing as a pleasurable activity and the rules and restrictions of the game are no longer perceived as controlling (Zichermann and Cunningham 2011). Gamification represents the attempt to transfer the motivational power of games to everyday activities. Most importantly, gamification holds the promise of enhancing intrinsic motivation at the same time as enabling the internalization of extrinsic motivation. Both aspects are important to ensure sustainable user motivation and engagement.

1.2.3. Status Quo of Gamification Research

Since its proliferation in industry and academia in 2010 (e.g., Deterding et al. 2011, Hamari et al. 2014), practitioners and thought-leaders have been the first advocates for gamification. A number of books have been published giving an overview of common gamification practices and providing guidelines for gamification designers (e.g., Reeves and Read 2009, McGonigal 2011, Zichermann and Cunningham 2011, Burke 2014). Based on the practical relevance of the topic, there has been a subsequent growth in recent years of academic research on gamification. Much of the work has been published in recent conference proceedings (Hamari et al. 2014). The literature can be divided into two strands.

The first strand is represented by a number of papers which discuss the phenomenon of gamification from different perspectives, including games, service marketing or information systems (e.g., Deterding et al. 2011, Huotari and Hamari 2012, Blohm and Leimeister 2013). Both Deterding et al. (2011) and Huorati and Hamari (2012) propose a definition of gamification, which have already been discussed at the beginning of this section (see section 1.2.1). Blohm and Leimeister (2013) focus in their work on the potential of gamification for practice and highlight the fact that '[g]amification supports and enables the transformation of organizational value creation processes'. What all these papers have in common is that they call for more gamification research.

The second strand covers papers which attempt to evaluate the impact of game design elements on different psychological and behavioral outcomes. A recent overview of this literature can be found in

Hamari et al. (2014). Overall, the authors examine 24 articles which use either qualitative or quantitative methods and are performed in different context such as commerce, education/learning, health/exercise, intra-organizational systems, sharing, sustainable consumption, work, innovation/ideation and data gathering. The reviewed papers report both positive and negative effects of gamification on the studied outcome. The majority of the research finds that gamification can have a positive effect, depending on the context and the characteristics of the user group (Hamari et al. 2014). However, most of the existing studies are exploratory in nature and lack a proper theoretical foundation which makes it difficult to identify the underlying key drivers or to generalize existing findings. In addition, Hamari et al. (2014) highlight the shortcoming that most of the studies present only descriptive statistics and omit inferential statistics. Moreover, the authors identify additional weaknesses such as small sample sizes, lack of control groups and relevant control variables. Based on the reviewed literature Hamari et al. (2014) conclude that '[a]s the research on gamification progresses, care should be taken to ensure that future results are more comparable'.

Table 2 presents three papers that Hamari et al. (2014) highlight as reference point for future research on gamification. These papers investigate the impact of different game design elements on user contribution behavior. The three studies (Farzan et al. 2008, Denny 2013, Hamari 2013) are based on field experiments and perform rigorous empirical research. More specifically, Farzan et al. (2008) evaluate whether virtual points and levels encourage contribution behavior from employees on IBM's social networking site Beehive. They find that users increase the quantity of their contributions after a virtual reward system is introduced. Denny (2013) investigates the impact of a badge-based achievement system on students' contributions within an online learning tool called PeerWise. He finds a positive effect for one of the two analyzed activities and the number of days on which students use the tool. Hamari (2013) conducts his research in a peer-to-peer trading service called Sharetribe. In contrast to Farzan et al. (2008) and Denny (2013), he does not find a positive effect of badges on user activity levels in general but only for a subgroup of users who actively monitor their own badges and those of others.

Source	Theoretical Background	Type of Study	Research Context	Core Service	Results
Farzan et al. (2008)	-	Field experiment	Intra-organizational systems	Companies social network site	Positive
Denny (2013)	-	Field experiment	Education/learning	Online learning tool	Positive
Hamari (2013)	Social comparison, goal-setting	Field experiment	Commerce	Peer-to-Peer trading service	No effect

Table 2: Shortlist of Empirical Literature on Gamification (Based on Hamari et al. 2014)

The results from the discussed literature mirror the main findings from Hamari et al.'s literature review. The three papers indicate that gamification can have a positive effect on user activity levels depending on the research context and the user group. However, only Hamari's (2013) paper is rooted in theory which makes it difficult to explain how and why the implemented game elements activate user contribution behavior in the research environments in Farzan et al. (2008) and Denny (2013) but not in the research context in Hamari (2013).

The five empirical papers presented in this thesis address this major shortcoming by building their analysis on a solid theoretical background. Each paper is rooted in theory tailored to the specific research question it addresses, and performs a rigorous empirical analysis to ensure that the results are comparable and can be generalized (see Table 5). More importantly, this thesis contributes to the existing literature by identifying some of the key drivers behind gamification and thereby improves the understanding of the question of why, when and how gamification works (see section 1.4. for a detailed description of these contributions).

1.3. Research Environment

1.3.1. Description of the Online Community

The website at the center of our analysis was launched in January 2006 and will remain anonymous at the owner's request. The platform offers registered and non-registered users the opportunity to ask questions to community members on everyday topics (e.g., beauty, computers, gardening). All registered users automatically participate in the community's virtual reward system. For almost all their activities, registered users receive an incentive in the form of so-called *status points*. As users accumulate status points, they automatically move up in a *hierarchical badge system*.

Table 3 presents a list of the activities and the corresponding status point scheme. Users can earn between 0 and 25 status points for contributing an answer depending on how the questioner or other users rate the quality of their answer.

Activities	Status Points per Activity
Answering Questions	0 – 25
Asking Questions	0 – 4
Following a User	5
Adding Friends	5 – 20
Inviting New Members	20
Adding and Copying Links	1 – 2

Table 3: Status Point Scheme

Apart from the core activity *answering questions*, registered users can also get status points by *asking questions* to the community. If a question receives at least one answer or is evaluated as *top* question by at least one other user, the questioner receives between 1 and 4 status points. No status points are earned for questions that remain unanswered. Registered users have also the opportunity to *follow other users*, which means that they are informed about the activities of others. A user who is followed by another user receives 5 points. Users can also *add friends* to their network of friends and earn a variable amount of status points depending on whether their befriending request is accepted by the other user or not and whether those users followed each other before the request was sent. Users can also *invite new members* to the community. A user earns 20 points when the invited user registers on the platform. Members can also *add and copy new links* to their link catalog. Each new added link earns them 2 points, and copying an existing link 1 point.

By accumulating status points users automatically move up in a hierarchical badge system. Table 4 presents a list of the available badges and the status points required for each badge. The labels of the first eight badges are noticeably hierarchical, as is evident from their titles: 'Student', 'Bachelor', 'Master', and so on. The 'Bachelor' badge, for example, requires an accumulation of at least 120 status points, while that of 'Master' requires 720 points. By earning an average of 4 status points per answer users would have to answer at least 30 questions to reach the former, and 180 for the latter badge. As the system is cumulative, users have to earn the 'Bachelor' badge before they can start earning points towards the level of 'Master'.

Label of Badge	Required Status Points	Label of Badge	Required Status Points
Student	0	Archimedes	4,790
Bachelor	120	Ts'ai Lun	4,890
Master	720	Johannes Gutenberg	4,990
Research Assistant	1,130	Alexander G. Bell	5,090
Doctor	1,640	Gottfried W. Leibniz	5,190
Assistant Professor	2,250	Max Planck	5,290
Professor	3,050	Johannes Kepler	5,390
Nobel Laureates	3,780	Leonardo da Vinci	5,490
James Watt	4,690	Albert Einstein	>6,490

Table 4: Badge System

The list of badges and the required status points for each badge is made public on the platform. The badge and the total number of earned status points are displayed in the personal profile of each user. A screenshot of such a user profile is illustrated in Figure 2.

Figure 2: Screenshot User Profile

Whenever a user *poses* or *answers a question*, their number of status points and highest attained badge becomes publicly visible to other platform users or guests.

1.3.2. Restructuring of the Virtual Reward System

In February 2007, the operator of this Q&A community fundamentally restructured its virtual reward system. According to the operator, the objective of the restructuring was to simplify and enhance the reward system. The provider changed the status point scheme for the activities on the platform by retrospectively recalculating the total status points of each user and modifying the badge system. As a result of this restructuration, the number of status points that could be earned for the activities *adding friends, following a user, inviting new members*, and *adding* and *copying links* were *reduced* or even *abolished*. The activities *asking* and *answering questions*, which constitute the main purpose of the community, were unaffected.

As mentioned above, the community provider *recalculated* retrospectively the total number of status points that each user had earned since registering, based on the rules of the new point scheme. For example, users who had previously been rewarded with up to 20 status points for adding a new friend to their network now received none after the restructuring, since the reward for this activity had been abolished, and the provider at a stroke removed all the points they had previously earned with these now valueless activities. Consequently, the majority of users found their status points reduced, some quite substantially.

The other changes to the badge system introduced by the provider included the addition of two new badges – ‘Beginner’ and ‘Albert Schweitzer’ – the renaming of the labels between ‘James Watt’ and ‘Leonardo da Vinci’, and the inflation of the number of status points required for each badge. For example, a user who had previously accumulated 3,100 status points and had held the badge ‘Professor’, suddenly saw their status reduced by two badges to the badge ‘Doctor’ following the restructuration event, and this even without having lost any points due to de-valued activities, but

merely on account of the inflation of the required status points. Overall, almost all users lost at least one badge as a consequence of the restructuring.

The planned restructuring was repeatedly announced to the community prior to its implementation from about 5 months prior to the event. However, neither the recalculation nor the deduction of status points nor the details of the changes to the badge system were communicated to users in advance. Thus, the loss of badges and points had taken them all by surprise.

1.4. Overview and Contribution

The main goal of this dissertation is to enhance the understanding of the question of whether, how, and under what circumstances the gamification can be said to take effect. This thesis comprises five empirical papers. Each paper draws on the research environment introduced above for the empirical analysis, with the first two – *Mutter and Kundisch (2015a)* and *Mutter and Kundisch (2014b)* – exploiting the exogenous variation caused by the restructuring of the implemented virtual reward system for their analysis, and the other three – *Mutter and Kundisch (2014a)*, *Mutter (2014)* and *Mutter and Kundisch (2015b)* – using a time window during which user contribution behavior was unaffected by the restructuring.

Table 5 presents an overview of the theoretical background and the corresponding research questions for each paper.

Paper	Theoretical Background	Research Question
Mutter and Kundisch (2014a)	Goal-Gradient Hypothesis	*What is the impact of proximity to the next badge on the quantity of user contributions?* *What is the impact of proximity to the next badge on the quality of user contributions?*
Mutter (2014)	Self-Learning	*Does successful badge achievement increase future efforts to attain the next badge in a hierarchical badge system?*
Mutter and Kundisch (2015a)	Small-Area Hypothesis	*Does the small-area effect activate the contribution behavior of users in online communities?*
Mutter and Kundisch (2014b)	Status and Status Demotion	*Does user status demotion reduce user activity levels?*
Mutter and Kundisch (2015b)	Goal-Setting Theory, Prospect Theory	*Do individual performance patterns exhibit the main properties of the prospect theory value function (i.e., reference point dependence, loss aversion, and diminishing sensitivity) in the days surrounding 'mere' goal achievement?*

Table 5: Overview Theoretical Background and Research Question

The articles *Mutter and Kundisch (2014a), Mutter and Kundisch (2015a), Mutter and Kundisch (2014b), Mutter (2014)* build on the substantial body of research in the field of marketing on customer loyalty programs and extend existing findings on the *goal-gradient hypothesis, self-learning, small-area hypothesis,* and *status demotion*. In particular, these papers generalize results from the decision making literature (e.g., buying five more cups of coffee to get one coffee for free) to the motivation and performance literature (e.g., performing five more answers to get a badge). At the same time, this research provides empirical evidence that existing findings for monetary or quasi-monetary rewards (e.g., upgrades, lounge access or priority booking at frequent flyer programs) do also apply to non-monetary rewards (e.g., points, badges). Finally, the paper *Mutter and Kundisch (2015b)* provides empirical evidence for the *prospect theory model for goal behavior* from Heath et al. (1999) and thereby also connects the decision making and motivation and performance literature.

The following pages contain a short summary of the studies included in this dissertation. After each summary, the theoretical contributions as well as the managerial implications of each paper are presented. At the end of the section a summary table provides detailed information for each of the studies included in this dissertation regarding the contributions made by the respective authors, and the scientific dissemination of research results to which they gave rise in the form of conference presentations and publications.

Summary of *Mutter and Kundisch (2014a)*

The first co-authored paper, *Mutter and Kundisch (2014a)*, is a joint investigation into the applicability of the goal-gradient hypothesis to the activation of user contribution levels through goals in the form of badges. The goal-gradient hypothesis states that the effort to reach a goal increases as one gets closer to the goal (e.g., Kivetz et al. 2006). This research evaluates user contribution levels by measuring both the quantity and the quality of contributions. The empirical results indicate that the *quantity* of user contributions increases substantially in the days shortly before earning the next badge and peak on the day of the promotion, whereas the *quality* of user contributions declines only slightly. By comparing the impact of badges on the quantity and quality of contributions, this research provides support for the goal-gradient hypothesis in the context of online communities.

Theoretical Contributions of *Mutter and Kundisch (2014a)*

This paper contributes to the literature on gamification (e.g., Hamari et al. 2014) by testing the goal-gradient hypothesis in the context of online communities and providing first empirical evidence that users continuously increase their activity levels with increasing proximity to a badge. In addition, this is the first research which analyzes how the quality – as well as the quantity – of user contributions is affected by badges. The paper also contributes to the empirical literature on the goal-gradient hypothesis (e.g., Kivetz et al. 2006, Drèze and Nunes 2006, 2011) by providing first empirical

evidence with goals in form of non-monetary rewards, and by showing that the goal-gradient hypothesis also applies to motivational phenomena such as user effort.

Practical Implications of *Mutter and Kundisch (2014a)*

The study's findings indicate that virtual rewards like badges tend to activate contribution quantity rather than quality. In order to avoid encouraging purely opportunistic user behavior, whereby users trade contribution quality for quantity, gamification designers might want to create systems which reward contribution quality as well as quantity. Gamification designers aiming to exploit the activating effect of badges ought to take into account the predictions of the goal gradient hypothesis when designing a badge system. The prevalence of the goal gradient hypothesis advocates the incorporation of a set of badges with a predetermined number of required activities within a virtual reward system.

Summary of *Mutter (2014)*

The second paper (Mutter 2014) analyzes the impact of successful badge achievement on future effort to attain the next badge in a hierarchical badge system. The findings indicate that after successful badge achievement users increase their subsequent effort to attain the next badge, but only as long as badges represent a challenge to the user. Self-learning is identified as a key driver for this behavior.

Theoretical Contributions of *Mutter (2014)*

This paper contributes to the literature on gamification (e.g., Hamari et al. 2014) by providing empirical evidence for the impact of successful badge achievement on user contribution levels in a hierarchical badge system. Furthermore, this research also contributes to the research on goal-setting and self-learning (e.g., Dzewaltowski et al. 1990, Ryan 1970, Drèze and Nunes 2011) by being the first to provide empirical evidence of this effect with goals in form of non-monetary rewards, and by showing that self-learning also applies to motivational phenomena such as user effort.

Practical Implications of *Mutter (2014)*

Gamification designers should be aware of the positive impact of successful goal achievement in a recurring goal framework and, for the effect to be lasting, ensure that successive goals are perceived as challenging. Moreover, in terms of structuring a recurring goal system, the prevalence of self-learning would recommend the adoption of multiple goals with an increasing level of difficulty instead of a smaller number of goals that are more difficult to achieve.

Summary of *Mutter and Kundisch (2015a)*

The third paper was a research undertaken jointly with Dennis Kundisch. This paper investigates the applicability of the small-area hypothesis to the activation of user contributions through badges. The small-area hypothesis states that individuals in pursuit of a goal exhibit stronger motivation when they

focus on whichever is smaller in size: the share of completed actions or the share of actions still needed to reach a goal (e.g., Koo and Fishbach 2012). In other words, the question is whether and how the framing of the recorded progress affects motivation. In practical terms, users who are in the early stages of goal-pursuit are more effectively motivated when presented with their accumulated progress (e.g. 10% achieved) rather than with their remaining progress (e.g., 90% remaining), whereas with greater proximity to the goal, it is more effective to focus users on their remaining progress (e.g. 10%) rather than on their accumulated progress (e.g., 90%). Consistent with theoretical predictions, the results indicate that the small-area effect activates online user contribution behavior. The findings thus provide empirical evidence for the influence of the framing of progress towards badges on user behavior.

Theoretical Contributions of *Mutter and Kundisch (2015a)*

This paper contributes to the literature on gamification (e.g., Hamari et al. 2014) by providing empirical evidence that the framing of the progress towards virtual rewards affects user contribution levels. Moreover, this research contributes to the existing work on the small-area hypothesis (Koo and Fishbach 2012) by providing first empirical evidence of this effect with goals in form of non-monetary rewards, and by showing that the small-area effect also applies to motivational phenomena such as user effort.

Practical Implications of *Mutter and Kundisch (2015a)*

Gamification designers should be aware that the framing of progress towards virtual rewards influences user effort. The findings suggest that it would be more beneficial to frame progress in terms of accumulated actions in the beginning of one's goal pursuit up to a half-way point, after which it is more motivating to switch the framing to the number of actions remaining. Moreover, the existence of the small-area effect advocates a virtual reward system with multiple goals and medium achievement levels over a virtual reward system with fewer goals and higher achievement levels, since the small-area effect appears to be effective in activating user contribution behavior shortly before and after users attain their goal.

Summary of *Mutter and Kundisch (2014b)*

The fourth paper was a research undertaken jointly with Dennis Kundisch. The paper investigates how user status demotion affects user activity levels. In the underlying research environment, the user's status is represented by the badge held on the online community. When February 2007 the provider fundamentally restructured the virtual reward system of the community, nearly all users saw their status demoted (see section 1.3.2). This research uses the exogenous variation caused by the restructuring to identify the impact of user status demotion on user contribution levels. The empirical

results indicate that user status demotion has a statistically and economically significant negative impact on user contribution behavior.

Theoretical Contributions of *Mutter and Kundisch (2014b)*

This paper contributes to the literature on gamification (e.g., Hamari et al. 2014) by providing empirical evidence for the impact of status demotion on user activity levels in online communities. Moreover, by offering new theoretical insights on the key drivers that stimulate or inhibit user contribution behavior the study also contributes to the literature on online communities (e.g., Wasko and Faraj 2005). Finally, this research contributes to the literature on status demotion (e.g., Wagner et al. 2009, Drèze and Nunes 2009) by being the first to provide empirical evidence for the negative impact of status demotion in a virtual reward system based on non-monetary rewards and by showing that status demotion also applies to motivational phenomena such as user effort.

Practical Implications of *Mutter and Kundisch (2014b)*

Whether operators of online communities plan to implement or already have adopted a virtual reward system that reflects user status they should be aware of the negative impact of status demotion on user activity levels. Operators of such communities who face the challenge of restructuring their badge system (e.g., adding new badges) or consider reviewing the extrinsic incentive system for their users should by all means avoid status demotion. Otherwise the restructuring is likely to negatively affect the motivation of their users by significantly inhibiting rather than enhancing user activity levels and, hence, defeat the purpose of the reward system.

Summary of *Mutter and Kundisch (2015b)*

The fifth paper was a research undertaken jointly with Dennis Kundisch. This research tests the applicability of the prospect theory model of goal behavior – proposed by Heath et al. (1999) – to predict individual performance in the presence of *mere* goals. The model proposed by Heath et al. (1999) is based on the assumption that goals inherit the main properties of the prospect theory value function, i.e., reference point dependence, loss aversion, and diminishing sensitivity. The paper analyzes how users adjust their contribution behavior in the days surrounding goal achievement, where goals are represented by badges. The results reveal that users gradually increase their performance in the days prior to earning a badge, with performance peaking on the day of the promotion. In subsequent days, user performance gradually diminishes again, with the decline being strongest on the day immediately following the badge achievement. These findings reflect the characteristic S-shape of the prospect theory value function which is convex below the reference point and concave above it. The results thus support the transferability of the main properties of the prospect theory value function to goal behavior in the field and suggest a distinct shape of the value function around goals.

Theoretical Contributions of *Mutter and Kundisch (2015b)*

This paper contributes to research on goal setting by providing field evidence for the applicability of the model provided by Heath et al. (1999) for the prediction of user performance in the presence of *mere* goals. Thus, this research offers evidence that the prospect theory value function provides 'a unifying explanation for findings in both the goal literature and the judgment and decision making literature' (Heath et al. 1999, p. 80). Thereby, this paper connects the goal setting literature with the decision making literature, with the potential for each to derive new insights. In addition, this research contributes to the recent literature on gamification (e.g., Hamari et al. 2014) by providing a theoretical explanation and empirical evidence for the impact of badges in the form of *mere* goals on user contribution behavior.

Practical Implications of *Mutter and Kundisch (2015b)*

The prospect theory model of goal behavior provides a rationale for how users orchestrate their contribution behavior with progress towards a goal. This helps gamification designers to predict user contribution behavior as a function of a user's progress towards a goal. Moreover, according to the model the goal's level of difficulty should be aligned to the ability (or opportunity costs) of a user to achieve their goal. This implies that the optimal level of difficulty can vary between users. For example, regular users need more challenging goals than occasional users. This might be operationalized in practice by assigning the number of points per activity dynamically depending on the contribution level of a user.

Contributions to, Presentations, and Scientific Dissemination of Studies Submitted as Part of this Dissertation

Publication	**Mutter, T., and Kundisch, D. 2014a.** "Behavioral Mechanisms Prompted by Badges: The Goal-Gradient Hypothesis," in *Proceedings of the International Conference of Information Systems*. Completed Research.
Contribution to joint work with co-authors	Co-authorship with D. Kundisch (70% T. Mutter, 30% D. Kundisch) - Acquisition of the dataset by D. Kundisch - Construction and description of the dataset by T. Mutter - Literature review by T. Mutter - Concretization of the research question jointly with D. Kundisch - Positioning of the paper joint with D. Kundisch - Hypotheses development, statistical modelling and conduction of all statistical analyses by T. Mutter - Implementation of all robustness checks by T. Mutter - Write-up of paper by T. Mutter. Feedback, comments and corrections by D. Kundisch - Write-up of the response to the reviewers and revision of the paper for one round of review by T. Mutter. Feedback, comments and corrections by D. Kundisch
Conferences/ Workshops/ Seminars	The paper was presented by T. Mutter at the following conferences, workshops, and seminars: - University of Paderborn, Doctoral Workshop, 2014 - International Conference of Information Systems, Auckland. New Zealand, 2014
Scientific Dissemination	The work on this paper started in March 2013. The paper is published in the *Proceedings of the International Conference of Information Systems (ICIS)*, Auckland, New Zealand, 2014 (VHB Ranking: A, Orientierungslisten der Wissenschaftlichen Kommission Wirtschaftsinformatik: A)

Publication	**Mutter, T. 2014.** "The Impact of Goal Achievement on User Effort," *Working Paper*, University of Paderborn.
Contribution of joint work with co-authors	Single authored paper.
Conferences/ Workshops	The paper has not been presented at any conference or workshop.
Scientific Dissemination	The work on this paper started in July 2014.

Publication	**Mutter, T., and Kundisch, D. 2015a.** "Behavioral Mechanisms Prompted by Virtual Rewards: The Small-Area Hypothesis," in *Proceedings of the European Conference on Information Systems.* Completed Research.
Contribution to joint work with co-authors	Co-authorship with D. Kundisch (75% T. Mutter, 25% D. Kundisch) - Acquisition of the dataset by D. Kundisch - Construction and description of the dataset by T. Mutter - Literature review by T. Mutter - Concretization of the research question jointly with D. Kundisch - Positioning of the paper jointly with D. Kundisch - Hypotheses development, statistical modelling and conduction of all statistical analyses by T. Mutter - Implementation of all robustness checks by T. Mutter - Write-up of paper by T. Mutter. Feedback, comments and corrections by D. Kundisch - Write-up of the response to the reviewers and revision of the paper for one round of review by T. Mutter. Feedback, comments and corrections by D. Kundisch
Conferences/ Workshops	The paper was presented by T. Mutter at the following conference: - Conference on Information Systems and Technology, San Francisco, USA, 2014 - European Conference on Information System, Münster, Germany, 2015
Scientific Dissemination	The work on this paper started in August 2013. The paper is published in the *Proceedings of the European Conference on Information System (ECIS),* Münster, Germany, 2015 (VHB Ranking: B, Orientierungslisten der Wissenschaftlichen Kommission Wirtschaftsinformatik: B).

Publication	**Mutter, T., and Kundisch, D. 2014b.** "Don't take away my Status! – Evidence from the Restructuring of a Virtual Reward System," *Computer Networks* (75:B), pp. 477-490.
Contribution to joint work with co-authors	Co-authorship with D. Kundisch (65% T. Mutter, 35% D. Kundisch) - Acquisition of the dataset by D. Kundisch - Construction and description of the dataset by T. Mutter - Literature review by T. Mutter - Concretization of the research question jointly with D. Kundisch - Positioning of the paper jointly with D. Kundisch - Hypotheses development, statistical modelling and all statistical analyses by T. Mutter - Implementation of all robustness checks by T. Mutter - Write-up of paper by T. Mutter. Feedback, comments and corrections by D. Kundisch - Write-up of the response to the reviewers and revision of the paper for two rounds of review at *Computer Networks* by T. Mutter. Feedback, comments and corrections by D. Kundisch
Conferences/ Workshops/ Seminars	The paper was presented by T. Mutter at the following conferences, workshops, and seminars: - University of Paderborn, Ideas in Management and Economics Seminar, 2013 - European Conference on Information Systems (ECIS), Utrecht. Netherlands, 2013
Scientific Dissemination	The work on this paper started in July 2011. A research-in-progress version of the paper is published in the proceedings of the *European Conference on Information Systems*, Utrecht, Netherlands, 2013 (VHB Ranking: B, Orientierungslisten der Wissenschaftlichen Kommission Wirtschaftsinformatik: B). The full paper was finally accepted at *Computer Networks* (5-Year Impact Factor: 1.87) on August 11th 2014.

Publication	**Mutter, T., and Kundisch, D. 2015b.** "Goals as Reference Points: Empirical Evidence from a Virtual Reward System," *Working Paper*, University of Paderborn.
Contribution to joint work with co-authors	Co-authorship with D. Kundisch (75% T. Mutter, 25% D. Kundisch) - Acquisition of the dataset by D. Kundisch - Construction and description of the dataset by T. Mutter - Literature review by T. Mutter - Concretization of the research question jointly with D. Kundisch - Positioning of the paper jointly with D. Kundisch - Hypotheses development, statistical modelling and conduction of all statistical analyses by T. Mutter - Implementation of all robustness checks by T. Mutter - Write-up of paper by T. Mutter. Feedback, comments and corrections by D. Kundisch - Write-up of the response to the reviewers and revision of the paper for one round of review by T. Mutter. Feedback, comments and corrections by D. Kundisch
Conferences/ Workshops	The paper has not been presented at any conference or workshop
Scientific Dissemination	Work on this paper started in February 2014.

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