Game O'Clock: A Gamification Solution to Improve Time Reporting

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Abstract

Reporting the time spent working on different tasks is valuable both for companies and employees. Yet often employees fail to properly and timely report their time, hampering the implementation of the time reporting process. We propose a gamification solution to address this problem. A prototype was implemented based on Google Suite technologies and evaluated in the setting of a post-graduation course, whose students used the solution in the last eight weeks of the course. Results suggest that the number of timesheets submitted slightly improved, with a statistically significant increase of 8.9% when compared against the baseline. However, players think their motivation did not change after using the app, which is too simple to be engaging in the long term. They enjoyed the teams and leaderboards but think more rewards, individual achievements, and reminders should be available.

Keywords: Gamification, Timesheets, Time Reporting, Work Process, Motivation.

1. Introduction

Many companies are currently struggling to improve employees' productivity, which is particularly important for routine, repetitive, and monotonous tasks, which are usually not motivating. Not all these tasks can be redesigned. Thus a good option is to improve employee engagement, which is proven to positively influence productivity [13].

An example is the reporting of time spent working on different tasks, required by most companies. This task is nowadays mostly done by filling a digital timesheet and submitting it to the Human Resources department, using the company's software and/or a dedicated tool. This process is valuable for both parts and allows employees to understand and justify how and where their time is invested. Yet often employees fail to properly and timely submit their timesheets, hampering the implementation of the time reporting process.

Gamification is an approach to make processes related to non-gaming contexts more fun, which can boost motivation [5]. Besides being successfully applied in fields like education [1] and health [8], researchers and practitioners have been using gamification to make processes more engaging for their employees, thus improving those processes [19]. While some tools that comprise the time reporting process have been gamified, like Microsoft Dynamics 365[1] and SSW Time Pro[2], they are not focused on this process and there are no public studies available evaluating their application. Moreover, we are not aware of any research study addressing the usage of gamification to improve time reporting.

Given the evidence that gamification applied to the workplace can lead to significant improvements in employee engagement [22], this paper explores its potential to increase

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employees' motivation in reporting time correctly and timely. We proposed a gamification solution, which was implemented as a software tool using Google Suite[3] technologies. This work contributes not only by presenting and evaluating a gamification solution to enhance employees' engagement with the time reporting process (thus filling a research gap), but also by showing that is feasible to run a gamification intervention using simple and existing tools.

This paper describes the first iteration of a larger research effort following Design Science Research Methodology (DSRM), based on an iterative process and applied with the intent of solving problems involving IT and organizations [20]. We start this paper with a review of works related to gamification both in enterprise and task management. Next, we present the proposal and its design and development, followed by a discussion on how the proposal was demonstrated and evaluated in the setting of a post-graduation course with 28 students. The paper closes with a discussion of the results and some conclusions and future work.

2.   Related Work

We are not aware of any study conducted to investigate the effect of gamification in the time reporting process. Yet, we can still learn from related studies, like those related to enterprise gamification and gamification of task management. In the following sections, we present and discuss relevant works and solutions related to these areas.

First, we must describe concepts linked to motivation, which plays an important role in gamification initiatives. Motivation can be intrinsic (the activity is inherently interesting) or extrinsic (the activity leads to a separable outcome) [23]. The Self-Determination Theory (SDT) focuses on intrinsic motivation and is based on three psychological needs: **competence** (sense of controlling the outcome and feeling mastery; related to the concept of *flow*, a state of mind when one is totally absorbed on an activity [3]), **relatedness** (sense of interacting and be connected with others), and **autonomy** (sense of being the source of one's own behavior) [24]. This theory also states that extrinsic motivators are effective if they promote these needs. Overall, mostly important is to understand the different motivators and how to foster them.

2.1.   Enterprise Gamification

Enterprise gamification consists on changing business processes using gamification to boost engagement and impact behavior of customers and employees, being this study focused on the last. Such initiatives are proven to increase engagement, enhance productivity, improve efficiency, and foster innovation across organizations [11]. While applying gamification in the workplace is not straightforward, and can be subject to many challenges (like the lack of meaningful choices available to engage employees and the disregard of players' needs [11]), there is evidence that the right incentives can influence people to change their behavior [4].

Oprescu et al. propose a set of principles to implement gamification to engage employees to adopt and use work processes [19]. Besides following a user-centered design that allows tailoring for specific preferences, such initiatives should allow fun and engaging experiences, be oriented to learning, and be supported by psychological theories. Positive feedback should always reward achievements, thus providing immediate progression. Some authors studied how to use gamification to improve specific work processes. Marques et al. proposed a gamified software tool to increase employees' engagement and motivation in implementing Scrum, using game elements like points, rewards, feedback, and cooperative challenges [14]. This was one of many studies where gamification was studied in the context of software development [21]. Raflesia and Surendro developed a gamified service desk system for improving employees' motivation and service system quality, using elements like points, rewards, and leaderboards. [25]. Conceição et al. propose a gamification model to improve service desk performance, where operators receive rewards after resolving incidents, based on criteria like incident difficulty [2]. Elm et al. developed a gamification system based on trivia and strategy to motivate employees to share knowledge with game elements like competition, feedback, rewards,

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[3] Google Suite: https://gsuite.google.com (Accessed: 20/09/2018)

exploration, and loss aversion. [7]. Evaluations of these proposals showed increase on employees' engagement and productivity. Neeli presents a three-steps method to implement gamification in Business Process Outsourcing industry: identifying challenges, understanding employees' motivators, and defining the adequate game mechanics. [18]. Makanawala et al. discuss challenges that can affect a gamification initiative in customer service, including the difficulty in developing a general solution that works in different teams; prioritizing gamification against other features during product development; and ensuring employees that gamification results will not be used to measure their performance. [12].

2.2.   Gamification of Task Management

Task management systems can be applied in many ways, as they are not restricted to a single target behavior. There are similarities in how such systems operate and how time reporting is executed: both involve recording data that can provide valuable information. Kappen et al. studied the usefulness of two role-playing games (RPG), *Task Hammer*[4] and *Epic Win*[5]*,* where players win points and develop their avatar's attributes by completing tasks [9]. Lessel et al. investigated the usefulness of a gamified task management app, with the goal of studying "bottom-up" gamification [10]. *Chore Wars*[6] is an RPG where each member of the household gain points for completing tasks. McGonigal shared her and other people's experience with *Chore Wars*, who agreed that this app transformed dull tasks they often hated into a fun and creative experience [15]. Diefenbach et al. studied *Habitica*[7], an RPG to build good habits, to analyze counterproductive effects of gamification. Observed effects included being punished for not checking off tasks timely during productive times, which could be avoided if users' behavior was actually tracked, instead of relying on user's input [6]. Other popular apps to gamify task management have not yet been evaluated scientifically, such as *LevelUpLife*[8]*, Todoist Karma*[9]*,* and *Stickk*[10]. These apps apply game elements like points, challenges, progression, rewards, and narrative. Except for *Stickk*, where users' input is validated by a ref chosen by them, other apps solely rely on user's input. These apps vary in their degree of customization, but they are often too much complex and impose a lot of effort for the user.

2.3.   Summary

This analysis confirms the evidence that gamification applied to workplaces can improve employee engagement. Researchers and practitioners have been developing and studying gamification solutions applied to varied work processes. Most solutions use game elements like points, badges, levels, and leaderboards, while some are closer to the definition of serious games. Overall, authors stress the importance of aligning gamification initiatives with player needs. Regarding task management, studies show that recording repetitive work adds a sense of progression that makes tasks more palpable, which might pressure players for completing them. Most works transform tasks into challenges and give incentives to make those tasks' fulfilment more rewarding, while some embed narratives or simple themes in those apps. Yet, relying on players to record data not only might lead to countereffects, but is also a burden for themselves. We are not aware of any study or app using gamification to increase employees' motivation in reporting their time timely, a gap we tried to fill by designing a gamified for time reporting, and by proposing and evaluating a concrete solution.

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[4] Task Hammer: https://task-hammer.soft112.com/ (Accessed: 25/03/2019)
[5] Epic Win: www.rexbox.co.uk/epicwin/ (Accessed: 25/03/2019)
[6] Chore Wars: www.chorewars.com/ (Accessed: 25/03/2019)
[7] Habitica: https://habitica.com/ (Accessed: 25/03/2019)
[8] LevelUpLife: https://lvluplife.com/ (Accessed: 25/03/2019)
[9] Todoist Karma: https://todoist.com/karma (Accessed: 25/03/2019)
[10] Stickk: www.stickk.com/ (Accessed: 25/03/2019)

3.   Proposal

To make time reporting tasks more engaging for employees, thus improving their productivity in this process, we propose a generic gamification solution, which can be adapted to an organization's time reporting process and workers' profile. As gamification design should be supported by some kind of process, this solution was designed by following 6D Framework, an iterative game design process composed by six steps [26], as it is one of the most mentioned and more complete frameworks to formalize the gamification design process [17].

3.1.   Define Objectives

The solution's objectives, which should bring real benefit to the organization, are defined here. This solution has the single goal of improving the rates of time reporting, with a periodicity aligned with the organization's demands.

3.2.   Delineate Target Behaviors and Metrics

Here we define the behaviors we want players to perform and the metrics for measuring them. The target behavior that translates the defined objective is for employees to report the time they spent working on their tasks within the periodicity defined. The metrics used to support this behavior are the number of reports submitted per period and employee (total and mean).

3.3.   Describe your Players

Target players (i.e. employees) can be varied, and their profiling might differ with their area of work, among other factors. After selecting the context and users, these should be studied, either through reviewing literature, or by applying other methods, like interviews or surveys. In this proposal, we aimed at employing as to employ both types of motivation (intrinsic and extrinsic) and to satisfy SDT needs in a balanced way.

3.4.   Devise Activity Cycles

Cycles that will engage players based on their actions and solution's feedback are described here. Each defined period was considered as a game "cycle", during which players must prepare for the final moment of reporting their time. After that, participants receive feedback regarding their performance using constructive and encouraging messages. This feedback should create awareness regarding players' compliance (or not) with the deadline, guiding users towards the target behavior and motivate them to take further action.

3.5.   Don't Forget the Fun

Fun elements must be included so that players are likely to engage with the system. We can see the time reporting process as a path to an important milestone, thus a progress bar showing how much time is left before the reporting time was used. To promote social connections, players were grouped in teams and assigned collective challenges. By creating a virtual environment that associates the experience with funny elements, fun can be increased. Progress towards the main goal was given by emotions of a character. Achievements were illustrated with appealing images, and memes related to the time reporting process were attached to the goal attainment. Engaging graphics were used, and messages were displayed to reinforce the idea that submitting timesheets is awesome, and those who do it are awesome.

3.6.   Deploy the Appropriate Tools

The tools used to build the gamification solution are defined here. Here we describe the conceptual game construction (i.e. the game elements), and in Section 4.1 we describe an implementation as a software tool. Not all game elements are tangible like points, but they

all important to understand the game (such as progress) [26]. Game elements to promote defined behaviors are described below (in italics). Given the technologies used (see Section 4.1), some game elements were discarded and are not presented here but will be discussed in Section 5 (Evaluation). In Fig. 1 we can see a conceptual map linking all the game elements used in the first version of the proposal. Then, we explain the rationale behind the choice of these game elements, and how they relate with each other to promote the target behaviors, thus achieving the goals.
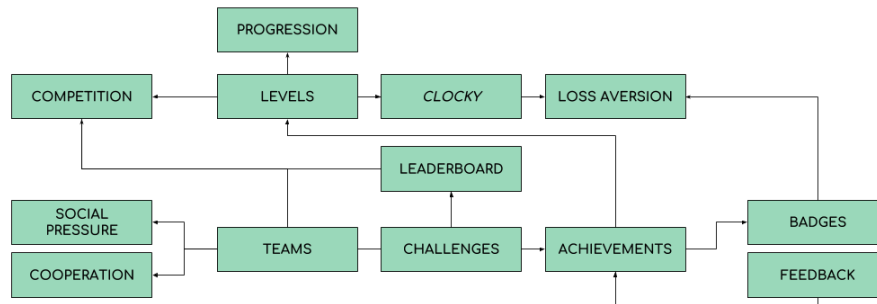

Fig. 1. Game Elements used in this proposal and their relationships.

Players compete in *teams* to promote *competition* among and *cooperation* within them. The game poses two *challenges*: individual (reporting time within the period) and collective (all team players reported time within the period). By completing the first challenge, players are hence completing the other, but not the opposite, as it depended on all team's members. Teams change each period and are selected as to group lower performers (i.e., people who do not often report time) with higher ones. This will likely induce *social pressure*, as competitive players might push their peers to report on time. Players know their team when the period starts, and all of them must report their time before the deadline. Right after, the winners are disclosed. The first team to have all members reporting time wins that challenge. If no team complies with this, the team with more and quicker reports wins. When players complete challenges, these *achievements* are awarded with a *badge* (one per challenge). Badges are dynamic: players must keep doing the target behavior otherwise they lose them in that period, thus inducing *loss aversion*. Points were not used to study how players react to a gamification solution without such a popular element. Players *progress* through *levels* by completing (or not) their individual challenges. There are five levels, and players start in level three (the middle one). If a player fails a challenge, (s)he levels down once. If (s)he completes it, (s)he levels up once. To promote bonding, each level is illustrated with an expression of a main character named *Clocky*. Players receive *feedback* about their compliance with time reporting in the challenge report, including the teams competing, the winning team and how many players reported time per team, and a wall of fame (list of all players that reported time). Also, current level and badges are shown in an unordered *leaderboard*. Players are encouraged to send feedback, either regarding the time reporting process or the gamification solution.

This solution can make players feel extrinsically rewarded for winning a challenge and fearing to lose badges. Feedback and winning a challenge can help players feel competent. Relatedness can be fulfilled by playing in teams, as players establish a social connection with their peers. These motivators can likely foster engagement with the time reporting process.

4. Demonstration

Here we demonstrate how the proposed solution was validated to show that it can be used to solve the research problem in the context of a post-graduation course.

4.1. Software Tool

The proposal was implemented as a software tool, named *Game O'Clock*, using Google Suite technologies. This responsive tool was build using Google Sites[11]. The information

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[11] Google Sites: https://sites.google.com/ (Accessed: 20/09/2018)

displayed was stored and structured in Google Sheets[12], and visually enhanced using Awesome Table[13]. This allowed to create a simple, cheap, and quick to implement solution.

Players report their time in a dedicated page through a Google Form[14]. The *Homepage* displays general game information of the game (Fig. 2, on the left): a progress bar (showing how much time is left before reporting deadline); and an unordered leaderboard displaying players' names, *Clocky* avatar, and badges owned. The *Challenges* page (Fig. 2, on the right) displays information of past challenges, including the teams competing, the winning team and the number of players per team who reported time; and a *Wall of Fame* listing all players that reported time. Memes mentioned in the previous step were used here. *Game Rules* page describes the functionalities, and in *Share O'Clock* page a Google Form is available to submit feedback on the solution. The tool displays several positive feedback messages. Given the technology's limitations in creating sign-in options, the game does not have an opt-out option. Even if users do not use *Game O'Clock* at all, they still are part of the teams.
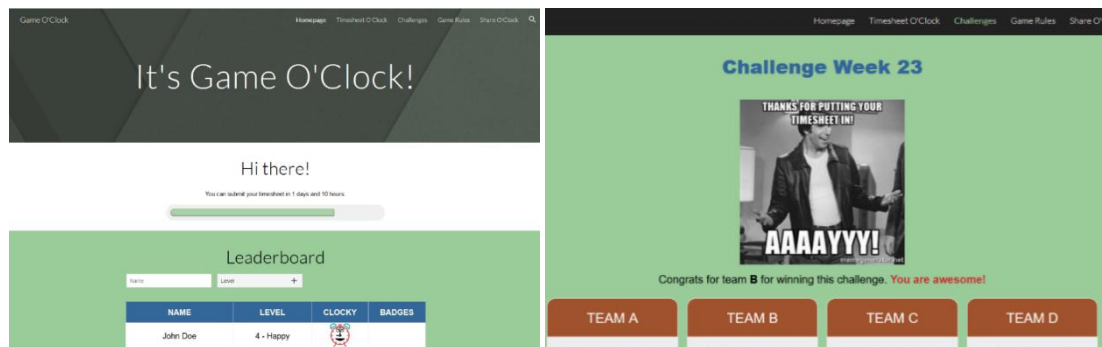

Fig. 2. *Game O'Clock*

4.2.   Context and User Research

The proposal was applied in a class of a 24-week post-graduation course in Software and Information Systems Engineering (hereby only cited as "course"), where engineers outside the Computer Science and Information Systems area were vocationally retrained. The course was sponsored by a large consultant group providing audit, tax, consulting, risk, and financial advisory services. The company selected the students, who became their employees when the course ended. The course was managed by five employees – the monitors. The class had 28 students, mostly in their twenties and starting their professional careers.

Students started to report the time they worked on each subject on the 9th week. Yet, the reporting rates within deadline (Sunday 11:59pm) were low. Hence, the gamification solution and the study procedure were presented to the students in the 16th week of the course and used until the end (23rd week). Monitors refused to deliver consent forms, as they were already consenting for their employees to participate in the study. We coped with this by being transparent about the study and ensuring they would not be punished based on data collected.

To report time, students inserted their student ID, week number, and time spent working in each subject in a form – the timesheet. Teams were defined each week. Each challenge had four teams of seven elements competing. Players knew their team every Saturday, and had to report time on Fridays, from 1pm to 6pm (a new defined deadline).

Participants were studied during a group interview and via a survey. The group interview was conducted with all but one student (absent due to illness) in the course's facilities for 50 minutes. A semi-structured protocol was followed, allowing for flexibility and improvisation, and clearing the path to explore emerging themes. The interview questionnaire consisted of four parts: experience with games/gamification; experience and insights about time reporting; presentation of the study; and final thoughts. The survey was built using Google Forms, and inputs from the group interview were considered in the questionnaire for a deeper analysis. The

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[12] Google Sheets: https://www.google.com/sheets/ (Accessed: 20/09/2018)
[13] Awesome Table: https://awesome-table.com/ (Accessed: 20/09/2018)
[14] Google Forms: https://www.google.com/forms (Accessed: 20/09/2018)

questionnaire had sections on 1) demographics; 2) time reporting; and 3) games and gamification, was disseminated by e-mail and was open for one month. In total, 15 responses were received, all considered valid (response ratio of 0.54). Most responses were provided using a 5-point Likert scale. The outputs of both methods are presented and discussed below.

Respondents found reporting time useful for both the company (Mdn=4,IQR=1) and employees (Mdn=4,IQR=1). Important metrics could be extracted and used to optimize work processes (Mdn=4,IQR=0) and compare time spent in different periods to draw conclusions about work evolution. Employees could self-reflect on these results to understand how they were spending their time (Mdn=4,IQR=1) and how they can improve their work practices (Mdn=4,IQR=1). Respondents lacked motivation to report their time (Mdn=4,IQR=0.5), and considered forgetfulness (Mdn=4,IQR=1); lack of a defined deadline (Mdn=4,IQR=1); and the low-priority of the process (Mdn=4,IQR=1) as factors affecting a proper and timely time reporting. Respondents recommended the initiatives listed in Table 1 during the interview to improve the process, which were evaluated according to their importance in the survey. They believed that having reminders to report time was the initiative with most impact on the process, followed by defining an official deadline and using a simple and user-friendly tool. Most students liked (N=14,93.3%), and often played games, either occasionally (N=9,60.0%) or weekly (N=5,33.3%). They mostly considered themselves casual gamers (N=11, 73.3%). They preferred multiplayer (N=11,73.3%) over single player (N=4,26.7%) games, and to play with people they know, either online (N=7,46.7%) or offline (N=5,33.3%). Action (N=10,66.7%), sports (N=10,66.7%, and board/card/trivia games (N=6,40.0%) are the game genres they prefer. Around half the respondents knew what gamification was (N=8,53.3%), while most did not know any gamification solution applied in the workplace (N=12,80.0%), but thought that such solution would not be a distraction from their work (Mdn=2,IQR=1).

Table 1. Initiatives suggested to improve time reporting rated according to their importance.

Initiative	Mdn	IQR
Comparing reported hours with my peers	2	1,5
Implementing analytics based on hours reported	4	2
Possibility to report hours every day.	4	2
Having a simple and user-friendly time reporting tool.	4	1
Having an automatic login system to record time.	4	1,5
Definition of an official deadline	4	1
Reminders for submitting timesheets.	4	0,5

4.3. Baseline Study

The baseline sample is composed by metrics collected for seven weeks, from the 9th to the 15th week, before the gamification solution was implemented. During this period, an average of 13.1 timesheets (sd=6.5) were submitted out of the 28 that should have been submitted (46.9%). Each student submitted an average of 3.3 timesheets (sd=1.3) during this period, out of the 7 timesheets (s)he should have submitted (46.9%).

4.4. Field Study

The solution was implemented in the last eight weeks of the course (16th to the 23rd). Fig. 3 shows the sum of timesheets submitted per week in both baseline and field study periods.
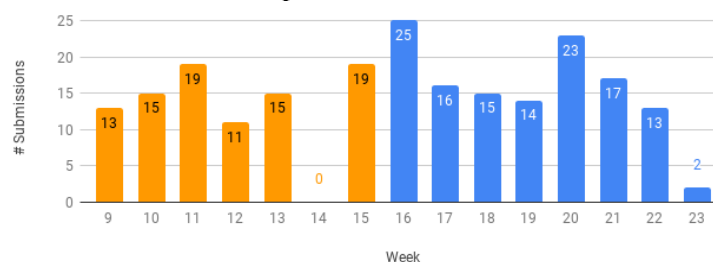

Fig. 3. Number of timesheets submitted within the defined deadline during the baseline (orange bars) and field study (blue bars) periods.

An average of 15.6 timesheets (sd=7.0) were submitted per week during that period, corresponding to 55.8% of the target value. Each student submitted an average of 4.5 timesheets (sd=1.8) during this period, corresponding to 56.3% of the target value. Regarding gamification results, the number of individual badges (matching the number of timesheets submitted) decayed from the 16th to 19th weeks, went up in the 20th week, and then declined until the end of the course. Only in the first two weeks of the study all students on the winner team submitted their timesheets on time, meaning the target number of cooperative badges were achieved. Distribution of students per levels in each week is shown in Fig. 4. Most players leveled up to level five in the first week, and a small rate leveled down to level two, as most of them submitted their timesheets. Recall that no student was on level one or five as they could only level up or down once per challenge. Then, the number of students in level five increased, but abruptly decayed in the last week. Until then, more than half of the students were in level four or five and significant number of students were in level one from the 19th to 23rd weeks. This shows that many students did not submit timesheets regularly (and got stuck in the lowest level), but some complied with the task as they were on high levels. Averagely, 3.91 timesheets were submitted per team (sd=1.74). Still, the values of the last week were a clear outlier, as only two timesheets were submitted overall on time (7.14%).
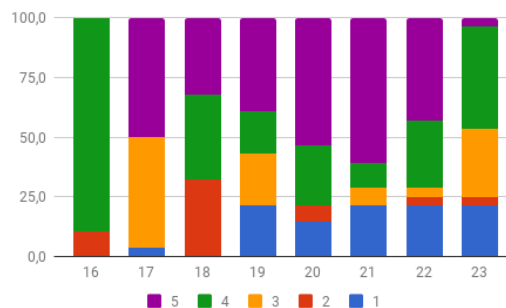

Fig. 4. Distribution of levels during the field study by week, being each level represented by a different color.

4.5. Analysis of Users' Satisfaction

Students' feedback was collected in 20th week of the course (i.e. after 5 weeks using gamification) with a group interview, and in the end of the course using a survey instrument.

The group interview was conducted with all students in the courses' facilities and lasted for around 50 minutes. Again, a semi-structured protocol was used, with the single goal of presenting and discussing the study's results so far. Around half of the students said they did not use the tool. The others said they were first curious about and discussed the tool, but engagement decayed very quickly. They liked to be grouped in teams, but that more information should be available, like team history (submission rate, badges unlocked, etc.), which would promote the definition of strategies and team spirit. Badges, leaderboard, and levels were considered fun elements that need improvements. Leaderboard should show the level number and if and how players levelled up. Students enjoyed *Clocky's* emotions but did not consider it rewarding enough. During the interview, students made fun of a peer whose *Clocky* was always crying (i.e. was on the lowest level), suggesting the element had impact on them. One student found memes a fun element with impact on players. Inversely, they suggested to display the winning team on a more visible place, like *Homepage*, instead of *Challenges' Results.* They did not understand criteria to be featured in the *Wall of Fame* but thought that access should be restricted (e.g. to players who always submitted on time or were awarded with more badges), as it was easy for everyone to get there. Rewards were not considered appealing, and students stressed the importance of differentiating and rewarding different behaviors in the future and providing more virtual and physical rewards. They considered *Game Rules* page content unclear, and no one consulted the *Share O'Clock* page.

Students considered the tool too simple to be motivating in the long term, and that more rewards, individual achievements, and info should be available. They considered the score system and players' records crucial to convey proper progress information, so that people can see their evolution. Students said the study collided with a period of high workload, which

might have influenced the results. They were also not satisfied with the absence of a written consent form and explicit opt-out option, which they considered a priority to fix in the future.

The survey was build using Google Forms, and had sections on 1) demographics; 2) feedback on *Game O'Clock* regarding engagement and how it helped improving the reporting rate; and 3) feedback on *Game O'Clock* regarding future work. The survey was disseminated by e-mail and open for one month. In total, 14 responses were received, all considered valid (0.5 response ratio). Most responses were provided using a 5-point Likert scale.

Respondents classified game elements regarding the motivation and fun they provided. Results in Table 2 show that students' motivation did not seem to have been influenced by these game elements, despite the significant ratio of neutral options (Score=3). *Badges* (Mdn=2,IQR=1) and *progress bar* (Mdn=2,IQR=1.75) seem to be the less motivating elements. The ratio of neutral answers related to fun was higher, and IQR values (i.e., answers concordance) were lower. *Memes* (Mdn=4,IQR=1) and *Wall of Fame* (Mdn=4,IQR=1) were elements perceived as more fun, followed by the *leaderboard* (Mdn=3.5,IQR=1) and *levels* (Mdn=3.5,IQR=1). *Progress bar* was the element perceived as less fun (Mdn=2,IQR=2). Most students considered the *leaderboard* (50.0%) and *teams* (42.9%) the most effective elements. *Progress bar* was considered the less effective game element.

Table 2. Classification of the degree of motivation and fun of the game elements.

Game Elements	Motivation			Fun		
	Mdn	IQR	%Neutral	Mdn	IQR	%Neutral
Memes	3	3	14.3	4	1	28.6
Teams	3	2	21.4	3	1	35.7
Challenges' Results	2.5	2.75	14.3	3	1	42.9
Wall of Fame	3	2	14.3	4	1	28.6
Progress Bar	2	1.75	28.6	2	2	35.7
Badges	2	1	21.4	3	1.75	35.7
Leaderboard	3	2	28.6	3.5	1	35.7
Levels	2.5	2	7.1	3.5	1	35.7
Game Rules	2.5	2	28.6	3	1	50.0
Share O'Clock	2.5	1.75	28.6	3	1	57.1

Overall, students considered that this experience did not perform well (Mdn=2;IQR=1). Despite not being much engaged with *Game O'Clock* (Mdn=2,IQR=1), students had no clear opinion on whether they were more motivated to submit timesheets after the gamification experiment (Mdn=3,IQR=0.75). As their motivation was not apparently influenced by each game element, we hypothesize that their motivation did not change at all.

Some improvements were proposed, including using more and diverse rewards (including real prizes); providing different ranking systems; giving feedback about hours worked (by discussing results and coaching); and creating a more dynamic and visually appealing app.

4.6. Comparison of Before and After Scenarios

A Shapiro-Wilk normality test was applied to metrics of the baseline and field studies. For the number and percentage of timesheets submitted timely by students, we had to reject the null hypothesis that samples follow a normal distribution (p<0.05). For the number and percentage of timesheets submitted timely per week, even though we cannot reject the null hypothesis, data samples are too small to reach a decision of normality. As data do not appear to follow a normal distribution, all statistical differences between groups were checked using a non-parametric Mann-Whitney's U test. The statistics calculated are displayed in Table 3. We can see that the number of timesheets submitted (both by week and per student) increased by 8.9% when compared against the baseline. The Mann-Whitney U test revealed significant differences between the baseline and the field study for the number and percentage of timesheets submitted per student (p-value < 0.05).

Table 3. Statistics for the metrics in baseline and field studies.

		Baseline			Field Study			Mann-Whitney U test	
		Target	mean	sd	Target	mean	sd	U	p-value
Student	**# Mean**	7	3,3	1,3	8	4,5	1,8	203.000	0.002
	% Mean		46,9	18,6		55,8	22,7	243.000	0.014
Week	**# Mean**	28	13,1	6,5	28	15,6	7,0	21.500	0.485
	% Mean		46,9	23,2		55,8	24,9	21.500	0.485

5.   Evaluation

The evaluation of the proposal suggested a slight improvement in results of the field study when compared with the baseline. Still, players did not seem to like the experience, nor were engaged or motivated to use the solution. In fact, most players said they did not use the app or stopped using it very soon. Despite the long-term effect not being a priority in this initial study, the goal was for the app to be engaging during the whole study, which did not happen.

Gamification results shown that while some players were more consistent in complying with the task, ending the study in level four or five, others did not regularly submit their timesheets. Henceforth, it is also important to understand which factors motivate each cluster. Participants of this study were keen to receive feedback on their actions, given their focus on having proper progress information through game records and coaching on their results. Players liked to be grouped in teams but found the progress bar the less fun and motivating element, whose implementation should be revised. *Clocky* and *memes* were considered fun, but we argue they were not fun enough to engage players in the target behavior. Results of the interview and survey were not consistent about badges, but we theorize that players enjoyed the concept (as they seem to be moved by extrinsic motivators) but did not like how they were implemented in the solution. We wanted to study how players would react to a gamification solution without points by conveying progress with other elements (namely levels and badges), but this choice was not effective. Points are a very popular game element that players are used to work with and consider them essential. Overall, these students seem to be motivated by game elements promoting relatedness (teams, cooperation, and competition) and providing extrinsic motivation (rewards, leaderboards, and points). Results presented in this paper might differ in other groups, so it's hard to generalize only based on these results. This proposal was implemented as to meet as much needs and motivations as possible, but it is not easy to outline a general profile, even if there is a common trait, like the work field.

Players believe the app is too simple, but some improvements suggested are hardly achieved even in the future due to the choice of using Google Suite technology, which limited the choice and implementation of some game elements. Likewise, the autonomy need was not addressed in the proposal as we could not implement a login functionality. Also, some parts of the gamification process, like creating the teams, were manual. Nevertheless, the use of simple and existing tools to build the proposal makes it feasible for others to set up something similar with little programming effort, even if little sophisticated.

Given the important role of consent in how gamification is perceived in the workplace [16], we wanted to deliver consent forms, but monitors refused to. We tried to operationalize consent by ensuring the rules were clear, the solution was fair and just, and no one would be punished based on data collected. Yet, students felt this was not enough, and that we must provide a way out of the game.

6.   Threats to Validity

This section discusses the threats to the validity of this study's results, categorized into the four types proposed by Wohlin et al.: internal, external, construct, and conclusion [27].

Internal validity assesses the causal relationship between treatment and outcome. All instruments, like the interview guide, were validated by all authors to prevent issues in the study's design. External validity translates to what extent the study results can be generalized to other settings. This proposal was aimed at employees, which might not be motivated by the same factors as students. Thus, results must be framed and evaluated in the context of this study, and conclusions cannot be generalizable for other scenarios. Construct validity shows how the

study settings reflect the properties we really intend to capture. This study could not benefit from a strong theoretical base given the lack of literature related to the problems affecting the time reporting process and the usage of gamification to cope with such challenges. Two user research methods were used to improve validity of the solution. Results might variate with motivational factors affecting participants. All researchers validated each step of the research to reduce researcher bias. Conclusion validity focuses on factors affecting the ability to draw conclusions about relations between treatment and outcome. Despite the existence of statistically significant differences among studies, these tests have low statistical power and there is a risk that conclusions drawn can be wrong. The reduced size of the field study's sample can explain this. Not all students replied to the survey or actively engage in the interview, thus their insights were not considered in the analysis and can have influenced the results, which might not be representative of the whole sample. Other factors might have biased these results and would be crucial to evaluate their impact. Some examples are the existence of problems with time reporting besides motivation; participants' fear of being penalized for non-participation; and the high workload faced by students during the study.

7. Conclusion

Employees often fail to properly and timely report their time, despite the benefits of this process for both employees and organizations, and literature still lacks research on how to tackle this problem. We developed a gamification solution implemented as a software tool using Google Suite technologies to make time reporting tasks more engaging for employees, which was demonstrated in the context of a post-graduation course. A comparison of data from a baseline and a field studies suggests that results slightly improved after using the proposal, but we cannot conclude this was caused by the proposal itself. Despite enjoying the use of team activities, badges, and leaderboards, students reported that such a simple solution was not enough to sustain engagement in the long term. We found that these students are mainly motivated by social and extrinsic motivators. They identified some improvement opportunities in this study which, after applied, might increase the potential of the solution.

These results can be used not only by researchers, but also by organizations trying to improve their time reporting process. Future work includes not only improve the proposal based on the results, which might include developing a more powerful tool using other technologies that do not pose the same limitations as Google Suite, but also understand how to sustain behavior change over the long term. This can be achieved not only by conducting more research, but also by varying the rewards system periodically or switching for more intrinsic rewards are some options to keep employees engaged [4].

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