

CENTERIS - International Conference on ENTERprise Information Systems / ProjMAN - International Conference on Project MANagement / HCist - International Conference on Health and Social Care Information Systems and Technologies 2021

An experimental study on the effects of gamification on task performance

Changiz Hosseini^a, Oda Humlung^a, Asle Fagerstrøm^{a*}, Moutaz Haddara^a

^a*Kristiania University College, School of Economics, Innovation and Technology, 0152 Oslo, Norway*

Abstract

This experimental study investigates the effects of gamification on task performance. A between-group experimental design was used in relation to the Covid-19 pandemic where the participants were asked to perform tasks related to: a) hygiene and infection (wash hands, keep distance, etc.), b) routines (walk every day, be social with friends, clean the house, etc.), and c) personal issues (learn something new, check in with a friend, etc.). The test group used an application based on a gamified system and the control group used the same application without a gamified system. Our main findings suggest that gamification has increased the quality of work in task performance and subsequent deliveries over time. In addition, gamification has positively affected on-time deliveries. If a deadline was missed, gamification motivated users to always deliver. The contribution of this study to research and implications for management are discussed, and future research avenues are presented.

© 2021 The Authors. Published by Elsevier B.V.

This is an open access article under the CC BY-NC-ND license (<https://creativecommons.org/licenses/by-nc-nd/4.0>)

Peer-review under responsibility of the scientific committee of the CENTERIS –International Conference on ENTERprise Information Systems / ProjMAN - International Conference on Project MANagement / HCist - International Conference on Health and Social Care Information Systems and Technologies 2021

Keywords: Project management; task performance; gamification; experiment

* Corresponding author. Tel.: +47 95075325.

E-mail address: asle.fagerstrom@kristiania.no

1. Introduction

For every two employees who report being engaged at work in the United States, there is one that reports being disengaged. While that might initially seem acceptable, 50 percent of employees simply categorize themselves as “not engaged” [1]. This can potentially lead to job dissatisfaction, leaves of absence [2], or intentions to quit [3]. On the other hand, high employee engagement is positively associated with organizational commitment and organizational citizenship, as well as customer satisfaction [4]. Engagement is also considered as crucial to project performance, as it is proven to have a positive effect in several instances, one of which is task performance (i.e. activities that are related to the formal job) [5].

Gamification has already been established to be highly successful at engaging when applied adequately [6, 7]. It is therefore promising for organizations looking to optimize their business. If applied correctly, gamification can create a positive and meaningful experience for employees when interacting with workplace technologies. In turn, this can mitigate the probability of IT failures resulting from lack of engagement. However, the field of gamification faces several challenges as it is relatively new and thus lacks unison on definition and best practices. Furthermore, there is current academic discussion regarding which research field it belongs to, and it is often misinterpreted as “exploitationware” [8], or oversimplified through the misconception that it is just making something “game-like” [9]. This paper argues that these challenges are shifting the focus away from a greater problem in the field of gamification, which is the lack of cases that have successfully isolated the effect of gamification where engagement has been boosted. While it is hard to isolate any variable in natural circumstances, there is room for improved efforts in this area. Thus, this paper aims to contribute to the body of gamification literature by isolating the direct effect gamification design elements may have on engagement, while keeping the theoretical foundation of gamification in mind. This is done by deploying a gamified application amongst participants in a controlled task performance experiment. The aim of this paper is not primarily to expose different designs of gamification as the design will vary depending on the context. Rather, the purpose is to isolate and understand the effects of gamification design elements as a method or technique to generate engagement.

The remainder of this paper is structured as follows. Section 2 provides a literature review on task management, gamification, and task performance. Section 3 presents an overview of the adopted research method and the experimental design applied in the study. The results of our experiment are then presented in section 4 and discussed in section 5. Finally, conclusions are presented in section 6.

2. Literature review

Many of the earlier academic contributions to gamification literature had the main goal of conceptualizing, discussing and analyzing what it entails for something to be defined as gamified. Seaborn and Fels [10] synthesized a significant portion of gamification theory and concluded that most researchers agree that gamification is inspired by games/game theory/game design, and that it is used in non-game context, which is consistent with the early definition of the gamification concept by Deterding et al. [11]. Despite the academic community generally agreeing on the definition, the field still experiences complications when identifying what it actually entails for something to be gamified, as the definition is arguably quite vague or elastic. Many of the main questions raised are related to the fact that there is potential subjectivity in determining whether a system is gamified versus it being a game. This is why other researchers such as Huotari and Hamari [12] aimed to view the definition from a more psychological and social science perspective. Their main argument against the more “technical” definition was that you cannot identify gamification solely on a set of game design mechanics and principles. They point to the example that dashboards, loyalty programs, and other marketing tactics would fall under this definition, indirectly saying that such elements are not gamification examples nor systems. Werbach and Hunter [13] support the view of Huotari and Hamari [12] arguing and proposing that the definition should pivot into saying that gamification should make processes more “game-like” and take into account the psychological perspectives attached to it. Zichermann and Linder [14] also view gamification in a similar manner as Huotari and Hamari [12], with Zichermann and Cunningham [15] taking it a step further by connecting it to self-determination theory. Self-determination theory is a macro-theory which investigates the motivations of human behavior and the theory is being applied to understand people’s behavior in sports, health care, religion, work, and education. The theory has several sub-theories and connects to concepts such

as feelings of autonomy, competence, and relatedness, which are concepts that are tightly linked with hedonic experiences in games as they are found to be associated with enjoyment [16].

Connecting gamification to a learning theory highlights the importance of not forgetting the effect gamification aims to have, which is to foster human motivation and performance in a given activity [17]; this translates to an increase in engagement. When motivation is internalized within an individual, it becomes a driver of good quality engagement [18] and has naturally received much attention amongst gamification researchers [e.g. 17, 19, 20]. However, not all motivation is found to be internal. There are two main types of sources of motivation: an action is intrinsically motivated when it suits an inner desire (joy, learning or the feeling of accomplishment), while actions are extrinsically motivated when external rewards are being offered, or in avoidance with a negative or undesirable consequence [18]. This separation of motivations would initially lead gamification designers to focus their efforts towards designing experiences that tap into intrinsic motivations. While extrinsic motivations cannot be transformed into intrinsic motivations, they can, however, become internalized [21]. This makes extrinsic motivation attractive for gamification designers, as it can then lead to greater persistence, positive self-perception, and finally, better quality of engagement. Extrinsic motivations have also been found to positively affect performance quality [20]. Therefore, Zichermann and Cunningham [15] suggest that gamification implementations must take into consideration both intrinsic and extrinsic motivations to maximize the effects.

As noted by Mekler, Brühlmann [20], lacking comprehension of intrinsic and extrinsic motivations can lead to undesired effects. For instance, a case of implementing leaderboards to motivate and reward employees resulted in many of those employees feeling they were being micromanaged and were under the whim of an “electronic whip” [22]. This is arguably a result of not properly understanding the target group and context in which gamification is applied. Hamari and Tuunanen [23] emphasize the importance of this, comparing it to segmenting customer groups in the marketing industry. This can be illustrated in Kapp’s [16] fourth gamification element: conflict, competition, and cooperation. In the previous case, a better approach might be to implement game elements that promote cooperation instead of competition. As pointed out by Hamari and Tuunanen [23], it is important to understand the target segment in a nuanced manner, as it can quickly result in simplifications, if not speculations. These authors mention the four player types (killers, achievers, socializers and explorers) introduced by Bartle [24] as a central contribution to this issue. Bartle [24] introduces the difference between the player types and how they interact and provides guidelines as to how game designers can emphasize one type of play over another. For instance, males are found to be more motivated to conquer and outdo other players than females, who are more interested in their own performance [25]. Previous research has shown that collective work engagement increases task performance of students working in groups [26]. Following Hamari and Tuunanen [23], a player type “essentially refers to an emphasis in the set of motivations or behaviors”. Therefore, appreciating the different player types helps to clarify how to apply the correct gamification elements in a given context, depending on the desired effect.

Most gamification studies have been organized in the education and health domains [see 10, 27, 28] or user training [29]; there are few studies conducted within a project management context. As argued by Sammut, Seychell [30], it is one of these areas where the potential benefits of gamification are exponential [30]. In Sammut, Seychell [30], two prototypes were developed to help with data collection within a project. One of the prototypes was a basic project management system, while the other was the exact same system but featuring various gamification elements including experience points, a leveling system, visual elements, and badges. This study aimed to investigate whether gamification managed to increase employee motivation and/or if the implementation of these features would complicate the existing workflow. Data was collected via semi-structured interviews with the participants. The findings showed that all participants were generally positive towards the gamified prototype, but not all design elements were equally received as positive. For example, project managers were critical towards badges, whereas developers found them motivating and rewarding [30]. The study concluded that the gamified prototype had been successful, but acknowledged more attention was required regarding which elements should be implemented. It was also noted that perhaps not every role in a project team should have the same gamification mechanics [30]. A study conducted by Pereira, Amorim [31] also aimed to gamify an agile project management process tool called iMobilis with the aim of increasing the speed and delivery of tasks in each sprint. The results showed that the participants generally reported increased engagement, but more interestingly, the results demonstrated an increase in collaboration amongst the team members which indirectly resulted in increased productivity [31].

A main finding in our literature review was that when choosing technical game design elements, such as the ones employed by Kapp [16], the particular context must be taken into consideration. In the current study, we employed the framework developed by Liu, Santhanam [22] which highlight the context and avoid the main critique towards gamification. Table 1 illustrates how the different gamification elements work together in the framework.

Table 1. Gamification design framework based on Liu, Santhanam [22].

Gamified systems		Implementing gamification design principles	Meaningful engagement	
Gamification objects	Gamification mechanics		Desirable experiential outcomes	Desirable instrumental outcomes
Progress (bar)	Leaderboard	Feedback	Improved hedonic experience (engagement)	For companies: Higher quality performance, on time delivery. Less time spent on quality checks and waiting for deliveries.
Time	Self-competition	Aesthetics	Create and reinforce habit for task delivery and performance	For project members: More communication, less effort in delivery lists, higher performance on self-reporting.
Bar charts	Rules (has to complete list before delivery)			
Pie charts				

This research seeks to influence users to deliver tasks? on time and to a high quality as quickly and effectively as possible. One of the main challenges in any project is that habits are closely linked to routine [32] and routine can result in work becoming boring. However, gamification has been proven to increase engagement of users, especially in contexts related to learning/training which have a set amount of daily routine work. Thus, the aim of this study was to examine whether gamification can have a similar effect on task performance in project management, especially if the quality remains or increases during repeated deliveries over a longer period, creating better and more stable habits for routine work in task performance. Two factors comprised task performance in our study: 1) quality, and 2) timing.

Performance is measured based on quality of work. Following Cooke-Davies [33], the final project outcome is completely reliant on the quality of processes performed by people within the project's lifecycle. In the context of project management, the objective is to specifically investigate task management, completion, and performance. More precisely, whether gamification in routine tasks can increase both on-time delivery and quality of work in project management through habitualizing routine work. The quality of work is measured using controllers that check if the task has been done, and then provide a rating of "approved" or "not approved" depending on the result. From this, a percentage can be calculated to represent the quality of the delivery (calculated based on amount of approved versus not approved). Based on this argument, we hypothesize the following assumptions: 1a Gamification will lead to a higher quality of work in task performance, and, 1b Gamification will lead to a better quality of work in subsequent deliveries over time.

As mentioned, additional essential aspects of task performance in project management are delivery and deadline. As demonstrated in the literature, many projects exceed their time schedules. According to Munns and Bjeirmi [34], project management planning and activities should include defining the requirement of work and tasks, establishing the extent of work and tasks, allocating the proper resources required, planning the execution of the work, monitoring the progress of the work, and adjusting deviations from the plan. These aspects relate to being able to deliver in a timely manner to proceed to the next step and push the project forward. Hence, one of the goals of project management is for activities to cease as project objectives are reached. To test the effect of gamification on timing, a distinction has been made between delivery and deadline in this study. The purpose is to determine whether there is a connection between routines resulting in habits. For example, if one deadline is missed (routine is broken), does that affect subsequent deliveries - with and without gamification? Will gamification motivate users to complete their tasks even though the deadline is missed, and/or will users perform better regarding the deadline next time? This leads to the two following assumptions: 2a Gamification will help with more on-time deliveries, and, 2b If a deadline is missed, gamification will have a positive impact in ensuring that work will be delivered regardless.

3. Method

3.1. Participants

Eight participants accepted an invitation to participate in the experiment. A selection criterion for the participants was that they mainly worked from home in the Covid-19 pandemic instead of their usual workplace. This was essential as the tasks they were going to do were related to healthy behavior when working from home in the Covid-19 pandemic. The sample included one man and seven women. Half of the participants were under 25 years old, and the other half were between 26 and 39 years old.

3.2. Apparatus

An application was made based on the gamification concepts presented in Table 1. Gamified objects (progress bar, time, bar charts, and pie charts) and gamification mechanics (leaderboard, self-competition, and rules) were implemented in the application. Fig. 1 shows a screenshot of the gamified application's layout and interface (in Norwegian language). In addition, a non-gamified version was made without any gamified objects and gamification mechanics. In the gamified application, the *progress bars* were used for providing feedback on checking off list elements. *Time* was used as motivation for timely actions. *Rules* were set to urge users to check off all list elements (they were not allowed to press “deliver” until all elements were checked). Finally, *aesthetics* was employed to distinguish between the state of the list elements.

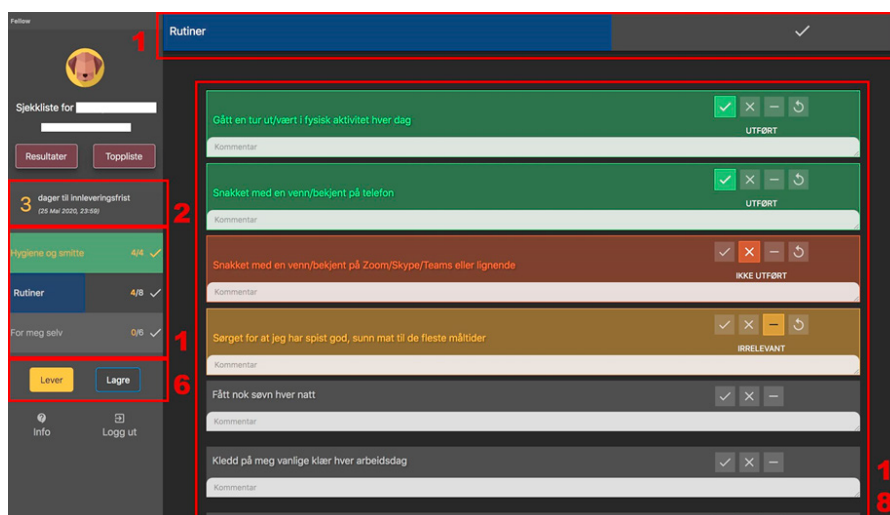


Fig. 1. Gamified application interface.

3.3. Experiment Design

The experiment consisted of one test group and one control group; the test group used the application with incorporated gamification elements (Fig. 1) whereas the control group used the application without gamification elements. This between-group design allowed for the identification of the cause and effect of gamification. It also allowed users to continue using the same application over time, an important aspect to consider as time itself is a central part of gamification [16].

3.4. Procedure

The participants were informed that they were part of a research experiment related to healthy behavior in the Covid-19 pandemic. After accepting the consent form, each participant was given a unique username and password for logging into the application via their internet browser. In the application, the participants were asked to check off tasks related to: a) hygiene and infection (wash hands, keep distance, etc.), b) routines (take a walk every day, be social with friends, clean the house, etc.), and c) personal issues (learn something new, ask a friend about how it's going, etc.). All participants were asked to complete a checklist at the end of each of four delivery cycles.

4. Findings

Table 2 shows that, in general, the test group delivered more quality compared to the control group. Furthermore, the control group demonstrated a downward trend for the entire time frame, which was not the case for the test group.

Table 2. Quality of deliveries for the test group and control group.

Participants	Test group				Control group			
	Delivery 1	Delivery 2	Delivery 3	Delivery 4	Delivery 1	Delivery 2	Delivery 3	Delivery 4
1	61%	67%	78%	0%	0%	0%	0%	0%
2	83%	83%	0%	72%	0%	72%	0%	0%
3	67%	0%	0%	72%	83%	72%	61%	55%
4	44%	0%	0%	55%	67%	0%	0%	0%
	64%	38%	20%	50%	38%	36%	15%	14%

Table 3 shows that the test group scored higher in the first and last delivery in terms of checklist delivered compared to the control group which displayed a downward trend.

Table 3. Checklist delivered for the test group and control group

Participants	Test group				Control group			
	Delivery 1	Delivery 2	Delivery 3	Delivery 4	Delivery 1	Delivery 2	Delivery 3	Delivery 4
1	Yes	Yes	Yes	No	No	No	No	No
2	Yes	Yes	No	Yes	No	Yes	No	No
3	Yes	No	No	Yes	Yes	Yes	Yes	Yes
4	Yes	No	No	Yes	Yes	No	No	No
	100%	50%	25%	75%	50%	50%	25%	25%

Table 4 shows that the test group performed better than the control group for delivery on time. The test group had a relatively stable performance, while the control group displayed a downward trend.

Table 4. Checklist delivered on time for the test group and control group

Participants	Test group				Control group			
	Delivery 1	Delivery 2	Delivery 3	Delivery 4	Delivery 1	Delivery 2	Delivery 3	Delivery 4
1	Yes	Yes	Yes	No	No	No	No	No
2	Yes	Yes	No	Yes	No	Yes	No	No
3	Yes	No	No	Yes	Yes	Yes	Yes	No
4	Yes	No	No	No	Yes	No	No	No
	100%	50%	25%	50%	50%	50%	25%	0%

5. Discussion

Our main findings suggest that gamified users delivered lists with almost twice the quality compared to non-gamified users. Therefore, the assumption that gamification will lead to a higher quality of work in task performance

(Assumption 1a) is supported. Variances in list qualities between the gamified and non-gamified groups showed a trend of the gamified users delivering good quality initially, followed by a drop in quality which then raised again towards the end. Non-gamified users, however, continued to drop in quality in delivery for the remainder of the experiment. Thus, the assumption that gamification will lead to a better quality of work in subsequent deliveries over time (Assumption 1b) is also supported. Participants in the study did not possess any extrinsic motivations to use the application, as they were not offered any form of reward for their participation and there was no obligation from the researchers. The high quality in lists can be a result of high intrinsic motivations to complete the task as these were related to good hygiene, routines, and personal well-being in a state of emergency. The tasks were the same for all participants and as the gamified users delivered better quality, there was a tendency towards gamification having a positive reinforcing effect on the intrinsic motivations. This coincides well with the promise that gamification increases engagement, as it is meant to foster human motivation and performance in a given activity [17]. With intrinsic motivations already in place, gamification helps elevate engagement. As noted, gamification designers should be inclined to focus their efforts towards designing experiences that tap into intrinsic motivations. There was no obligation for the participants to deliver lists in the experiment. Between the gamified and non-gamified groups, there was variance with respect to delivery, and if it was done before the deadline. On average, gamified users delivered more and had a higher on-time percentage than non-gamified users. Hence, the assumption that gamification will help with more on-time deliveries (Assumption 2a) is supported. The experiment ran for more than 18 days and this allowed sufficient time (in accordance with [32]) to establish a routine. Therefore, gamification users showing more deliveries and hitting deadlines more regularly can be attributed to gamification successfully establishing new routines in a consistent context. When non-gamified users missed a deadline, no list was submitted at any stage. With the gamified users, however, there were several instances where users delivered their lists even when the deadline had been missed. While there is not enough evidence from this study to draw any conclusions on this, combining the experimental results with the gamification literature (which states that it is successfully helpful to establish routines), the results indicate that gamification has a positive effect on delivery despite missing deadlines. Hence, the assumption that if a deadline is missed, gamification will have a positive impact in ensuring that work will be delivered anyway (Assumption 2b) is also supported.

6. Conclusions

This study aimed to explore whether gamification could enforce a desirable behavior. That denotes a search for patterns and regularities, which is in line with the positivist research paradigm. Experiments are also one of the most used strategies in positivist research, as they assume that the world can be explored and investigated objectively. As gamification is complex, it arguably makes it difficult to design research based solely on the reductionist method of positivism. Gamification is a combination of many elements working together [16], and should therefore be studied as a whole. Research on the subject should also be designed in a repeatable or refutable manner. This project is designed accordingly, as it incorporates measurements and observations which allow for quantitative analysis. Additionally, the design is not dependent on the researcher(s) being a specific individual (objective) and it is based on assumptions that can be proved or disproved. The study also looks for generalizations as well as all characteristics of positivism. Overall, the short time frame and resulting small dataset make it challenging to state any specific generalizations from this study. Therefore, replicating the experiment over a longer time frame with more participants would provide more data, and possibly the ability to draw more statistically significant conclusions. One of the main contributions of this research for practitioners is that the current trend of incorporating gamification concepts to excite and persuade users to find more “tedious” processes, such as routine task performance or similar objectives in project management, seems to be effective. This is supported by the literature claiming that gamification should be used to make employees more engaged in their work [22, 28]. Therefore, it is recommended to advise practitioners and systems’ vendors to invest resources into incorporating and implementing gamification in their systems.

References

1. Gallup, *Employee Engagement On The Rise In The U.S.* 2020, Gallup Inc.

2. Fisherl, C.D., *Boredom at work: A neglected concept*. Human Relations, 1993. **46**(3): p. 395-417.
3. Saks, A.M., *Antecedents and consequences of employee engagement*. Journal of managerial psychology, 2006.
4. Harter, J.K., F.L. Schmidt, and T.L. Hayes, *Business-unit-level relationship between employee satisfaction, employee engagement, and business outcomes: a meta-analysis*. Journal of applied psychology, 2002. **87**(2): p. 268.
5. Torrente, P., et al., *Teams make it work: How team work engagement mediates between social resources and performance in teams*. Psicothema, 2012. **24**(1): p. 106-112.
6. Burke, B., *Gamify: How gamification motivates people to do extraordinary things*. 2016: Routledge.
7. Humlung, O. and M. Haddara, *The hero's journey to innovation: gamification in enterprise systems*. Procedia Computer Science, 2019. **164**: p. 86-95.
8. Colby, R. and M. Johnson, *Rhetoric/composition/play through video games: Reshaping theory and practice of writing*. 2013: Springer.
9. Landers, R.N., *Gamification misunderstood: How badly executed and rhetorical gamification obscures its transformative potential*. Journal of Management inquiry, 2019. **28**(2): p. 137-140.
10. Seaborn, K. and D.I. Fels, *Gamification in theory and action: A survey*. International Journal of human-computer studies, 2015. **74**: p. 14-31.
11. Deterding, S., et al., *From Game Design Elements to Gamefulness: Defining "Gamification"*, in *MindTrek'11*. 2011, ACM: Tampere, Finland.
12. Huotari, K. and J. Hamari, *Defining gamification: a service marketing perspective*. in *Proceeding of the 16th international academic MindTrek conference*. 2012.
13. Werbach, K. and D. Hunter, *For the win: How game thinking can revolutionize your business*. 2012: Wharton digital press.
14. Zichermann, G. and J. Linder, *Game-based marketing: inspire customer loyalty through rewards, challenges, and contests*. 2010: John Wiley & Sons.
15. Zichermann, G. and C. Cunningham, *Gamification by design: Implementing game mechanics in web and mobile apps*. 2011: "O'Reilly Media, Inc."
16. Kapp, K.M., *The gamification of learning and instruction: game-based methods and strategies for training and education*. 2012: John Wiley & Sons.
17. Sailer, M., et al., *How gamification motivates: An experimental study of the effects of specific game design elements on psychological need satisfaction*. Computers in Human Behavior, 2017. **69**: p. 371-380.
18. Ryan, R.M. and E.L. Deci, *Intrinsic and extrinsic motivations: Classic definitions and new directions*. Contemporary educational psychology, 2000. **25**(1): p. 54-67.
19. Alsawaier, R.S., *The effect of gamification on motivation and engagement*. The International Journal of Information and Learning Technology, 2018.
20. Mekler, E.D., et al., *Towards understanding the effects of individual gamification elements on intrinsic motivation and performance*. Computers in Human Behavior, 2017. **71**: p. 525-534.
21. Deci, E., *L Intrinsic motivation and self-determination in human behavior/EL Deci, RM Ryan*. 1985.
22. Liu, D., R. Santhanam, and J. Webster, *Toward Meaningful Engagement: A Framework for Design and Research of Gamified Information Systems*. MIS quarterly, 2017. **41**(4).
23. Hamari, J. and J. Tuunanen, *Player types: A meta-synthesis*. Transactions Of The Digital Games Research Association, 2014. **1**(2).
24. Bartle, R., *Hearts, clubs, diamonds, spades: Players who suit MUDs*. Journal of MUD research, 1996. **1**(1): p. 19.
25. Heeter, C., et al. *Beyond player types: gaming achievement goal*. in *Proceedings of the 2011 ACM SIGGRAPH symposium on video games*. 2011.
26. Salanova, M., et al., *Perceived collective efficacy, subjective well-being and task performance among electronic work groups: An experimental study*. Small Group Research, 2003. **34**(1): p. 43-73.
27. Hamari, J., J. Koivisto, and H. Sarsa, *Does gamification work?--a literature review of empirical studies on gamification*. in *2014 47th Hawaii international conference on system sciences*. 2014. Ieee.
28. Koivisto, J. and J. Hamari, *The rise of motivational information systems: A review of gamification research*. International Journal of Information Management, 2019. **45**: p. 191-210.
29. Hosseini, C. and M. Haddara, *Gamification in Enterprise Systems: A Literature Review*. in *Proceedings of the Future Technologies Conference*. 2019. Springer.
30. Sammut, R., D. Seychell, and N. Attard, *Gamification of project management within a corporate environment: An exploratory study*. in *2014 6th International Conference on Games and Virtual Worlds for Serious Applications (VS-GAMES)*. 2014. IEEE.
31. Pereira, I.M., et al. *Gamification use in agile project management: an experience report*. in *Brazilian workshop on agile methods*. 2016. Springer.
32. Lally, P., et al., *How are habits formed: Modelling habit formation in the real world*. European journal of social psychology, 2010. **40**(6): p. 998-1009.
33. Cooke-Davies, T., *The "real" success factors on projects*. International journal of project management, 2002. **20**(3): p. 185-190.
34. Munns, A.K. and B.F. Bjeirmi, *The role of project management in achieving project success*. International journal of project management, 1996. **14**(2): p. 81-87.