

Understanding Grassroots Sports Gamification in the Wild

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ABSTRACT

While gamification is an often used tool in building interactive experiences for sports, little work has addressed systems designed by users for users and deeply embedded in the social setting of physical exercise. Consequently, a better understanding of sports gamification in the wild is needed to build systems that reflect the users' pre-existing social context. This paper presents a qualitative study of a gamification system, the Boar Board, designed by a sports coach to support users participating in regular exercises. Through surveys, interviews and observations over eight months, we built an understanding of the user adoption of the system and how the Boar Board supported the goals of the group. Based on this, we endeavour to understand the social aspects of the system, including trust, and posit a number of design considerations for future inquiry into gamification systems for sports.

Author Keywords

sports, gamification, lead users

ACM Classification Keywords

H.5.m. Information Interfaces and Presentation (e.g. HCI): Miscellaneous

INTRODUCTION

Recent years have seen a proliferation of technical solutions aimed towards supporting exercise and sports. Notably, a number of them have used gamification, "the use of game design elements in non-game contexts" [9], to promote regular physical exercise and to provide motivation. Console systems such as *WiiFit* [25] are now commonplace in homes and the popular gamified running app *Zombies, Run!* has been shown to influence running routine and perception [16]. In this paper, we present an in-the-wild study of a lead-user-designed gamification system aimed towards a fitness class.

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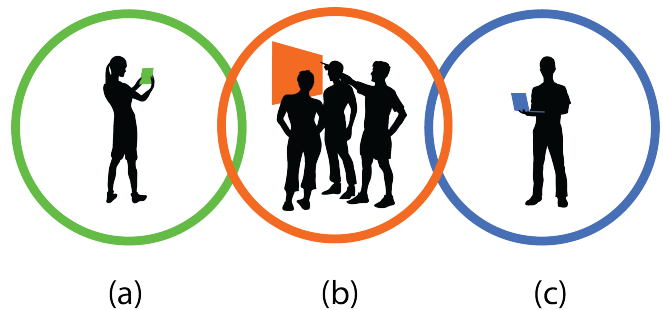


Figure 1. The three key components of the Boar Board: (a) player cards (b) the board, and (c) the coach-managed Facebook group

We believe that designers can learn from imperfect user-designed real-life gamification, and that this study also highlights research challenges for understanding and supporting user-centred gamification.

In order to explore this, we investigate the case of a gamification system created by non-expert designers (i.e. those without prior knowledge of gamification or design education) to support an organised exercise group. Contrary to most work in gamification for exercise and fitness, which have mainly explored behavioural change (e.g. [5], as observed in a literature review by Webb et al. [35]), our inquiry investigates the use of gamification for highly motivated, physically active individuals. Furthermore, the system was not instigated or designed by researchers, but represents an unusual opportunity to study the design of a system in the wild. The gamification system we studied — the Boar Board — was primarily designed by an experienced sports coach who was also the leader of a regular high-intensity exercise group. The system offers for the users personal avatars placed on a publicly available board, player cards and the support of a Facebook group (see Figure 1). Players complete skill trees that are closely related to the exercise goals of the training sessions. We contribute the following: 1) a qualitative empirical study of the design and subsequent usage of the Boar Board, a successful real-life gamification system; 2) a proposed model for understanding the needs and trust dynamics of the users of the system; and 3) six design considerations for motivational gamification systems based on studying Boar Board.

This paper is organised as follows. First, we review related work relevant to our inquiry. We then describe our theoretic-

cal approach and provide a functional description of the Boar Board to establish the context of our inquiry. We then present the methodology used to study the system and the group that was using it. Afterwards, we show our results — a model for understanding the group dynamics involved in the system and design considerations for future systems.

RELATED WORK

This section introduces a set of past works that framed our inquiry. First, we review research in motivation to understand what motivation support systems should provide. We then analyse prior work in gamification in general and in designing contextualised gamification systems.

Motivation

Self-determination theory (SDT), as described by Ryan & Deci [27], divides motivation into intrinsic and extrinsic motivation, where intrinsic motivation emerges from activities that are satisfactory in themselves, while extrinsic motivation arises from external goals (e.g. money, health, or social approval). As SDT has frequently been used to understand motivation in sports and exercise [30] we use it to assess the users' motivation. Furthermore, we chose to use the Sports Motivation Scale (SMS-28), developed by Brière et. al [1], with a validated translation by Pelletier et al. [24], to quantify these motivational aspects. It breaks down intrinsic motivation into three subgroups: “to know,” “to accomplish,” and “to experience stimulation.” It also measures identified, introjected and external regulation, as well as amotivation – a lack of motivation.

Social sports in HCI

The field of HCI for sports has a history of designing systems for supporting the social experience of physical exercise. Early work focused on guidelines for applications that promote physical exercise and advocated embracing the social aspects of fitness [3]. Catering to the needs of running groups was also seen as a good opportunity to technical intervention. Timmermann et al. [32] focused on facilitating running group activities. Further work explored mediating social support. HeartLink [6] and RUFUS [36] provided friends and family with additional means for supporting runners in races. In contrast, Joggobot [13] used a drone as a non-human companion for running. Finally, Jogging over a Distance [22] allowed pairs of users to exercise ‘together’ while being physically separated. These examples show the importance of supporting the social aspect of sports through systems development. Developing technologies that support the social side of sports is essential to support the athletes' motivation. Technology can help support experiencing relatedness e.g. the feeling of belonging to a social group, which in turn can produce motivation [27]. Furthermore, support is needed for social comparison so that users are able to build an understanding of achievement using social reference [12]. Woźniak et al. showed that users expect high customization when interacting with sport applications [38]. Our work is different from past efforts as it explores how a system can fit into established social construct within an exercise group with a trainer. Further, in contrast to previous work, we study a group of motivated

individuals committed to a fitness class and not user groups that require persuasion to maintain an exercise routine.

Gamification

The term “gamification” is relatively new, but the practice is arguably much older; religious rituals have elements of play and games [15]. Gamification has been defined as “the use of game design elements in non-game contexts” [9] and has been argued to be technology-neutral as the game design elements are themselves technology-neutral [8]. Since gamification takes advantage of the innate drive to play [29], it can act as a rewarding action [18]. Gamification is often introduced to heighten engagement for activities where the users have little intrinsic motivation, but when designing for situations where users already have intrinsic motivation it is important not to obscure the or misrepresent the main activity [17]. Richards et al. [26] state that it is also critical for successful gamification systems to consider the broad context of deployment and identification of stakeholder requirements as well as a deep understanding of the target population. In our work we have attempted to take these concerns into consideration when evaluating the system we study.

Gamification and social environments

Gamification systems often provide commonly used game design elements (e.g. reward systems with points, levels, badges, and leader boards [9] based on quantified data from the activity). Such systems share many qualities with the practice of personal informatics [19], where users gather and present quantified data on themselves in order to promote understanding. Zuckerman & Gal-Oz [39] evaluated the inclusion of game design elements in “StepByStep,” a system aimed to promote walking, finding that adding gamification to a system which already provided quantified data did not make the system more effective, but that users appreciated gamification elements such as leader boards.

Arguing that gamification needs to focus on intended experiences, Deterding [7] stresses a move away from focusing on applying individual game mechanics to perceiving the design scope of gamification as the complete experience of socio-technical systems. Referring to Aristotle's concept of *eudaimonia*—the good life—Deterding suggests “eudaimonic design” as an alternative to the name gamification as a way of stressing the importance of ethical considerations when taking this stance [7]. In a similar vein, Niess and Woźniak highlighted the importance of eudaimonic needs in the context of physical activity [23]. In our work, we endeavoured to see how these concerns are reflected in a system that was deeply embedded in a social context.

Accounting for social structures

Von Hippel [33] identified the concept of “lead users”: actively innovating users with strong needs in their area of expertise. Von Hippel suggests that lead users can offer valuable insights regarding needs and prototype solutions. In urban planning studies, Saad-Sulonen [28] identifies “self-organization”, where networked communities of participants initiate activities. It is noted that user participation in design

not only improves understanding of the problem, but also reduces resistance to change [14]. Bruce et al. [2] also introduced the term “situated evaluation” for evaluation of socio-technical systems that employs observation and interviews, seeking to uncover emergence of innovation through practice. In this work, we attempt to broaden the understanding of how designs are enacted and adopted by a user group driven by a lead user, through understanding the social and cultural embedding of a gamification systems built solely by non-professionals.

With the above in mind, our work challenges the present definitions of gamification that usually see the notion as a conscious design effort and view it as an emerging phenomenon in a social context; thus differing from past inquiries. Moreover, we focus on gamification designed by non-experts. Specifically, we investigate how a sports coach developed a gamified training support system with the help of his exercise group without the aid of professional designers. This enables us to ask questions about how users may take a more active role in designing gamification systems, and to explore underlying dimensions relating to motivational and social processes in user groups.

CONTEXT: THE BOAR BOARD

Our inquiry on gamification for motivation in sports started when we found that a head coach at a fitness centre had started to design a gamification system for informing and motivating the participants in his fitness class. This attracted our attention, as we were aware that most gamification systems related to exercise address problems of behavioural change [39]. Further, we recognized that studying systems that support sport *in situ* represented a gap in current research [37]. The Board represents a particularly interesting case to study as it is designed for those who already have enough motivation to attend a regular fitness class and thus it escapes the theoretical lens of “persuasive” technology, which is most commonly applied to exercise systems: the Board focuses on providing extra motivation rather than convincing unwilling participants. We approached the training centre with a proposal to study the process as it unfolded. As stated in later interviews, the head coach, M, was incentivised by the fact that a research study would offer an opportunity to reflect on how the Boar Board was created and verify whether it was indeed motivating its users, as well as confer the added legitimacy offered by an official university study. M was the main designer of the system. His profile closely resembles what von Hippel’s [33] “lead users”. The participants in his exercise program were involved in testing the system and provided feedback throughout the process.

The Boar Board consists of a physical board, player cards and a Facebook group (shown in Figure 1). The system was created to support a general fitness class at a commercial training centre. M (the head coach) authored an exercise programme with the stated goal to offer balanced overall fitness development, a fair degree of fun, and elements of martial arts. It is worth noting that neither M nor any of the users of the system claimed any knowledge of gamification when creating the Boar Board. With a steady attendance (the coach esti-

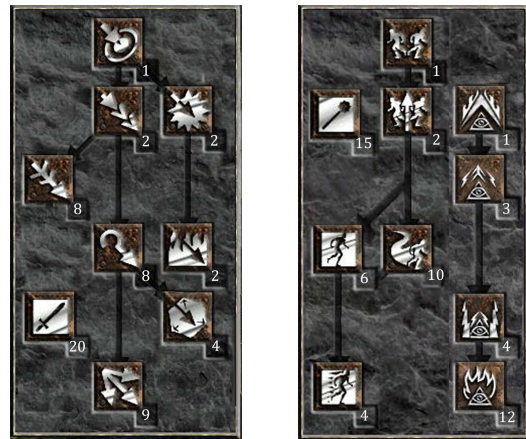


Figure 2. Two skill trees from the Boar Board. The trees contain tasks in acrobatics (left) and endurance (right). The number of points assigned to a given task is shown next to its icon. The ultimate task is shown at the bottom of the tree.

mates the group size at around 30 people) and many users following a strict training regime, M looked for ways to make the sessions entertaining and challenging. At first, a simple table with planned goals was set up where users declared their desired achievements and could then write their actual results at the end of the season. M planned for the goals to be easily achievable:

‘I used exercises they haven’t done before, so many people made better progress than expected. This was a conscious choice on my end. (M)’

As M observed positive improvement and increased activity, he proceeded to design a more elaborate system during the summer break. He then shared the idea with a fellow coach who was also a graphic designer, who suggested the system could take the style of a fantasy role-playing game (RPG). This seemed appealing, as RPG games have a focus on storytelling and characters, often with complex mechanics for measuring character development throughout the game. M decided to use boars as the theme; participants would start as “squeakers,” and as they completed the challenges they would earn more impressive titles up to the final, tenth level “legendary boar.” Boars, M notes, are often used in Poland to describe guys who are “huge, strong and motivated”, and they are also especially fitting for the kind of fitness classes he presides over:

‘We run in forests, roll around in mud during obstacle races and we’re strong and ready. (M)’

Additionally, M designed a number of “skill trees” based on various aspects of fitness (shown in Figure 2), a term used in RPG games for a hierarchical tree structure that represents a certain group of skills or challenges. Badges were introduced in the second month of the system’s operation as a response to users requesting recognition for activities performed together. This is how the Boar Board was started. Next, we provide a detailed description of how this gamification system (referred to as “the system” in this paper) operates at the moment of writing.



Figure 3. The Boar Board hanging on a wall in a public space with player avatar markers in dedicated spaces. The skill trees are presented on top. Levels with point requirement, descriptions, and inspirational quotes are featured in the centre of the board. The bottom part contains an excerpt from the rules of the system. To the right are badges that can be obtained through group activities.

Game Mechanics

Players gain points by completing exercise challenges. One can achieve a node in the skill trees only if they have achieved its parent node. A player's skill level is then gauged by the last node achieved in the skill tree. The four skill trees focus on strength, endurance, balance, and acrobatics respectively, and each skill tree is composed of eleven skills. The player chooses which skills they want to achieve, but in order to achieve them they have to pass a physical test. The trees begin with basic exercises that most users can complete without prior specific training. The trees then split into branches and demand more specific skills. The final skill of each skill tree usually consists of a difficult task, which offers a challenge even for the head coach.

Badges provide reward for extracurricular activities. Badges are awarded for attending self-organised group training sessions outside of the main exercise programme (e.g. going running with friends). Activities leading to a badge can only be counted if completed in a group of at least three users and documented by a photo posted to the programme's Facebook group.

The total number of points determines a player's level. The ten boar-themed levels are assigned based on points. Points are awarded for completing tasks (e.g. ten pull-ups) on the skill trees, with the basic skills in each tree (the mother nodes) being worth the least points, and each subsequent skill adding more points. Participants are also awarded points for badges they have achieved. All points are then summed up to determine the current level of a user.

Player status is permanently displayed on a board in the fitness centre. The main artefact of the system is a board made of polyurethane foam, which is prominently displayed in the fitness centre. Users who are part of the system have avatars, which represent their current level of fitness. The avatars are pinned in dedicated fields for each activity. The board also features a detailed description of the skill trees. Badges that can be won are prominently displayed next to the board. The avatar markers show the levels of all users and are moved exclusively by the head coach. Figure 3 presents the board and the badges as displayed in the training centre.

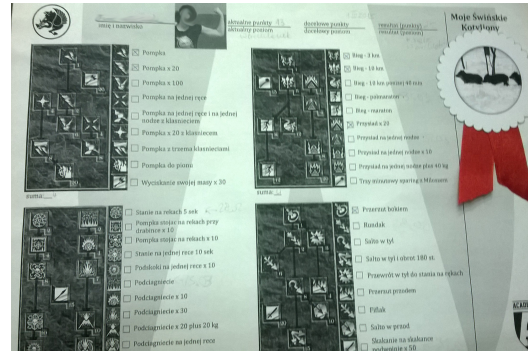


Figure 4. The Boar Board player card, anonymised. The card features all the skill trees in the system, a copy of the player's avatar (another copy is displayed on the board) and a space to affix badges obtained in extracurricular group activities.

Social coordination

The Boar Board Facebook group is used to coordinate activities for the users of Boar Board, schedule events and share experiences. The coach uploads all important announcements to the Facebook feed along with upcoming competitions, meetings and seminars. It is quite common for users to post either motivational videos to the group or material describing extreme athletic achievements (e.g. difficult acrobatic drills or impressive competition results).

Apart from the social network aspect, some tasks have particular requirements: The rules state that skill points can only be gained when an official test is taken with the head coach as a witness. In special cases (e.g. running marathons) photos or official results are permitted as proof. The board also states that the required exercises are to be "performed perfectly." A month of regular attendance in the training session is required to join the Boar Board. This is verified by the head coach using the fitness centre's attendance system. Once admitted to the programme, a user receives a player card (shown in Figure 4), which contains the skill trees as well as space to affix badges. This is intended to serve as a personalised help to track progress. The skill trees were designed based on M's extensive knowledge of training and physiology. They feature an easy entry point, but the difficulty increases sharply, with the final skills in the tree being accessible only to expert sportspeople.

The structure of the board is aimed at promoting development of physical skills in all areas and higher levels are not achievable if one does not obtain points in multiple trees. Furthermore, an additional mechanism intended to sustain continuing participation was introduced: When a user is absent for a month without a medical reason, their avatar marker is removed from the board. The marker can be returned to the board at the cost of ten points.

METHOD

To assess if the Boar Board increases motivation and to understand the processes behind its design and function, we performed several research activities over a period of eight months; shown in Figure 5.

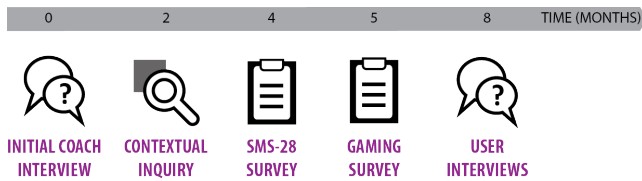


Figure 5. An overview of the research activities performed to study the Boar Board. The activities were performed sequentially, in time periods shown on top.

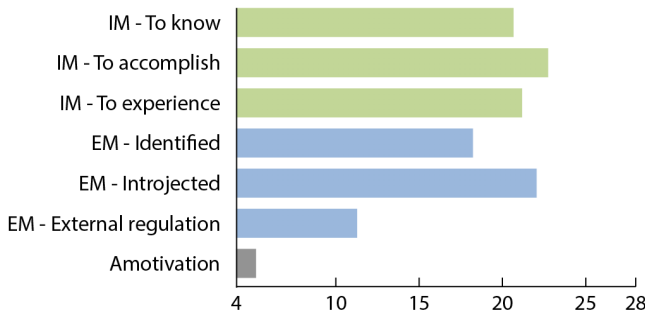


Figure 6. The results of the SMS-28 are clustered into different types of intrinsic motivation (IM), extrinsic motivation (EM), and amotivation. The participants exhibited above-average results for both IM and EM. Note that the maximum value for each category is 28 (4 questions with answers on a 0-7 Likert scale).

Preliminary inquiries

Our inquiry began with a preliminary interview with the head coach M who approved the study and granted us access to other data sources. We were invited to the Boar Board Facebook group and received all of the visual designs for the gamification system. We monitored and archived all activities in the Facebook group regularly. The start of our activities took place after the system had been operational for about two months. We were allowed to visit the fitness centre where classes took place and observe how users interacted with the Boar Board. We listened to discussion around the board in front of the exercise room and asked questions. We prompted users to explain the rules of the game to us and reflect on how the board affected their interactions with others. This gave us an initial understanding of how the system worked and the underlying game mechanics.

Surveys

As the next stage of our inquiry, we used two surveys to assess the participants. Firstly, we used the Sports Motivation Scale (SMS-28) [1] to assess how motivated the participants were, since it has been shown that SMS-28 scores are normally distributed in the general population of people practising sports [24]. This enabled us to better understand the role of the Boar Board as it was meant to provide additional extrinsic motivation. We asked 18 randomly chosen members of the exercise group (mean age $\mu = 23.42$, $\bar{x} = 23$, $\sigma = 5.3$) to complete the SMS-28 questionnaire. The survey was offered both online and on paper. We asked class attendees to complete the survey when they exited the training centre after a session.

We hypothesised that the design and adoption of the system may have been deeply affected by the fact that the exercise

group was also a community of gamers [10]. Consequently, we administered another survey, developed specifically for this study, which aimed to identify if the participants were active gamers. We wanted to eliminate the possibility that the system design adoption was based on the fact that a majority of those attending training sessions were deeply involved with different forms of gaming. The survey asked how much time the participants spent playing games and collected demographic data about the group. If the majority of the board's users were gamers, i.e. those intrinsically motivated to play games, the engagement created by the system could be explained by the users' prior experiences with similar games.

In order to determine if this was the case, we asked 14 randomly chosen Boar Board participants (mean age $\mu = 24.46$, $\bar{x} = 25$, $\sigma = 4.55$) to complete a survey where we asked how often they played tabletop, console/PC and mobile games. We also collected basic demographic data. The lower number of participants who responded to this survey than the SMS-28 is because some users submitted incomplete answers and were thus not included in the results. As we endeavoured to minimise the time needed for the study (our work was performed during and before fitness classes) we did not repeat the survey.

User interviews

Finally, we conducted semi-structured interviews in an attempt to understand the social dynamics in relation to the gamification system. As we were now familiar with the mechanics, we asked about specific features of the system. The interviews were conducted immediately preceding a training session in a separate room at the training centre. We conducted two batches of interviews with a month in between (labelled as A–D and I–V in Table 1). Additionally, we conducted a two-hour-long interview with the head coach M about the details of the design process of the gamification system and his perceptions of how the board worked in practice. It must be noted that as the Boar Board was already operational when we conducted our inquiry, the description of the design process is fragmented as M did not document it. Thus, this work does not contain information about specific steps in the design process. Furthermore, we conducted a follow-up interview with M regarding theme and design. Table 1 shows an overview of the key values for all interviewees. The sessions were recorded and transcribed for further analysis (total recording time: 4 hours 25 minutes). We asked about specific aspects of the gamification system such as the experience of having the board physically displayed in front of the exercise room and its role in the group. We also investigated the sources of motivation present among the participants, focusing on the exact roles in the system and the head coach.

Analysis

The collected data was analysed using a grounded theory approach. Grounded theory is a qualitative analysis method that starts with data collection and then constructs categories that lead to forming a theory through constant comparison. We aimed at identifying the qualities of the system that drive the user's feelings and emotions. While we are aware that our interactions with the participants did influence the analysis, we

	Code	Age	Gender	Months active	Training sessions per week
1st interview round	A	23	M	4	2-3
	B	19	M	4	2-3
	C	23	F	3	2-3
	D	21	M	4	4+
2nd interview round	I	24	F	8	2-3
	II	28	M	8	2-3
	III	25	F	7	2-3
	IV	24	M	2	2-3
	V	19	M	8	4+
Head coach	M	27	M	N/A	4+

Table 1. Basic demographic and training session participation data on interviewees in our study. Note that interviews were spread in time to gather an accurate account of the adoption of the system. Months active are presented at time of interview.

are confident that the data gathered in the wild can provide interesting insights. Consequently, the analysis presented in the paper can be considered constructivist [31]. Two researchers engaged in iterative open coding sessions followed by categorising and axial coding as suggested by [4]. We strived to build a model that would explain the data in terms that would be actionable for future design.

RESULTS

This section presents the outcomes of our inquiry; beginning with our survey results followed by our analysis of the interviews.

Motivation survey

The results of administering the SMS-28 are shown in Figure 6. It shows that the group members were highly motivated. This suggests that while the Boar Board may help them gauge how well they do and provide an additional source of external stimulus when intrinsic motivation is not enough as well as motivation to advance in all areas, it is not the main reason for the users to involve themselves in the fitness classes. Consequently, the rest of our inquiry is based on the premise that the Boar Board works as intended, as a source of additional support for users to develop their fitness through engagement in a social game.

Gaming Survey

The data obtained from the gaming survey (presented in Figure 7) shows that while gamers were present in the group, they were not a majority. Only three participants reported regularly engaging in video games. It can be observed that the group exhibited a familiarity with games, but the games are not a significant part of the lives of most participants. As a consequence, we believe that the Boar Board is not successful for reasons directly linked to users perceiving the system as an analogy to other games in which they are deeply engaged. This, in turn, leads us to investigate other factors and

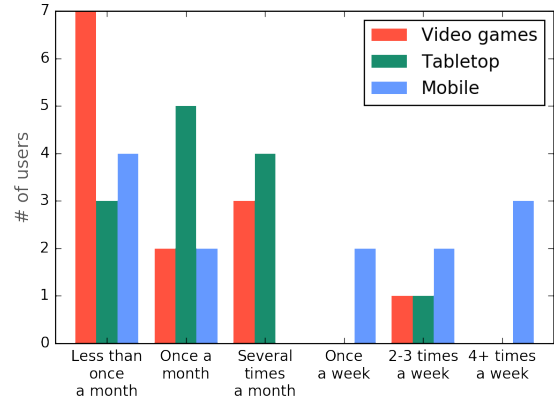


Figure 7. Gaming survey responses. Most participants reported they sporadically engaged in gaming activities with only a minority being active gamers.



Figure 8. The three dimensions of the proposed understanding of the Boar Board. All the interviewees mentioned these concepts as their core needs with regard to the system. For each need, we identified three satisfiers through the interviews and also noted that the balance between the satisfiers was personal.

mechanics in play that make the users engage with and trust the Boar Board.

FINDINGS

Our grounded theory analysis revealed three dimensions of the system in which the users understood its mechanics: trust, success evaluation and motivation. We believe these dimensions also show the key user needs for the Boar Board. The users needed help to feel motivated, based on a belief that they were succeeding. In order to adopt the system and to use it for verification of their successes, they had to trust that the system model was relevant and the data about their performance was correct. For each of these needs we further identified three ways through which the participants satisfied the need. Users did not use these ways uniformly, but we found that they rarely depended on just one. All the interviewees mentioned the three needs and the desire to satisfy them. Figure 8 shows the three dimensions.

Trust

Trust lays at the base of our proposed model for understanding the Boar Board. From the interview data, we derived that the users trusted the trainer and the system he designed. They also had a sense of group purpose. All the other aspects of the system benefited from the trust mechanics. Users reflected on how they trusted the trainer, M, both as the system creator and as the one responsible for verifying their skills.

'M created this weird sport [the fitness class] we are all practising. [...] It's M's privilege to verify one's abilities. (V)'

The system itself was also perceived as one to be trusted, although some participants did not believe everyone else followed the rules:

'The system is very just. It takes a month to get a marker. It is not always followed. (V)'

'Some people cannot do what they declared in the initial set-up. At least that is my impression. (I)'

and noted that they trusted M. to verify incorrectly entered information:

'We depend on M for verifying everything. (I)'

M, in his turn, endeavoured to make the system a source of information, and notes that the fact that the information concerning the current status of each user is contained within a single physical space plays an important role in the system. Not only does the physical board draw the users to attend fitness classes, but it also gives a higher level of control to M:

'I can easily see if people are on the levels they should be on. As I pass by the board multiple times during a day, I remember most of the contents by heart. This also prevents possible tampering. (M)'

This indicates that the sense of trust in the system was closely related to trusting M. We theorise that the system sometimes functioned merely as a metaphor of trusting the coach: as he designed and recommended the system it was adopted by the users. Some users also mentioned a general belief in justice and the idea that truth will always defend itself. This belief was not so much concerned with verification: users reporting this belief used vague statements, where the actual process was less important than the belief itself. Thus, we observed that the system evoked a sense of social justice in the users:

'Lies will surface sooner or later. (V)'

Success evaluation

In our model, success evaluation adds purpose on building a formal framework around motivation. All the achievements are based on trust in the purposefulness of the activities. Users defined their success in relation to personal goals, to the rest of the group and to the board. Success was measured both by qualitative and quantitative means. Quantitative means were based on activities performed, the points allocated for those activities, and how this related to other users in the group. Personal quantitative goals, such as weight, were also often mentioned. Qualitative measurements were based on feeling good after exercises and enjoying the training sessions:

'I was positive from the beginning [towards participating in the exercise group]. Now, I enjoy the classes more and I feel more at home in the group. (I)'



Figure 9. Users interacting directly with the board and discussing game status. Group members would often gather around the board waiting for a training session to begin, during breaks or before leaving for home.

One notable thing is that the board was useful to help users develop personal goals, and sometimes to quantify them. One user said:

'Initially, the board did not play a role [in my motivation]. Now it is a road sign of what I can and want to achieve. The board gets me closer to my goals. (III)'

The board also supported less measurable goals and internal desires:

'I can feel the difference. With the board you become stronger and fitter. (II)'

The users often gathered around the board:

'We usually talk about how many points we're still missing. Sometimes we discuss particular exercises (I)'

The physical location of the board made it hard to ignore. The participants needed to walk next to the board whenever they attended a training session and the space where it was displayed was quite prominent. We observed users pointing to the board to compare results and discuss the differences. They would also often point to particular skills and request feedback and assistance from peers. Figure 9 shows users gathered around the Boar Board in a training session break.

Motivation

The need to be motivated is at the core of gamification, and the interviewees had much to say about this matter. This is reflected in our model, where motivation is at the core of the processes surrounding the Boar Board. We identified three ways to satisfy this need, namely internalized motivation, group support and the Boar Board system. To start with, interviewees were intrinsically motivated, a finding also borne out by the SMS-28:

'The training itself is my goal. (D)'

noted one user, while another user said

'Most motivation is on my side. I personally want to come here. (IV)'

Highly internalized integrated regulation, such as the user reports that

'I'm most motivated by being able to get on the bus unassisted when I am old. (V)'

was also prominent. Users also found that the social context in the form of the group helped them stay motivated, and in some cases was important for them irrespective of the board:

'Getting a marker did not change how others in the group see me. (IV)'

The board was accepted as a motivational factor. It did help that user found it intriguing to start with:

'In the beginning, I appreciated that the board was something you couldn't see at other training centres. Later, as I was on level one and every one was pushing for higher levels, I figured I should start pushing too. (III)'

This also indicates that the individuality of the gamification system was an appreciated quality. Many of the users noted that the board provided them with goals:

'The "badge" activities support my main "board" goals. (II)'

The Boar Board Facebook group was also mentioned as a source of motivation:

'I can always find something funny, terrifying, or motivating in the Facebook group. And I know it's coming from the people I know. (IV)'

The mediating role of the Facebook group can also be observed in this excerpt from M:s post, which refers to an obstacle course run, in which some members of the group participated:

'Huge congrats to everyone! We made it and took our revenge for the 4th place last autumn! There's a lot of work ahead of us, but it's time to rest and regenerate for now. Let's focus on curing your injuries and perfecting technique. We're going for the gold next time! (M)'

Furthermore, users believed the board enhanced team spirit and provided motivation in the form of social pressure to attend the next class:

'I believe the board makes people return. (II)'

DISCUSSION

The system was tailor-made by a trusted lead user for a specific exercise group consisting of individuals who have high levels of intrinsic motivation; this group is rarely catered for in existing solutions. This is surprising since M, a seasoned coach, recognised that part of his work with these motivated participants was to provide additional motivational support when their intrinsic motivations were not sufficient on their own. The system also provided the participants with personal goals to aim for that were transparent to the group and the trainer, thus enabling social support. As the Boar Board was recognized by users as a source of both motivation and information, it appears to have succeeded to be useful to these participants.

We theorise that the successful adoption of the Boar Board can be explained by the needs model, that suggests that the system offers its users an opportunity to find their own personal balance within the three dimensions (trust–success evaluation–motivation). While the Boar Board may seem a very well-defined and basic quantitative way of measuring training effort and exercise performance, it is a complex system if one considers its social context. The users are fascinated by M's passion for exercise and hope that M will provide feedback, encouragement, and verification. However, as M is coaching a group of people, personal advice is rarely

possible. The Boar Board provides the users with an additional resource on which they can depend.

The Boar Board thus serves as a way for M to delegate some of the user needs to an additional channel of support where some of the participants' trust in M's competence is conferred to the board itself. As a consequence, M can delegate some of his tasks to the system and coordinate the group in a more effective manner. We speculate that the system has become a stand-in for M. According to Facebook posts, he has been able to take more time off for other pursuits, a development that coincided with the users asking for — and receiving — system recognition for planning events on their own. Through designing a system specifically for the group and letting the group influence the design, we believe the Boar Board has become a flexible tool to help them balance and support their specific needs.

For this reason, we also believe that it is important not only to explore how to support designing gamification systems, but also to support tools to help stakeholders design their own solutions. Dubberly et al. [11] argue that healthcare should be broadened to include self-management and self-tracking, reframing patients as designers, and notes that there is a shift in design practice that increasingly recognises that users manage or design their own experiences. This is based partly on the democratization of data and informational tools, but also on the rising health care costs: designing for users as individuals is expensive unless they are involved in the solution.

Our study shows that future systems, which aim to gamify parts of existing practices, should investigate carefully which parts of the experience can be safely delegated to external support, and which aspects are better performed through facilitators or user-to-user interactions. The Boar Board may have successfully facilitated a transition of leadership from strictly individual to group-based, future system design could incorporate studies into the social context of a practice before deployment. A key question that emerges from our inquiry is whether the Boar Board could have been designed by a professional gamification-oriented designer. Our work explores how lead user design can support the adoption of a system through domain knowledge and trust. We believe that the fact that M was a lead user with recognized domain competence designing the system was a good choice as the system benefited from users transferring their trust in M to the system which he designed. M would optimally be aided by professionals and extra theoretical knowledge, but the fact that he is identified as the main author of the Boar Board builds the social legitimacy of the system. We believe future design procedures must be revised to enable designing for this kind of 'vicarious' trust, where designers can act as effective facilitators but the main agents are lead users with domain competence and a trusted role in the community. This could also be a case for end-user development [20], where non-professionals are given tools and methods to allow them to create their own systems.

A consequent challenge that emerges for the game and HCI communities is how this fact can influence future work in gamification. By analysing the Boar Board we aim to bring

a case of non-expert gamification design by a lead user to the attention of researchers. It appears that the social context of the system and M's understanding of that context was the key to success. While M allowed the system to take some of his responsibilities, he still provided personal guidance during the classes. Further, gamification encouraged enhanced social interactions e.g. mutual support and knowledge sharing.

We believe that the needs model that we built to understand and explain the underlying social mechanics in the Boar Board can be revisited and reused for designing similar systems. Our work shows how important the social dynamic underlying the gamification is for everyday sports motivation practice. When addressing similar user groups and purposes, our model can serve as an entry point to conducting design research in the wild within a specified sports community. A similar mapping of the underlying dynamics may be instrumental in creating artefacts that reflect the group structure and result in providing effective extrinsic motivation.

Limitations

Our findings can be generalised to a limited extent. As our study was conducted in the wild, it offers high ecological validity. Nevertheless, we are aware of the lack of control and the existence of confounding variables that limit the generalisability. Our study of the Boar Board was naturally limited in time. We were able to observe the design and deployment of the gamification system used in the wild until it reached a certain level of maturity. However, as there is little information on user-designed gamification in the literature, we are unable to fully ascertain a relevant time frame for the system to mature. Consequently, our study is an 8-month snapshot of the history of the Boar Board. It is worth noting that Boar Board's target group is mostly composed of relatively young individuals that were raised in a culture where games and videos games are strongly present. As a consequence, despite that facts that most participants were not active in gaming, they must have been familiar with some game elements. It is possible that the same situation in a gaming-illiterate group would have demanded more trust in order to make adoption successful.

Finally, a note on the analogue quality of the system described. As noted in the Related works section, game design elements and the theory of gamification are not limited to computers, but rather are overarching principles that govern the application of play and games in any form or media. While there is of course elements of analogue interfaces that are difficult to generalize to technological interfaces, gamification systems and the understanding of their social contexts could be generalized to digital solution design.

Design considerations

We studied the Boar Board to understand its function and design process. However, as interaction designers with expertise in gaming, we identify several lessons learnt in the process that can inform future design through our results and reflection on the discussion above. Even though the Boar Board presents a mostly analogue system tailored for a very specific

user group, we believe that several lessons learnt in our in-the-wild study can inform the design of future gamification systems (irrespective of whether or not they employ digital technology). Our findings are especially relevant for systems aiming to provide extrinsic motivation in sports.

On a general level, our findings reflect the recommendations provided by Richards et al. [26] who state that it is also critical for successful gamification systems to consider the broad context of deployment and identification of stakeholder requirements as well as a deep understanding of the target population. However, our work sheds more light on the details of the understanding of users required for a sports gamification systems. As the Boar Board is a fully user-designed sports gamification system, we point to observations emerging from its setting and design process that can serve as recommendations. In the spirit of past work that looked at analogue interaction to influence the design of future digital counterparts (e.g. [34, 21]), we formulate our design considerations for future gamification systems for supporting motivation in sports.

Designing for vicarious trust. Designing for trust is fundamental to usability, but we believe that we have successfully argued that the participants chose to adopt the system partly because they trusted the system's creator. This poses a challenge for systems where professional designers or researchers are involved. We recommend that designers who undertake gamification efforts for groups study trust dynamics closely and make sure they are reflected in the design. The example of the Boar Board indicates that personal trust and pre-existing social interactions can be transferred into the design artefacts.

Enable lead users to design or reconfigure designs. Furthermore, we believe that designs should take care to investigate how to enable users with domain expertise, who act as formal and informal leaders of groups, to act as lead users and inform the design of the specific needs of their group. While the design of the Boar Board may not be complicated from a game design perspective (relative to other game designs), it was well-received by the end users, and our interviews suggest that this was in large part due to M's domain competence and how the trust for M was transferred to the system itself. This process could also be supported by reconfiguration options in existing solutions that make it possible for lead users to design themes or redesign models for their own groups. M made little use of technology for the Boar Board, even if he and the users showed a certain level of knowledge by their use of Facebook groups. This is may be due to the unavailability of game design tools (digital or analogue); M used the tools immediately at hand. As gamification is arguably technology-neutral, as discussed in the Related work section, this does not invalidate the system as a gamification system. Still, we see an emergent need for *providing tools for supporting design in user-driven gamification development* as this would facilitate the development of gamification systems by lead users or domain experts. As the Boar Board illustrates how a lead user can design well-adopted gamification systems, design tools

and processes that support this activity can encourage this to occur more often and make it easier.

Consider tangible and situated designs. We observed that the fact that the Boar Board was primarily a tangible artefact restricted to a single space played an important role in the system. We theorise that this may be especially relevant when working when sport-oriented communities as physical activity has a well-developed tradition of physical trophies as award for achievement. Further, the status of the system was available directly in the physical spaces associated with training. While gamification systems mainly take advantage of the digital domain, we urge designers to explore companion artefacts that occupy fixed physical spaces. Future systems should explicitly encourage collocated interactions between participants in the gamification system and aim to incorporate tangible artefacts as ways to offer a frame of reference or even boundary objects wherever the gamified activity takes place.

Consider the social context. Enhance, rather than modify, underlying social systems. Reflecting on the technology that the users employed to make the Boar Board, we can observe that the seemingly low fidelity of the technical solutions did not inhibit comprehension, communication or information management. This hints that *designing for technology-neutral gamification* can be an overarching design goal for future exercise motivation systems. As we have observed that the physical board played a pivotal role in Boar Board and also elicited situated social interactions, it appears that the tangibility of the solution provided additional support for the support dynamic involved in the system. While recent work on gamification in the CHI community has seen gamification enacted mainly through digital systems, the Boar Board shows that contextualising artefacts (digital or analogue) plays a crucial role in determining the success of a gamification design process. Specifically, that the Boar Board was strategically placed within a social and architectural context – and its tangibility – created affordances for spontaneous discussions and exploration. Consequently, choosing how abstract the system is, given the design constraints, emerges as a key design choice that remains to be explored in future studies. Our experience with the Boar Board suggests that research focusing on exercise motivation may benefit from *exploring the underlying social system of the group*. We have observed that the Boar Board was an effective way to quantify group pressure and make personal goals transparent. As exercise groups are a means of finding and sustaining social support for exercise motivation, future gamification systems should strive to enhance underlying social constructs rather than attempt to modify them.

Designing for inclusive and differing user strategies. The needs model that emerged from the grounded theory approach presented in this paper also showcases how users of the Boar Board effectively appropriated the system mechanics to suit their individual goals. Informed by motivation research, we know that users strive for different goals when involved in physical exercise. We observed that the Boar Board was perceived as appealing by users looking for competition, aiming

at maintaining their health or trying to lose weight. Future systems should promote inclusiveness to assure they effectively provide extrinsic motivation.

Allow for highly intrinsically motivated users. Gamification is often associated with support of unmotivated users [17]. The users of the Boar Board, however, were highly motivated and still found the system relevant for use in their training. A gamification system can provide motivation when needed, but can also provide quantifiable goals and serve as a subject for discussion. This may point to a need within research on gamification to acknowledge that “trivial” additions of game design to existing activities may be sufficient and actually optimal rather than naïve or shallow design: as motivated users are already immersed in the activity itself, an immersive game experience is not needed. It may also indicate that this kind of design is to be conducted internally rather than by outside designers. As such, it may point out a simplification in the current discussion about gamification, which currently does not stress the importance of considering the design agency of end-users when applying gamification in real world contexts.

CONCLUSION AND FUTURE WORK

This paper presented a systematic study of the Boar Board — a user-designed gamification system that provides motivation for a general fitness exercise group. The system uses a publicly-available board and player cards, where users accumulate points for completing exercise tasks. The game mechanics and visual style are inspired by RPGs. Through administering the SMS-28 survey to a part of the group, we established that those using the system were highly intrinsically motivated, a group that is unusual as a target for gamification.

Using interview analysis, we proposed a model for understanding the success of the system in terms of perception of trust, success evaluation and motivation, which we believe can be reused to aid in understanding the design of similar systems. Our inquiry can be an inspiration for further research into how non-experts and non-designers can be involved in designing applied gamification systems, especially in the sports domain. We believe that our findings and the design considerations we derived from them will be especially useful for design and design research of gamification systems aimed towards pre-existing social contexts.

While this paper focused on providing an accurate account of how the system was designed and understanding how it became a constructive and substantial motivating factor, we believe that user-designed gamification systems require more attention and that the research community should explore how users can be effectively involved in the design. Another approach would be to investigate whether effective tools for designing gamification by non-experts can be created. We also see potential for another inquiry into the role of tangible artefacts for gamification or even the balance between digital and tangible artefacts and their influence on motivation in gamification systems. Additionally, the question of how sociomateriality is manifested in such systems remains open. We hope that our research is only a start for more advanced inquiries into user involvement in the design of gamification.

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