Can Gamification lead to Increase Paid Crowdworkers Output?

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Abstract. Gamifying serious work environments, such as paid crowdsourcing platforms, potentially increases crowdworkers' task motivation, engagement and enjoyment. This, in turn, can lead to a higher willingness to contribute, higher quality of work and long-term engagement. However, it remains unclear how crowdworkers behave, when gamification is applied to motivate them to do more tasks than being paid for.

In this study, we conducted an experiment on Amazon Mechanical Turk to investigate this context in a controlled setting, enabling the isolation of gamification effects. With 320 crowdworkers, we study the effect of different gamification affordances (progressbars, badges and leaderboards) on autonomous motivation and task performed. We find that some gamification affordances (namely badges and leaderboard) can lead crowdworkers to do more work than they are paid for. However, this is not necessarily linked to autonomous motivation because we did not consistently observe an increase in autonomous motivate together with more performed tasks.

Keywords: Crowdworking, Gamfication, Motivation, Autonomous Motivation

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1 Introduction

Gamification (i.e. using game-like elements in a non-game context) has received increased attention in both academic research and practice as a means to improve individuals' experience, engagement, or motivation [1–3]. Gamification triggers an innate disposition in humans, leading to a perception of tasks as games [4]. Although spanning various contexts, from education [5] over healthcare [6] to working contexts [7], finding and applying the right gamification elements remains challenging [8], leading to often mixed results [1]. Hence, an ever-increasing body of research has addressed the question of how and why gamification elements influence psychological and behavioral outcomes in certain contexts [1].

Against this background, crowdsourcing platforms have proven to provide a rich environment of unexpected and sometimes counterintuitive effects and observations [9]. The working environment of paid crowdsourcing (PCS) platforms (e.g. Amazon MTurk or ClickWorker) seems incompatible with gamification because of the following reasons. In PCS, similar to other working contexts, individuals are to a great extent extrinsically motivated by the prospect of earning money [10]. Research suggests that extrinsic rewards may decrease intrinsic motivation because of the motivation crowding effect (e.g. extrinsic motivation reduces autonomous motivation) [11, 12], potentially rendering gamification less effective. Besides that, there are further characteristics that differentiate PCS from traditional work contexts. First, crowdworkers usually receive piece-rate payments for their work, such that doing more tasks leads to a higher wage [13]. This payment scheme leads to the extrinsic reward being more salient, compared to e.g. hourly wages. Second, companies use PCS platforms for rather simplistic and repetitive tasks (e.g. image tagging, audio transcription or translation) that are too complex for information systems (IS) but do not require specific training of employees. Accordingly, individuals are unlikely to be intrinsically motivated by honest interest, enjoyment and inherent satisfaction [14, 15]. Third, PCS platforms detach work tasks from a traditional workplace setting. Workers are socially and geographically distant from each other and usually don't get to know their coworkers. Together, these features of PCS environments exclude important motivational factors of traditional workplaces, like social appreciation for work done, personal growth opportunities, or interesting work tasks [16]. Thus, it is reasonable to assume that the motivation to earn money is at the center of participating in PCS [13, 17]. Overall, research on gamification mechanisms and principles in PCS environments still is in its early stages, especially regarding crowdworking and the interplay of intrinsic and autonomous motivation [7, 9].

In this context, this study aims to address the following research question:

RQ: Can gamification affordances surmount economic incentives in PCS environments?

To address this question, we conducted an experimental study via the online labor market Amazon Mechanical Turk (MTurk). Thereby, we respond to the suggestion of various scholars (e.g. [1, 7, 9, 18]) that more experimental studies in controlled experimental settings are needed to isolate the effects of specific gamification affordances. To pinnacle the work setting typically found in PCS, we designed our

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experiment as less motivating and stimulating as possible (e.g. applying an effort task – namely slider task) to control for any causes for autonomous motivation that could interfere with the effects of the gamification affordance.

2 Theoretical Background

2.1 Gamification and Autonomous Motivation

Gamification describes the transfer of game mechanisms and principles to non-gaming contexts [3]. Humans especially enjoy partaking in games when the activity's nature is purposeful, engaging and fun [4]. Within IS, this leads to a notion of gamified IS [2] offering 'similar experiences and motivations as games do, and consequently, attempting to affect user behavior' [1]. In line with the self-determination theory (SDT), the self-purposeful nature of games can be considered as an intrinsically regulated behavior with a perceived internal locus of causality [4, 15, 21]. A high internal locus of causality hereby refers to individuals feeling sufficiently competent, related and self-directed (i.e. autonomous) for a given challenge or task, triggering autonomous motivation [15].

2.2 Crowdsourcing and Crowdworking

Howe [22] termed crowdsourcing as a new way of outsourcing labor. Crowdsourcing, as a combination of the terms 'crowd' and 'outsourcing', is often used as an umbrella term for a wide array of ways to use the potential of a large and open crowd of people [23]. However, companies refer to the crowd as utilizing a collective for organizational purposes with the aid of information technology (IT).

Normally, tasks that cannot be carried out by the organization, due to the sheer size and/or complexity of the tasks itself, are outsourced using crowdsourcing [24], e.g. labeling or tagging documents and photos [25]. The underlying concept of crowdsourcing is that 'many hands make light work' [24], leading to better results [26] by capitalizing on the workforce, knowledge and/or experience of the crowd [27].

Postulating a positive influence on work productivity, gamification has been researched in such work settings as well [7, 9]. Especially in the context of PCS, an interesting phenomena arises: Individuals may be both subject to external rewards (to compensate for the work task) and gamification mechanism (to increase the productivity) at the same time [9]. However, most studies focus on the interactions of gamification affordances with specific tasks or contexts. This means that research on the fundamental interaction of being paid (e.g. being externally motivated) and gamification affordances (e.g. offering the participants a motivating game-like experience) constitutes a prevailing and relevant research gap [9].

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3 Research Model and Hypotheses

In this study we follow the research model depicted in Figure 1. The research model bases on the reported effects of gamification affordances on autonomous motivation [15] and on the expected impact gamification could have on in-task behavior, e.g. how many tasks are performed. Regarding the selection of gamification affordances, in gamification literature, several gamification affordances can be identified [28]. Amongst the most prominent and often applied ones [1] are progressbar [21] badges [10], and leaderboards [29, 30] and are therefore applied in this study as a representative selection of the variety of gamification affordances.

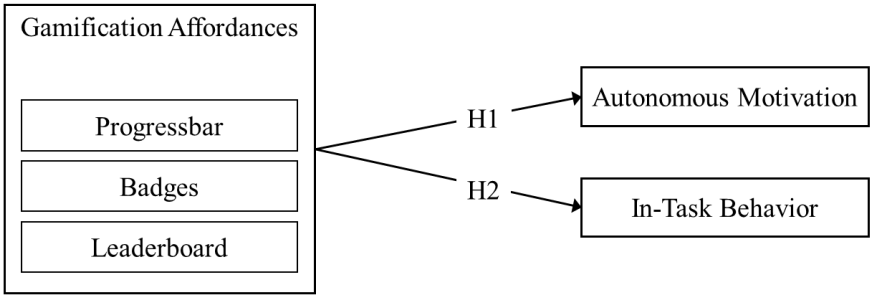

Figure 1. Research Model and Hypotheses

As the work context and the task are designed to be maximally extrinsically motivated, according to the SDT, the perceived locus of causality is external and the perceived autonomy very low [15]. Through the theoretical lens provided by the SDT, a gamification affordance acts as a stimulus that promotes an activity, increasing autonomous motivation. Hence, the majority of autonomous motivation is expected to be caused by the gamification affordances, leading to following hypotheses to be derived:

H1a – The gamification affordance 'Progressbar' leads to a higher level of autonomous motivation in crowdworkers.

H1b – The gamification affordance 'Badges' leads to a higher level of autonomous motivation in crowdworkers.

H1c – The gamification affordance 'Leaderboard' leads to a higher level of autonomous motivation in crowdworkers.

Secondly, gamification affordances are applied to foster certain behavior, e.g. attitude, engagement or intention to behave [31]. In context of this study, the desired behavior is that participants (e.g. crowdworkers) are performing more task than they are reimbursed for. Hence, the following hypotheses can be derived:

H2a – The gamification affordance 'Progressbar' leads to higher number of performed tasks.

H2b – The gamification affordance 'Badges' leads to higher number of performed tasks.

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H2c – The gamification affordance 'Leaderboard' leads to higher number of performed tasks.

However, as literature suggest [8], gamification affordances can have vastly different effects depending on the context. Hence, we anticipate that the effects of the gamification affordances will be different in effect-strength.

4 Research Design and Methods

To test our hypotheses, we conducted an online experiment via the online labor market Amazon Mechanical Turk (MTurk) with a 1x4 between subjects design, avoiding carryover effects [32]. We collected data from 13th to 21th of February 2019 in two batches until we had at least eighty observations per treatment, leading to a total of 320 participants. Overall, the sample is comprised of 52% females (three participants preferred not to answer that question). The youngest participant was born in 2000, the oldest in 1949. The median participants' year of birth is 1983 (mean 37,58 and SD 11,02). Regarding employment status, the majority of participants works either as a paid employee (63%) or is self-employed (22%), the rest is either unemployed or students. 100% of the participants were in the United States of America.

4.1 Data Collection Procedure and Sample

In the beginning, each participant was given a short introduction, explaining the experiment. After the introduction, a set of comprehension question had to be answered to ensure that the instructions were understood (participants were excluded after failing to answer the comprehension questions twice).

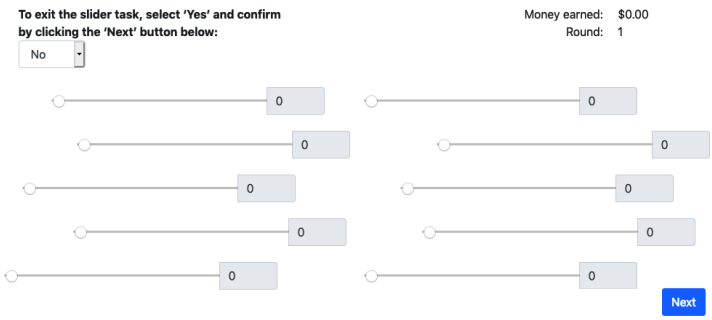

Figure 2. Screenshot of the slider task

In the experiment, participants had to perform at least 5 of 20 slider tasks to be paid 2$ - any additional slider task did not increase the incentive. A slider task consists of a screen displaying ten sliders (see Figure 2). All sliders have to be positioned at 50 (if one or more sliders are not correctly positioned, participants are not able to proceed, and an error message is displayed).

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Participants exiting the experiment and having completed five or more slider tasks had to answer a questionnaire to complete the experiment. Participants with less than five completed rounds were forwarded to the last page of the experiment and earned no money. To incentive conscientious answering of our questions, we reward participants who correctly answered at least three out of four attention checks with an additional bonus of $0.50. Hence, participants could maximally earn $2.50. At the end, participants got feedback on the amount of money earned.

4.2 Control and Treatment Configurations

We implemented four experimental treatments, consisting of a variation of visual elements presented during the slider task (badges and progress bar) or on a separate page in-between rounds (leaderboard) and included a short paragraph describing these elements in the instructions. For the control treatment, no elements were added to the interface.

For the progress bar treatment, we included a panel above the sliders which visualized the individual progress towards the completion of twenty rounds with horizontally arranged bullets (see Figure 3). Once a participant reached a certain round, the color of the corresponding bullet changed from grey to green.

Figure 3. Panel displaying the progress bar (participant is currently in round eight)

For the badge treatment, we introduced three levels of badges: bronze, silver and gold. Participants could earn badges by completing rounds of the slider task. To earn the bronze, silver and gold badge, participants had to reach round 4, 8 and 16, respectively.

Figure 4. Panel displaying the badges (participant is currently in round eleven and has been rewarded with the bronze and silver badge)

For the leaderboard treatment, we ran a pilot study of the slider task with twenty participants. We used the round-times of these participants to pre populate our leaderboard with the ten fastest personal bests. This ‘historic’ leaderboard (which included player names chosen by participants in the pilot) was shown to participants

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playing the leaderboard treatment in the instructions and displayed in-between rounds of the slider task (see Figure 5). More specifically, the leaderboard was dynamically updated to include participants' personal round times. Moreover, to also give feedback for rounds which were not among the ten fastest, participants received feedback on their time for the last round.

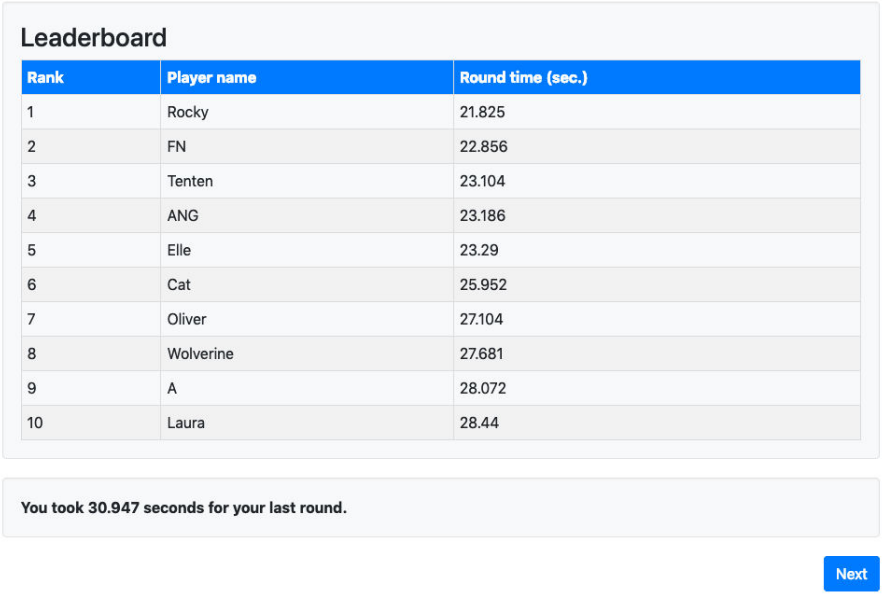

Figure 5. 'Historic' leaderboard prepopulated with top ten personal best round times of pilot study.

4.3 Measures

In-task behavior was measured by the total number of rounds that a participant has completed. Participants were asked to complete at least five rounds. After they completed five rounds, they were free to complete up to 15 more rounds. Autonomous motivation was measured with a reflective 7-point scale adapted from [35, 36] (see Table 1 in the Appendix).

One item, measuring attention retention, was dropped due to a factor loading below .60 [37] Overall, the autonomous motivation construct exhibits sufficient CR (>,80) and AVE (>.50) following the recommendations of Urbach and Ahlemann [38].

5 Results

We analyzed the data from the follow-up survey by means of descriptive statistics and used a t-test to test our two sets of hypotheses concerning the impact of the gamification affordances on autonomous motivation (H1) and in-task behavior (H2).

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Table 2 summarizes the results of our analyses, which were carried out using R. We then analyzed the t-tests for a significant difference between the control (without gamification affordances) and the three treatments conditions (progressbar, badges, leaderboard).

Table 1. Descriptive statistics and t-test results

			Autonomous motivation (1-7)	**In-task behavior (5-20)**
Treatments	**Progressbar (n=80)**	Mean	3.07	8.23
		SD	1.82	0.54
		SE	0.20	0.603
		t-value (df)	-0.07 (152)	-1.68 (150)
		p-value	0.94	0.09
	Badges (n=80)	Mean	3.22	10.29
		SD	1.88	6.30
		SE	0.21	0.705
		t-value (df)	-0.607 (156)	-3.92 (138)
		p-value	0.54	**<0.001****
	Leaderboard (n=80)	Mean	3.99	9.11
		SD	1.79	5.61
		SE	0.20	0.63
		t-value (df)	-3.38 (157)	-2.74 (147)
		p-value	**<0.001****	**<0.001****
	Control (n=80)	Mean	3.05	6.95
		SD	1.73	4.26
		SE	0.193	0.48

*SD = Standard deviation, SE = Standard error, * α=0.05, ** α=0.01*

With regards to autonomous motivation, we found a significant difference between the control and the treatment condition of leaderboard. Thus, our data indicates that the present of a leaderboard does indeed increase the autonomous motivation of crowdworkers, supporting hypothesis H1c. However, the other gamification affordances (badges and leaderboard) did not lead to a significant increase in autonomous motivation, providing not support for H1a and H1b.

Regarding in-task behavior (e.g. the number of performed (slider)-tasks), our data reveals that there is a significant difference between the control and two of the treatment conditions, e.g. badges and leaderboard. Therefore, the hypotheses H2b and H2c are supported, while there is no evidence to support H2a.

The results for autonomous motivation and in-task behavior are visualized in Figure 6. In Figure 6, the error bars indicate the 95% confidence interval.

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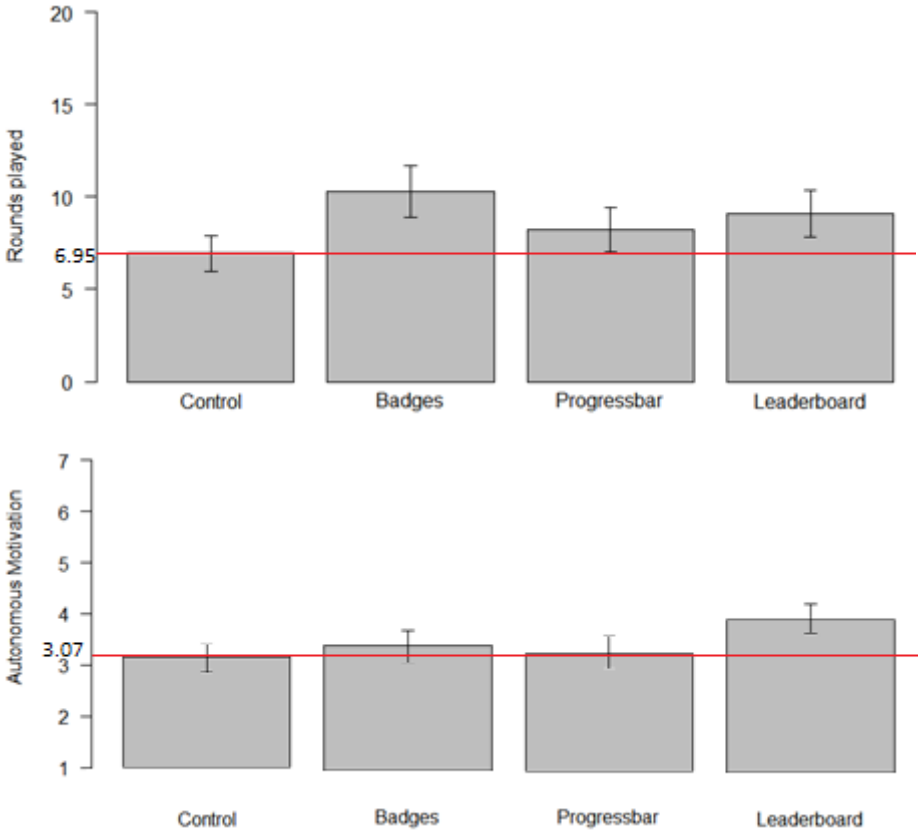

Figure 6. Differences between conditions for the two constructs (CI-95%)

6 Discussion

To best of our knowledge, this study is the first study to investigate the effects of gamification on the number voluntarily performed extra tasks in a crowdworking environment. The results of this study indicate that certain gamification affordances can positively influence the in task behavior (i.e. badges and leaderboard) as well as autonomous motivation (leaderboard). This is especially interesting, because there has been research on the interaction of extrinsic and intrinsic motivation, which suggests, that an extrinsically motivating stimuli can undermine the existing autonomous motivation of an individual. For instance, when a task was previously performed voluntarily (e.g. autonomously motivated), the introduction of pay (e.g. extrinsic motivating) the overall motivation and related in task behavior (e.g. completed tasks) is reduced [39, 40].

However, our results indicate that gamification leads to a substitution of monetary (extrinsic) motivation by the introduction of gamification affordances while also increasing the overall output. This is particularly interesting as it can be assumed that

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crowdworkers are almost exclusively motivated by financial incentives. However, it turned out that the motivation to perform a task through the implementation of gamification features was even higher than the task completion based on monetary incentives. This is noteworthy, as the task set in this study was chosen in such a way that there is hardly any possibility of finding pleasure in it. This fact suggests that the relationship between extrinsic and autonomous motivation is more complex than the motivation crowding effect [11, 12] suggests. Accordingly, extrinsic motivation would diminish intrinsic motivation. However, this is not the case in this study; the opposite can be observed for some gamification affordances. This suggests that the source of motivation (in the case of extrinsic: money or prestige) or in the case of autonomous motivation (different gameful experiences [41] has a major influence on their interaction. This findings indicate, that depending on the source of motivation, different patterns of interference can be observed. This is an important building block to better understand how gamification works overall.

7 Limitations and Opportunities for Future Research

In the following paragraphs cover the limitations of this study and will be discussed in order to sharpen this works contribution as well as to highlight areas for future research [42].

Firstly, in this study a selection of three gamification affordances was applied, namely progressbar, badges and leaderboard. These gamification affordances were selected because they are amongst the most common ones [3]. Nonetheless, other gamification features should be investigated, e.g. interaction with other persuasive elements, such as messages, conversational agents, storytelling etc. Secondly, long term effects of gamification should be studies, e.g. are crowdworkers getting less and less sensitive for gamification affordances over time. This has not been further investigated in this study. Thirdly, different player types [43–45] and personal dispositions, such as big five character trades [46], could provide further insights into why certain gamification affordances are more or less successful in context of crowdworking. For instance, the individuals in a crowdworking crowd are expected to be primarily motivated by extrinsic rewards, which could render other affordances (such as social interaction [45]) less effective. However, it is unclear if this will be the case and should therefore be investigated. Fourthly, this study applies multiple t-tests to verify the formulated hypothesis. Other approaches (e.g. variance analysis or structural equation model) could have been carried out instead, rendering the applied method a limitation of this study. Fifthly, the three applied gamification affordances were selected based on popularity [9]. This constitutes a major limitation, as, for instance, the leaderboard affordance is structurally different to the other two affordances. Lastly, ethical implications of the presented results should be explored. For instance, is it justifiable to motivate crowdworkers with gamification to do more and not pay them for their additional work.

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8 Conclusion

At first glance, the setting of crowdworking seems counter-intuitive for the application of gamification. However, we found that even in such a primarily extrinsic motivated setting, the rational of making “as much money as possible”, can be countered by offering gameful experiences through gamification affordances (in this case badges and leaderboard)., seducing workers to do more work than being paid for. This suggests that the interplay of extrinsic and intrinsic motivation is far more complex than simply a direct substitution, as it could be assumed based on the motivation crowding effect [11, 12], opening up a new perspective of the interaction of intrinsic and extrinsic motivating elements in the context of crowdworking.

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Appendix

Table 2. Items and measures and factor loadings

Autonomous motivation (CR = .957, AVE = .779)	I enjoyed doing the slider task very much.	.966
	The slider task was fun to do	.974
	I thought this was a boring activity	.871
	~~This activity did not hold my attention at all. *~~	~~.557~~
	I would describe this activity as very interesting.	.867
	I thought this activity was quite enjoyable.	.961
	While I was doing this activity, I was thinking about how much I enjoyed it	.893

CR = Cronbach's alpha, AVE = Average Variance Extracted
*Note. * items were dropped due to low factor loading.*

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