



UNIVERSIDADE CATÓLICA PORTUGUESA

PLAYING AT WORK: A STUDY ON A GAMIFIED WORKPLACE

Dissertation presented to the Universidade Católica Portuguesa to obtain the master's
degree in Psychology in Business and Economics.

By

Madalena Ribeiro e Silva

Faculty of Human Sciences

June, 2023



UNIVERSIDADE CATÓLICA PORTUGUESA

PLAYING AT WORK: A STUDY ON A GAMIFIED WORKPLACE

Dissertation presented to the Universidade Católica Portuguesa to obtain the master's
degree in Psychology in Business and Economics.

By

Madalena Ribeiro e Silva

Dissertation written under the supervision of

Professor Joana Carneiro Pinto, Ph.D.

Faculty of Human Sciences

June, 2023

Acknowledgements

I would like to express my deepest appreciation to Professor Joana Carneiro Pinto for the valuable support throughout the process. Her expertise, feedback and encouragement were crucial not only for the completion of the present study but also for my personal development as well.

I would also like to extend my sincere appreciation to Grupo Ageas Portugal and its employees for their valuable collaboration which allowed the completing of this study and for all the time invested in facilitating the process.

I am grateful for Yes Marketing, IT company which develops the gamification app, for its great contribution in collecting the necessary data through a survey specially designing for the present study.

Finally, I would to like to express my heartfelt thanks to Universidade Católica Portuguesa and their academic and administrative personnel for the amazing academic experience provided and for the opportunity to elevate myself academically and personally.

Abstract

Employees are the most valuable capital in an organization (Beqiri, 2019). Prioritising employees' psychological state is crucial because motivated, engaged, and satisfied employees place more effort in achieving the company's goals (Beqiri, 2019). Consequently, the idea of making the workplace fun to enhance the job experience has emerged in the organizational context (Ford, McLaughlin, & Newstrom, 2003). More recently, the gamification has presented itself as a solution for this matter by increasing user's engagement (Bitrián, Buil, & Catalán, 2021) and making work more fun (Vegt, et al, 2015). This dissertation aims to explore the connection between the antecedents and consequents of using gamification in the workplace. Therefore, the objective of the current study is to create an integrative model that accounts for a variety of factors that influence the actual use of gamification apps. In particular, the testing model considers variables from the Self-Determination Theory (autonomy, competence, and relatedness) and the Technology Acceptance Model (perceived ease of use, perceived usefulness, and attitude towards use) as antecedents of the actual use of gamification, and job engagement (vigor, dedication and absorption) and organizational commitment (affective and continuance) as psychological outcomes. The participants included in this study were 120 employees at Grupo Ageas Portugal. Through the application of SPSS statistical tests (Correlation, Regression, and Mediation Analysis) it was concluded that the antecedents perceived ease of use, attitude towards use of gamification, and the need for relating with other people (relatedness) are good predictors of the actual use of a gamification app. The actual use of the gamification is a good predictor of the vigor, dedication (job engagement) and affective and calculative commitment. There is also an indirect relationship between the antecedent perceived ease of use and the consequences (Vigour, Dedication, Affective Commitment and Calculative Commitment), mediated by the actual use of gamification. To get the greatest results for the organization and their employees, businesses should carefully weigh the potential advantages and disadvantages of implementing gamification, as well as the variables that may influence its efficacy.

Keywords: Gamification, Technology Acceptance Model, Self-Determination Theory, Job Engagement, Organizational Commitment.

Resumo

Os trabalhadores são o capital mais valioso de uma organização (Beqiri, 2019). Dar prioridade ao estado psicológico dos trabalhadores é crucial, porque aqueles que estão motivados, empenhados e satisfeitos esforçam-se mais para atingir os objectivos da empresa (Beqiri, 2019). Este foi o ponto de partida para tornar o local de trabalho divertido com a finalidade de melhorar a experiência profissional (Ford, McLaughlin, & Newstrom, 2003). A gamificação tem-se apresentado como uma solução para esta questão, aumentando o envolvimento dos utilizadores (Bitrián, Buil, & Catalán, 2021) e tornando o trabalho mais divertido (Vegt, et. al, 2015). Esta dissertação pretende explorar a relação entre um conjunto de antecedentes e consequentes da utilização da gamificação no local de trabalho. Por conseguinte, o objectivo é criar um modelo integrativo que tenha em conta uma variedade de factores que influenciam a utilização real de aplicações de gamificação. Em particular, o modelo de teste considera variáveis da Teoria da Autodeterminação (autonomia, competência e relacionamento) e do Modelo de Aceitação de Tecnologia (facilidade de uso percebida, utilidade percebida e atitude em relação ao uso) como antecedentes do uso real da gamificação, e o envolvimento no trabalho (vigor, dedicação e absorção) e o compromisso organizacional (afectivo e contínuo) como resultados psicológicos. Os participantes incluídos neste estudo foram 120 colaboradores do Grupo Ageas Portugal. Através da aplicação de testes estatísticos SPSS (Correlação, Regressão e Análise de Mediação), concluiu-se que os antecedentes relativos à facilidade de utilização percebida, atitude face à utilização da gamificação e necessidade de se relacionar com outras pessoas são bons preditores da utilização efectiva de uma aplicação de gamificação. A utilização efectiva da gamificação é um bom preditor do vigor, da dedicação (envolvimento no trabalho) e do empenho afectivo e calculativo. Existe também uma relação indirecta entre o antecedente facilidade de utilização percebida e as consequências (Vigor, Dedicação, Compromisso Afectivo e Compromisso Calculativo), mediada pela utilização efectiva da gamificação. Para obter os melhores resultados para a organização e seus colaboradores, as empresas devem ponderar cuidadosamente as potenciais vantagens e desvantagens da implementação da gamificação, bem como as variáveis que podem influenciar a sua eficácia.

Keywords: Gamificação, Modelo de Aceitação Tecnológica, Teoria da Autodeterminação, Envolvimento no Trabalho, Compromisso com a Organização

Table of contents

| | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|----|
| General Introduction | 8 |
| Chapter 1: Literature Review | 11 |
| 1. Gamification | 11 |
| 1.1. Definitions..... | 11 |
| 1.2. Designs, Mechanisms and Strategies | 12 |
| 1.3. Application of Gamification in the Workplace: positive and not so positive consequences..... | 16 |
| 2. Theoretical Basis for the Application of Gamification | 18 |
| 2.1. Theoretical Foundations that Emphasize Behaviour..... | 19 |
| 2.1.1. <i>Planned Behaviour Model</i> | 19 |
| 2.1.2. <i>Technology Acceptance Model</i> | 20 |
| 2.2. Theoretical Foundations that Emphasize Emotions and Motivation | 22 |
| 2.2.1. <i>Flow Theory</i> | 22 |
| 2.2.2. <i>Social Influence Theories</i> | 23 |
| 2.2.3. <i>Self-Determination Theory</i> | 24 |
| 3. Psychological Variables | 25 |
| 3.1 Job Engagement | 26 |
| 3.2 Organizational Commitment..... | 27 |
| Chapter 2: Empirical Study | 30 |
| 5. Methodology | 30 |
| 5.1 The context..... | 30 |
| 5. 2. Participants..... | 30 |
| 5.3. Variables and Instruments..... | 32 |
| 5.4. Procedures, Data Collection and Data Analysis..... | 34 |
| 6. Results | 35 |
| 6.1. Correlational Analysis..... | 35 |
| 6.2. Regression Analysis | 38 |
| 6.2.1. <i>Perceived usefulness, perceived ease of use, and attitude towards use (TAM) predict the actual use of gamification (paths a-c).</i> | 38 |
| 6.2.2. <i>Autonomy, competence and relatedness (SDT) predict the actual use of gamification (paths d-f).</i> | 39 |

| | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 6.2.3. <i>The actual use of gamification predicts vigour, dedication, affective commitment (Job Engagement) (paths h-j). The actual use of gamification predicts affective and calculative commitment (paths j-k).</i> | 39 |
| 6.2.4 <i>The relationship between the antecedents and the consequences is mediated by the actual use of gamification</i> | 40 |
| 7. Discussion | 49 |
| 8. Limitations and Future Recommendations | 52 |
| Reference List | 54 |

General Introduction

Employees are the most valuable capital in an organization and managers direct their focus on employee's motivation, satisfaction, and wellbeing (Beqiri, 2019). Prioritising these factors is crucial in achieving the company's goals because motivated, engaged, satisfied and happy employees are the ones who place more effort in attaining them (Beqiri, 2019). The well-being of employees leads to improved performance. The quality inherent in job experience and employee interpersonal relationships has a significant impact on workers' engagement and well-being (Hammedia, *et.al*, 2020).

Additionally, in order to enhance the job experience, a new concept emerged in the organizational context, which is making the workplace fun. Ford, McLaughlin, and Newstrom (2003) were amongst the pioneers of this new study field and characterized a fun workplace as a "work environment that intentionally encourages, initiates, and supports a variety of enjoyable and pleasurable activities" (p. 22). Fun in the workplace is defined as qualities or characteristics of the workplace that can produce favourable emotional states in employees such as delight, entertainment, and pleasure. Workplace fun shows a persistent positive link with employees' attitudes. However, qualitative studies have shown that fun at the office is not necessarily fun - "fun" is context-sensitive (Michel, Tews & Allen, 2019).

The definitions of fun and engagement both include the following features: a pleasant psychological state and a high level of energy expended in attaining their goals. Also, a joyful work atmosphere may assist to reduce stress while also enhancing productivity and employee engagement (Sakr, Zotti & Khaddage-Soboh, 2019). There is also evidence to suggest that experiencing fun at work motivates people to be more cooperative and empathetic with their co-workers, as well as more dedicated and involved to their work. Engaging workers in enjoyable activities is a terrific approach to offer them a break that benefits both the worker and the firm. An enjoyable work atmosphere may relieve stress and enhance enjoyment, which leads to increased involvement with the team, people, and the business itself (Harris, 2016). Moreover, some types of office fun provide individuals with a revitalizing respite, which offers a beneficial impact. Individuals believe that such impact leads to higher levels of workplace and task involvement. Furthermore, some people are able to experience fun through their professional duties, which the authors attribute to a type of engagement defined as "flow" (Csikszentmihalyi, *et. al*, 2014).

The introduction of technology in the work context has caused significant shifts in the work-life and consequent interactions with co-workers (Pillemer & Rothbard, 2018). In addition to changes in the nature of work, technology is reshaping the way we interact and communicate with co-workers (Leonardi & Vaast, 2017), and organizational life has grown increasingly reliant on social contact (Pillemer & Rothbard, 2018). The use of technology has also challenged the boundaries between personal and professional roles (Pillemer & Rothbard, 2018), as well as work-life boundaries (Bødker, 2016). Technology surpasses physical barriers - people nowadays are able to work from home, especially after the Covid-19 pandemic, which rapidly increased the use of technology at work, and as the author Hodder (2020) stated “video-conferencing through platforms such as Skype, Teams and Zoom has now become the new normal” (p. 265).

Therefore, combining the necessity for making work enjoyable with the introduction of technology, a new concept emerged and rapidly rose to popularity. This concept was *gamification* which consist in “the use of game design elements in non-game contexts” (Deterding et. al, 2011). And according to research, it is useful to overcome organizational difficulties and efficiently achieving goals by increasing user engagement (Singh, 2012). Therefore, the use of gamification can be beneficial at work due to its positive effect on its user’s engagement (Bitrián, Buil, & Catalán, 2021) and making work more fun (Vegt, et. al, 2015). As Herzig, Ameling, and Schill (2015) stated “The concept of gamification is based on the common sense that individuals would rather play than work” (p. 483).

Gamification has been marketed as the long-awaited solution to the diminishing employee engagement (Hamari, Huotari, & Tolvanen, 2015; Mitchell, Schuster, & Jin, 2020). Managers may give objectives and future stages to employees who seek and successfully fulfil those goals using gamification, which provides a goal-oriented framework. Workplace gamification research typically supports its positive effect on a number of behavioural determinants and outcomes (Hamari, Koivisto, & Sarsa, 2014, Mitchell, Schuster, & Jin, 2020). However, the application of these apps - meaning the design, mechanisms and elements used - has an impact on the results (Maher, et al, 2022). Therefore, it is relevant to understand how gamification apps might help make work more enjoyable and meaningful and impact employees’ performance and well-being. Using this knowledge to create models to understand what aspects of gamification matter, and what variables related to the use of this app impact

psychological desired results would be beneficial in order to apply more adequate gamification apps.

The goal of the present study is to develop an integrative model that anticipates a set of variables as antecedents and consequences of the intention to use and actual use of gamification apps. Specifically, our testing model includes variables related to the Technology Acceptance Model (perceived ease of use, perceived usefulness, and attitude towards use) and the Self-Determination Theory (autonomy, competence and relatedness) as antecedents of the intention to use, the actual use of gamification, and job engagement and organizational commitment has psychological results/consequences. The present study was conducted in an organization which is one of the leaders in the Portuguese insurance ranking.

Chapter 1: Literature Review

1. Gamification

1.1. Definitions

Landers, Auer, Collmus, and Armstrong (2018) state that gamification science is concerned with the development of gamified solutions for improving current mechanisms without requiring producing an output that individuals would typically refer to as a game. Additionally, the six key areas of focus for gamification are as follows: “predictor constructs, criterion constructs, mediator constructs, moderator constructs, design processes, and research methods” (p.331).

Gamification consists of the application of game design elements in contexts other than games, which are considered an innovative and effective way of making jobs more fun and motivating employees (Vegt, et. al, 2015).

Moreover, Dale (2014) offers a very detailed definition of the key elements of gamification. Firstly, the author approaches game mechanics which refers to the utilization of components used in several games (e.g., points, badges, and leaderboards). Secondly, includes the concept of experience design which results from the users’ interaction with certain components (e.g., gameplay, play space, and storyline). Afterwards, gamification is defined as means of interacting digitally rather than directly, in which participants interact with digital devices rather than with people. Additionally, gamification’s purpose is to push individuals to modify their behaviours, gain new abilities, or drive creativity. Gamification is concerned with assisting participants in achieving their objectives. When the company’s intended outcomes are matched with player objectives, the organisation accomplishes its objectives as a result of the players attaining their objectives.

Additionally, Wood and Reiners (2015) defend that gamification is the application of game design concepts to non-game environments to infuse enjoyment, playfulness, and enthusiasm into jobs and routines. The authors argue that the meticulous incorporation of a spectrum of elements, such as game-based aspects and techniques, into the architecture and layout of a particular process results in an improvement in user motivation. Nonetheless, there is still a distinction from the notion of actual games, which is primarily focused on the implementation of games to attain meaningful goals.

Furthermore, Tobon, Ruiz-Alba, and García-Madariaga (2020) present a list of definitions such as: (i) “the use of game design elements in a non-game context” (p. 2)¹ (Deterding, Dixon, Khaled & Nacke, 2011), (ii) “gamification is a form of service packaging where a core service is enhanced by a rules-based service system that provides feedback and interaction mechanisms to the user to facilitate and support the users' overall value creation” (p. 19)² (Huotari & Hamari, 2017), (iii) “A process of enhancing services with (motivational) affordance in order to invoke gameful experiences and further behavioural outcomes” (p. 3026)³ (Hamari, Koivisto & Sarsa, 2014), and (iv) “The process of game-thinking and game mechanics in order to engage the user and solve problems” (p. xiv) (Linder & Zichermann, 2010).

1.2. Designs, Mechanisms and Strategies

Key elements of gamification: components and mechanisms

Wood and Reiners (2015) provide an overview of the key elements of gamification according to the framework proposed by Werbach and Hunter (2012). Firstly, the components included in their description are points, badges, leaderboards, quests, challenges, virtual goods, gifting, and difficulty levels. According to the authors, points are useful to track and report the performance score. Badges are able to indicate achievement and pre-defined accomplishments, which may be adaptable and used in conjunction with leaderboards as a method for monitoring success. The potential badges are normally known ahead of time to push the user to attain personal goals avoiding immediate competition. Leaderboards can be used to show user advancement and overall performance in contrast to competitors. Quests refer to tasks in which a user progresses through a series of challenges toward a specific goal in order to be rewarded, quests are established by targets that must be specific, understandable, and brief. Challenges are competitions involving two participants where the aim is to beat one another. Virtual goods are commodities that are seen to be desirable because they provide a benefit to the individual or help to differentiate the user in a certain manner, offering a feeling of individuality. Gifting allows users to share resources with other participants enabling them to experience the advantages of gifting, assisting, and cooperating. Difficulty levels, which provide individuals with unexpected challenges

¹ Retrieved from the Proceedings of the 15th International Academic MindTrek, 2011

² Retrieved from the Electronic Markets Proceeding MindTek, 2012. Workshop Gamification, 2011

³ Retrieved from the 47th Hawaii International Conference on System Science

as they proceed, progressively increment in difficulty to ensure that users are not overburdened.

Secondly, the mechanisms included in their description are achievements, challenges, cooperation, feedback, ownership, progression, transactions, and stochastic elements. Achievements are the participant's ambitions and indicate plotline landmarks, an accomplishment might be the completion of a project, a span of action, or the acquisition of a variety of resources. A badge can be presented for an accomplishment. Challenges are characterized as activities that need individual attention to accomplish, they are described as a collection of targets to be met. Cooperation refers to collaboration among individuals to achieve a target that would be impossible to achieve independently. Feedback, such as scoreboards, notifications, or similar graphical or informative displays, that enables the participant to assess their performance and instigate more actions. Ownership refers to the possession of items which can be purchased, utilized, and exchanged. Storyline progression, which consists in adding a visual representation to show the individual's development in a task. Therefore, when a user is unsure regarding their next step, progress might be induced to keep them from becoming irritated. Tips, environment adjustments, or explicitly executing the action can be useful in these situations. Transactions are exchanges amongst individuals that enable for the exchange of assets. Finally, stochastic aspects increase enjoyment through unpredictability.

Game elements

As previously mentioned, Tobon, Ruiz-Alba, and García-Madariaga (2020) presented various definitions for gamification, but also provided a list of the different elements presented along those definitions. Deterding, Dixon, Khaled & Nacke (2011) suggested as important gamification elements the “self-representation with avatars; three-dimensional environments; narrative context; feedback; reputation, rank, and levels; marketplace and economies; competition under rules that are explicit and enforced; teams; parallel communication systems (...); time pressure” (p.11). Moreover, Hamari, Koivisto & Sarsa, (2014) suggested the following motivational affordances as the most relevant present in literature: points and leaderboards, achievements/badges, levels, story/theme, a clear goal, feedback, rewards, progress, challenge. Furthermore, Huotari & Hamari (2017) concluded that game settings described in prior articles were mostly: rules, conflicting goals, variable and uncertain outcomes as the systemic conditions; and

the voluntary involvement of player/users, hedonic pleasure, mastery/achievement, relatedness, competence, flow and immersion as the experiential conditions.

In gamification, the game elements generally used are, according to Algashami et.al, (2018), “leaderboards, badges, points, avatars reflecting individual and collective performance, levels and status” (p.1). According to Tobon, Ruiz-Alba, and García-Madariaga (2020) rewards and challenges are the most applied mechanisms in gamification and the most commonly used features are points, badges, and leaderboards. Dale (2014) suggests that the following are the most frequent game mechanisms applied in gamification: “*achievements (Experience Points, Levels, Bonuses etc.); exercises (Challenges, Discoveries etc.); synchronizing with the community (Leaderboards, Collaboration etc.); result transparency (Experience Bars, Continuous Feedback etc.); time (Countdown, Speed etc.); luck (Lottery, Random Achievements etc.)*” (p. 82).

Mechanics for behavioural modification

Hervás, Ruiz-Carrasco, Mondéjar, and Bravo (2017) propose a taxonomy of gamification mechanics for behavioural modification. This framework consists of various gamification mechanisms and the associated psychological fundamentals. First, goals (which are the main motivations and methods of action centered on the users’ objectives and endeavours) are associated with “self-efficacy”, “cognitive restructuring” and “social influence”. Secondly, status (an individual’s features that set them apart from the others) is associated with “self-efficacy” and “social influence”. Additionally, randomness (game features that contribute to uncertainty) and appointment (a situation where a participant would engage at a present time) are linked to nudge. Furthermore, scoring (provides feedback regarding user’s performance and progress) is associated with “self-efficacy”, “social influence” and “nudge”. And finally, immersion (extreme psychological engagement) is correlated to “self-efficacy” and “vicarious learning”.

Moreover, according to the authors, each mechanism presents a list of subcategories: achievements, challenges, quests, levels and aversion fit in the “goals” mechanism; ranking, leaderboards, and social sharing are included in the “status” mechanism; free lunch, luck, variations and surprise are comprised in “randomness”; countdown and schedule are included in “appointment”; points, combos and bonus are part of the “scoring”; and, role, narrative and exploration are subcategories of the “immersion” mechanism (Hervás, Ruiz-Carrasco, Mondéjar, and Bravo, 2017).

Several studies explored the mechanisms used in gamification. For example, Tobon, Ruiz-Alba, and García-Madariaga (2020) defend that rewards, challenge, meaningfulness, social influence, evaluation, and interaction are the major processes that may be attributed to gamification's effect on users' decisions.

Regarding rewards, Zeng, Tang, and Wang (2017) defend that extrinsic motivation may be influenced favourably by game components that offer individuals with incentives and acknowledgements or notify individuals of the fulfilment status of their objectives, whilst intrinsic motivation may be strengthened by game aspects that assist construct a fantasy setting. Furthermore, game features like acknowledgment and progression may cause the absorption of extrinsic drive. Furthermore, when a goal is of great complexity, the effects of game components on extrinsic and intrinsic motivation are less noticeable, although absorption of extrinsic drive may improve with increased task complexity. Moreover, Hamari and Koivisto (2015) concluded that rewards such as points, badges, and leaderboards are related with an increase in motivation to participate. Additionally, Hofacker et al. (2016) argue that extrinsic and intrinsic motivations are supported through rewards such as points and badges.

Furthermore, Hamari (2017) observed the effectiveness of using badges and explored the different possible explanations to understand the results. The author mentioned the fact that badges allow users to more easily view clear goals, and consequently, clear goals lead to an increase in the desired behaviour. Therefore, the act of unlocking badges might be a clear goal itself. Furthermore, clear goals allow the individual to become more efficient by facilitating their comprehension of how to attain them. Additionally, the study mentions the fact that badges are a form of feedback that might direct the behaviour in the right direction, feedback is an essential aspect that positively contributes to engagement. The visibility aspect of badges, the fact that is visible to other users, might motivate users to engage in certain behaviours that their peers are already engaged in.

In terms of social influence, Landers, Bauer and Callan (2017) concluded that leaderboards in gamification are effective, especially in simpler tasks. This is related to goal setting having a higher efficacy when applied to basic activities with proper guidance, and it is also owing to the relationship between effort and goal achievement being more accessible to the individual. There is a connection between goal setting and the success of leaderboards that can be explained through the goal-setting components. Firstly, regarding commitment, it is important that people believe the goals defined (or

in this case the leaderboards) are considered worthy in order to effectively impact performance. Moreover, it is crucial that workers value and trust gamification. Furthermore, the authors demonstrated that leaderboards are as useful as setting difficult-to-impossible goals to improve task performance. The adoption of leaderboards is prone to lead to employees targeting the top or near-top goals presented even if there is no guidance on how to achieve them.

Concerning challenges, Mulcahy, Russell-Bennett, Zainuddin, and Kuhn (2018) stated that individual challenges enable players to compete with the game, and users noted that the drive to improve on prior performance acted as an inherent drive for continuing play. Moreover, Jang Kitchen and Kim (2018) concluded that using challenges as a gamification mechanism contributed to improving consumer's interaction in terms of arousal and appealing experience.

1.3. Application of Gamification in the Workplace: positive and not so positive consequences

According to Dale (2014), Bunchball, an American business formed by Rajat Paharia, introduced the first advanced gamification technologies in 2005. Bunchball was the first organization to provide a system for corporations to construct gamified processes using pre-made features such as points, leaderboards, and badges. Later, gamification emerged as a prominent concept in 2010 due to a surge in Internet popularity, with multiple videos from the DICE conference on gamification gaining traction, further raising understanding of the concept.

In 2011, the term “gamification” is formally acknowledged by the Oxford Dictionary and included to its selection of words of the year. (Dale, 2014; Procopie, Giușcă, Bumbac, & Vasilcovschi, 2015).

Procopie, Giușcă, Bumbac, and Vasilcovschi (2015) emphasize that gamification has become a popular corporate technique, with leading businesses like Microsoft, Nike, Dell, Siemens, Deloitte, and eBay implementing it.

Studies demonstrate that games may help people gain multidisciplinary knowledge in fields (Kangas, 2010). Various gamification applications have been established in sectors such as education, economics, health and wellness, civil awareness, and so on (Nacke & Deterding, 2017). Regarding the application of gamification in the organizational context, it can be useful in various ways, including: “external (marketing, sales, customer engagement), internal (HR, productivity

enhancement, crowdsourcing) and behaviour change (health & wellness, sustainability, personal finance)” (p. 549) (Procopie, Giușcă, Bumbac, and Vasilcovschi, 2015).

As a result of applying gamification in the workplace, Çeker and Özdaml (2017) listed different ways in which gamification can be useful and the benefits that might result from it. Some examples include transforming difficult labour practices into more pleasant ones, converting some tedious tasks into more doable and interesting ones, as thus allowing to focus more readily, boosting participation and offering inspiration and happiness in the workplace. Moreover, Hammedia *et. al* (2020) defends that gamification’s positive outcomes include creating a fun work context and enhancing positive interactions between coworkers. In sum, gamification allows work tasks to be more enjoyable (Cardador, Northcraft & Whicker, 2017).

Concerning workers’ productivity, gamification enables access to visible, comparable, and instantaneous data in real-time, albeit on a continuous basis, performance reports. And these types of performance feedback are able to increase work motivation and effectiveness (Cardador, Northcraft & Whicker, 2017).

In terms of employees’ personal development resultant from gamification, Law *et al.*, (2020) found out that employees developed teamwork skills that consequently improved interpersonal communication, collaborative learning and team-based problem-solving. Moreover, Oxarart and Houghton (2021) propose that gamification features enhance multiple self-leadership states and processes which consequently leads to self-concordance, meaning that there is consistency between individuals’ personal interests and essential principles and their work tasks.

However, research has shown that the effectiveness of the application of certain gamification features might be influenced by the user’s personal characteristics. For example, access to visible, comparable, and immediate performance information has a greater impact when employees present great competitive characteristics and are least advantageous to average or low-performing employees (Cardador, Northcraft & Whicker, 2017).

Nonetheless, gamification is not only beneficial for the employees. Managers and companies might also benefit from its features, especially compared to other performance management systems. More concrete knowledge regarding the employee’s performance is essential for managers to help their workers enhance their behaviour and results by establishing goals and a learning path in a more efficient

manner (Cardador, Northcraft & Whicker, 2017). Therefore, it is necessary to extend our knowledge regarding the impact of gamification.

Nonetheless, there are also undesirable negative outcomes that might arise from the use of gamification. Algashami *et. al* (2018) adverted for the risks that might arise from gamification depending on the way rewards are presented, calculated, and attributed. Due to these potential dangers, poor work ethics like free-riding, work harassment, and a lack of cohesiveness within the group" are produced. The authors related these negative outcomes to human factors, in particular, group interactions, business ethos, drive, and character. Moreover, the chosen game design element may also provoke emotional and cognitive unsatisfactory results, such as psychological distress. For example, individuals may experience distress as a result of moving down a leaderboard (Mullins & Sabherwal, 2020). Passalacqua, *et. al* (2020) also argued that the gamification implementation may have a detrimental impact on user well-being and should thus be done with prudence.

Additionally, leaderboards, a popular gamification approach, meant to boost engagement by allowing users to compare themselves against others, can be used in a variety of applications; however, people's perceptions of this technique vary in different settings (Jia, Liu, Yu & Volda, 2017). Moreover, leaderboards might be disturbing to those who perform poorly (Andrade, Mizoguchi & Isotani, 2016). Furthermore, leaderboards may cause users to feel disadvantaged in comparison to those who are in a better position (Kim, 2018) which in turn may lead to great levels of distress (Schlömmer, Spieß & Schlögl, 2021).

2. Theoretical Basis for the Application of Gamification

Tobon, Ruiz-Alba, and García-Madariaga (2020) present the Self-Determination Theory (SDT), the Theory of Planned Behaviour (TPB), the Flow Theory (FT) and the Social Influence Theory (SI) as the main gamification theories in the psychological framework and the Technology Acceptance Model (TAM) as the main in the computer science framework. The authors also argue that "the Self-Determination Theory (SDT) and the Technology Acceptance Model (TAM) are the two most popular theories for why gamification succeeds.

According to the authors here are some examples of how these theories relate to gamification. Firstly, according to the Self-Determination Theory (SDT), humans exhibit three basic psychological demands: autonomy, competence, and relatedness. As a result,

it is evident that individuals desire more than immediate or representational gains. Secondly, Technology Acceptance Model (TAM) states that individuals will interact with an application, product, or service online if it is valuable and simple to use which is useful to have in mind when creating a gamified product or service. Moreover, the Planned Behaviour Theory discusses how badges may be an effective approach in gamified products to engage users by allowing them to compare their performance to that of other players. Subjective norms then force everyone to achieve at a higher level. Additionally, the Flow theory explains why using a successfully gamified application would be pleasurable and engaging if the gamification contains high interaction and suitable challenges. Finally, the social theories, which explore how others influence one's beliefs, attitudes, emotions, explains the influence of badges on the frequency of usage is moderated by performance comparisons amongst users (Tobon, Ruiz-Alba & García-Madariaga, 2020).

Additionally, Krath, Schürmann, and Von Korflesch (2021) conducted a systematic review of studies regarding gamification and concluded that the some of the main theoretical foundations of gamification were: Self-Determination Theory (with a sum of 82 studies applying this theory), Flow Theory (47 studies), Technology Acceptance Model (13 studies), Theory of Planned Behaviour (10 studies), and Social Comparison Theory (4 studies). The authors also conduct a distinction between the theories found to be the theoretical foundations of gamification based on their focus. Firstly, the theoretical basis of gamification with an emphasis on emotion and motivation are the Self-Determination Theory (Ryan & Deci, 2017), the Flow Theory (Csikszentmihalyi, 1975) and the Social Comparison Theory (Festinger, 1954). Secondly, the theoretical foundations that emphasize behaviour focus on defining the factors that influence behavioural outcomes, the Technology Acceptance Model and the Theory of Planned Behaviour. Both describe the significance of behavioural attitudes and subjective standards on behavioural intention, which contributes to factual conduct (Krath, Schürmann, & Von Korflesch, 2021).

2.1. Theoretical Foundations that Emphasize Behaviour

2.1.1. *Planned Behaviour Model*

The Planned Behaviour Theory (TPB; Ajzen, 1985) is a social psychology theory that has been validated for forecasting human decision-making. As a result, using this TPB model and associating each TPB belief with the most popular gamification aspects

can assist in targeting transversal competencies (Mata, et. al, 2019). The TPB is a decision-making model that identifies what variables influence behaviour.

This theory defends that the intention to perform various behaviours can be predicted by three main concepts: attitudes toward the behaviour, subjective norms, and perceived behavioural control (Ajzen, 1991). First, the concept of attitude can be a positive or negative assessment of an individual's behaviour. Secondly, subjective norms are defined as experienced social pressures to do or refrain from performing the desired behaviour, it comprises the individual perception of the environment expectations and the drive to comply with this standard. Finally, perceived behavioural control, which refers to the perceived level of difficulty in executing the behaviour, includes the one's self-efficacy and their perception of control over a situation. These three elements, when combined, produce in the intention to execute a specific behaviour (Ajzen, 1991; Bittner & Shipper, 2014).

Furthermore, research advocates employing gamification aspects in conjunction with TPB principles as follows: behavioural beliefs, such as goals, points, badges, and feedback can be provided as a guidance and motivator; normative beliefs, i.e., individuals sense societal pressure can be used to engage in or refrain from engaging in an activity; others beliefs can influence social recognition, social engagement, and advancement; and, control beliefs, i.e., challenges, progress, a scoreboard, and levels may provide people with the assurance that they are self-developing (Mata, et. al, 2019).

This theory has also been used in the context of gamification to explain individual intention to use gamified products or services. For example, Bittner and Shipper (2014) stated that gamification might be beneficial in systems that are susceptible to social pressure and environmental unpredictability. Additionally, the authors concluded that if the individual's inner drive, delight, and flow are aroused, they may be less influenced by negative social influence.

2.1.2. Technology Acceptance Model

The Technology Acceptance Model (TAM; Davis, 1989) focuses on three aspects to explain users' motivation "perceived usefulness, perceived ease of use, and attitude toward use". Additionally, it defends that "perceived usefulness" and "ease of use" have a significant influence on the "attitude toward use". Regarding perceived usefulness, it refers to an individual's belief that using a particular system could improve their job performance. Regarding perceived ease of use, this consists of the

extent to which a person feels that using technology will be simple. The simpler the system, the more likely it will be embraced by people. The variable attitude toward use considers the person's attitude toward a specific technology system and their personal beliefs. Additionally, the perceived utility and convenience of use have a significant influence on attitudes toward use (Grover, Kar, Janssen & Ilavarasan, 2019). This model was created with the notion that the perceived usefulness and ease of use of any technology may forecast its adoption. Furthermore, it postulates an immediate link between these two user's perceptions. According to TAM, individuals will regard a technology as more beneficial when it is simpler to use (Bourgonjon, *et.al.*, 2013).

Moreover, extrinsic influences have a significant impact on acceptance such as interpersonal context. An individual's surroundings can influence the length and degree of usage (Varannai, Sasvári, & Urbanovics, 2017). There are also other external factors that can impact the aspects previously mentioned, for example, user training, system characteristics, user participation in design and the implementation process nature (Taherdoost, 2018).

The knowledge provided by the TAM model can be useful for app developers by making their apps easy and user-friendly, users will be more motivated to use them because individuals are most likely to interact with an application, product, or service if it is beneficial and simple to use (Tobon, Ruiz-Alba & García-Madariaga, 2020).

Numerous experiments used the Technology Acceptance Model (TAM), which highlights perceived ease of use and usefulness as important elements in understanding consumer intentions to utilize certain systems (Boyle, *et.al*, 2016). Also, implementing digital games in accordance with the suggestions of the Technology Acceptance Model framework may improve users' educational experiences (Le Compte, Watson, & Elizondo, 2014; Carenys & Moya, 2016). Additionally, TAM forecasts and describes the acceptability and cognitive benefits of adopting gamification, supporting the notion that employing a gamification platform enhances engagement and behavioural intentions to use in the future (Vanduhe, Nat, & Hasan, 2020). But, despite the beneficial influence on the acceptance gamification adoption in the e-learning environment, there are substantial variances in actual use by users with diverse digital backgrounds (Panagiotarou, Stamatiou, Pierrakeas, & Kameas, 2020). Overall, various studies indicate that perceived trustworthiness, perceived usefulness, and perceived ease of use are significant determinants of users' actual adoption of various technologies and services and actual usage behaviour (Lee & Jung, 2016; Wang, Yu &

Wei, 2019; Alalwan, Rana, Dwivedi & Algharabat, 2018; Zhou, Lu & Wang, 2016). Moreover, workers are more predisposed to use a gamified systems that they perceive as ease to use and have a positive attitude towards, therefore these variables indirectly affect job engagement by increasing the use of the gamified systems (Chandrasekaran & Jaideep 2017; Costa & Sa, 2018; Zichermann & Linder, 2017; Khanna & Arora, 2019).

2.2. Theoretical Foundations that Emphasize Emotions and Motivation

2.2.1. *Flow Theory*

Davis and Csikszentmihalyi's Flow Theory (FT; 1977) characterized “flow” as the experiences of genuinely driven individuals that immerse in a selected behaviour for its inherent purpose. This is characterized as the “holistic sensation that people feel when they act with total involvement” (Csikszentmihalyi, 1975, p. 36).

According to the FT, an optimal experience is described as an experience where an individual feels that the context includes enough possibilities for action (or challenges) that are proportionate to the individual's own potential to perform (or skills). When both difficulties and skills are high, the individual is not only savouring the experience, but also pushing his or her potential with the possibility of acquiring new competencies and boosting self-esteem and personal richness (Ajzen, 1991). Flow is intimately tied to motivation: when people are completely involved in an activity, they see it as intrinsically gratifying and embrace it for the sake of the activity rather than to attain the end objective (Csikszentmihalyi, 2014).

The Flow Theory argues that a desirable experience is when the individual precepts their surroundings as containing a large number of opportunities for action (or challenges) and that they are able to deal with these situations, that is, their skills are enough. Learning and individual development occur when both challenges and skills are high. Therefore, to be a successful pleasurable and engaging gamified application it needs to contain high interaction and suitable challenges (Tobon, Ruiz-Alba & García-Madariaga, 2020). Moreover, Cowley, Charles, Black and Hickey (2008) defend that the cornerstone underlying the flow process is to strike the correct equilibrium between increasing individual's capabilities via practice and increasing the task's obstacles through innovation.

According to Silic and Back (2017) gamification consists in the introduction of game design concepts to work organizations with the final purpose of influencing an

individual's work engagement via job satisfaction and motivation. Thus, the users' actions should be influenced via gamified activities where the goal is to achieve the Flow experience. This goal can be attained through either intrinsic or extrinsic motivation. The intrinsic drive originates from the activity itself, and the extrinsic drive comes from various external causes. Additionally, the authors argue that while having extrinsic objectives might have long-term negative consequences that may impair the state of flow, it is still feasible to activate flow by integrating extrinsic incentives. Therefore, gamification can be useful by introducing elements such as badges that provide simultaneously intrinsic and extrinsic motivation.

2.2.2. Social Influence Theories

The dimension of social influence is comprised in a set of theories which propose that an individual's attitudes, beliefs, and resultant behaviours are shaped by their social environment through social processes (Tobon, Ruiz-Alba & García-Madariaga, 2020). The term "social influence" relates to an individual's sense of how significant others view the desired conduct and whether they anticipate that behaviour to be performed (Ajzen, 1991). Moreover, Hamari and Koivisto (2013) hypothesize that social influence impacts attitudes toward utilizing a service via the recognition and assimilation mechanisms necessary for group development. According to Tobon, Ruiz-Alba and García-Madariaga (2020) the most relevant theories on social influence are (i) the Theory of Social Comparison Process (TSCP; Festinger, 1954), which states that individuals determine their personal and social value through social comparison processes (Festinger, 1954), (ii) the Self-Determination Theory (SDT; Ryan & Deci, 2017), because of the variable relatedness which refers to the psychological basic need for interaction and establishing connections with others, and (iii) the Planned Behaviour Theory (PBT; Ajzen, 1991), due to the inclusion of subjective norms which refer to the perceived social appraisal of specific behaviours.

The Social Influence Theories explore how one individual, or a group of individuals, influences the beliefs, attitudes, emotions, or actions of others.

The social influence and acknowledgment that users obtain via gamification has been demonstrated to be one major indicator of gamification system uptake and usage (Hamari, & Koivisto, 2013; Hamari, 2013).

Furthermore, according to this set of theories, people are more inclined to participate in actions that they feel peers are also engaging in (Cialdini & James, 2009).

Therefore, gamification enhances social proof by allowing individuals to monitor the actions of others and the actions for which they have been awarded (Hamari, 2013). Additionally, one of the motivations for gamification has been to capitalize on the positive influence that develops when individuals compare their points and badges with one another and thereby measure themselves (Hamari, 2013). This effect is known as social comparison (Festinger 1954).

Subjective norms, perceived recognition, and perceived reciprocal advantage were all found to have a positive link with usage and execution persistence, as well as intention to suggest the gamified system to others, as mediated by attitude (Hamari & Koivisto, 2015) This implies that social variables are a key antecedent for persistent behaviour and aspirations to utilize motivational technology in the future.

2.2.3. Self-Determination Theory

The Self-Determination Theory SDT; (Ryan & Deci, 2000) focuses on motivation and the human's synergy and dependency on the social environment. Concerning motivation, it explores intrinsic and extrinsic motivations and the impact of these types on an individual's circumstantial reactions, including in the social domain. It also relates to the need to satisfy the fundamental psychological requirements of autonomy, competence, and relatedness and how this satisfaction is essential to "self-determined drive, general well-being, and development. Moreover, the theory emphasizes that the social and cultural environment has a major influence on whether people's basic psychological needs, perceived sense of self-direction, performance, and well-being are met or impeded (Legault, 2017).

Kam and Umar (2018) applied this theory to gamification and suggested a framework where game design and game elements impact the psychological mediators of motivation, which according to the SDT are autonomy, competence and relatedness. The psychological need for autonomy is satisfied when the individual is provided with the opportunity to make decisions and choose actions, Kam and Umar (2018) propose that this reflects "to participate under his own volition, without coercion" and that "the gamification design should also offer the option of multiple attempts so that the participant may engage with it as often as he chooses".

The satisfaction of the psychological need for competence depends on whether the employee feels effective and capable of performing his job tasks (Jeno, Adachi, Grytnes, Vandvik & Deci, 2019). In gamification, it should reflect optimal challenges

and the level of difficulty should match the employee's ability "so that a sense of mastery or achievement would result from overcoming the challenge". Research on gamification recommends decomposing greater goals into smaller ones (Kam & Umar, 2018).

The basic psychological need for relatedness refers to the need for interpersonal connection and being valued. In gamification, this need is satisfied when it provides "opportunities for participants to compete, collaborate or share their achievements can support social interaction" (Kam & Umar, 2018).

According to Self-Determination Theory, gamification is an example of source extrinsic motivation, in which collecting points, badges, or other prizes explains why individuals engage in gamified services or products. Nonetheless, these types of incentives can eventually develop into a sort of intrinsic motivation. Also, using feedback as an implicit incentive enhances the implicit motivation to participate more effectively than explicit rewards such as points. The introduction of gamified systems enhances application engagement; this behavioural shift has been linked to the influence of intrinsic motivation (Tobon, Ruiz-Alba & García-Madariaga, 2020).

3. Psychological Variables

Most empirical research focuses on gamification's motivating affordances as well as its psychological and behavioural effects (Hamari, Koivisto, & Sarsa, 2014; Ortiz Rojas, Chiluiza, & Valcke, 2016). Psychological outcomes are psychological responses like as enjoyment, engagement, flow, or autonomy that are often thought to be promoted by game designs. Behavioural outcomes are actions acquired via the usage of gamification, such as greater understanding or improved educational outputs (Lee, 2019).

According to existing literature, the application of gamification produces behavioural and psychological outcomes. Moreover, studies on psychological effects mostly have emphasized on elements such as motivation, attitude, and enjoyment. (Hamari, Koivisto, & Sarsa, 2014).

The present study focuses on the application of gamification in the organizational context and therefore the study variables considered appropriate were "Job Engagement" and "Organizational Commitment". Work engagement and organizational commitment appear to have comparable favourable effects on employee output (Cesário & Chambel, 2017).

3.1 Job Engagement

Kahn (1990) described job engagement as the synchronization of organizational members' selves with their work duties; including the amount of physical, mental, and emotional energy they deploy during role performances. Moreover, Schaufeli & Bakker (2004) define it “as a positive, fulfilling, work-related state of mind that is characterized by vigour, dedication, and absorption.” (p. 295). This continuous and ubiquitous affective-cognitive state is not concentrated on any one item, event, person, or activity.

Firstly, vigour is related to elevated levels of endurance and psychological fortitude when operating, the desire to put effort into one's task, and tenacity even in the presence of setbacks. Secondly, dedication is linked to a feeling of purpose, passion, motivation, pleasure, and challenge. Finally, absorption is defined by being completely focused and contentedly absorbed in one's activity, whereby time goes swiftly, and one finds it challenging to disengage from it. Schaufeli & Bakker (2004) categorized it as “focused attention, clear mind, mind and body union, effortless concentration, complete control, loss of self-consciousness, distortion of time, and intrinsic enjoyment” (p. 295), based on the description given by Csikszentmihalyi (1990)

Job engagement is the degree of the individual's involvement in a given activity. It entails involvement, attention, participation, and tenacity on a task. It comprises three different dimensions: emotional (overall positive affect), cognitive (investment in one's activities) and behavioural (participation and involvement) (Pilotti, et. al, 2017). Job engagement is a good, gratifying, work-related state of a person; it is the ideal relationship between personal traits, job aspects, and work performance; and it is an essential way for an institution to create comparative edge (Yin, 2018). Therefore, job engagement is a wholly favourable and largely consistent measure of occupational well-being (Schaufeli et al. 2002).

Job engagement has gained a lot of interest from businesses since past correlational studies on job engagement indicate that it has a great influence on companies and performance (Yin, 2018). Studies discovered that including entertaining initiatives and well-designed gamification into the HR process can (Ērgle, & Ludviga, 2018; Kumar & Raghavendran, 2015; Sarangi & Shan, 2015;) to increase employee engagement. Moreover, gamification boosts workforce engagement through internal motivation, goal setting, and competitiveness (DuVernet & Popp, 2014).

Features such as leaderboards, badges, goals, and rewards are gamification can increase employee engagement by fostering a sense of community inside the workplace (Yeh, Chen & Lin, 2018; Ma, Elliott & Smith, 2019; Huotari & Hamari, 2017; Laato & Islam, 2019).

Passalacqua, *et al.*, (2020) illustrated that gamification can be a suitable solution for a lack of employee engagement. The combination of self-set objectives and feedback game features has the greatest potential to produce long-term intrinsic motivation, leading to increased employee engagement and performance. However, Trusova (2019) conducted a study to test the impact of Gamified Teamwork on Team Members' Engagement. In this study, the hypothesis that team members in gamified settings present higher levels of flow experience compared to non-gamified teamwork was rejected, but the author defends that this result might be due to the fact that the impact of gamification on participants' engagement can be influenced by "the nature of the gamified system". Robson, *et al.*, (2016) provided guidance in the application of gamified systems aimed at increasing the employees' engagement levels. Firstly, it is essential to comprehend the future users before selecting the most appropriate mechanisms. Secondly, the authors emphasize the importance of choosing the best time to reward users. Moreover, the system used must be continuously engaging and therefore designers are encouraged to keep adding new levels and challenges if required. And finally, it is brought to attention the need for applying gamification mechanisms for scorekeeping. Moreover, gamification can enhance job engagement through an increase in drive, satisfaction, sense of autonomy, and competence (Raj, & Palanisamy, 2019; Laato & Islam, 2019; Elkhani, Alipour & Alem Tabriz, 2020; Gagné, *et. Al*, 2021).

3.2 Organizational Commitment

According to a framework of organizational commitment created by Allen and Meyer (1990), commitment is comprised of three different elements: affective, normative, and calculative. Firstly, affective commitment, defined as a favourable emotion of attachment towards the institution, results in a deep urge to stay and a sense of pride in loyalty to the company. Secondly, normative commitment is the ethical conviction or duty to stay with the group. High normative levels lead employees to hesitate about leaving their workplace even if a new beneficial job opportunity arises. Finally, calculative commitment is the determination to stay with the company despite

the high financial expenses to the employee of quitting (Cesário & Chambel, 2017; Moin, 2018). In sum, organizational commitment is the employees' psychological attachment to their company (Cesário & Chambel, 2017).

Hussain, *et al.*, (2018) conducted an experiment regarding gamification using control groups and concluded that while loyalty and motivation did demonstrate a weak correlation with either the gamified or non-gamified setting, the gamified group did demonstrate relevant results in employee engagement, employee retention, and organizational commitment. A possible explanation for this effect is that gamification enhances employees' positive feelings which increases their commitment to the organization. These results support the idea that gamification may enable increase in productivity and profitability.

Through literature review it has been concluded that there is a lack of studies related to gamification that approach this variable, especially applied to the organizational context. But studies conducted in other study fields have shown that gamification may be used as a powerful method to instruct the ideas of professional commitment (Alhosseini & Pourabbasi, 2018) and that customer commitment is increased via gameful activities (Wolf, Weiger, & Hammerschmidt, 2018). Research has shown that organizational commitment can be affected by gamification by shaping how the employees feel about their company (sense of kinship and job satisfaction) (Laato & Islam, 2019; Gagné *et al.*, 2021), through a variety of mediating factors, such as relatedness (Almarshad *et al.*, 2020).

4. Aim and Objectives of the present Dissertation

The current study aims to test an integrative model (see Figure 1) that predicts a collection of characteristics as antecedents and outcomes of the use of a gamification app. Specifically, our testing model incorporates variables from the Technology Acceptance Model (perceived ease of use, perceived usefulness, and attitude toward use) and the Self-Determination Theory (autonomy, competence, and relatedness) as predictors of the actual use of gamification, and job engagement and organizational commitment as psychological consequences.

Based on the study's objectives, the following hypotheses were formulated:

H1: Perceived usefulness, perceived ease of use, and attitude towards use (TAM) predict the actual use of gamification (paths a-c)

H2: Autonomy, competence, and relatedness (SDT) predict the actual use of gamification (paths d-f).

H3: Actual use of gamification predicts vigour, dedication, and absorption (job engagement) (paths h-i).

H4: Actual use of gamification predicts affective and calculative/continuance work commitment (paths j-k).

H5: The relationship between the antecedents and the consequences is mediated by the actual use of gamification

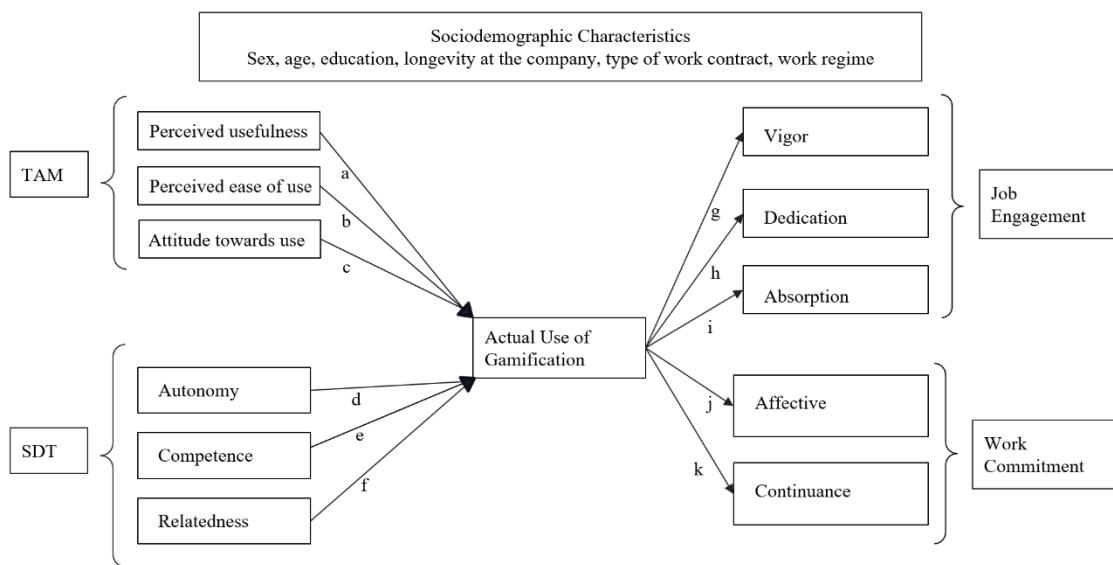


Figure 1. *The Conceptual Framework for the Integrative Model of Nature, Antecedents, and Consequences of Gamification*

Chapter 2: Empirical Study

5. Methodology

5.1 The context

The organization where the present study was conducted is a Portuguese insurance company. The reason Grupo AGEAS Portugal was chosen to apply the survey was that they provided a gamified app with features that were relevant for this study. The app has a desktop as well as a mobile version. When entering the app, the users are welcome and can automatically see their balance in prizes. There is a display of the prizes (such as vouchers, restaurants, ...) which they can view in the app. The prizes are meant to impact engagement according to the company that designs the app.

To receive points, users can complete challenges, for example, a wheel of fortune which has a quiz appended. Users can also win extra points if they are the first ones to participate in a challenge and through their high participation rate. The challenges have different themes such as sustainability or getting to know the company's new office (the space was developed while employees were working remotely). To stimulate e-learning, the quizzes present the solutions in the end. There are new challenges each week or every two weeks. There are challenges meant to be done individually and as a team.

In terms of leader boards, there are individual rankings, team rankings, and challenge rankings. There are 72 teams. Each team has an "influencer" who is considered the "captain" of the team and who oversees motivating the team to use the app. The team challenges are, for example, for users to make decisions and give suggestions regarding building names, themes, spaces, and events. Each user responds individually but can see the other team members' suggestions. For example, a challenge was to answer the question "what is your team made of?" and the team brainstorms a suggestion and then the captain submits it. The most voted phrases, by the different teams, win and are exposed in the building.

5.2. Participants

The participants were employees from Grupo Ageas Portugal, an insurance company, that uses a gamified app, therefore the sampling method used was the

convenience method, which is a non-probability sampling method where the participants are an already formed group of people who are more easily reached.

Table 1 presents the sociodemographic characteristics of the participants. Participated in this study a total of 120 Portuguese workers. Initially 125 participants answered the questionnaire, however 5 did not complete it correctly and did not answer to various questions. In the present study, 80 (66.7%) participants were female and 40 (33.3%) were male, ranging from 24 to 66 years old ($M= 42.98$; $SD=9.368$). Regarding the education level, 1 participant (.8%) had completed a doctorate degree, 32 participants (26.7%) had completed a master's degree, 57 participants (47.5%) had completed their bachelor's degree, 29 participants (24.2%) had completed secondary school and 1 participant (.8%) had completed basic education.

Concerning longevity at the company, the mean was 13.96 years ($SD=11.195$), ranging from less than a year, to 45 years. In regard of the type of work contract, 27 participants (22.5%) had a fixed-term employment contract, 20 participants (16.7%) had an open-ended employment contract, 70 participants (58.3) had a permanent employment contract, and 1 (.8%) participant had a short-term employment contract. In terms of work regime, 106 participants (88.3) were working on a mixed/hybrid regime, 3 (2.5%) were working exclusively remotely, and 11 (9.2%) were working exclusively at the office.

Table 1.
Sociodemographic characteristics of the participants ($n=120$)

| Sociodemographic characteristics | | N | % |
|-----------------------------------------|--------------------------------|----------|----------|
| Gender | Female | 80 | 66.7 |
| | Male | 40 | 33.3 |
| Educational Level | Basic | 1 | .8 |
| | Secondary | 29 | 24.2 |
| | Bachelor's degree | 57 | 47.5 |
| | Master's degree | 32 | 26.7 |
| | Doctorate's degree | 1 | .8 |
| Type of Work Contract | Fixed-term Employment Contract | 27 | 22.5 |
| | Open-ended Employment Contract | 20 | 16.7 |
| | Permanent Employment Contract | 70 | 58.3 |
| | Short-term Employment Contract | 1 | .8 |
| Work Regime | Mixed/Hybrid | 106 | 88.3 |
| | Online/Remote | 3 | 2.5 |

5.3. Variables and Instruments

This study included sociodemographic variables such as age, gender, level of education, longevity at the company, type of work contract and work regime.

The variables included as antecedents of the use of the gamification app in the current proposed model were perceived usefulness (TAM), perceived ease of use (TAM), attitude toward use (TAM), autonomy (SDT), competence (SDT), and relatedness (SDT).

Perceived Usefulness (PU), Perceived Ease of Use (PEU), and Attitude Towards Use (AT) to assess the dimensions from the TAM model a scale that aims to evaluate these variables (Park, 2009) was applied. A total of 11 items of this scale were used: 3 items from the PU subscale ($\alpha=.91$), 3 items from the PEU subscale ($\alpha=.79$), and 3 items from the AT subscale ($\alpha=.83$), (examples of items from the subscale “Perceived Ease of Use (PEU)”: “*I find the app easy to use*”; from the subscale “Perceived usefulness (PU)”: “*The app would improve my performance*”; and, from the subscale Attitude (AT): “*Using the app is a good idea*”,. The original scale was in English and therefore had to be translated to be applied to the Portuguese sample present in this study.

Autonomy, Competence and Relatedness (SDT). The adaptation to Portuguese of the Basic Need Satisfaction in General Scale (Johnston & Finney, 2010) by Sousa, Ribeiro, Palmeira, Teixeira and Silva (2012) was applied. This scale has a total of 20 items and three subscales (Autonomy, Competence, Relatedness). The subscale “Autonomy” entails 7 items (e.g., “*I feel pressured in my job*”; $\alpha=.61$), the subscale “Competence” includes 6 items (e.g., “*Often, I do not feel very competent*”; $\alpha=.68$) and the subscale “Relatedness” incorporates 8 items (e.g., “*I pretty much keep to myself and don't have a lot of social contacts at work*”; $\alpha=.78$). There are 9 reversed items in this scale, three for each construct.

Actual Use of Gamification. A single item named Actual Use (AU) from Wu and Wang (2005) was used, the item was modified to “*How often do you engage with the app?*”. Additionally, four items named Actual use (AU) from Tella and Olasina (2014) were also adapted and used. These items were “*Whether I like it or not, the app is being used in my organization*”, “*I receive app alerts every month*”, “*I use the app*

every day” and “The app has come to stay in this organization”. The original scales were in English and therefore had to be translated to be applied to the Portuguese sample present in this study ($\alpha=.79$).

The variables included as consequences of the use of the gamification app in the current proposed model were vigour, dedication and absorption from Job Engagement and affective and calculative Work Commitment.

Job Engagement. The Portuguese translated version of the 7-point Likert scale (1: absolutely disagree; 7: absolutely agree) Work & Well-being Survey (UWES; Schaufeli & Bakker, 2003) ($\alpha= .95$) by Porto-Martins and Benevides-Pereira (2008) was used. This scale has a total of 16 items divided into three subscales: “Vigour”, “Dedication” and “Absorption”. The subscale Vigour (VI) comprises six items (e.g., At my work, I feel bursting with energy; $\alpha=.83$), the subscale Dedication (DE) entails five items (e.g., “I find the work that I do full of meaning and purpose”; $\alpha=.94$), and the subscale Absorption (AB) contains six items (e.g., “Time flies when I'm working”; $\alpha=.85$).

Work Commitment. The Portuguese translated version of the 7-point Likert scale (1 absolutely disagree; 7: absolutely agree) Allen and Meyer’s (1997) commitment scale ($\alpha = .87$) by Cesário and Chambel (2017) was applied in the present study. This scale consists of 19-item split into three different subscales, but for the purposes of this study we used six items from the dimension Affective (e.g., “I would be happy if I developed the rest of my career in this company”; $\alpha=.38$), and five items from the dimension Calculative. Calculative (e.g., “I feel that I have too few options to consider leaving this organization”; $\alpha=.84$). In their study Cesário and Chambel (2017) concluded that the three subscales presented adequate internal consistencies (affective commitment $\alpha = .90$; and calculative commitment $\alpha =.77$).

Table 2 presents the psychometric characteristics of the assessment instruments obtained with this sample.

Table 2. Psychometric characteristics of the assessment instruments (n=120)

| Construct | Items | Cronbach’s α | M | SD | Min-Max |
|-----------------------|-------|---------------------|--------|---------|-------------|
| Perceived Usefulness | 3 | .91 | 4.2861 | 1.57495 | 1.00 – 7.00 |
| Perceived Ease of Use | 3 | .79 | 5.8278 | 1.06290 | 2.67 – 7.00 |

| | | | | | |
|------------------------|---|-----|--------|---------|-------------|
| Attitude Towards Use | 3 | .83 | 5.4139 | 1.17235 | 1.00 – 7.00 |
| Actual Use | 5 | .79 | 4.1150 | 1.20605 | 2.00 – 7.00 |
| Autonomy | 6 | .61 | 4.6111 | .84303 | 1.50 – 7.00 |
| Competence | 6 | .68 | 5.2069 | .94627 | 2.00 – 7.00 |
| Relatedness | 8 | .78 | 5.3427 | .86746 | 3.00 – 7.00 |
| Vigour | 5 | .83 | 5.3267 | .88153 | 3.00 – 7.00 |
| Dedication | 5 | .94 | 5.2867 | 1.14429 | 2.00 – 7.00 |
| Absorption | 6 | .85 | 4.9653 | 1.10086 | 1.50 – 7.00 |
| Affective Commitment | 6 | .83 | 4.0069 | .78126 | 2.17 – 6.50 |
| Calculative Commitment | 5 | .84 | 4.3233 | 1.37814 | 1.00 – 7.00 |

5.4. Procedures, Data Collection and Data Analysis

The study was cross-sectional, which means the participants were only evaluated in a single moment in time (from June to August 2022). Data was collected through the actual gamified app provided to the employees of the company. The questionnaire had 82 items and took approximately 8 minutes to complete. All ethical procedures necessary were considered, the company's HR department reviewed the questionnaire before approving it and data confidentiality was assured by the company that provided the app and the Data Protection Department. Before answering the questionnaire, users were provided a text, by the company, with the goal and context of the present research. This message was followed by an informed consent with information about who was conducting the study and associated University. Additionally, participants were informed that their cooperation was voluntary and anonymous. The instruments selected for each research variable were included in the next section. And, finally, participants were asked sociodemographic questions: gender, age, education level, longevity in the company, type of work contract and if they were working at the office, remotely or both.

To increase participation, the company rewarded employees who completed the questionnaire with points. Also, app users would receive a push-up notification upon entering the app.

Data collected was entered into an SPSS database. The internal consistency of each assessment instrument was measured using Cronbach's alpha. In order to test the

hypotheses, a Pearson's correlation coefficient test was carried out to measure the degree of association between actual use of gamification at work (mediator variable, MeV), antecedent variables and consequent variables. After, linear regression analyses were carried out to estimate the relationships among the variables studied (H1-H4).

A mediation analysis (Hayes process model 4) was carried out to test H5, specifically to analyse the relationship between the predictors (TAM and SDT) and the dependent variables (job engagement and work commitment) via the mediator variable (actual use of gamification). Results were considered statistically significant when $p < .05$.

6. Results

6.1. Correlational Analysis

Firstly, a correlational analysis between the study variables was conducted. Regarding the antecedent variables, it was possible to observe that perceived usefulness sustains a strong positive correlation with attitude towards use ($r = .661$, $p < .01$); it presents a moderate positive correlation with perceived ease of use ($r = .399$, $p < .01$), and with vigour ($r = .346$, $p < .01$); it also establishes a weak positive correlation with competence ($r = .180$, $p < .05$), with relatedness ($r = .218$, $p < .05$), with dedication ($r = .211$, $p < .05$) and with calculative commitment ($r = .256$, $p < .01$). Additionally, perceived ease of use strongly correlates with attitude towards use ($r = .574$, $p < .01$, strong positive correlation); it also presents a weak positive correlation with relatedness ($r = .261$, $p < .01$), with vigour ($r = .210$, $p < .05$), and with dedication ($r = .204$, $p < .05$). Moreover, attitude towards use presents a weak positive correlation with relatedness ($r = .181$, $p < .05$), with vigour ($r = .298$, $p < .01$), with dedication ($r = .258$, $p < .01$), and with calculative commitment ($r = .232$, $p < .01$).

Furthermore, autonomy sustained a strong positive correlation with competence ($r = .704$, $p < .01$), and with relatedness ($r = .575$, $p < .01$); a moderate positive correlation with vigour ($r = .494$, $p < .01$), and with dedication ($r = .394$, $p < .01$); a weak positive correlation with absorption ($r = .296$, $p < .01$); and finally, a weak negative correlation with affective commitment ($r = -.220$, $p < .05$). Moreover, competence presented a strong positive correlation with relatedness ($r = .651$, $p < .01$) and dedication ($r = .535$, $p < .01$); a moderate positive correlation with vigour ($r = .471$, $p < .01$) and with absorption ($r = .396$, $p < .01$); and a weak negative correlation with affective commitment ($r = -.224$, $p < .05$).

Relatedness presents a moderate correlation with vigour ($r=.457$, $p<.01$), a moderate positive correlation with dedication ($r=.449$, $p<.01$), and a moderate positive correlation with absorption ($r=.344$, $p<.01$).

Regarding actual use, it was possible to observe a strong positive correlation with perceived usefulness ($r=.646$, $p<.01$), with perceived ease of use ($r=.502$, $p<.01$), and with attitude towards use ($r=.695$, $p<.01$); it also presented a moderate positive correlation with dedication ($r=.319$, $p<.01$); as well as a weak positive correlation with relatedness ($r=.277$, $p<.01$), with vigour ($r=.297$, $p<.01$), with affective commitment ($r=.214$, $p<.05$), and with calculative commitment ($r=.187$, $p<.05$).

Concerning the consequent variables, vigour showed a strong positive correlation with dedication ($r=.652$, $p<.01$), and with absorption ($r=.642$, $p<.01$); and a weak positive correlation with affective commitment ($r=.278$, $p<.01$). Additionally, dedication presented a strong positive correlation with absorption ($r=.667$, $p<.01$); as well as weak positive correlation with affective commitment ($r=-.262$, $p<.01$). Moreover, affective commitment correlates moderately with absorption ($r=.357$, $p<.01$). Finally, the only statistically significant negative correlations observed were between affective commitment and autonomy ($r=-.220$, $p<.01$) as well as affective commitment and competence ($r=-.224$, $p<.01$). However, both correlations are considered weak ($r<.3$).

To sum up, the results confirm part of the predictions from H1, H2, H3, H4 and H5. Regarding H1 (*“Perceived usefulness, perceived ease of use, and attitude towards use (TAM) affect predict the actual use of gamification (paths a-c)”*) perceived usefulness, perceived ease of use and attitude towards use correlated statistically significantly with the actual use of gamification. Regarding H2 (*“Autonomy, competence, and relatedness (SDT) predict the actual use of gamification (paths d-f)”*), only the variable relatedness correlated statistically significantly with the actual use of gamification. Concerning H3 (*“Actual use of gamification predicts vigour, dedication, and absorption (job engagement) (paths h-i)”*) and H4 (*“Actual use of gamification predicts affective and calculative work commitment (paths j-k)”*) the variable absorption (Job Engagement) was the only one that did not correlate statistically significantly with the actual use of gamification. To conclude, the overall results confirm H5 (*“The relationship between the antecedents and the consequences is mediated by the actual use of gamification.”*).

Table 2. Correlations between the studied variables

| Variable | 1.PU | 2. PEU | 3. ATU | 4.AU | 5.AUT | 6.COMP | 7.REL | 8.VI | 9.DE | 1.AB | 11.AC | 12.CC |
|----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|-------|
| 1. Perceived Usefulness | - | | | | | | | | | | | |
| 2. Perceived Ease of Use | .399** | - | | | | | | | | | | |
| 3. Attitude Toward Use | .661** | .574** | - | | | | | | | | | |
| 4. Actual Use | .646** | .502** | .695** | - | | | | | | | | |
| 5. Autonomy | .177 | .134 | .130 | .052 | - | | | | | | | |
| 6. Competence | .180* | .146 | .122 | .095 | .704** | - | | | | | | |
| 7. Relatedness | .218* | .261** | .181* | .277** | .575** | .651** | - | | | | | |
| 8. Vigour | .346** | .210* | .298** | .297** | .494** | .471** | .457** | - | | | | |
| 9. Dedication | .211* | .204* | .258** | .319** | .394** | .535** | .449** | .652** | - | | | |
| 10. Absorption | .112 | .166 | .081 | .141 | .296** | .396** | .344** | .642** | .667** | - | | |
| 11. Affective Commitment | .094 | -.016 | .034 | .214* | -.220* | -.224* | -.114 | .278** | .262** | .357** | - | |
| 12. Calculative Commitment | .256** | -.044 | .232* | .187* | .040 | -.111 | -.047 | .166 | .098 | .070 | .118 | - |

Note: *p<.05 **p<.01

6.2. Regression Analysis

6.2.1. Perceived usefulness, perceived ease of use, and attitude towards use (TAM) predict the actual use of gamification (paths a-c).

Antecedents: perceived usefulness, perceived ease of use, attitude towards use

Dependent: actual use

| Model (PU, PEU, ATU → AU) | R ² =.558; r ² adj=.547 | F(3, 116)= 48.880, p<.001 | B | SD B | β |
|---------------------------|-----------------------------------------------|---------------------------|------|------|------|
| PU | t= 1.905, p=.059 | | .163 | .086 | .144 |
| PEU | t= 3.952, p<.001 | | .249 | .063 | .325 |
| ATU | t=4.312, p<.001 | | .409 | .095 | .397 |

Because the coefficient of determination (R²) for the regression analysis is .558, the independent variables can explain 55.8% of the variation in the dependent variable. The corrected R² is .547, indicating that the independent factors explain 54.7% of the variation in the dependent variable when the number of independent variables in the model is adjusted. The F-test for overall model significance is 48.880 with a p-value less than .001, suggesting that the model is of statistical significance (F(3,116)=48.880, p.001).

When the Regression Analysis was performed, the t-value for Perceived Usefulness was 1.905, with a p-value of .059 (t=1.905, p=.059). Because this result is not statistically significant, the independent variable is unrelated to the dependent variable. (p<.05).

Perceived Ease of Use had a t-value of 3.952 and a p-value of .001 (t= 3.952, p.001). This means that the independent variable is significantly connected to the dependent variable and that the relationship is statistically significant at .1%. The p-value is less than .001, which is much less than the standard level of significance of p.05. The independent variable's unstandardized coefficient (B) was .249 (standard error =.063), whereas the standardized coefficient (beta) was .325.

The Attitude Towards Use t-value was 4.312, with a p-value of .001 (t=4.312, p.001). The independent variable's unstandardized coefficient (B) was .409 (standard error =.095), whereas the standardized coefficient (beta) was .397. This means that the independent variable is significantly connected to the dependent variable and that the relationship is statistically significant at .1%.

6.2.2. *Autonomy, competence and relatedness (SDT) predict the actual use of gamification (paths d-f).*

Antecedent: relatedness

Dependent: actual use

| Model (REL → AU) | R ² =.077; r ² adj=.069 | F(1, 118)= 9.797, p<.002 | B | SD B | β |
|------------------|-----------------------------------------------|--------------------------|------|------|------|
| REL | t= 3.130, p=.002 | | .385 | .123 | .277 |

The coefficient of determination (R²) for the regression analysis is .077, indicating that Relatedness can explain 7.7% of the variation in Actual Use. The corrected R² is .069, indicating that Relatedness can explain 6.9% of the variation in Actual Use when adjusted for the number of independent variables in the model. The F-test for overall model significance is 9.797 with a p-value less than .002, suggesting that the model is statistically significant (F(1, 118)= 9.797, p.002). The independent variable's unstandardized coefficient (B) was .385 (standard error =.123), whereas the standardized coefficient (beta) was .277. The t-value, B, SD B, and Beta all imply that the independent variable is related to the dependent variable and that the connection is statistically significant at the .2% level.

6.2.3. *The actual use of gamification predicts vigour, dedication, affective commitment (Job Engagement) (paths h-j). The actual use of gamification predicts affective and calculative commitment (paths j-k).*

| Model | R ² adj | F(1, 118) | B | SD B | β |
|----------------|-----------------------------------------------|--------------------------|------|------|------|
| Model (AU→VIG) | R ² =.088; r ² adj=.081 | F(1, 118)=11.440, p<.001 | .217 | .064 | .297 |
| Model (AU→DED) | R ² =.102; r ² adj=.094 | F(1, 118)=13.354, p<.001 | .303 | .083 | .319 |
| Model (AU→AC) | R ² =.049; r ² adj=.038 | F(1, 118)=5.684, p=.019 | .139 | .058 | .214 |
| Model (AU→CC) | R ² =.035; r ² adj=.027 | F(1,118)= 4.283, p=.041 | .214 | .103 | .187 |

The following findings are based on regression analyses using Actual Use as the independent variable.

The coefficient of determination (R²) for the regression analysis for Vigour as the dependent variable was .088, which implies that the independent variable can explain 8.8% of the variance in the dependent variable. The corrected R² was .081, which implies that the independent variable can explain 8.1% of the variance in the dependent variable when adjusted for the number of independent variables in the model. The F-test for the overall significance of the model was 11.440, with a p-value less than .001, indicating

that the model is statistically significant ($F(1, 118)=11.440, p<.001$). The independent variable's unstandardized coefficient (B) was .217 (standard error =.064), whereas the standardized coefficient (beta) was .297. Concerning Dedication as the dependent variable, the coefficient of determination (R²) for the regression analysis was .102, which suggests that the independent variable can explain 1.2% of the variance in the dependent variable. The corrected R² was .094, which implies that the independent variable can explain 9.4% of the variance in the dependent variable when adjusted for the number of independent variables in the model. The F-test for overall model significance was 13.354, with a p-value less than .001 suggesting that the model is statistically significant ($F(1, 118)=13.354, p.001$). The independent variable's unstandardized coefficient (B) was .303 (standard error =.083), whereas the standardized coefficient (beta) was .319.

Furthermore, when Affective Commitment was used as the dependent variable in the regression analysis, the coefficient of determination (R²) was .049, indicating that the independent variable can explain 4.9% of the variance in the dependent variable. The corrected R² was .038, which implies that the independent variable can explain 3.8% of the variance in the dependent variable when adjusted for the number of independent variables in the model. The F-test for overall model significance was 5.684 with a p-value of .019. This indicates that the model is statistically significant ($F(1, 118)=5.684, p=.019$). The independent variable's unstandardized coefficient (B) was .139 (standard error =.058), whereas the standardized coefficient (beta) was .214.

Finally, using Continuance Commitment as the dependent variable, the coefficient of determination (R²) for the regression analysis was .035, indicating that the independent variable can explain 3.5% of the variance in the dependent variable. The corrected R² was .027, which implies that the independent variable can explain 2.7% of the variance in the dependent variable when adjusted for the number of independent variables in the model. The F-test for overall model significance was 4.283 with a p-value of .041, suggesting that the model is statistically significant ($F(1,118)=4.283, p=.041$). The independent variable's unstandardized coefficient (B) was .214 (standard error =.103), whereas the standardized coefficient (beta) was .187.

6.2.4 The relationship between the antecedents and the consequences is mediated by the actual use of gamification

Mediation (Antecedents → actual use of gamification → Consequents):

A mediation analysis using Model 4 from Process Hayes, which examines the relationship between various independent variables (Perceived Ease of Use, Attitude

Towards Use, and Relatedness) and two dependent variables (Actual Use and Vigour) was conducted.

Outcome: *Actual use of gamification*

| | | | B | se | t | p | LLCI | ULCI |
|------------------|-----------------------------------|------------------------------|-------|-------|--------|-------|-------|-------|
| Model (PEU → AU) | R=.5015; R ² =.2516 | F(1,118)=39.6594, p=.0000 | .5691 | .0904 | 6.2976 | .0000 | .3901 | .7481 |
| Model (ATU → AU) | R=.6951; R ² =.4832 | F(1,118)=11.3126, p<.001 | .7151 | .0681 | 1.5030 | .0000 | .5803 | .8499 |
| Model (REL → AU) | R=.2769; R ² =.0767 | F(1,118)=9.7969, p=.0022 | .3849 | .1230 | 3.1300 | .0022 | .1414 | .6285 |

The following findings are based on a Mediation Analysis utilizing Process Hayes' Model 4 and using Actual usage of gamification as the outcome.

The coefficient of determination was .5015 (R²=.2516) between the independent variable, Perceived Ease of Use, and the dependent variable, Actual Use. The F-test for overall model significance was 39.6594, with a p-value of .0000, showing that the model is statistically significant. The independent variable's unstandardized coefficient (B) was .5691 (standard error =.0904), and the t-value was 6.2976, p =.000. The 95% lower limit of the confidence interval was .3901, and the 95% upper limit was .7481. This indicates that the independent variable is substantially related to the dependent variable and that the connection is statistically significant.

The coefficient of determination was .6951 (R²=.4832) between the independent variable, Attitude Towards Use, and the dependent variable, Actual Use. The F-test for overall model significance was 11.3126, with a p-value of .001, showing that the model is statistically significant. The independent variable's unstandardized coefficient (B) was .7151 (standard error =.0681), and the t-value was 1.5030, p=.000. The 95% lower limit of the confidence interval was .5803, and the 95% upper limit was .8499. This indicates that the independent variable is substantially related to the dependent variable and that the connection is statistically significant.

The coefficient of determination between Relatedness, the independent variable, and Actual Use, the dependent variable, was .2769 (R²=.0767). The F-test for overall model significance was 9.7969 with a p-value of .0022, suggesting that the model is statistically significant. The independent variable's unstandardized coefficient (B) was .3849 (standard error =.1230), and the t-value was 3.1300, p =.0022. The 95% lower limit of the confidence interval was .1414, and the 95% upper limit was .6285. This implies a statistically significant relationship between the independent and dependent variables.

Outcome: Vigour

| | | | B | se | t | p | LLCI | ULCI |
|------------------|-----------------------------------|---------------------------|-------|-------|--------|-------|--------|-------|
| Model (PEU → VI) | R=.3055; R ² =.0933 | F(2,117)=6.0224, p=.0032 | .0675 | .0844 | .7999 | .4254 | -.0996 | .2346 |
| Model (ATU → VI) | R=.3233; R ² =.1045 | F(2,117)=6.8273, p=.0016 | .1328 | .0915 | 1.4517 | .1493 | -.0484 | .3141 |
| Model (REL → VI) | R=.4906; R ² =.2407 | F(2,117)=18.5435, p=.0000 | .4127 | .0852 | 4.8445 | .0000 | .2440 | .5815 |

The following are the findings of a Mediation Analysis utilizing Process Hayes' Model 4 with Vigour as the outcome.

The coefficient of determination was .3055 (R²=.0933) between the independent variable, Perceived Ease of Use, and the dependent variable, Vigour. The F-test for overall model significance was 6.0224 with a p-value of .0032, suggesting that the model is statistically significant. The independent variable's unstandardized coefficient (B) was .0675 (standard error =.0844), and the t-value was .7999, p =.4254. The 95% lower limit of the confidence interval was -.0996, and the 95% upper limit was .2346. Because the p-value is higher than .05., the data indicate that Perceived Ease of Use is not a significant predictor of Vigour.

The coefficient of determination between the independent variable, Attitude Towards Use, and the dependent variable, Actual Use, was .3233, showing a minor to moderate positive connection between the variables. The coefficient of determination (R²) was .1045, suggesting that the independent variable explains nearly 10% of the variation in the dependent variable. The F-test score is 6.8273, and the p-value was .0016, showing that the whole model is statistically significant. The B coefficient was .1328, suggesting that for a one-unit rise in the independent variable, the dependent variable is predicted to increase by .1328 units on average when all other variables in the model are held constant. The standard error (se) is .0915, reflecting the accuracy of the B coefficient estimate. The B coefficient is not statistically significant, according to the t-test statistic of 1.4517 with a p-value of .1493. The lower and upper confidence intervals (LLCI and ULCI) are, however, -.0484 and .3141, respectively. This signifies that there is a 95% likelihood that the real population value of B coefficient falls within this range, and that this interval does not contain 0, indicating that the independent variable has an influence on the dependent variable.

The coefficient of determination between Relatedness and Actual Use was .2407 (R²), suggesting that the model explains 24.07% of the variation in the outcome variable. The entire model is significant (F(2,117)=18.5435, p=.0000). The mediator variable (B)

has a coefficient of .4127, a standard error of .0852, and a t-value of 4.8445 (p=.0000), showing that it is a significant predictor of the outcome variable. The lower and upper 95% confidence intervals for the coefficient are .2440 and .5815, respectively.

Outcome: Dedication

| | | | B | se | t | p | LLCI | ULCI |
|------------------|----------------------|---------------------------|-------|-------|--------|-------|--------|-------|
| Model (PEU → DE) | R=.3228; R2=.1042 | F(2,117)=6.8051, p=.0016 | .0627 | .1089 | .5761 | .5657 | -.1529 | .2784 |
| Model (ATU → DE) | R=.2578; R2=.0665 | F(2,117)=8.4038, p=.0045 | .0684 | .1188 | .5757 | .5959 | -.1669 | .3037 |
| Model (REL → DE) | R=.4922; R2=.2422 | F(2,117)=18.7017, p=.0000 | .5147 | .1105 | 4.6590 | .0000 | .2959 | .7335 |

The following are the findings of a Mediation Analysis utilizing Process Hayes' Model 4 with Dedication as the outcome.

The coefficient of determination was .3228 (R2=.1042) between the independent variable, Perceived Ease of Use, and the dependent variable, Dedication. The F-test for overall model significance was 6.8051 with a p-value of .0016, suggesting that the model is statistically significant. The independent variable's unstandardized coefficient (B) was .0627 (standard error =.1089), and the t-value was .5761 (p =.5657). The 95% lower limit of the confidence interval was -.1529, and the 95% upper limit was .2784.

The coefficient of determination (R2) between the independent variable, Attitude Towards Use, and the dependent variable, Dedication, was .0665, suggesting that the model accounts for 6.65% of the variation in the outcome variable. The total model (F(2,117)=8.4038, p=.0045) is statistically significant. The mediator variable (B) coefficient is .0684, with a standard error of .1188 and a t-value of .5757 (p=.5959). Because the p-value is higher than .05, this implies that the mediator variable is not a significant predictor of the outcome variable. The lower and upper 95% confidence intervals for the coefficient are -.1669 and .3037, respectively.

The coefficient of determination between Relatedness and Dedication, the independent variable, was .2422 (R2), suggesting that the model explains 24.22% of the variation in the outcome variable. The total model is significant (F(2,117)=18.7017, p=.0000). The mediator variable (B) has a coefficient of .5147, a standard error of 4.6590, and a p-value of .0000, showing that it is a significant predictor of the outcome variable. The lower and upper 95% confidence intervals for the coefficient are .2959 and .7335, respectively.

Outcome: *Affective Commitment*

| | | | B | se | t | p | LLCI | ULCI |
|------------------|-----------------------------------|--------------------------|--------|-------|---------|-------|--------|--------|
| Model (PEU → AC) | R=.2576; R ² =.0663 | F(2,117)=4.1564, p=.0180 | -.1213 | .0759 | -1.5980 | .1127 | -.2716 | .0290 |
| Model (ATU → AC) | R=.2675; R ² =.0715 | F(2,117)=4.5071, p=.0130 | -.1482 | .0826 | -1.7952 | .0752 | -.3118 | .0153 |
| Model (REL → AC) | R=.2803; R ² =.0785 | F(2,117)=4.9866, p=.0084 | -.1692 | .0832 | -2.0341 | .0442 | -.3339 | -.0045 |

The following are the findings of a Mediation Analysis utilizing Process Hayes' Model 4 and Affective Commitment as the outcome.

The correlation coefficient between the independent variable, Perceived Ease of Use, and the dependent variable, Affective Commitment, was .0663 (R²), suggesting that the model explains 6.63% of the variation in the result variable. The total model (F(2,117)=4.1564, p=.0180) is statistically significant. The mediator variable (B) coefficient is -.1213, with a standard error of .0759 and a t-value of -1.5980 (p=.1127). Because the p-value is higher than .05, this implies that the mediator variable is not a significant predictor of the outcome variable. The lowest and upper 95% confidence limits for the coefficient are -.2716 and .029.

The coefficient of determination between the independent variable, Affective Commitment, and the dependent variable, Attitude Towards Use, was .0715 (R²), suggesting that the model explains 7.15% of the variation in the result variable. The total model (F(2,117)=4.5071, p=.0130) is statistically significant. The mediator variable (b) has a coefficient of -.1482, a standard error of .0826, and a t-value of -1.7952 (p=.0752). Because the p-value is higher than .05, this implies that the mediator variable is not a significant predictor of the outcome variable. The lower and upper 95% confidence intervals for the coefficient are -.3118 and .0153, respectively.

The coefficient of determination between Relatedness, the independent variable, and Affective Commitment, the dependent variable, was .0785 (R²), suggesting that the model explains 7.85% of the variation in the result variable. The total model (F(2,117)=4.9866, p=.0084) is statistically significant. The mediator variable (B) coefficient is -.1692, with a standard error of .0832 and a t-value of -2.0341 (p=.0442). As the p-value is smaller than .05, this implies that the mediator variable is a significant predictor of the outcome variable. The lower and upper 95% confidence intervals for the coefficient are -.3339 and -.0045, respectively.

Outcome: Calculative Commitment

| | | | B | se | t | p | LLCI | LLCI |
|------------------|-----------------------------------|--------------------------|--------|-------|---------|-------|--------|-------|
| Model (PEU → CC) | R=.2460; R ² =.0605 | F(2,117)=3.6788 p=.0259 | -.2393 | .1343 | -1.7820 | .0773 | -.5053 | .0267 |
| Model (ATU → CC) | R=.2345; R ² =.0550 | F(2,117)=3.4041, p=.0366 | .2310 | .1470 | 1.5721 | .1186 | -.0600 | .5221 |
| Model (REL → CC) | R=.2133; R ² =.0455 | F(2,117)=2.7891, p=.0656 | -.1693 | .1493 | -1.1334 | .2594 | -.4650 | .1265 |

The following are the findings of a Mediation Analysis utilizing Process Hayes' Model 4 and Calculative Commitment as the conclusion.

The correlation coefficient between the independent variable, Perceived Ease of Use, and the dependent variable, Calculative Commitment, was .0605 (R²), suggesting that the model explains 6.05% of the variation in the outcome variable. The total model (F(2,117)=3.6788, p=.0259) is statistically significant. The mediator variable (B) coefficient was -.2393, with a standard error of .1343 and a t-value of -1.7820 (p=.0773). Because the p-value is higher than .05., this implies that the mediator variable is not a significant predictor of the outcome variable. The lowest and upper 95% confidence intervals for the coefficient are -.5053 and .0267, respectively.

The coefficient of determination (R²) between the independent variable, Attitude Towards Use, and the dependent variable, Calculative Commitment, was .0550, suggesting that the model accounts for 5.50% of the variation in the result variable. The total model (F(2,117)=3.4041, p=.0366) is statistically significant. The mediator variable (B) coefficient was .2310, with a standard error of .1470 and a t-value of 1.5721 (p=.1186). Because the p-value is higher than .05., this implies that the mediator variable is not a significant predictor of the outcome variable. The lowest and upper 95% confidence intervals for the coefficient are -.0600 and .5221, respectively.

The coefficient of determination between Relatedness, the independent variable, and Calculative Commitment, the dependent variable, was .0455 (R²), suggesting that the model explains 4.55% of the variation in the result variable. The entire model is non-significant (F(2,117)=2.7891, p=.0656). The mediator variable (B) coefficient is -.1693, with a standard error of .1493 and a t-value of -1.1334 (p=.2594). Because the p-value is higher than .05., this implies that the mediator variable is not a significant predictor of the outcome variable. The lowest and upper 95% confidence intervals for the coefficient are -.4650 and .1265, respectively.

Indirect Effects (Antecedents → actual use of gamification → Consequents):

Outcome: *Indirect effect of PEU on Vigour*

| | Effect | BootSE | BootLLCI | BootULCI |
|------------------------|--------|--------|----------|----------|
| Model (PEU → AU → VIG) | .1067 | .0419 | .270 | .1928 |

The results showed that there was a significant indirect effect of Perceived Ease of Use on Vigour (effect=.1067, SE=.0419, 95% CI=.270;.1928). The CI does not include zero therefore it is significant.

Outcome: *Indirect effect of PEU on Dedication*

| | Effect | BootSE | BootLLCI | BootULCI |
|------------------------|--------|--------|----------|----------|
| Model (PEU → AU → DED) | .1564 | .0617 | .0464 | .2871 |

The results showed that there was a significant indirect effect of Perceived Ease of Use on Dedication (effect=.1564, SE=.0617, 95% CI=.0464;.2871). The CI does not include zero therefore it is significant.

Outcome: *Indirect effect of PEU on Affective*

| | Effect | BootSE | BootLLCI | BootULCI |
|-----------------------|--------|--------|----------|----------|
| Model (PEU → AU → AC) | .1095 | .0485 | .0272 | .2142 |

The results showed that there was a significant indirect effect of Perceived Ease of Use on Affective Commitment (effect=.1095, SE=.0485, 95% CI=.0272;.2142). The CI does not include zero therefore it is significant.

Outcome: *Indirect effect of PEU on Calculative*

| | Effect | BootSE | BootLLCI | BootULCI |
|-----------------------|--------|--------|----------|----------|
| Model (PEU → AU → CC) | .1819 | .0806 | .0274 | .3504 |

The results showed that there was a significant indirect effect of Perceived Ease of Use on Calculative Commitment (effect=.1819, SE=.0806, 95% CI=.0274;.3504). The CI does not include zero therefore it is significant.

Outcome: *Indirect effect of ATU on Vigour*

| | Effect | BootSE | BootLLCI | BootULCI |
|------------------------|--------|--------|----------|----------|
| Model (ATU → AU → VIG) | .0912 | .0668 | -.0296 | .2324 |

The results showed that there was not a significant indirect effect of Attitude Towards Use on Vigour (effect=.0912, SE=.0668, 95% CI=-.0296;.2324). The CI does include zero therefore it is not significant.

Outcome: *Indirect effect of ATU on Dedication*

| | Effect | BootSE | BootLLCI | BootULCI |
|------------------------|--------|--------|----------|----------|
| Model (ATU → AU → DED) | .1833 | .0766 | .0446 | .3438 |

The results showed that there was a significant indirect effect of Attitude Towards Use on Dedication (effect=.1833, SE=.0766, 95% CI=.0446;.3438). The CI does not include zero therefore it is significant.

Outcome: *Indirect effect of ATU on Affective*

| | Effect | BootSE | BootLLCI | BootULCI |
|-----------------------|--------|--------|----------|----------|
| Model (ATU → AU → AC) | .1709 | .0669 | .0449 | .3074 |

The results showed that there was a significant indirect effect of Attitude Towards Use on Affective Commitment (effect=.1709, SE=.0669, 95% CI=.0449;.3074). The CI does not include zero therefore it is significant.

Outcome: *Indirect effect of ATU on Calculative*

| | Effect | BootSE | BootLLCI | BootULCI |
|-----------------------|--------|--------|----------|----------|
| Model (ATU → AU → CC) | .0413 | .1190 | -.1953 | .2765 |

The results showed that there was not a significant indirect effect of Attitude Towards Use on Calculative Commitment (effect=.0413, SE=.1190, 95% CI=-.1953;.2765). The CI does include zero therefore it is not significant.

Outcome: *Indirect effect of REL on Vigour*

| | Effect | BootSE | BootLLCI | BootULCI |
|------------------------|--------|--------|----------|----------|
| Model (REL → AU → VIG) | .0520 | .0298 | .0033 | .1204 |

The results showed that there was a significant indirect effect of Relatedness on Vigour (effect=.0520, SE=.0298, 95% CI=.0033;.1204). The CI does not include zero therefore it is significant.

Outcome: *Indirect effect of REL on Dedication*

| | Effect | BootSE | BootLLCI | BootULCI |
|------------------------|--------|--------|----------|----------|
| Model (REL → AU → DED) | .0770 | .0389 | .0090 | .1595 |

The results showed that there was a significant indirect effect of Relatedness on Dedication (effect=.0770, SE=.0389, 95% CI=.0090;.1595). The CI does not include zero therefore it is significant.

Outcome: *Indirect effect of REL on Affective*

| | Effect | BootSE | BootLLCI | BootULCI |
|-----------------------|--------|--------|----------|----------|
| Model (REL → AU → AC) | .0664 | .0334 | .0102 | .1411 |

The results showed that there was a significant indirect effect of Relatedness on Affective Commitment (effect=.0664, SE=.0334, 95% CI=.0102;.1411). The CI does not include zero therefore it is significant.

Outcome: *Indirect effect of REL on Calculative*

| | Effect | BootSE | BootLLCI | BootULCI |
|-----------------------|--------|--------|----------|----------|
| Model (ATT → AU → CC) | .0953 | .0583 | -.0007 | .2268 |

The results showed that there was not a significant indirect effect of Relatedness on Calculative Commitment (effect=.0953, SE=.0583, 95% CI=-.0007;.2268). The CI does include zero therefore it is not significant.

7. Discussion

Firstly, through correlation analysis it was possible to conclude that regarding antecedents, all variables from the Technology Acceptance Model (Perceived Usefulness, Perceived Ease of Use and Attitude Towards Use) correlated positively with Actual Use, confirming H1 (paths a-c). Additionally, from the Self-Determination Theory only the variable Relatedness correlated positively with Actual Use, confirming only part of H2 (paths d-f). Concerning consequences, Actual Use correlated positively with Vigour and Dedication (Job Engagement), confirming only part of H3 (paths h-i). As well as with Affective and Calculative Commitment (Organizational Commitment), confirming H4 (paths j-k).

Secondly, when conducting the Regression Analysis, regarding antecedents, it was observed that from the Technology Acceptance Model the variables Perceived Ease of Use and Attitude Towards Use are predictors of Actual Use unlike Perceived Usefulness, confirming only part of H1 (paths a-c). As previously mentioned, the simpler the system, the more likely it will be embraced by people, which explains the variable perceived ease of use as a predictor (Alalwan, Rana, Dwivedi & Algharabat, 2018; Lee & Jung, 2016; Wang, Yu & Wei, 2019; Zhou, Lu & Wang, 2016). The variable “attitude toward use” is also a reasonable predictor since it refers to the person’s attitude toward a specific technology system (Grover, Kar, Janssen & Ilavarasan, 2019). Additionally, the variable Relatedness (from the Self-Determination Theory) was a predictor for Actual Use. As mentioned before, the basic psychological need for relatedness refers to the need for interpersonal connection and being valued. Individuals might perceive gamification as an opportunity for social interaction, specially if given the chance to compete, collaborate or share their achievements (Kam & Umar, 2018).

Concerning consequents, Actual Use was a predictor for Vigour and Dedication from the Job Engagement Theory. First, vigour is associated with increased levels of mental toughness when working, the willingness to put effort into one’s task, and persistence even in the face of setbacks. Second, dedication is associated with a sense of mission, passion, drive, enjoyment, and challenge. The actual use of gamification being

a predictor for these variables might be explained by the fact that gamification might boost internal motivation, goal setting, and competitiveness (DuVernet & Popp, 2014) which might intensify performance or the need to outperform. As Passalacqua, et al., (2020) defended when self-set objectives are combined with feedback game features it can generate long-term intrinsic motivation, which raises employee engagement and performance.

Moreover, the actual use of gamification was also a predictor for Affective and Calculative Commitment from the Organizational Commitment Model. Organizational commitment can take on a variety of forms, including affective commitment—which is characterized as a positive emotion of attachment toward the organization—and normative commitment – which is the moral obligation to stick with the group (Allen and Meyer, 1990). According to Hussain, et.al (2018) gamified teams did show meaningful improvements in employee engagement, staff retention, and organizational commitment. Gamification’s ability to boost positive feelings among employees and so strengthen their commitment to the company is one explanation for this effect. This supports the idea that the use of gamification, which allows individuals to interact with other members of the same organization and to spark positive emotions towards the company or co-workers, works as a predictor for Affective and Calculative Commitment from the Organizational Commitment Model.

Regarding actual use as an outcome, the Mediation Analysis showed that the indirect effects of TAM variables Perceived Ease of Use and Attitude Towards Use were statistically significant. Overall, numerous studies indicate that perceived trustworthiness, perceived utility, and perceived ease of use are significant determinants of users’ actual adoption of various technologies and services and actual usage behaviour (Alalwan, Rana, Dwivedi & Algharabat, 2018; Lee & Jung, 2016; Wang, Yu & Wei, 2019; Zhou, Lu & Wang, 2016). When applying Vigour and Dedication as the outcomes (separately), the variables of Perceived Ease of Use and Attitude Towards Use were statistically significant in terms of direct effects. In terms of indirect effects, Perceived Ease of Use showed an indirect effect of using gamification on Vigour, Dedication, Affective Commitment and Calculative Commitment, confirming H5 (“*The relationship between the antecedents and the consequences is mediated by the actual use of gamification*”). Concerning Attitude Towards the Use of gamification it had an indirect effect through the actual use on Dedication and Affective Commitment, but not on Vigour nor on

Calculative Commitment, confirming only part of H5 (“*The relationship between the antecedents and the consequences is mediated by the actual use of gamification*”).

According to research, adding gamification components to daily chores at work can improve motivation and workplace engagement, which in turn raises output, effectiveness, and satisfaction with work. And since workers are more prone to use a gamified systems that they perceive as ease to use and have a cheerful outlook towards, these variables indirectly affect job engagement by amplifying the use of the gamified system (Chandrasekaran & Jaideep 2017; Costa & Sa, 2018; Khanna & Arora, 2019; Zichermann & Linder, 2017). This is because gamification can enhance job engagement through an increase in drive, satisfaction, sense of autonomy, and competence (Elkhani, Alipour & Alem Tabriz, 2020; Gagné, et. al, 2021; Laato & Islam, 2019; Raj, & Palanisamy, 2019).

When selecting Affective Commitment as the outcome, the models for Perceived Ease of Use and Attitude Towards Use were all statistically significant however none of the antecedents showed a different effect. And when selecting Calculative Commitment as the outcome, only the Perceived Ease of Use was statistically significant, however without a significant different effect. Research suggests that gamification may boost employees' sense of kinship with the company as well as the satisfaction with one's job resulting in higher organizational commitment (Gagné et al., 2021; Laato & Islam, 2019).

Regarding the Self-Determination Theory variable Relatedness, it also had a statistically significant direct effect on the actual use of gamification. In general, research points to Relatedness as a crucial variable that might affect the efficacy of gamification systems, particularly in terms of engagement, social interaction and sense of community. This is due to the possibilities for social engagement and collaboration, which can in turn inspire workers to participate in the use of the gamification apps (Kam & Umar, 2018). Relatedness also a showed statistically model and significant direct and indirect effects on Vigour and Dedication confirming H5 (“*The relationship between the antecedents and the consequences is mediated by the actual use of gamification*”). Authors have previously tried to explain these effects. Social connection and teamwork are two gamification characteristics that can increase employee engagement by making them feel more connected to their co-workers and the organization. Leaderboards, badges, goals, and rewards are gamification features that can increase employee engagement by fostering a sense of community inside the workplace (Huotari & Hamari, 2017; Laato & Islam, 2019; Ma, Elliott & Smith, 2019; Yeh, Chen & Lin, 2018). And, when selecting

Affective Commitment and Calculative Commitment (separately) as the outcome, the model for Relatedness was statistically significant, however, in terms of the indirect effect of Relatedness through the actual use of gamification it had an impact on Affective Commitment. Research has shown that gamification can influence how employees feel about their company, affecting their organizational commitment, through a variety of mediating factors, such as relatedness (Almarshad et al., 2020).

To conclude, the perception of ease of use, the attitude towards gamification and the need for relating with other people affect the aspects of job engagement and organizational commitment when using gamification, directly and indirectly through the use of the gamification app.

8. Limitations and Future Recommendations

There were some limitations when conducting the present study. Firstly, the sample used is considered relatively small, therefore this study should be interpreted as a pilot study. Secondly, some of the scales were directly translated from English and were not previously adapted to a Portuguese sample.

In future studies it might be useful to have more participants and different companies to understand if these results are applicable in different settings. It would be interesting to compare if this applies to different sectors and industries and to different levels of an organization. Moreover, a more profound comprehension of the game elements and mechanisms used in the app would be advantageous to gather knowledge regarding the impact of those features in these different variables.

To get the greatest results for their employees and the organization, businesses should carefully weigh the potential advantages and disadvantages of implementing gamification, as well as the variables that may influence its efficacy. By offering a fun and engaging way to perform work and reach objectives, gamification can be a useful technique to promote employee engagement. Gamification of work processes has the potential to increase employee engagement, motivation, and productivity. Firstly, organizations should focus on providing gamification experiences that are user-friendly, pleasant, and in line with workers' aims and values is vital for firms. Secondly, organizations should prioritize fostering a sense of belonging and connection among their workforce through team-building exercises or collaborative initiatives using gamification systems. Employees may feel more attached to the company as a result.

To conclude, the use of gamified apps in the workplace seems to be beneficial to enhance the employee experience in terms of job tasks and in terms of social interaction, the feeling of playing at work provided using these apps might lighten up the working-related perception by making more fun and interesting. And it might also be advantageous for the organization itself because by improving psychological aspects such as job engagement and organizational commitment it also enhances organizational results.

Reference List

- Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In J. Kuhl & J. Beckmann (Eds.), *Action-control: From cognition to behavior* (pp. 11-39). Heidelberg: Springer. doi:1.1007/978-3-642-69746-3_1
- Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, 50(2), 179-211. doi:1.1016/0749-5978(91)90020-T
- Algashami, A., Cham, S., Vuillier, L., Stefanidis, A., Phalp, K., & Ali, R. (2018). Conceptualising gamification risks to teamwork within enterprise. In IFIP Working Conference on The Practice of Enterprise Modeling (pp. 105-120). Springer, Cham. doi:1.1007/978-3-030-25890-4_8
- Alhosseini, S. S. N., & Pourabbasi, A. (2018). Earthquake in the city: using real life gamification model for teaching professional commitment in high school students. *Journal of medical ethics and history of medicine*, 11. doi:1.30699/jmehm.11.3.86
- Allen, N. J., & Meyer, J. P. (1990). The measurement and antecedents of affective, calculative and normative commitment to the organization. *Journal of Occupational Psychology*, 63(1), 1-18. doi:1.1111/j.2044-8325.199.tb00506.x
- AlMarshedi, A., Wanick Vieira, V., & Ranchhod, A. (2015). SGI: a framework for increasing the sustainability of gamification impact. *International Journal for Infonomics*, 8(1/2), 1044-1052. doi:1.20535/ijinf.2015.8.1/2.819
- Beqiri, T. (2019). Empirical study on intrinsic motivation factors of employees in transition economies. *International Journal of Economics and Business Administration*, Volume VII, Issue 4, 307-319. DOI: 1.35808/ijeba/345
- Bitrián, P., Buil, I., & Catalán, S. (2021). Enhancing user engagement: The role of gamification in mobile apps. *Journal of Business Research*, 132, 170-185. doi:1.1016/j.jbusres.2021.03.051
- Bittner, J. V., & Shipper, J. (2014). Motivational effects and age differences of gamification in product advertising. *Journal of consumer marketing*. doi:1.1108/JCM-07-2013-0691
- Bourgonjon, J., De Grove, F., De Smet, C., Van Looy, J., Soetaert, R., & Valcke, M. (2013). Acceptance of game-based learning by secondary school teachers. *Computers & education*, 67, 21-35. doi:1.1016/j.compedu.2013.02.010
- Boyle, E. A., Hainey, T., Connolly, T. M., Gray, G., Earp, J., Ott, M., ... & Pereira, J. (2016). An update to the systematic literature review of empirical evidence of the impacts and

- outcomes of computer games and serious games. *Computers & Education*, 94, 178-192. doi:1.1016/j.compedu.2015.11.003
- Bødker, S. (2016). Rethinking technology on the boundaries of life and work. *Personal and Ubiquitous Computing*, 20(4), 533-544. doi:1.1007/s00779-016-0922-x
- Cardador, M. T., Northcraft, G. B., & Whicker, J. (2017). A theory of work gamification: Something old, something new, something borrowed, something cool?. *Human Resource Management Review*, 27(2), 353-365. doi:1.1016/j.hrmr.2016.09.004
- Cardella, G. M., Hernández-Sánchez, B. R., & Sánchez-García, J. C. (2020). Basic psychological needs as a motivational competence: Examining validity and measurement invariance of Spanish BPNSF scale. *Sustainability*, 12(13), 5422. doi:1.3390/su12135422
- Carenys, J., & Moya, S. (2016). Digital game-based learning in accounting and business education. *Accounting Education*, 25(6), 598-651. doi:1.1080/09639284.2016.1241951
- Çeker, E., & Özdaml, F. (2017). What "Gamification" Is and What It's Not. *European Journal of Contemporary Education*, 6(2), 221-228. doi:1.13187/ejced.2017.2.221
- Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York: Harper. doi:1.1007/978-3-662-02737-5
- Csikszentmihalyi, M. (2000). *Beyond boredom and anxiety*. Jossey-bass. doi:1.4324/9780203210039
- Csikszentmihalyi, M., Csikszentmihalyi, M., Abuhamdeh, S., & Nakamura, J. (2014). *Flow. Flow and the foundations of positive psychology: The collected works of Mihaly Csikszentmihalyi*, 227-238. doi:1.1007/978-94-017-9088-8_17
- Csikszentmihalyi, M., & Larson, R. (2014). *Flow and the foundations of positive psychology* (Vol. 10, pp. 978-94). Dordrecht: Springer. doi:1.1007/978-94-017-9088-8
- Cowley, B., Charles, D., Black, M., & Hickey, R. (2008). Toward an understanding of flow in video games. *Computers in Entertainment (CIE)*, 6(2), 1-27. doi:1.1145/1371216.1371221
- Cesário, F., & Chambel, M. J. (2017). Linking organizational commitment and work engagement to employee performance. *Knowledge and Process Management*, 24(2), 152-158. doi:1.1002/kpm.1526
- Cialdini, R. B., & James, L. (2009). *Influence: Science and practice* (Vol. 4). Boston: Pearson education. ISBN-10:0321011473

- Dale, S. (2014). Gamification: Making work fun, or making fun of work?. *Business information review*, 31(2), 82-9. doi:1.1177/0266382114536921
- Davis, M.S., & Csíkszentmihályi, M. (1977). Beyond Boredom and Anxiety: The Experience of Play in Work and Games. *Contemporary Sociology*, 6, 197. doi:1.2307/2065801
- Deci, E. L., Olafsen, A. H., & Ryan, R. M. (2017). Self-determination theory in work organizations: *The state of a science*. *Annual review of organizational psychology and organizational behavior*, 4, 19-43. doi:1.1146/annurev-orgpsych-032516-113108
- Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011, September). From game design elements to gamefulness: defining "gamification". In *Proceedings of the 15th international academic MindTrek conference: Envisioning future media environments* (pp. 9-15). doi:1.1145/2181037.2181040
- Dilig-Ruiz, A., MacDonald, I., Varin, M. D., Vandyk, A., Graham, I. D., & Squires, J. E. (2018). Job satisfaction among critical care nurses: A systematic review. *International journal of nursing studies*, 88, 123-134. doi:1.1016/j.ijnurstu.2018.08.008
- DuVernet, A. M., & Popp, E. (2014). Gamification of workplace practices. *TIP: The Industrial-Organizational Psychologist*, 52(1), 39-44.
- Ērgle, D., & Ludviga, I. (2018, September). Use of gamification in human resource management: impact on engagement and satisfaction. In *10th International Scientific Conference "Business and Management"* (pp. 409-417).
- Festinger, L. (1954). A theory of social comparison processes. *Human relations*, 7(2), 117-14. doi:1.1177/001872675400700202
- Ford, R. C., McLaughlin, F. S., & Newstrom, J. W. (2003). Questions and Answers about Fun at Work. *Human Resource Planning*, 26(4). doi:1.1002/hrp.10109
- Gass, R. (2015). Social Influence, Sociology of. *International Encyclopedia of the Social & Behavioral Sciences*. 1.1016/B978-0-08-097086-8.32074-8.
- Golden, T. D., Veiga, J. F., & Dino, R. N. (2008). The impact of professional isolation on teleworker job performance and turnover intentions: does time spent teleworking, interacting face-to-face, or having access to communication-enhancing technology matter? *Journal of Applied Psychology*, 93(6), 1412. doi:1.1037/0021-901.93.6.1412
- Grover, P., Kar, A. K., Janssen, M., & Ilavarasan, P. V. (2019). Perceived usefulness, ease of use and user acceptance of blockchain technology for digital transactions—insights from user-generated content on Twitter. *Enterprise Information Systems*, 13(6), 771-80. doi:1.1080/17517575.2018.1474962

- Hamari, J. (2013). Transforming homo economicus into homo ludens: A field experiment on gamification in a utilitarian peer-to-peer trading service. *Electronic commerce research and applications*, 12(4), 236-245. doi:1.1016/j.elerap.2013.01.004
- Hamari, J. (2017). Do badges increase user activity? A field experiment on the effects of gamification. *Computers in human behavior*, 71, 469-478. doi:1.1016/j.chb.2017.02.032
- Hamari, J., Huotari, K. and Tolvanen, J. (2015) Gamification from the Economics Perspective. In: Walz, S.P. and Deterding, S., Eds., *The Gameful World: Approaches, Issues, Applications*, MIT Press, Cambridge, 139-161. ISBN: 978-0-262-02800-4
- Hamari, J., & Koivisto, J. (2013). Social motivations to use gamification: an empirical study of gamifying exercise. doi:1.1016/j.chb.2013.08.001
- Hamari, J., & Koivisto, J. (2015). “Working out for likes”: An empirical study on social influence in exercise gamification. *Computers in Human Behavior*, 50, 333-347. . doi:1.1016/j.chb.2015.04.011
- Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does gamification work? --a literature review of empirical studies on gamification. *2014 47th Hawaii international conference on system sciences* (pp. 3025-3034). Doi: 1.1109/HICSS.2014.377
- Harris, P. (2016), “Why it pays to play: workplace fun breeds employee wellbeing and productivity”, HR Magazine, Vol. 25.
- Herzig, P., Ameling, M., & Schill, A. (2015). Workplace psychology and gamification: Theory and application. In *Gamification in education and business* (pp. 451-471). Springer, Cham. doi:1.1007/978-3-319-10208-5_22
- Hervás, R., Ruiz-Carrasco, D., Mondéjar, T., & Bravo, J. (2017, May). Gamification mechanics for behavioral change: a systematic review and proposed taxonomy. In *Proceedings of the 11th EAI International Conference on Pervasive Computing Technologies for Healthcare* (pp. 395-404). doi:1.4108/eai.20-5-2017.152706
- Hodder, A. (2020). New Technology, Work and Employment in the era of COVID-19: reflecting on legacies of research. *New technology, work and employment*, 35(3), 262-275. doi:1.1111/ntwe.12214
- Huotari, K., & Hamari, J. (2012). Defining gamification - a service marketing perspective. In *Proceedings of the 16th International Academic MindTrek Conference: Envisioning Future Media Environments* (pp. 17-22). School of Information, UC Berkeley, CA, United States. doi:1.1145/2393132.2393137

- Huotari, K., & Hamari, J. (2017). A definition for gamification: anchoring gamification in the service marketing literature. *Electronic Markets*, 27(1), 21-31. doi:1.1007/s12525-015-0212-z
- Hussain, S., Qazi, S., Ahmed, R. R., Streimikiene, D., & Vveinhardt, J. (2018). Employees management: evidence from gamification techniques. *Montenegrin Journal of Economics*, 14(4), 97-107. doi:1.14254/1800-5845/2018.14-4.7
- Kahn, W.A. (1990), "Psychological conditions of personal engagement and disengagement at work", *Academy of Management Journal*, Vol. 33 No. 4, pp. 692-724. doi:1.5465/256287
- Kam, A. H., & Umar, I. N. (2018). Fostering authentic learning motivations through gamification: A self-determination theory (SDT) approach. *J. Eng. Sci. Technol*, 13, 1-9. doi:1.21916/jest.2018.0902.01
- Kangas, M. (2010). Creative and playful learning: Learning through game co-creation and games in a playful learning environment. *Thinking skills and Creativity*, 5(1), 1-15. doi:1.1016/j.tsc.2009.1.002
- Krath, J., Schürmann, L., & Von Korfflesch, H. F. (2021). Revealing the theoretical basis of gamification: A systematic review and analysis of theory in research on gamification, serious games and game-based learning. *Computers in Human Behavior*, 125, 106963. doi:1.1016/j.chb.2021.106963
- Kumar, H, Raghavendran, S (2015) Gamification, the finer art: Fostering creativity and employee engagement. *Journal of Business Strategy* 36(6): 3–12. doi:1.1108/JBS-04-2014-0036
- Kuvaas, B., Buch, R., Weibel, A., Dysvik, A., & Nerstad, C. G. (2017). Do intrinsic and extrinsic motivation relate differently to employee outcomes?. *Journal of Economic Psychology*, 61, 244-258. doi:1.1016/j.joep.2017.06.009
- Jang, S., Kitchen, P. J., & Kim, J. (2018). The effects of gamified customer benefits and characteristics on behavioral engagement and purchase: Evidence from mobile exercise application uses. *Journal of Business Research*, 92, 250-259. doi:1.1016/j.jbusres.2018.07.016
- Jeno, L. M., Adachi, P. J., Grytnes, J. A., Vandvik, V., & Deci, E. L. (2019). The effects of m-learning on motivation, achievement and well-being: A Self-Determination Theory approach. *British Journal of Educational Technology*, 50(2), 669-683. doi:1.1111/bjet.12721

- Johnston, M. M., & Finney, S. J. (2010). Measuring basic needs satisfaction: Evaluating previous research and conducting new psychometric evaluations of the Basic Needs Satisfaction in General Scale. *Contemporary Educational Psychology*, 35, 280-296. doi:1.1016/j.cedpsych.201.04.003
- Landers, R. N., Auer, E. M., Collmus, A. B., & Armstrong, M. B. (2018). Gamification science, its history and future: Definitions and a research agenda. *Simulation & Gaming*, 49(3), 315-337. doi:1.1177/1046878118773772
- Landers, R. N., Bauer, K. N., & Callan, R. C. (2017). Gamification of task performance with leaderboards: A goal setting experiment. *Computers in Human Behavior*, 71, 508-515. doi:1.1016/j.chb.2017.01.056
- Law, L., Lau, M., Leung, Y. W., Kwong, T., & Wong, E. Y. (2020). Gamification for Teamwork Skills: Can a Challenge-based Online Tournament Help Students Learn New Knowledge Collaboratively in Teams?. *Global Research in Higher Education*, 3(2), 63. doi:1.5281/zenodo.4155331
- Le Compte, A., Watson, T., & Elizondo, D. (2014). Serious games: A design methodology from concept to end-user. Paper presented at the 6th international conference on virtual worlds and games for serious education, Malta.
- Lee, B. C. (2019). The effect of gamification on psychological and behavioral outcomes: Implications for cruise tourism destinations. *Sustainability*, 11(11), 3002. doi:1.3390/su11113002
- Legault, L. (2017). Self-Determination Theory. *Encyclopedia of Personality and Individual Differences*. DOI:1.1007/978-3-319-28099-8_1162-1
- Leonardi, P. M., & Vaast, E. 2017. Social media and their affordances for organizing: A review and agenda for research. *Academy of Management Annals*, 11: 150–188. doi:1.5465/annals.2015.0133
- Linder, J., & Zichermann, G. (2010). Game based marketing. *Inspire customer loyalty*.
- Maher, C. A., Olds, T., Vandelanotte, C., Plotnikoff, R., Edney, S. M., Ryan, J. C., ... & Curtis, R. G. (2022). Gamification in a Physical Activity App: What Gamification Features Are Being Used, by Whom, and Does It Make a Difference?. *Games for Health Journal*, 11(3), 193-199. doi:1.1089/g4h.2021.0109
- Mata, O., Mendez, I., Aguilar, M., Ponce, P., & Molina, A. (2019, December). A Methodology to motivate students to develop transversal competencies in academic courses based on the theory of planned behavior by using gamification and ANNs. In *2019 IEEE Tenth International Conference on Technology for Education (T4E)* (pp. 174-177). IEEE.

- Michel, J. W., Tews, M. J., & Allen, D. G. (2019). Fun in the workplace: A review and expanded theoretical perspective. *Human Resource Management Review*, 29(1), 98-111. doi:1.1016/j.hrmr.2018.05.003
- Mitchell, R., Schuster, L., & Jin, H. S. (2020). Gamification and the impact of extrinsic motivation on needs satisfaction: Making work fun?. *Journal of Business Research*, 106, 323-33. Doi:1.1016/j.jbusres.2018.11.022
- Moin, M. F. (2018). The link between perceptions of leader emotion regulation and followers' organizational commitment. *Journal of Management Development*. doi:1.1108/JMD-01-2018-0011
- Mulcahy, R. F., Russell-Bennett, R., Zainuddin, N., & Kuhn, K. A. (2018). Designing gamified transformative and social marketing services: An investigation of serious m-games. *Journal of Service Theory and Practice*.
- Mullins, J. K., & Sabherwal, R. (2020). Gamification: A cognitive-emotional view. *Journal of Business Research*, 106, 304-314. doi:1.1016/j.jbusres.2019.08.028
- Nacke, L. E., & Deterding, S. (2017). The maturing of gamification research. *Computers in Human Behavior*, 71, 450-454. doi:1.1016/j.chb.2016.11.041
- Ortiz Rojas, M. E., Chiluiza, K., & Valcke, M. (2016). Gamification in higher education and stem: A systematic review of literature. In *8th International Conference on Education and New Learning Technologies (EDULEARN)* (pp. 6548-6558). Iated-int Assoc Technology Education A& Development.
- Passalacqua, M., Léger, P. M., Nacke, L. E., Fredette, M., Labonté-Lemoyne, É., Lin, X., Caprioli, T., & Sénécal, S. (2020). Playing in the backstore: interface gamification increases warehousing workforce engagement. *Industrial Management & Data Systems*. doi:1.1108/IMDS-07-2020-0459
- Panagiotarou, A., Stamatiou, Y. C., Pierrakeas, C., & Kameas, A. (2020). Gamification acceptance for learners with different E-skills. *International Journal of Learning, Teaching and Educational Research*, 19(2), 263-278.
- Park, S. Y. (2009). An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-learning. *Journal of Educational Technology & Society*, 12(3), 150-162. doi:1.2307/jeductechsoci.12.3.150
- Pillemer, J., & Rothbard, N. P. (2018). Friends without benefits: Understanding the dark sides of workplace friendship. *Academy of Management Review*, 43(4), 635-66. doi:1.5465/amr.2015.0314

- Pilotti, M., Anderson, S., Hardy, P., Murphy, P., & Vincent, P. (2017). Factors Related to Cognitive, Emotional, and Behavioral Engagement in the Online Asynchronous Classroom. *International Journal of Teaching and Learning in Higher Education*, 29(1), 145-153. doi:1.24926/ijtlhe.v29i1.1391
- Procopie, R., Giușcă, S., Bumbac, R., & Vasilcovschi, A. (2015, June). Innovation and gamification: a view on the scientific literature evolution. In *Association for Innovation and Quality in Sustainable Business, BASIQ 2015 International Conference: New Trends in sustainable business and consumption. Bucharest, Romania* (pp. 18-19). doi:1.1109/BASIQ.2015.7371047
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American psychologist*, 55(1), 68. doi:1.1037/0003-066X.55.1.68
- Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Publications.
- Robson, K., Plangger, K., Kietzmann, J. H., McCarthy, I., & Pitt, L. (2016). Game on: Engaging customers and employees through gamification. *Business horizons*, 59(1), 29-36. doi:1.1016/j.bushor.2015.09.006
- Sakr, C., Zotti, R., & Khaddage-Soboh, N. (2019). The impact of implementing fun activities on employee's engagement: The case of Lebanese financial institutions. *International Journal of Organizational Analysis*. doi:1.1108/IJOA-07-2018-1449
- Schaufeli, W. B., & Bakker, A. B. (2003). Work & Well-being Survey (UWES)©. *Psyc TESTS*. doi:1.1037/t43721-000
- Schaufeli, W. B., & Bakker, A. B. (2004). Job demands, job resources, and their relationship with burnout and engagement: A multi-sample study. *Journal of Organizational Behavior: The International Journal of Industrial, Occupational and Organizational Psychology and Behavior*, 25(3), 293-315. doi:1.1002/job.248
- Schaufeli, W. B., Salanova, M., Gonzales-Roma, V., & Bakker, A. B. (2002). The measurement of engagement and burnout: A two sample confirmatory factor analytic approach. *Journal of Happiness Studies*, 3, 71–92. doi:1.1023/A:1015630930326
- Silic, M., & Back, A. (2017, March). Impact of gamification on user's knowledge-sharing practices: Relationships between work motivation, performance expectancy and work engagement. In *Silic, M., & Back, A. (2017, January). Impact of Gamification on User's Knowledge-Sharing Practices: Relationships between Work Motivation, Performance*

- Expectancy and Work Engagement. In Proceedings of the 50th Hawaii International Conference on System Sciences.* doi:1.24251/HICSS.2017.656
- Singh, S. P. (2012). Gamification: A strategic tool for organizational effectiveness. *International Journal of Management, 1*(1), 108-113. doi:1.17577/IJME.2012.0101.1007
- Sousa, S. S., Ribeiro, J. L. P., Palmeira, A. L., Teixeira, P. J., & Silva, M. N. (2012). Estudo da basic need satisfaction in general scale para a língua portuguesa. doi:1.7939/R3PN8D
- Taherdoost, H. (2018). A review of technology acceptance and adoption models and theories. *Procedia manufacturing, 22*, 960-967. doi:1.1016/j.promfg.2018.03.149
- Teles, H., Ramalho, N., Ramalho, V., & Ribeiro, S. (2017). Adaptação e validação da Utrecht Work Engagement Scale (UWES) aplicada a assistentes sociais em Portugal. doi:1.14417/ap.1124
- Tobon, S., Ruiz-Alba, J. L., & García-Madariaga, J. (2020). Gamification and online consumer decisions: Is the game over?. *Decision Support Systems, 128*, 113167. doi:1.1016/j.dss.2019.113167
- Toscano, F., & Zappalà, S. (2020). Social isolation and stress as predictors of productivity perception and remote work satisfaction during the COVID-19 pandemic: the role of concern about the virus in a moderated double mediation. *Sustainability, 12*(23), 9804. doi:1.3390/su12239804
- Trusova, P. (2019) The Effect of Gamified Teamwork on Team Members' Engagement. doi:1.2139/ssrn.3348616
- Vanduhe, V. Z., Nat, M., & Hasan, H. F. (2020). Calculative intentions to use gamification for training in higher education: Integrating the technology acceptance model (TAM), Social motivation, and task technology fit (TTF). *IEEE Access, 8*, 21473-21484. doi:1.1109/ACCESS.202.2962710
- Varannai, I., Sasvári, P. L., & Urbanovics, A. (2017). The use of gamification in higher education: an empirical study. *International Journal of Advanced Computer Science and Applications, 8*(10), 1-6. doi:1.14569/IJACSA.2017.081001
- Vegt, N., Visch, V., de Ridder, H., & Vermeeren, A. (2015). Designing gamification to guide competitive and cooperative behavior in teamwork. In *Gamification in education and business* (pp. 513-533). Springer, Cham. doi:1.1007/978-3-319-10208-5_24
- Wolf, T., Weiger, W. H., & Hammerschmidt, M. (2018). Gamified services: How gameful experiences drive customer commitment. In *GamiFIN* (pp. 75-82).

- Wood, L. C., & Reiners, T. (2015). Gamification. In *Encyclopedia of Information Science and Technology, Third Edition* (pp. 3039-3047). IGI Global. doi: 1.4018/978-1-4666-5888-2.ch292
- Zeng, Z., Tang, J., & Wang, T. (2017). Motivation mechanism of gamification in crowdsourcing projects. *International Journal of Crowd Science*.
- Yin, N. (2018). The influencing outcomes of job engagement: an interpretation from the social exchange theory. *International Journal of Productivity and Performance Management*. doi: 1.1108/IJPPM-01-2018-0019