‘Not all Treasures are Silver and Gold’ – Understanding the Gamification Element Lootbox and its Influence on Motivation and Performance

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‘NOT ALL TREASURES ARE SILVER AND GOLD’ – UNDERSTANDING THE GAMIFICATION ELEMENT LOOTBOX AND ITS INFLUENCE ON MOTIVATION AND PERFORMANCE

Completed Research Paper

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Abstract

So-called “lootboxes,” have recently developed into a quasi-standard for online gaming. Lootboxes are digital single-use containers, containing random items, which can be used to change the appearance of a player’s online persona or to progress faster through the game. Lootboxes are awarded for specific achievements (e.g., playing a certain number of hours) inclining players to play many hours and take on increasingly difficult tasks. Through the lens of gamification, lootboxes offer a new approach to shape user motivation and behavior. In this study, an online experiment with 414 participants was conducted to investigate the potential of lootboxes as a gamification element. Two lootbox designs were tested against awarding badges and a control treatment (no gamification) in a non-game context. Our results indicate that lootboxes, containing changes to the nature of a task (e.g., making it easier), show great potential to motivate users and increase performance.

Keywords: Lootboxes, Gamification, Randomness, Task Performance, Motivation, Gamification.

1 Introduction

A far-reaching development in computer games was the introduction of so-called “lootboxes,” which have developed into a quasi-standard for online gaming (Koeder et al. 2018; Wagenaar 2016). Lootboxes can be described as digital single-use containers, containing random rewards. Random rewards mean that players do not know what the reward will be before opening the lootbox. Within games, the item gained from lootboxes can be used to change the appearance of their in-game character or to progress faster in the game (Drummond and Sauer 2018). Lootboxes can be purchased but also be acquired by specific tasks (proceeding in the game or fulfilling a certain goal).

Under the term gamification, Information Systems (IS) scholars have engaged the topic of applying game-like elements in a non-game context (Deterding et al. 2011). Common gamification elements are (Koivisto and Hamari 2019): badges (Hamari 2013), progress bars, (Huotari and Hamari 2012), and
leaderboards (Bunchball 2010; Christy and Fox 2014). Game-like elements in a non-game context can trigger the innate disposition of individuals to game and play (Csikszentmihalyi 1975), changing the perception of tasks to be a game. This change in perception entails various benefits, such as an increase in motivation (Buckley and Doyle 2016) or an increase in participation (Mekler et al. 2017). Gamification literature has addressed the effects of various gamification elements in various contexts, from education (Majuri et al. 2018), healthcare (Alahäivälä and Oinas-Kukkonen 2016), to work contexts (Warmelink et al. 2020).

Besides applying established game elements in various contexts, scholars also engage the transfer of newly developed game-elements into non-game environments (Rapp 2017). For instance, increasing participation in an experimental trade platform (Hamari 2017). When looking at lootboxes through the lens of gamification, they provide a distinctive characteristic to current gamification elements. Lootboxes assign rewards (their contents) randomly, unlike Badges (Hamari and Koivisto 2015). Thus, users do not know what the reward will be. A recent study has addressed how the randomness of rewards influences the performance of participants in an online experiment, showing that lootboxes (containing a selection of pictures of landmarks) can increase an individual’s extrinsic motivation and performance (Lichtenberg and Brendel 2020). However, the content of a lootbox in a game has an in-game value, for instance, changing the appearance of the player’s online persona or improving certain character attributes (Drummond and Sauer 2018).

Overall, the element of lootboxes has shown to be a promising gamification element (Lichtenberg and Brendel 2020), but has only been introduced to gamification research recently, lacking extensive research and empirical evidence. Also, the potential of context relevant rewards to shape behaviour has been studied in games (Cleghorn and Griffiths 2015; Moore 2011; Rapp 2016), whereas the effects on individuals outside of games has yet to be analysed. However, it can be expected, that lootboxes with context relevant value have a similar positive influence on individuals’ motivation and behavior. Against this background, our study seeks to understand the effect of lootboxes (i.e., awarding rewards randomly) with context-related value (i.e., that influences an individual’s environment) as a gamification element (i.e., as a game element outside of a game-like context). Specifically, this study addresses the following research questions:

**RQ1:** What is the effect of random reward gamification elements on a user’s motivation and behaviour?

**RQ2:** What is the influence of context-related value on the effect of random reward gamification elements on a user’s motivation and behaviour?

## 2 Research Background

### 2.1 Intrinsic and Extrinsic Motivation

We base our understanding of the potential effects of lootboxes on the self-determination theory (SDT) (Deci and Ryan 1988; Ryan and Deci 2000), following the notion that gamification influences an individual’s motivation (Haque et al. 2018). The SDT is a macro theory of human behavior, focusing on the relation of innate psychological needs, motivation, and behavior. Within the SDT, it is assumed that environmental factors (such as task design, financial compensation, gamification) affect an individual’s basic psychological needs for autonomy, competence, and self-determination, which shape motivation (Deci and Ryan 1988; Ryan and Deci 2000). The SDT has garnered empirical support in various settings, including digital work (Lichtenberg et al. 2020), re-education (Niemiec and Ryan 2009), healthcare (Chatzisarantis and Hagger 2009; Hagger and Chatzisarantis 2008; Ng et al. 2012), and organizational research (Gagné and Deci 2005).

Regarding motivation, the SDT distinguishes motivation into three types (Deci and Ryan 1988; Ryan and Deci 2000): (1) **intrinsic motivation:** Intrinsic motivation refers to an individual being motivated by the task itself. An example of intrinsic motivation is having fun during a task (Teo et al. 1999). (2)
extrinsic motivation: Extrinsic motivation refers to motivation through external factors. Common forms of external factors are rewards or punishment. For instance, getting motivated by rewards (Amabile et al. 1994). (3) amotivation: Amotivation refers to an individual being indifferent to a behavior. An example of amotivation is the absence of intentional regulation (Gagné and Deci 2005) (Amotivation is not discussed in detail in the course of this work and was only mentioned for the sake of completeness).

An individual’s motivation is rarely either intrinsic or extrinsic, but rather a combination of both motives because normally multiple stimuli for intrinsic and extrinsic motivation are present at the same time (Deci and Ryan, 2000). For instance, the work performance of an individual is not exclusively induced by extrinsic motivation (i.e., being paid) but also by the characteristics of the task performed, which can lead to intrinsic motivation (Durward et al. 2020).

However, the interplay of intrinsic and extrinsic motivation has shown to be intricate, meaning that additional causes for intrinsic or extrinsic motivation do not merely increase the motivation of an individual. Following the motivation crowding theory (Frey and Jegen 2001), the interaction cause for intrinsic and extrinsic motivation can take two forms (Frey and Jegen 2001; Wu 2019): (1) crowding-out: The motivation crowding-out occurs when individuals feel controlled by external interference (e.g., being rewarded), which are leading to external motivation. This feeling of being controlled reduces self-esteem and self-determination and thereby intrinsic motivation (Frey and Jegen 2001; Wu 2019). (2) crowding-in: The motivation crowding-in occurs when individuals feel supported by external interference (e.g., freedom of choice). Feeling supported increases self-esteem and self-determination, leading to a higher level of intrinsic motivation (Cui et al. 2014; Wu 2019).

2.2 Relating Lootboxes to Gamification

In computer games, a lootbox is a digital single-use container that contains random rewards within a system (e.g., games – see Figure 1 for an example) (Lawrence 2017). Lootboxes are awarded for specific achievements or behavior (overcoming a challenge, play a certain number of hours, etc.), inclining players to play many hours and take on increasingly difficult quests (i.e., tasks) (Koeder et al. 2018). The rewards from the lootboxes are random, meaning that the player does not know the content. However, in many cases, the player is aware of the pool of contents (Koeder et al. 2018; Lawrence 2017). The content of a lootbox can have various functions and forms. Commonly, it can be used by players to progress faster in the game or change the appearance of their in-game persona (Drummond and Sauer 2018).

Figure 1. Lootbox from the Computer Game ‘Overwatch’

Research on lootboxes in a gaming context has shown that lootboxes are an effective way to motivate and shape player behavior (Koeder et al. 2018; Lawrence 2017). For instance, the in-game value of a
reward (e.g., prestige amongst players, unlocking new gaming content, or increasing the “power” of the avatar) is highly relevant for players (Koeder et al. 2018). Hence, users collect lootboxes with the hope of getting a desired and rare reward. Not getting this reward can trigger a “gamblers fallacy” (i.e., expecting an event to occur if it hasn’t in a while), which is associated with gambling addiction (Ritchie 1954). Based on this, lootboxes can be seen as “gamblification” (Macey and Hamari 2019).

When comparing lootboxes to gamification literature, the mechanism of rewarding users to increase motivation and support desired behavior is a common practice. In gamification research, a reward is described as anything that is given to a user for an achievement, intended to increase external motivation (Laschke and Hasenenzahl 2011; Munson and Consolvo 2012; Reeve 2005). For instance, rewards for increased learning efforts (Davis and Singh 2015). However, lootboxes differ in two main ways: (1) by the rewards are random, and (2) by the value of the reward.

Regarding the random rewards of lootboxes, literature (Nielsen 2019) reports that awarding rewards in a random pattern can increase the effectiveness of rewards. Individuals are motivated explicitly by the “moment of surprise” (Munson and Consolvo 2012, p. 31) when receiving an unexpected reward. For instance, when rewards are given in irregular intervals, which is not predictable, individuals are more motivated, compared to when they are rewarded in a reliable predictable manner (Malone 1981; Munson and Consolvo 2012). Nonetheless, the gamification element of badges offering the user the opportunity to earn specific rewards for achieving particular goals (Hamari 2013) has also shown to be effective in many instances (Koivisto and Hamari 2019; Lichtenberg et al. 2020; Mekler et al. 2017). To summarize, the literature suggests that randomness of rewards can add to the overall effectiveness of rewards, but it has yet to be investigated if this holds for gamification.

In computer games, lootboxes contain desirable items, which promise significant improvements for the player (Koeder et al. 2018). In gamification, the reward does not need monetary value (Koivisto and Hamari 2019) but can. For instance, the reward could have only social value (e.g. social comparison in form of a higher position on a leaderboard) (Jia et al. 2017). However, we would argue that the value of the content of lootboxes is different from rewards in current gamification research and practice. Most prominently, the aspect of increasing the players’ capabilities to progress in the game (e.g., by granting new abilities and improving the effectiveness of existing ones), differs to rewards in gamification, such as badges (Haaranen et al. 2014), changing the appearance of a digital avatar (Koeder et al. 2018), or leaderboards (Christy and Fox 2014).

Overall, lootboxes offer a new perspective on rewarding players for specific behavior and achievements. Awarding random rewards with a context-related value is different from current gamification elements. To translate lootboxes to a non-game context and to understand the interplay of random rewards and context-related amount constitutes a potentially valuable research opportunity.

3 Research Model and Hypotheses

In this study, we follow a research model (see Figure 2) based on the three-part framework of Koivisto and Hamari (2019): (1) gamification elements, (2) psychological outcomes, and (3) behavioral outcomes. Regarding the gamification element, we employ three different gamification elements: badges, lootboxes (rewards have no context-related value), and lootboxes, containing rewards that have a context-related value (will be called lootboxes with value in the following). We added badges to the set of two different lootbox designs to provide grounds for comparison to existing rewards. For the psychological outcome, we expect the three rewards to influence user motivation. Specifically, we base our understanding of this relation on the SDT (Ryan and Deci 2000) and motivation crowding theory (Frey and Jegen 2001). Lastly, we selected the number of tasks completed as the behavioral outcome variable for performance. We selected performance because mimics the conditions lootboxes are awarded in some games. In computer games, players gain lootboxes for a specific behavior, such as the completion of a certain level or playing a specific number of rounds (Rapp 2016). Nonetheless, we acknowledge that completing tasks online can be related to crowding (Lichtenberg et al. 2020), but the number of tasks can be found in many contexts, such as education (Denny 2013) or
health (Alahäiväla and Oinas-Kukkonen 2016). Our set of developed hypotheses will be presented in the following sub-sections.

Figure 2. Research Model and Hypotheses

### 3.1 Extrinsic Motivation

External influences, such as rewards, trigger extrinsic motivation (Deci and Ryan 1988; Ryan and Deci 2000). In general, rewards are anything that is given to users because of something they have achieved. Fulfilling an individual’s need for achievement and competence (Reeve 2005). For example, an individual’s feeling of being competent can be triggered by rewarding the completion of a difficult task or an increase in skill (Niemiec and Ryan 2009). For instance, Davis and Singh (2015) revealed that awarding badges for successful completion of learning tasks have a positive impact on learning motivation. Similarly, Hamari (2013) analysed the influence of rewarding badges for trading in an experimental trading platform on extrinsic motivation, concluding that rewarding badges increase extrinsic motivation. Against this background, a lootbox (and its content) can be understood as a reward. Thus, it can be expected that rewarding a lootbox will also trigger external motivation. Thus, the following hypothesis can be formulated:

\[ H1a: \text{Badges have a positive impact on an individual’s extrinsic motivation.} \]

\[ H1b: \text{Lootboxes with no value have a higher positive impact on an individual’s extrinsic motivation compared to badges.} \]

\[ H1c: \text{Lootboxes with value have a higher positive impact on an individual’s extrinsic motivation compared to Lootboxes without value.} \]

### 3.2 Intrinsic Motivation

Following the motivation crowding theory (Frey and Jegen 2001), rewards constitute an external interference that tries to control an individual’s behavior. This agenda leads individuals to the perception of being controlled and losing autonomy which ultimately reduces intrinsic motivation (i.e., rewards lower intrinsic motivation) (Deci et al. 1999; Ryan and Deci 2000). Because all gamification elements investigated in this study are reward-based, we formulate the following hypothesis:

\[ H2a: \text{Badges have a negative impact on an individual’s intrinsic motivation.} \]

\[ H2b: \text{Lootboxes with no value have a higher negative impact on an individual’s intrinsic motivation compared to badges.} \]

\[ H2c: \text{Lootboxes with value have a higher negative impact on an individual’s intrinsic motivation compared to Lootboxes without value.} \]
3.3 Performance

Gamification is applied to influence an individual’s behavior (Hamari and Koivisto 2015). In computer games, players gain lootboxes for a specific behavior, such as completing a certain level or playing a certain number of rounds (Koeder et al. 2018). This can be compared to the study of Lichtenberg et al. (2020). In their study, crowdsworkers were motivated by badges and lootboxes to complete more tasks than for which they are being paid. Against this background, we formulate the following hypothesis:

H3a: Badges have a positive impact on an individual’s performance.

H3b: Lootboxes with no value have a higher positive impact on an individual’s performance compared to badges.

H3c: Lootboxes with value have a higher positive impact on an individual’s performance compared to Lootboxes without value.

However, we expect not only a direct influence of the gamification elements on the performance but also a connection between the elements and the extrinsic or intrinsic motivation. Following the logic of the SDT, intrinsic, and extrinsic motivation influence behavior. Certain gamification elements have been proven to increase extrinsic motivation. For instance, Hamari (2013) concludes that rewarding badges increases motivation and the use of a service (i.e., list goods, comment, and complete transactions). In the context of performance, Niemiec and Ryan (2009) were able to show that motivation influences performance (e.g., academic performance). Therefore, we want to prove, that these findings are also applicable for this work and formulate therefore following hypotheses:

H4: Intrinsic motivation has a positive impact on an individual’s performance.

H5: Extrinsic motivation has a positive impact on an individual’s performance.

4 Research Design

To test our research model and related set of hypotheses, we conducted an online experiment with four conditions for a between-subjects design, avoiding carryover effects (Boudreau et al. 2001). The experiment was conducted from the 8th of February 2020 to the 21st of February 2020. On average, the participants needed 6.2 minutes for the experiment. All participants were recruited via social media platforms and personal networks (e.g., family and friends). For reimbursement, all participants had the option to enter a raffle for five 10€ online shopping vouchers. In total, our experiment had 414 participants. The sample is comprised of 65% females, with an average age of 29.1 years (SD 9.81). The youngest participant was 19, and the oldest was 88 years old. All participants resided in Germany.

4.1 Data Collection Procedure

![Data Collection Procedure Diagram]
Our data collection procedure consisted of three steps (Figure 3): (1) Explanation of experiment, (2a) performing a task, (2b) getting the reward, and (3) fill out the questionnaire. In the first step, the participants received an explanation of the structure of the following steps (completing five slider tasks with a subsequent survey). Every participant received the same explanation to make sure that all participants had the same information (Dennis and Valacich 2001). Furthermore, the applied gamification element was explained to participants of each treatments. For instance, the participants of a lootbox treatment got the information that the lootbox will be provided after a certain amount of completed tasks, whereas the rewards insight the lootbox are randomly selected. After the instructions, participants had two attempts to answer three comprehension questions correctly and failing to answer these questions lead to the exclusion from participating. We applied this procedure that no participant completed more tasks because the rules related to the number of completed tasks, rewards, and reimbursement were misunderstood. Next, participants were randomly assigned to a treatment and proceeded to step 2.

The following second step was divided into two sub-steps: (2a) perform task and (2b) receive reward (if the participant was in a gamification treatment). In step 2a, the participant had to perform slider tasks (Gill and Prowse 2016, 2013; Lezzi et al. 2015). For each slider task, participants were presented five sliders (see Figure 4), which were set to zero and had to be pulled into the middle position (50). After completing the fourth, seventh, tenth, and fourteenth tasks, participants in a gamification treatment proceeded to step 2b. In step 2b, users were rewarded with either a badge or a lootbox (see Treatment Configuration section for details) and were afterward returned to step 2a. In order to proceed to step 3, participants had to complete five tasks but were given the option to complete up to fifteen tasks voluntarily. Lastly, in step three, participants had to fill out a questionnaire regarding their demographic information and intrinsic and extrinsic motivation (see Measures section for details).

4.2 Treatment Configurations

In this study, we applied a total of four treatments: (1) control (no gamification), (2) badges (3) lootbox, and (4) lootbox with value. Participants in the control treatment (1) received no gamification. The other treatments (2–4) received rewards after completing a certain number of tasks (see Data Collection Procedure section for details). For the badge treatment (see Figure 5), a badge was displayed against a darkened background. The participants accepted the badge by clicking on it, returning to the slider tasks (step 2a). The badges are rewarded according to the current progress of the participant (the bronze badge is the first reward, and so on).
1. Bronze

2. Silver

3. Gold

4. Special

1. Lootbox

2. Lootbox

3. Lootbox

4. Lootbox

Badges

Lootbox

Lootbox with Value

Note, the pictures in the lootbox treatment were presented as they were selected randomly from a pool of pictures. The pictures have no difference in value (e.g., the content of the first lootbox is not more desirable than the content of the fourth lootbox).

For the lootbox treatments (3 and 4), a lootbox was displayed in the middle of the screen, illustrated as a treasure chest, and the rest of the page is darkened (see Figure 5). By clicking on the lootbox, its content was revealed. The lootbox without value (3) contained pictures of landmarks because they provide no value for the tasks. Each lootbox held a different image, and the rewards were identical between participants to ensure comparability (e.g., all participants got the same picture from the first lootbox and so on). The lootbox with value (4) contained the option to make the next slider tasks easier (see Figure 6), which is comparable to the lootbox rewards in games (Lawrence 2017).

4.3 Measures

After the participants had completed at least five tasks, they were able to proceed to the questionnaire (step 3). All participants received the same questionnaire. The questionnaire contained items regarding two constructs (in addition to questions regarding demographics). Each item was measured with a 7-point Likert scale. We adapted measurement instruments established in the literature, namely, extrinsic motivation (Amabile et al. 1994) and intrinsic motivation (Teo et al. 1999). The outcome variable performance was measured in terms of the number of completed tasks. The number of completed tasks equal the times a participant positioned all sliders correctly.
We conducted a confirmatory factor analysis (CFA) to check the factor loadings of the items for each construct, validating if the items have been selected appropriately. For our following amyloses, we only considered items with a factor loading above .60 (Streiner 2003). Furthermore, we evaluated the via Cronbach’s alpha (α) and the composite reliability (CR). To be considered, a construct was required to have a value above .80 for α and CR. Lastly, we calculated the average variance extracted (AVE), requiring a value larger than .50 (Urbach and Ahlemann 2010). The constructs with its corresponding items and factor loadings of the CFA are summarized in Table 1. The dependent variable performance is not depicted in the table because it was measured by counting the number of completed tasks per participant.

5 Results

We analysed the survey data through descriptive statistics and analysis of variance to compare the means of the different treatment groups. For the analysis, we used the statistical software SPSS Version 26.0. Before conducting the variance analysis for the dependent variables “extrinsic motivation,” “intrinsic motivation,” (Table 1) and “tasks completed” as performance, we firstly considered its requirements. Depending on the test of variance homogeneity, we conducted a one-way ANOVA or a nonparametric test. We considered the Levene test to verify variance homogeneity of the dependent variables. This resulted in a non-heterogeneous variances for extrinsic motivation $F(3,410) = 8.707, p = .043$ and a heterogenic variances for intrinsic motivation $F(3,410) = 2.278, p=.505$. The variance homogeneity for tasks completed was also significant $F(3,410) = 45.432, p = .004$. Due to the variance homogeneity of tasks completed and extrinsic motivation, the Games-Howel test was conducted.

In order to provide a detailed analysis of the differences between the mean values of the treatments, a post hoc test was conducted to test for pairwise comparisons in case of significant results of the variance analysis (Table 2). The group averages for performance show that all treatments (B : $M=12.05, SD=3.922$; L: $M=8.82, SD=3.928$; ITR: $M=13.05, SD=3.506$) differ from the control group which yields a lower number of tasks performed ($M=7.79, SD=3.526$). Additionally, it can be observed, that the extrinsic motivation is higher in all settings (B: $M=3.785, SD=1.632$; L: $M=3.153, SD=1.362$; ITR: $M=3.458, SD=1.329$) compared to the control group ($M=2.816, SD=1.348$).
can be observed, that the intrinsic motivation is overall (B: $M=3.016$, $SD=1.488$; L: $M=3.035$, $SD=1.551$; ITR: $M=3.425$, $SD=1.552$) higher compared to the baseline ($M=2.89$, $SD=1.411$) (Table 2).

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>All</th>
<th>Control (n = 99)</th>
<th>B (n = 107)</th>
<th>L (n = 115)</th>
<th>LV (n = 93)</th>
<th>Variance Analysis</th>
<th>Post-hoc Comparison Between Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsic Motivation (1-7)</td>
<td>Mean SD</td>
<td>3.082 1.466</td>
<td>2.89 1.411</td>
<td>3.016 1.488</td>
<td>3.035 1.551</td>
<td>3.425 1.552</td>
<td>One-way ANOVA F(3,387) = 3.669 $p &lt; .001$***</td>
</tr>
<tr>
<td>Gender % ♂</td>
<td>63.29</td>
<td>58.59</td>
<td>67.29</td>
<td>66.96</td>
<td>59.14</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

$SD = $ Standard Deviation; $B =$ Badges; $L =$ Lootbox; $LV =$ Lootbox with Value / In task rewards

Significance levels: *$p < .05$; **$p < .01$, ***$p < .001$;

Table 2. Descriptive Statistics

5.1 Measurement model

The measurement model includes manifest variables in terms of the experimentally manipulated variables and the number of completed tasks and reflective constructs. From the experimental treatments, we derived three variables (Table 3). The no reward variable (control treatment) was not included in our estimation and served as the reference group.

We then assessed the reflective measurement model of extrinsic and intrinsic motivation for individual item reliability, convergent validity, and discriminant validity. The model displays excellent measurement properties: all factor loadings are meaningful and significant, the composite reliability is above .7, the average variance extracted is above .5, and the Fornell–Lacker criterion is satisfied.

<table>
<thead>
<tr>
<th>(Latent) Variable</th>
<th>CR</th>
<th>AVE</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Performance</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>2. Extrinsic Motivation</td>
<td>.867</td>
<td>.569</td>
<td>.207</td>
<td>.754</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>4. Badges</td>
<td>n.a.</td>
<td>n.a.</td>
<td>.265</td>
<td>.207</td>
<td>-.025</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>5. Lootbox without Value</td>
<td>n.a.</td>
<td>n.a.</td>
<td>-.206</td>
<td>-.097</td>
<td>-.021</td>
<td>-.366</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

Table 3. Inter-Construct Correlations, CR, and AVE

5.2 Structural model

We applied partial least squares (PLS) to evaluate the measurement model and estimate the structural model. In experimental research designs with latent variables, SEM is preferable over other methods.
because it can account for measurement errors and multidimensional structures of theoretical constructs (Bagozzi et al. 1991; Bagozzi and Yi 1989) if latent variables are used. As the PLS estimator offers advantages in terms of fewer restrictive assumptions (Bagozzi et al. 1991), it finds broad application in experimental research designs (Fomelle, Bone and Lemon, 2016; Trenz & Tan, 2020).

![Figure 7. PLS Structural Model (n = 414)](image)

Significance levels: ***p ≤ .001, **p ≤ .01, *p ≤ .05

For our structural model, we dummy-coded the experimentally manipulated game elements (i.e., badges, lootboxes without value, and lootboxes with value). As our analysis includes extrinsic- and intrinsic motivation as a latent variable (Table 1), we applied a structural equation approach. We used partial least squares path modelling and employed SmartPLS 3.2.9. In the following, we first inspect the measurement models and will then estimate and interpret the structural model.

We then applied a bootstrap resampling procedure (with 5000 samples) to test the relationships (see Figure 7). In summary, we find support for the hypotheses connected with badges and lootboxes with value (H1a, H1c, H3a, H3c) and intrinsic motivation (H4) and extrinsic motivation (H5). Unfortunately, all other hypotheses (H1b, H2a, H2b, H3b) cannot be supported or are contradicted (H2c) (Table 4). We also identified a small negative effect of age on performance.

6 Discussion

Our experiment aimed to explore the potential transfer of lootboxes from the gaming context to a non-game context. By comparing two different lootbox reward designs (no context-related value versus context-related value) with the common gamification element of badges, our results have implications for research and practice.

Regarding our first research question, addressing the effect of the randomness of gamification rewards on motivation and behaviour (in this study measured as tasks completed), our results indicate that the mechanism of the randomness of rewards within the lootboxes does not significantly increase extrinsic motivation or performance on its own (H3b vs. H3c). However, adding context-related value to the gamification rewards of a lootbox leads to a significant increase in motivation and performance, superior to badges, answering our second research question.
<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>B</th>
<th>t-value</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a  Badges have a positive impact on an individual’s extrinsic motivation.</td>
<td>.312***</td>
<td>5.467</td>
<td>supported</td>
</tr>
<tr>
<td>H1b  Lootboxes with no value have a higher positive impact on an individual’s extrinsic motivation compared to badges.</td>
<td>.091</td>
<td>1.570</td>
<td>Not supported</td>
</tr>
<tr>
<td>H1c  Lootboxes with value have a higher positive impact on an individual’s extrinsic motivation compared to Lootboxes without value.</td>
<td>.224***</td>
<td>4.233</td>
<td>supported</td>
</tr>
<tr>
<td>H2a  Badges have a negative impact on an individual’s intrinsic motivation.</td>
<td>.038</td>
<td>0.629</td>
<td>Not supported</td>
</tr>
<tr>
<td>H2b  Lootboxes with no value have a higher negative impact on an individual’s intrinsic motivation compared to badges.</td>
<td>.043</td>
<td>0.701</td>
<td>Not supported</td>
</tr>
<tr>
<td>H2c  Lootboxes with value have a higher negative impact on an individual’s intrinsic motivation compared to Lootboxes without value.</td>
<td>.149**</td>
<td>2.538</td>
<td>contradicted</td>
</tr>
<tr>
<td>H3a  Badges have a positive impact on an individual’s performance.</td>
<td>.412***</td>
<td>7.403</td>
<td>supported</td>
</tr>
<tr>
<td>H3b  Lootboxes with no value have a higher positive impact on an individual’s performance compared to badges.</td>
<td>.071</td>
<td>1.303</td>
<td>Not supported</td>
</tr>
<tr>
<td>H3c  Lootboxes with value have a higher positive impact on an individual’s performance compared to Lootboxes without value.</td>
<td>.415***</td>
<td>8.150</td>
<td>supported</td>
</tr>
<tr>
<td>H4   Intrinsic motivation has a positive impact on an individual’s performance.</td>
<td>.218***</td>
<td>5.152</td>
<td>supported</td>
</tr>
<tr>
<td>H5   Extrinsic motivation has a positive impact on an individual’s performance.</td>
<td>.097**</td>
<td>2.146</td>
<td>supported</td>
</tr>
</tbody>
</table>

Significance levels: ***p ≤ .001, **p ≤ .01, *p ≤ .05

Table 4. Result for Hypotheses

Furthermore, our results indicate that arbitrary rewards, such as pictures or differently designed badges, can influence motivation and behaviour, but providing some kind of useful reward has a stronger effect. In this context, we would like to propose the following explanation for this effect. To trigger external motivation, an individual’s psychological needs for relatedness, competence, and autonomy have to be satisfied to some degree (Deci and Ryan 1988; Ryan and Deci 2000). Concerning our study design, we hypothesize that our context-related value reward provides an individual with an increase in feeling competence because the speed and ease in solving the tasks are supported. Thus, designing rewards in a way that enhances an individual’s performance provides a valuable new design principle (Liu et al. 2017) for gamification elements.

The motivation crowding theory (Frey and Jegen 2001) states that external influences can induce the feeling of being controlled, reducing intrinsic motivation, or of being support, increasing intrinsic motivation. The applied rewards (namely lootboxes and badges) are not designed to induce the feeling of being supported (e.g., offering freedom of choice). They are intended to provide an external reward for performing a certain task, which is an external influence that is intended to control an individual’s behavior (Frey and Jegen 2001; Wu 2019). However, all applied rewards did not reduce intrinsic motivation significantly. The short duration of the experiment could explain this. In literature, a decrease in intrinsic motivation through external control has been reported in long-term observations (Deci et al. 1999). Despite of this, for context-related value, a statistically significant positive effect on intrinsic motivation was detected. When inducing intrinsic motivation, external interference has to trigger an individual’s perception of the context or task to be interesting, challenging, or enjoyable (Deci and Ryan 1988; Ryan and Deci 2000). Slider tasks are designed to provide no trigger for these feelings (Lezzi et al. 2015). Thus, any feeling of interest, challenge, or enjoyment must be caused by the changes in the structure of the task by the context-relevant rewards (e.g., removing one of the five sliders). We would propose that the unpredictability of the lootbox contents (Deci et al. 1999; Lawrence 2017) and the surprise (Munson and Consolvo 2012) regarding the different value rewards are the explanation for the intrinsic motivation. Hence, future research should investigate the interplay of task structure changes as rewards and the randomness of rewards.

Lastly, we investigated rewards regarding their influence on performance (measured as task completed). Assuming rational behaviour, participants should have stopped performing tasks after
completing five tasks, granting them a place in the raffle for the online shopping vouchers. However, many participants continued to complete tasks (the mean of completed tasks across all treatments is 10.36). Thus, we observed similar behaviour to other studies on this topic, for instance the study of (Lichtenberg et al. 2020). They reported that crowdworkers completed more tasks than being paid for when they were offered badges for more tasks or could compete on a leaderboard. Hence, our results support that gamification can influence individuals to perform more tasks than being reimbursed for, which can be related to the context of short-term digital task work (e.g., crowdsourcing).

For practice, we see potential in using the concept of context-related value as a reframing approach for specific work tasks. For instance, in the context of crowdsourcing, sorting tasks by difficulty and letting crowdworkers start with the most difficult task and periodically rewarding them with ‘a reduction in difficulty’ could lead to higher levels of motivation and performance. Similarly, other designs for context-relevant rewards can be derived from our results, such as adding tasks that can be skipped. Overall, we see great value in adding gamification to the digital work environment to enhance the workers’ perception, emotions, and behaviour.

In the following, we will discuss the primary limitation of our study. Firstly, the design of our online experiments constitutes a major limitation. The participants were obtained via social media, family, and friends, and they could participate for the chance to win an online shopping voucher (this can have an influence on extrinsic motivation). Furthermore, all participants had to speak German, limiting the transferability of results to other languages and cultures. Secondly, the experiment was not conducted under real-world conditions (single use interaction), meaning that the task itself was not a task occurring in crowdsourcing (such as speech transcription (Kittur et al. 2013)) and completing the task had no consequences. There were no consequences for the participants, unlike, for instance, a crowdworker completing tasks to earn a living wage (Lichtenberg et al. 2020). Similarly, the task had to value-adding function to any greater task or cause (such as labelling pictures to gather an image set for machine learning (Kittur et al. 2013)).

7 Conclusion

This study investigated the effect of potential gamification element of lootboxes, adapted from a recent trend in gaming. Specifically, we analysed the impacts of the randomness of rewards and reward with context-related value on motivation and performance (measured as the number of tasks completed). The results of our research indicate that the randomness of rewards alone cannot induce significant changes in motivation and performance of individuals. However, lootboxes containing rewards with context-relevant value provide substantial differences in performance, extrinsic, and intrinsic motivation. In sum, our research contributes to gamification research by systematically analysing the new and effective gamification element of lootboxes. Based on our results, we see value in adding lootboxes to the toolset of gamification elements of IS developers.

8 Acknowledgements

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9 References


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Lichtenberg et al. / Understanding the Gamification Element Lootbox


