ATILIM UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
DEPARTMENT OF BUSINESS ADMINISTRATION
BUSINESS ADMINISTRATION MASTER'S PROGRAMME

IMPACT OF EXTENDED REALITY TECHNOLOGIES ON GAMIFICATION IN BUSINESS

Master's Thesis

Muhammed Furkan PALTACI

Ankara-2024

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ACCEPTANCE AND APPROVAL

This is to certify that this thesis titled “Impact of Extended Reality Technologies on Gamification in Business” and prepared by Muhammed Furkan PALTACI meets with the committee’s approval unanimously/by a majority vote as Master’s Thesis in the field of Master of Business Administration following the successful defense conducted on 09/09/2024.

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ETHICAL STATEMENT

I accept and acknowledge that I have prepared this thesis study, prepared in line with the Thesis Writing Guidelines of Atılım University Graduate School of Social Sciences;

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ÖZ

PALTACI, M. Furkan. Genişletilmiş Gerçeklik Teknolojilerinin İş Hayatında Oyunlaştırma Üzerine Etkisi, Yüksek Lisans Tezi, Ankara, 2024.

Bu çalışma, Sanal Gerçeklik (VR) destekli oyunlaştırmanın çalışan davranışları üzerindeki etkilerini, özellikle rekabet, eğlence, öğrenme sonuçları ve sonuç beklentileri bağlamında incelemektedir. Uzmanlık, pozisyon ve yaş bağımsız değişkenleriyle yapılan regresyon analizleri, uzmanlık ile rekabet, eğlence ve sonuç beklentileri arasında negatif bir ilişki göstermiştir. Daha deneyimli çalışanlar VR'den daha az fayda sağlarken, pozisyon ve yaşın etkileri önemsizdir. Eğlence de uzmanlık tarafından olumsuz etkilenmiş; güvenilirlik skorunu zayıf kılmıştır. Sonuçlar, VR oyunlaştırmanın daha az deneyimli çalışanlar için etkili olduğunu, ancak daha deneyimli çalışanların kişiselleştirilmiş ve zorlu ortamlarla daha fazla motive olduğunu göstermektedir.

Anahtar Sözcükler: Sanal Gerçeklik (VR), Oyunlaştırma, Çalışan Davranışları, Etki Değerlendirmesi, Çalışan Deneyimi

ABSTRACT

PALTACI, M. Furkan. Impact of Extended Reality Technologies on Gamification in Business, Yüksek Lisans Tezi, Ankara, 2024.

This study examines the effects of Virtual Reality (VR)-enabled gamification on employee behaviors, focusing on competition**,** entertainment**,** learning outcomes, and outcome expectations. Using proficiency**,** position**,** and age as independent variables, regression analyses were conducted. Results showed a negative relationship between proficiency and competition, entertainment, and outcome expectations, suggesting that more experienced employees benefit less from VR-based gamification. Position had no significant impact, and age had minimal influence. Engagement was also negatively affected by proficiency, with a low Cronbach's alpha indicating weak reliability. The findings suggest that VR gamification is more effective for less experienced employees, while more proficient employees need more personalized and challenging environments to stay engaged and motivated.

Keywords: Virtual Reality (VR), Gamification, Employee Behavior, Impact Assessment, Employee Experience

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INTRODUCTION

Virtual Reality (VR) has become a transformative technology in various sectors, including business, healthcare, education, and entertainment. By creating fully immersive environments, VR allows users to interact with digital worlds in ways that were previously unimaginable. Unlike Augmented Reality (AR), which overlays digital elements onto the physical world, or Mixed Reality (MR), which blends the real and virtual worlds, VR immerses users entirely in a computer-generated environment, providing a unique and interactive experience (Jerald, 2015).

The potential of VR in business is particularly significant. Companies are increasingly using VR for employee training, product design, and customer engagement, taking advantage of the technology's ability to simulate real-world scenarios. VR's capacity to create realistic, immersive environments enables businesses to train employees in a safe, controlled setting that mirrors actual work conditions. This has proven particularly valuable in industries where hands-on experience is essential but can be risky or expensive, such as manufacturing, healthcare, and aviation (Bailenson, 2018).

Employee training is one of the most promising applications of Virtual Reality (VR) in the business sector. Traditional training methods, such as lectures, videos, or text-based materials, often struggle to engage employees effectively or prepare them for real-world challenges. In contrast, VR-based training provides a more engaging and practical approach by allowing employees to immerse themselves in simulations of their work environment. This immersive type of training enhances the learning experience by offering employees the opportunity to practice skills and make decisions in a virtual setting that closely mirrors the complexities of their actual jobs (TrainingIndustry, 2022).

For instance, Bank of America successfully implemented VR training to enhance employee learning and skill development. The VR training modules simulate real-world scenarios within a virtual financial center, allowing employees to interact with co-workers and clients in a lifelike environment. The modules provide immediate feedback based on employees' actions, reinforcing learning and improving decision-making skills. As a result, employees trained using VR reported higher confidence and

effectiveness in their roles, learning material four times faster than with traditional classroom settings (TrainingIndustry, 2022).

Similarly, companies like Vodafone and Johnson & Johnson have utilized VR to improve soft skills and surgical training, respectively. These VR training programs allow for safe, controlled, and repeatable practice of essential skills, significantly enhancing knowledge retention and performance (VirtualSpeech, 2023). Such applications demonstrate that VR training can provide a more engaging, effective, and satisfying learning experience compared to traditional methods, making it a valuable tool for modern corporate training programs.

For example, in the healthcare industry, VR is used to simulate surgical procedures, enabling medical professionals to practice complex operations without the risks associated with practicing on live patients. Similarly, in aviation, pilots use VR to train for emergency situations, allowing them to experience and respond to various scenarios in a risk-free environment (Pottle, 2019). These applications not only improve skill acquisition and retention but also reduce the costs and risks associated with traditional training methods.

In addition to training, Virtual Reality (VR) is revolutionizing product development and consumer engagement by allowing companies to create detailed, interactive models of products before they are manufactured. This approach enables designers and engineers to explore various design options and identify potential issues early in the development process, thus accelerating product development, reducing costs, and fostering innovative solutions. For example, McKinsey has utilized VR to enhance its product development processes by creating immersive environments where teams can collaborate on designing and refining products, ranging from simple consumer goods to complex industrial equipment. This method allows for real-time modifications and immediate feedback, significantly improving the efficiency and effectiveness of the development process (McKinsey, 2019).

From a consumer perspective, VR offers new ways to engage with products and brands. For instance, automotive companies use VR to allow customers to experience a virtual test drive, exploring the interior and exterior of a car in a highly detailed digital environment. Similarly, in real estate, potential buyers can take virtual

tours of properties, experiencing the layout and ambiance of a space without needing to visit it in person. These immersive experiences not only enhance customer engagement but also provide businesses with valuable insights into consumer preferences and behaviors (Pantano et al., 2017).

The integration of VR into business practices is not just about adopting new technology; it is also a catalyst for broader organizational change. As companies incorporate VR into their operations, they are rethinking traditional approaches to work, training, and collaboration. The COVID-19 pandemic has accelerated this shift, with remote work and virtual collaboration becoming essential for maintaining business continuity. VR offers a more immersive and interactive alternative to standard teleconferencing, enabling teams to meet in virtual spaces that mimic real-world interactions (Slater & Sanchez-Vives, 2016).

This shift has significant implications for organizational culture. VR can foster a greater sense of presence and connection among remote workers, helping to maintain team cohesion and engagement in a distributed work environment. Moreover, as companies increasingly rely on VR for training and development, they may see shifts in employee expectations and job satisfaction, with workers seeking roles that offer opportunities for continuous learning and skill development in immersive, interactive formats (Bailenson, 2018).

Virtual Reality is poised to play a pivotal role in the future of business, offering new ways to train employees, engage consumers, and drive innovation in product development. As the technology continues to evolve and become more accessible, its impact on the workplace and beyond will only grow. Companies that embrace VR now will be better positioned to lead in their respective industries, offering cutting-edge experiences that meet the demands of a tech-savvy, increasingly virtual world.

In recent years, the integration of Virtual Reality (VR) into gamified workplace systems has gained increasing attention, offering immersive and interactive experiences that go beyond traditional gamification methods. Gamification, which uses game-like elements to improve employee engagement, motivation, and performance, has already proven to be effective. However, VR introduces a new dimension of immersion and interaction, raising questions about how it can further

enhance these dynamics. This study investigates the impact of VR-based gamification on key motivational and performance factors, focusing on five specific hypotheses.

First, it examines whether VR increases competition by fulfilling the need for competence as described in Self-Determination Theory (SDT**)**, ultimately boosting employee performance. Second, the study explores how VR can enhance entertainment in gamified environments, creating a flow state where employees experience greater immersion and focus as outlined in Flow Theory. Third, it investigates the role of VR in improving learning outcomes by fostering a sense of autonomy, allowing employees to take control of their professional development. Fourth, the study looks at how VR affects outcome expectations, assessing whether it optimizes the balance between task difficulty and skill level, thereby increasing employee motivation and performance. Finally, it evaluates the potential for VR to enhance employee engagement by fulfilling the need for relatedness, promoting stronger social connections and collaboration.

By exploring these five dimensions—competition, entertainment, learning, outcome expectations, and engagement—this study aims to provide a deeper understanding of the effectiveness of VR-enhanced gamification in business environments and identify the factors necessary for its successful implementation.

CHAPTER 1: **LITERATURE REVIEW**

1.1. Overview of Virtual Reality Technologies

1.1.1. Definition and importance

Virtual Reality (VR) is a rapidly advancing technology that enables users to interact with computer-generated environments in a way that mimics real-life experiences. The primary goal of VR is to create a fully immersive experience, often achieved through devices such as head-mounted displays (HMDs), haptic feedback systems, and spatial audio. These technologies work together to simulate a three-dimensional environment that responds to the user's movements and actions, fostering a sense of presence—where the user feels as though they are physically present in the virtual space (Slater, 2009).

The importance of VR extends far beyond its entertainment roots, finding critical applications in various sectors such as healthcare, education, and business. In healthcare, for example, VR is being used for surgical training, allowing surgeons to practice complex procedures in a risk-free environment. A study by Seymour et al. (2002) demonstrated that VR-trained surgeons performed better in the operating room compared to those who underwent traditional training. This highlights VR's potential to improve skills acquisition and patient safety.

In education, VR offers immersive learning experiences that traditional methods cannot match. For instance, it enables students to take virtual field trips to historical sites, explore scientific phenomena at a molecular level, or practice language skills in simulated conversations with native speakers. Research by Merchant et al. (2014) found that students using VR for learning had higher engagement and improved learning outcomes compared to those using conventional educational tools.

In the business world, VR is revolutionizing training and development by providing employees with realistic simulations of workplace scenarios. This not only enhances the learning experience but also allows for the practice of skills in a controlled environment, leading to better preparedness and performance in real-world situations. For instance, companies are using VR to simulate customer service

interactions, safety procedures, and complex technical tasks, thereby reducing the time and cost associated with traditional training methods (PWC, 2020).

Moreover, the importance of VR is increasingly being recognized in areas such as mental health, where it is used in exposure therapy for treating anxiety disorders. According to a meta-analysis by Opriș et al. (2012), VR-based therapy was found to be highly effective in treating conditions such as PTSD, phobias, and social anxiety, offering a safe and controlled environment for patients to confront their fears.

Overall, the definition and importance of VR are underscored by its ability to create immersive, interactive environments that can significantly enhance learning, training, and therapeutic outcomes. As VR technology continues to evolve, its applications are expected to expand, further integrating into various aspects of professional and personal life.

1.1.2. Current applications in business

Virtual Reality (VR) has rapidly become a valuable tool in the business world, offering innovative solutions for a variety of applications, from employee training to product development and customer engagement. One of the most significant uses of VR in business is in the area of employee training and development. Traditional training methods, such as lectures, manuals, and videos, are often less engaging and less effective in preparing employees for real-world tasks.

For instance, Walmart has implemented VR training programs across its stores, allowing employees to practice dealing with scenarios such as holiday rushes or emergency situations in a controlled, virtual environment. The results have shown improved employee confidence and performance, demonstrating the effectiveness of VR in enhancing workplace readiness (Morozova, A, n.d.). In a wide range of industries, companies leverage VR technology for design and manufacturing processes. This enables engineers and designers to immerse themselves in a virtual environment where they can visualize, modify, and test product designs with high precision. By doing so, they can identify potential issues and make necessary adjustments before moving on to the costly and time-consuming phase of creating physical prototypes. This approach not only enhances efficiency but also reduces the

risk of errors, ultimately leading to more refined and innovative products. This not only speeds up the development process but also reduces costs associated with physical prototyping (Hilfert & König, 2016).

Customer engagement is another area where VR is making a significant impact. Retailers are using VR to create immersive shopping experiences that allow customers to explore products in a virtual store, try on virtual clothes, or take virtual test drives. For example, IKEA offers a VR app that lets customers explore different kitchen designs and customize them according to their preferences, providing a more interactive and personalized shopping experience (IKEA, 2017).

Furthermore, VR is being used for remote collaboration and virtual meetings, particularly in the context of the global shift towards remote work. Companies are leveraging VR to create virtual meeting spaces where employees can interact as if they were in the same physical location. This not only enhances communication but also fosters a sense of presence and teamwork that can be challenging to achieve through traditional video conferencing tools (Kozlenkova et al., 2020).

Overall, the applications of VR in business are diverse and continually expanding, offering new ways to enhance productivity, improve training outcomes, and engage customers. As the technology becomes more advanced and accessible, its use in the business world is expected to grow, bringing with it new opportunities for innovation and growth.

1.1.3. Challenges and future prospects

While Virtual Reality (VR) offers numerous benefits, its widespread adoption in business and other sectors is hindered by several challenges. One of the most significant barriers is the cost of VR technology. High-quality VR systems, including headsets, motion controllers, and the powerful computers needed to run VR applications, can be prohibitively expensive for many businesses, especially small and medium-sized enterprises (SMEs). This high cost limits the ability of these companies to implement VR solutions, slowing down the overall adoption of the technology (Baccarne, B., 2014).

Another challenge is the technological limitations associated with VR. Despite advancements, issues such as latency—which can cause motion sickness—and the need for high computational power to create realistic simulations remain significant hurdles. Motion sickness is particularly concerning, as it can affect user comfort and limit the duration of VR sessions. To address this, developers are working on improving frame rates and reducing latency in VR systems, but these improvements often require even more advanced and expensive hardware (Rebenitsch & Owen, 2016).

User acceptance and adoption are also major concerns. While younger generations may be more receptive to new technologies, older employees or customers might be hesitant to adopt VR due to a lack of familiarity or perceived complexity. This can create a barrier to the effective implementation of VR solutions in business settings. To overcome this, companies need to invest in training and education to help users become comfortable with the technology and understand its benefits (Hollensen et al., 2021).

Prolonged use of Virtual Reality (VR) can have several health implications, including eye strain, fatigue, and other forms of physical discomfort. These issues, while not exclusive to VR, are often more pronounced due to the immersive nature of VR experiences, which require users to remain in a fixed position and maintain focus on a digital screen for extended periods. Current studies suggest that VR-induced symptoms such as visual fatigue and discomfort can be managed by optimizing ergonomic design and implementing regular breaks to reduce strain (Rebenitsch & Owen, 2016). Efforts to enhance the user experience and minimize adverse effects continue to be a significant area of focus for developers.

Looking ahead, the future prospects for VR in business are promising. The development of more affordable and accessible VR hardware, such as standalone VR headsets that do not require a powerful PC, is likely to drive broader adoption. Additionally, improvements in software, including more intuitive user interfaces and better integration with existing business tools, will make VR more user-friendly and effective (Fuchs, 2018).

The integration of Virtual Reality (VR) with emerging technologies such as Artificial Intelligence (AI) and 5G networks presents exciting opportunities for enhancing VR applications. AI can be utilized to develop more intelligent and adaptive VR environments, which improves the realism and interactivity of simulations. These AI-driven environments can adapt dynamically to user behavior, providing personalized experiences that are more engaging and effective.

Meanwhile, 5G technology plays a critical role in enhancing VR experiences by offering ultra-low-latency communication and higher data transmission speeds. This reduces the lag and improves the overall quality and responsiveness of VR applications, making real-time interactions smoother and more immersive. With the combination of 5G's high bandwidth and low latency, VR can be used more effectively in fields like remote training, telepresence, and interactive customer experiences. The use of 5G technology allows for more complex and data-intensive VR applications that were not feasible with previous network capabilities (Hazarika & Rahmati, 2023).

While VR faces several challenges, ongoing technological advancements and growing interest in the technology suggest a bright future. As these challenges are addressed, VR is poised to become an integral part of business operations, offering innovative solutions that enhance productivity, training, and customer engagement.

1.2. Gamification in Business

1.2.1. Definition and importance

Gamification is the process of integrating game elements and principles into non-gaming contexts to engage users, enhance motivation, and achieve desired outcomes. This concept has gained significant traction in the business world, as companies increasingly seek innovative ways to interact with customers, employees, and other stakeholders. By leveraging the psychological appeal of games, businesses can create more engaging experiences, foster loyalty, and improve overall performance.

At its core, gamification involves the use of game design elements such as points, badges, leaderboards, and challenges in a business environment. These elements tap into fundamental human desires for competition, achievement, and

recognition. For example, a company might use a points-based system to incentivize employees to complete training modules or to reward customers for repeat purchases. This approach not only makes the activities more enjoyable but also drives behavioral changes that align with business objectives.

The importance of gamification in business lies in its ability to transform mundane or complex tasks into engaging activities. This is particularly relevant in today's digital age, where attention spans are shorter, and consumers are inundated with information. By gamifying processes, businesses can capture and maintain the interest of their target audiences. For instance, gamified customer loyalty programs have been shown to significantly increase customer retention and satisfaction, as they make the process of earning rewards more interactive and enjoyable.

Moreover, gamification has proven to be an effective tool in employee engagement. Traditional employee motivation strategies often fall short in addressing the diverse needs and preferences of the modern workforce. Gamification offers a more personalized approach, allowing employees to set their own goals, track their progress, and earn rewards that are meaningful to them. This not only boosts morale but also enhances productivity and job satisfaction.

1.2.2. Key game elements and mechanics

The success of gamification in business largely depends on the effective use of key game elements and mechanics that drive user engagement and motivation. These elements are adapted from traditional game design to serve specific business goals, and they play a critical role in making gamified experiences both enjoyable and effective (Zichermann & Cunningham, 2011). Among the most commonly used game elements are points, badges, leaderboards, and challenges, each serving distinct psychological functions.

Points are the most basic element, offering a quantitative measure of progress or achievement. They provide instant feedback to users, reinforcing desired behaviors such as completing tasks or making purchases. Points can be accumulated over time and often serve as a currency within a gamified system, allowing users to unlock rewards or reach higher levels (Werbach & Hunter, 2012).

Badges function as visual representations of accomplishments. They are awarded for reaching specific milestones or completing challenges, providing users with tangible symbols of their achievements. Badges cater to the human need for recognition and status, which can be particularly motivating in social or competitive contexts (Sailer et al., 2013). For instance, in a corporate setting, employees might earn badges for completing training modules, which can then be displayed on their profiles, fostering a sense of pride and encouraging continued participation.

Leaderboards introduce an element of competition by ranking users based on their performance. This mechanic taps into the competitive nature of individuals, motivating them to outperform others and climb the ranks. Leaderboards are particularly effective in environments where social interaction is a key component, such as in sales teams or customer loyalty programs (Hamari et al., 2014).

Challenges are another crucial element, providing users with specific tasks or goals to achieve. Challenges can vary in difficulty and are often time-bound, adding a sense of urgency and excitement. By completing challenges, users can earn points, badges, or other rewards, which not only motivates them to engage with the system but also enhances their sense of accomplishment (Koivisto & Hamari, 2019).

These elements, when combined, create a powerful framework for driving engagement and behavior change in a business context. For example, a company might design a gamified sales platform where employees earn points for each sale, compete on leaderboards, and receive badges for hitting targets. This combination of elements not only makes the process more enjoyable but also aligns individual motivation with organizational goals, leading to improved performance.

The careful selection and integration of game elements and mechanics are essential for the success of gamification in business. By leveraging these tools, companies can create engaging, motivating, and effective experiences that drive both individual and organizational success.

1.3. Intersection of VR and Gamification

1.3.1. How VR enhances gamification

Virtual Reality (VR) has become a transformative technology in various fields, including gamification, by providing immersive and interactive experiences that significantly enhance user engagement and motivation. By blending the immersive qualities of VR with the motivational mechanisms of gamification, businesses and educational institutions can create compelling experiences that drive user behavior more effectively than traditional methods.

One of the primary ways VR enhances gamification is through its ability to create highly immersive environments that captivate users' attention. In a VR setting, users are not merely interacting with a screen; they are placed inside a virtual world where their actions have immediate and tangible effects (Slater & Sanchez-Vives, 2016). This heightened level of immersion leads to deeper engagement, as users feel more connected to the tasks they are performing. For example, a gamified training module delivered through VR can simulate real-world scenarios in a way that is far more engaging than a traditional computer-based training program. The realistic environments and interactive elements encourage users to complete tasks and overcome challenges, driving better learning outcomes.

Another significant advantage of VR in gamification is its ability to provide personalized experiences. In a VR environment, gamified elements such as points, badges, and challenges can be tailored to the individual user's performance and preferences (Makransky et al., 2017). This personalization increases the relevance of the tasks to the user, making the experience more enjoyable and effective. For instance, a VR-based fitness program can adjust the difficulty of exercises based on the user's fitness level, while providing real-time feedback and rewards that encourage continued participation.

Furthermore, VR enhances the social aspects of gamification by enabling more interactive and collaborative experiences. In VR, users can interact with others in a shared virtual space, participating in collaborative tasks or competing against one another in real-time. This social interaction adds a layer of motivation, as users are driven not only by the desire to achieve personal goals but also by the social rewards

of competing and collaborating with others (Martín-Gutiérrez, 2016). For example, a VR-based team-building exercise can create a sense of camaraderie and competition that is difficult to replicate in non-immersive environments.

1.3.2. Case studies of VR in gamification

Virtual Reality (VR) has been successfully implemented in various gamification initiatives across different sectors, demonstrating its potential to enhance engagement, learning, and performance. This section will explore case studies where VR has been integrated with gamification to achieve significant outcomes.

One notable case study is the use of VR in corporate training by companies like Walmart. Walmart has employed VR to gamify employee training programs, particularly in preparing staff for the Black Friday shopping event. Using VR headsets, employees are placed in a simulated store environment where they must handle a variety of scenarios, such as managing crowds and providing customer service during high-stress situations (Incao, 2018, September 20). The gamified VR experience allows employees to earn points and badges based on their performance, which not only makes the training process more engaging but also helps in better retention of the skills learned. This approach has led to measurable improvements in employee preparedness and customer service performance during actual events.

A successful implementation of VR in gamification within the field of education, particularly in STEM disciplines, can be seen in the development of VR-based learning platforms for teaching anatomy. These platforms allow students to interact with 3D models of the human body in a virtual environment, enabling them to perform dissections and explore anatomical structures in ways that are not possible with traditional methods. Such immersive and interactive experiences are shown to significantly enhance student engagement and understanding of complex material.

Research has demonstrated that students who utilize VR platforms perform better in assessments and have a deeper understanding of anatomical structures compared to those who use conventional learning methods. This improvement is attributed to the combination of gamified elements—such as scoring based on

accuracy and time—and the immersive nature of VR, which together provide a more engaging and effective learning environment (Moro et al., 2017).

In the health sector, VR has been used to gamify rehabilitation programs, providing patients with an engaging way to perform their exercises. One example is the use of VR in stroke rehabilitation, where patients participate in gamified exercises designed to improve motor skills. In these VR environments, patients can engage in activities such as virtual tennis or fishing, where their movements are tracked and rewarded with points and progress badges (Laver et al., 2017). The gamification aspect increases patient motivation and adherence to the rehabilitation program, leading to faster and more effective recovery outcomes.

These case studies illustrate the diverse applications of VR in gamification, highlighting its ability to transform traditional practices into more engaging and effective experiences. Whether in corporate training, education, or healthcare, VR combined with gamification offers a powerful tool for enhancing learning, performance, and engagement.

1.4. Gamification Models and Frameworks

1.4.1. Octalysis framework

The Octalysis Framework, developed by Yu-Kai Chou, is a comprehensive model for understanding and designing gamified systems. This framework is built around eight core drives of human motivation, which are divided into "white hat" and "black hat" motivations. White hat motivations are positive and focus on long-term engagement, such as development and accomplishment, while black hat motivations are more manipulative and can create urgency or addiction, such as fear of loss or avoidance (Chou, 2015).

The eight core drives are:

- *Epic Meaning and Calling* - This drive relates to the human desire to be part of something bigger than oneself. It taps into the need for purpose and often involves users feeling that they are on a mission to achieve something

greater, which can be seen in movements like social causes or participating in communities where one feels they are making a difference.

- *Development and Accomplishment* - This drive is associated with the internal desire to improve oneself, achieve mastery, and gain a sense of accomplishment. In gamified systems, this drive is often satisfied through progression systems, challenges, and rewards like points, badges, or levels (Xi & Hamari, 2019).
- *Empowerment of Creativity and Feedback* - Here, users are motivated by being able to express their creativity and receive immediate feedback on their actions. This drive is particularly powerful in environments where users can interact with the system in innovative ways, such as through custom content creation or problem-solving tasks that allow for creativity.
- *Ownership and Possession* - This drive reflects the desire to accumulate wealth, resources, or a sense of ownership. In a gamified context, this might be seen in the collection of virtual goods, currency, or even status. Users are motivated by the idea that they have something to lose if they do not engage with the system (Xi & Hamari, 2019).
- *Social Influence and Relatedness* - This drive encompasses social factors such as mentorship, acceptance, social responses, companionship, and competition. Social influence is a strong motivator in gamification, especially in contexts where users can compare their performance against others or work collaboratively to achieve goals.
- *Scarcity and Impatience* - This drive is motivated by the fear of missing out or the desire to have something that is rare or exclusive. Limited-time offers, exclusive content, or hard-to-obtain rewards are examples of how this drive can be leveraged in gamified systems.
- *Unpredictability and Curiosity* - This drive taps into the human desire for novelty and the unknown. Games often utilize this by incorporating elements of surprise, such as mystery boxes or unpredictable rewards, to keep users engaged.
- *Loss and Avoidance* - This drive involves the motivation to avoid negative consequences. In gamification, this can manifest as penalties for not

completing tasks or the loss of accumulated rewards if one does not maintain engagement (Chou, 2015).

The Octalysis Framework is unique in that it not only identifies what motivates users but also categorizes these motivations into positive and negative influences, allowing designers to create more balanced and ethically sound gamified experiences. While the framework is robust and widely applicable, it is most effective when used to design systems that require long-term engagement, as it provides a holistic view of the motivational spectrum (Tondello et al., 2016).

1.4.2. MDA framework (mechanics, dynamics, aesthetics)

The Mechanics-Dynamics-Aesthetics (MDA) Framework is a critical tool used in game design and gamification to analyze and structure the components of a game. Developed by Robin Hunicke, Marc LeBlanc, and Robert Zubek (2004), the MDA Framework breaks down the experience of a game into three interconnected components: Mechanics, Dynamics, and Aesthetics. This framework is particularly useful for gamification designers because it provides a structured way to approach the creation of engaging and meaningful experiences.

Mechanics refer to the rules and systems that govern the game. These are the basic building blocks of the game, including algorithms, data structures, and the rules that determine how the game functions. In gamification, mechanics could include the point systems, badges, levels, or the conditions for winning or losing (Hunicke et al., 2004). For example, in a fitness app, the mechanics might involve earning points for every mile run or unlocking new workouts after completing certain challenges.

Dynamics are the behaviors that emerge when players interact with the mechanics. These are the run-time behaviors and strategies that develop as players engage with the system. Dynamics are not directly programmed into the game but arise from the interaction between players and the mechanics. For example, in a social media platform with gamification elements, dynamics might include users competing for likes or followers, or forming alliances to achieve shared goals (Hunicke et al., 2004).

Aesthetics refer to the emotional responses and experiences evoked in the player. This aspect of the framework deals with how the game makes the player feel and is concerned with the overall experience. Aesthetics can include feelings of challenge, competition, cooperation, exploration, or even relaxation. In the context of gamification, aesthetics is crucial as they determine how engaging and enjoyable the experience is for the user (Schell, 2008). For instance, the aesthetics of a learning platform might focus on making the user feel accomplished and knowledgeable after completing each module.

The strength of the MDA Framework lies in its ability to help designers think about the player's experience from different perspectives, ensuring that the final product is not only functional but also engaging and meaningful. By starting with the desired aesthetic experience, designers can work backward to determine the necessary dynamics and mechanics that will create that experience. This backward approach ensures that all elements of the game or gamified system are aligned towards creating a cohesive experience (Hunicke et al., 2004).

One of the main advantages of using the MDA Framework in gamification is that it helps avoid common pitfalls, such as overemphasizing mechanics at the expense of player experience. By focusing on aesthetics, designers ensure that the emotional and psychological needs of the players are considered, which is crucial for long-term engagement (Schell, 2008).

1.5. Specific Factors in Gamification

Gamification, the application of game-design elements in non-game contexts, has become increasingly prevalent across various industries, including education, healthcare, and business. However, the effectiveness of gamification is not merely a result of applying game elements but is deeply influenced by specific factors that determine how well these elements resonate with users. These factors include user motivation, context, feedback mechanisms, and the integration of social elements.

User Motivation is perhaps the most critical factor in the success of any gamified system. Understanding what motivates the target audience is essential for designing effective gamification strategies. According to Self-Determination Theory (SDT), motivation can be divided into intrinsic and extrinsic types (Ryan & Deci,

2000). Intrinsic motivation, driven by personal satisfaction and interest, is often more sustainable in the long run compared to extrinsic motivation, which is driven by external rewards such as points or badges. For gamification to be effective, it must align with the intrinsic motivations of users. For example, educational platforms that use gamification often aim to foster a love for learning, rather than merely rewarding students with grades or certificates.

Context plays a crucial role in how gamification is perceived and engaged with by users. The same gamified elements can have different impacts depending on the environment in which they are applied. For instance, a gamified system designed for corporate training might need to focus on teamwork and collaboration, while a health app might focus on individual progress and self-improvement. The context also includes cultural factors, as different cultures may respond differently to various gamification strategies. For example, while competitive elements might be motivating in some cultures, they could be demotivating in others (Koivisto & Hamari, 2019).

Feedback Mechanisms are another critical factor in gamification. Effective feedback can significantly enhance user engagement by providing clear and immediate responses to actions. Feedback in gamification often comes in the form of points, badges, leaderboards, or progress bars, which help users track their achievements and understand their standing relative to others. However, the design of feedback mechanisms must be carefully considered to avoid overwhelming or demotivating users. Research has shown that feedback is most effective when it is timely, specific, and aligned with the user's goals (Hamari et al., 2014).

Social Elements are increasingly being recognized as a powerful factor in gamification. Social interactions can drive motivation through competition, collaboration, and social recognition. Features such as leaderboards, social sharing, and team challenges leverage the human need for social connection and approval. However, the integration of social elements must be handled with care to ensure that it enhances rather than detracts from the user experience. For example, while leaderboards can motivate some users, they might discourage others who perceive themselves as consistently underperforming (Morschheuser et al., 2019).

While gamification holds significant potential, its success depends on the careful consideration of factors such as user motivation, context, feedback

mechanisms, and social elements. By understanding and addressing these factors, designers can create gamified systems that are not only engaging but also effective in achieving their intended outcomes.

1.6. Workplace Gamification: Insights from Educational Research

The concept of gamification, initially explored in educational settings, has increasingly found relevance in the business world, particularly in enhancing employee motivation, performance, and engagement. Drawing on the framework presented by Baydaş and Çiçek (2019), this paper applies key concepts from their research on gamification in education to the workplace. The original study focused on factors such as entertainment, learning impact, outcome expectations, competition, and engagement within a gamified learning environment (GLE). By examining these factors from the perspective of employee management, we aim to demonstrate how gamification can be strategically used to improve productivity, foster a competitive yet collaborative culture, and facilitate continuous learning in corporate environments. The following sections reinterpret these core themes, highlighting their applicability to organizational settings while maintaining the integrity of the original study's conceptual foundation.

- *Entertainment:* In the workplace, entertainment refers to the incorporation of fun and engaging elements, such as interactive tasks, team challenges, or rewards systems, that enhance employee satisfaction and motivation. These elements can include visual and auditory cues, or gamified systems that make routine tasks more engaging. By introducing entertaining components, such as leaderboards, point systems, or progress bars, employees become more socially engaged with their colleagues and more invested in their work, leading to a positive and collaborative work environment. In gamified workplaces, entertainment serves as a crucial factor in maintaining employee morale and productivity (Baydaş & Çiçek, 2019).
- *Impact of Learning:* In a gamified work environment, the impact of learning refers to how effectively employees acquire new skills, knowledge, or behaviors through interactive and engaging methods. Gamified training sessions, for example, can increase employees' focus and retention of information. By offering instant feedback and clear progression metrics,

employees are encouraged to actively participate and improve their performance. This approach can be particularly beneficial for employees who may feel disengaged in traditional learning environments, as it provides them with immediate incentives to enhance their skills, leading to improved job performance and professional development (Baydaş & Çiçek, 2019).

- *Outcome Expectation:* In the context of gamification in the workplace, outcome expectation refers to the specific achievements or goals that employees strive to reach within a gamified system. This might include meeting performance targets, earning badges, or appearing on a leaderboard that highlights top performers. By setting clear expectations and linking them to rewards, gamification helps employees stay focused on key performance indicators (KPIs) and other metrics that contribute to organizational success. However, it's important that employees balance the pursuit of these rewards with a deep understanding of their work, as focusing too much on external recognition may detract from the quality of their output (Baydaş & Çiçek, 2019).
- *Competition:* Competition in a gamified workplace encourages employees to improve their performance by comparing their progress and achievements with their peers. By publicly displaying scores or rankings, employees are motivated to perform better and to contribute more actively to their teams. This healthy competition can foster a dynamic work environment where employees are encouraged to continuously improve their skills and outcomes. However, it's important to recognize that competition might not be equally effective for all employees; some may thrive in a competitive environment, while others may feel disengaged if they are less motivated by external recognition (Baydaş & Çiçek, 2019).
- *Engagement:* Employee engagement in a gamified workplace refers to how involved and invested employees are in their tasks and goals. Gamification enhances engagement by making everyday tasks more interactive and rewarding, which keeps employees focused and motivated. By utilizing elements like levels, badges, or achievements, companies can drive employees to remain committed to their objectives and take ownership of their work. Engaged employees are not only more productive but also more satisfied with

their roles, leading to improved retention and a positive work culture (Baydaş & Çiçek, 2019).

CHAPTER 2: THEORETICAL FRAMEWORK

2.1.Self-Determination Theory (SDT)

Self-Determination Theory (SDT) is a well-established framework in psychology that explains human motivation by focusing on the intrinsic and extrinsic factors that influence behavior. Developed by Deci and Ryan, SDT posits that individuals are naturally inclined to grow and develop, and their motivation can be enhanced or hindered by the fulfillment of three basic psychological needs: autonomy, competence, and relatedness (Deci & Ryan, 2000).

Autonomy refers to the need to feel in control of one's actions and decisions. When individuals perceive that their behaviors are self-endorsed and aligned with their values, they are more likely to experience intrinsic motivation. For instance, in the workplace, employees who are given the freedom to make decisions about how to approach their tasks are generally more motivated and engaged in their work (Ryan & Deci, 2017). Autonomy is not simply about independence but rather about feeling that one's actions are volitional and aligned with personal values.

Competence involves the need to feel effective and capable of achieving desired outcomes. When individuals successfully meet challenges and see progress in their skills and abilities, their intrinsic motivation is strengthened. This is why gamification, which often includes elements like feedback, challenges, and rewards, can be particularly effective in enhancing motivation. These elements help individuals perceive that they are improving and mastering new skills, thus satisfying the need for competence (Vansteenkiste et al., 2010).

Relatedness is the need to feel connected to others, whether through meaningful relationships or a sense of belonging to a group. In contexts such as education or work, when individuals feel that they are part of a supportive community, their motivation and engagement are likely to increase. For example, team-based projects that foster collaboration and a sense of shared purpose can satisfy this need, leading to higher levels of motivation and better outcomes (Deci & Ryan, 2000).

SDT also distinguishes between intrinsic and extrinsic motivation. Intrinsic motivation arises from within the individual and is driven by interest or enjoyment in the task itself. In contrast, extrinsic motivation is driven by external rewards or

pressures. While extrinsic motivators can be effective in the short term, SDT argues that they can undermine intrinsic motivation if they overshadow the satisfaction of the basic psychological needs (Ryan & Deci, 2000). For example, offering excessive rewards for tasks that individuals already find enjoyable might reduce their intrinsic interest in the task.

2.2.Flow Theory

Flow Theory, introduced by psychologist Mihaly Csikszentmihalyi, describes a mental state of complete immersion and engagement in an activity, often referred to as "being in the zone" (Csikszentmihalyi, 1990). This state is characterized by intense focus, a sense of control, and intrinsic enjoyment of the task at hand. Flow occurs when there is a balance between the challenges of the task and the individual's skill level, leading to optimal performance and deep satisfaction.

One of the key components of Flow Theory is the balance between challenge and skill. For flow to occur, the task must present a challenge that is neither too easy nor too difficult relative to the individual's abilities. If the task is too easy, the individual may become bored; if it is too difficult, they may experience anxiety or frustration. When the challenge is just right, it pushes the individual to extend their skills and fully engage in the activity, leading to a flow state (Csikszentmihalyi, 1997).

Clear goals and immediate feedback are also essential for achieving flow. Clear goals provide direction and purpose, while immediate feedback allows the individual to adjust their actions and stay aligned with the task requirements. In the context of gamification, these elements are often built into the design through well-defined objectives and real-time performance feedback, which help maintain the flow state and keep users engaged (Nakamura & Csikszentmihalyi, 2009).

Flow is often associated with activities that are intrinsically rewarding. Individuals in a flow state are driven by the sheer enjoyment of the activity itself, rather than by external rewards. This intrinsic motivation is what makes flow so powerful, as it can lead to sustained engagement and deep learning. For example, in a gamified educational environment, when students are in a flow state, they are more likely to

persist through challenges, learn more effectively, and achieve better outcomes (Shernoff et al., 2014).

The concept of flow has been applied across various domains, including education, work, and even leisure activities like gaming and sports. In education, teachers can design learning activities that are challenging yet attainable, with clear goals and timely feedback, to help students experience flow. Similarly, in the workplace, tasks can be structured to align with employees' skills and provide opportunities for growth, thereby enhancing job satisfaction and productivity (Csikszentmihalyi, 1990).

In conclusion, Flow Theory provides valuable insights into how engagement and motivation can be optimized by creating conditions that foster a state of flow. By balancing challenge and skill, setting clear goals, and providing immediate feedback, educators, employers, and game designers can enhance motivation and performance, leading to more fulfilling and productive experiences.

2.3.Hypothesis Development

2.3.1. Hypothesis: Competition

Hypothesis 1 (H1): The use of Virtual Reality (VR) in gamified workplace systems increases competitive dynamics, fulfilling the competence need in Self-Determination Theory, leading to enhanced employee performance.

Null Hypothesis 1 (H0): The use of Virtual Reality (VR) in gamified workplace systems does not increase competitive dynamics or fulfill the competence need as outlined in Self-Determination Theory, and thus does not significantly affect employee performance.

In a gamified business environment, competition is a significant motivator. According to Self-Determination Theory (SDT), the need for competence drives individuals to seek mastery and effectiveness in their tasks, enhancing motivation and performance (Ryan & Deci, 2000). Virtual Reality (VR) can amplify this by immersing employees in dynamic and interactive competitive scenarios, where their achievements are visible and acknowledged. The immersive nature of VR not only

makes competition more engaging but also gives employees immediate feedback, which further enhances the sense of competence. Research indicates that competition in VR environments can significantly elevate performance and engagement levels (Hamari et al., 2014).

2.3.2. Hypothesis: Entertainment

Hypothesis 2 (H2): Virtual Reality (VR) enhances entertainment in gamified work settings, leading to an optimal flow experience, as described by Flow Theory, where employees experience greater immersion and task focus.

Null Hypothesis 2 (H0): Virtual Reality (VR) does not significantly enhance the entertainment experience in gamified work environments, nor does it promote a flow state as per Flow Theory.

Entertainment plays a key role in sustaining engagement, particularly in gamified systems. Flow Theory posits that individuals enter a state of "flow" when tasks offer the right balance between challenge and skill (Csikszentmihalyi, 1990). VR, with its immersive capabilities, can provide a more engaging experience by elevating the entertainment value of otherwise mundane tasks, thus promoting deep focus and sustained involvement. VR's multisensory environments stimulate users, making tasks more enjoyable, which leads to increased motivation and better performance (Ke et al., 2016). Entertainment in gamified settings thus becomes a vehicle for achieving a flow state.

2.3.3. Hypothesis: Impact of learning

Hypothesis 3 (H3): Virtual Reality (VR)-enabled gamification improves employees' learning outcomes by fostering autonomy, a core component of Self-Determination Theory, allowing employees to take control of their professional development.

Null Hypothesis 3 (H0): Virtual Reality (VR)-enabled gamification does not significantly improve learning outcomes, nor does it promote autonomy in employees' professional development.

Learning in a workplace setting is often enhanced by providing employees control over their learning environment, a core principle of Self-Determination Theory (SDT). Autonomy, as a key driver in SDT, leads to greater intrinsic motivation when individuals feel they have control over their learning and development (Deci & Ryan, 2002). Virtual Reality (VR) in gamified environments allows employees to engage in simulations and scenarios that mimic real-world challenges, providing them with the freedom to explore and learn at their own pace. This enhances the effectiveness of the learning process by allowing more hands-on and immersive experiences (Alfadil, 2020).

2.3.4. Hypothesis: Outcome expectation

Hypothesis 4 (H4): The use of VR in business gamification raises employees' outcome expectations by optimizing the balance between task difficulty and skill level, leading to increased motivation and performance as explained by Flow Theory.

Null Hypothesis 4 (H0): The use of VR in business gamification does not raise employees' outcome expectations, nor does it optimize the challenge-skill balance, as predicted by Flow Theory.

Outcome expectations are integral to motivation in gamified systems, and Virtual Reality (VR) can significantly influence this. Flow Theory asserts that individuals are most motivated when tasks are designed to maintain an optimal balance between challenge and skill (Csikszentmihalyi, 1990). VR environments allow for real-time adaptation, adjusting difficulty levels based on employee performance, which can lead to enhanced expectations of success and increased motivation (Guo et al., 2016). By optimizing this balance, VR can create a more effective and motivating work environment, enhancing both performance and expectations of outcomes.

2.3.5. Hypothesis: Engagement

Hypothesis 5 (H5): Virtual Reality (VR)-based gamification increases employee engagement by satisfying the need for relatedness in Self-Determination Theory, promoting stronger social connections and collaboration.

Null Hypothesis 5 (H0): Virtual Reality (VR)-based gamification does not significantly increase employee engagement or satisfy the need for relatedness as outlined in Self-Determination Theory.

Employee engagement is a key driver of performance, and Virtual Reality (VR) can significantly enhance engagement by fulfilling the need for *relatedness*, a core concept in Self-Determination Theory (SDT). Relatedness refers to individuals' intrinsic need to feel connected to others in their environment (Ryan & Deci, 2017). VR enables the creation of immersive, socially interactive spaces where employees can collaborate in real-time, simulating face-to-face interactions and fostering stronger team dynamics. This sense of connectedness can lead to greater involvement in tasks and a deeper emotional investment in the organization's goals. Studies have shown that VR, when integrated into training and collaborative activities, promotes higher levels of engagement by satisfying the relatedness need, especially when these virtual environments encourage meaningful social interaction (Chen & Jang, 2010).

CHAPTER 3: METHODOLOGY

3.1.Research Method

Quantitative data analysis characterizes the process of interpretation carried out with the aim of improving the study that is taking place or will take place in the research. This analysis process includes a system for discovering weaknesses, understanding and identifying processes. Quantitative research evaluates inquiry from a positivist or realist approach. Quantitative observation is built on a construct that examines and makes sense of people's beliefs, the types of experiences they have had, their attitudes towards events or situations, their behaviors and interactions. Quantitative research is a research strategy that is receiving increasing interdisciplinary attention. Although this approach was once promoted as belonging to philosophical issues, it is a research method recognized for its ability to add a new dimension to the study of innovative issues and situations where no output can be obtained as a result of measuring variables under changing conditions.

Within the scope of this study, quantitative method was chosen in order to better understand what kind of contributions gamification applied with the help of augmented reality technologies in business life can provide to which departments. In this context, volunteers respond to closed-ended questions based on the factors of cost-effectiveness, agility, usability, applicability and innovativeness. These responses are analyzed as numerical values and statistical methods are used to provide an overview of the participants' attitudes, experiences and interactions.

3.2.Population

Based on the study's aim to measure the impact of gamification scenarios in business using extended reality technologies, a sample of 100 participants was selected from Gazi Technopark located within Gazi University Gölbaşı Campus in Ankara. Technoparks are known for their focus on technological innovation and for employing qualified personnel who are adept at following technological trends and implementing innovative ideas.

Table 1: Sample Size Determination

$$n = \left(\frac{Z^2 \cdot p \cdot (1-p)}{E^2} \right)$$

$$n = \left(\frac{1.96^2 \cdot 0.5 \cdot (1-0.5)}{0.05^2} \right) = \frac{3.8416 \cdot 0.25}{0.0025} = 96.04$$

The sample size of 100 participants was determined based on a calculated requirement of approximately 96.04 individuals, using standard sample size determination formulas above. This calculation was made under the assumption of a 95% confidence level (Z = 1.96), a margin of error of 5%, and an expected proportion of 0.5 to account for maximum variability in responses. Given the practical need to work with whole numbers, and to ensure the robustness of the study, the sample size was rounded up to 100 participants. This allows for greater reliability and precision in the results, making the findings more representative of the population being studied. The components used in the formulas are:

- *n (Sample Size)*: The number of participants needed. In your case, 96.04 was calculated and rounded to 100 for practicality.
- *Z (Z-value)*: Represents the confidence level. For a 95% confidence level, Z = 1.96, meaning we are 95% confident the sample results will reflect the true population within the margin of error.
- *p (Expected Proportion)*: The estimated proportion of the population that gives a certain response. p = 0.5 is used when we don't have prior knowledge, maximizing variability and ensuring a conservative estimate.
    - **(1 - p)**: The opposite response, also 0.5 in this case.
- *E (Margin of Error)*: The acceptable difference between the sample result and the true

The participants, who tested the VR-based simulation, were selected to provide a diverse yet representative sample of the population involved in technology development. The group included department managers, team leaders, general managers, human resources managers, specialized software developers, designers, and project managers.

During the test phase, these 100 participants interacted with and observed the VR simulation specifically designed to reflect various business scenarios. The simulation was intended to assess how effectively gamification can facilitate business processes and improve productivity. After testing the simulation, participants provided feedback based on their experiences. This feedback focused on the practicality of the simulation, its relevance to their everyday business operations, and its potential to enhance engagement and efficiency.

3.3.Sampling

Within the scope of this research, purposive sampling was used to measure the attitudes of specialized personnel working in the technopark. The research population was carefully selected based on specific criteria, including expertise, work area, and familiarity with the topic. Special attention was given to selecting participants who could provide valuable insights due to their specialized knowledge and experience in the technology sector.

The selection process was intentional and focused, ensuring that individuals who met the study's requirements were included. Although gender representation was considered, the primary goal was to ensure that the participants had the necessary qualifications to contribute meaningfully to the research. This method allowed us to gather data from experts who were most relevant to the study, regardless of their demographic background.

In conclusion, purposive sampling was applied as an effective strategy to ensure that the research captured the perspectives of highly knowledgeable individuals in the technology sector. This approach helped to increase the overall validity of the research by focusing on the quality and relevance of the participants' insights.

3.4.Measurement

The survey was designed specifically for participants who experienced the VR-based gamification simulation. The survey consisted of 5 scales, labeled as competition, entertainment, impact of learning, outcome expectationand engagement, and 12 propositions selected and adopted from the original set of 23 from Baydaş & Çiçek (2019), with the aim of supporting the study's two main hypotheses regarding

the effectiveness and impact of gamification in business processes using extended reality technologies.

This survey was compiled by soliciting responses from participants using digital response collection platforms. After experiencing the VR simulation, participants provided their answers to the 12 propositions through these digital platforms, based on their firsthand experiences. All feedback was accurately recorded and compiled into an Excel file for further analysis. This approach allowed for a focused evaluation based solely on the experiences of those who had directly engaged with the VR environment, providing more relevant and reliable data for the study.

3.5.Environment

The VR gamified environment offers a comprehensive suite of features that cater to various professional needs, from hiring and training to collaboration and leisure. This VR platform also includes cross-platform support, which can be used with both computer and virtual reality infrastructure. By integrating immersive and interactive tools, the environment enhances user engagement, facilitates effective communication, and supports innovative problem-solving. Whether users are conducting digital interviews, delivering speeches, engaging in team meetings, or participating in recreational activities, the VR environment provides a versatile platform that mirrors real-world dynamics while leveraging the advantages of digital interactivity and immersion.

- ***Peer Meeting Spot:*** This area is designed for professional interactions, such as hiring procedures and networking. HR professionals can host virtual interviews with job candidates using personalized avatars, allowing for a dynamic and immersive hiring process. Candidates can showcase their skills and qualifications in this simulated environment, while HR professionals assess their suitability for the organization. The Peer Meeting Spot includes customizable meeting rooms, interactive presentations, and real-time collaboration tools, enhancing the effectiveness of the hiring process.
- ***Meeting Zone:*** The Meeting Zone is a dedicated space where teams can convene for discussions and collaborative efforts. Users, represented by

avatars, gather around virtual tables, indicated by green pop-ups, to engage in meaningful exchanges. This zone includes virtual whiteboards, document sharing capabilities, and real-time messaging tools, fostering effective communication and teamwork. It serves various purposes, from formal meetings to informal discussions, providing a versatile platform for idea-sharing and decision-making.

- ***Demonstration Space:*** This area focuses on product development and refinement, particularly for 3D models. Users can thoroughly analyze, deconstruct, and discuss intricate details of models in a collaborative setting. The space allows for comprehensive reviews, enabling participants to identify improvements and explore enhancements before finalizing a product. It leverages interactive tools and simulations to visualize models from different perspectives, assess their functionality, and experiment with modifications in real-time.
- ***The Blackboard:*** A versatile tool within the VR environment, The Blackboard allows users to create, organize, and manage digital notes seamlessly. It supports efficient brainstorming and collaborative discussions by enabling users to jot down, edit, rearrange, and enhance their notes with multimedia elements like images and diagrams. The Blackboard integrates with cloud servers, ensuring secure storage and easy access from any device. Users can also export their notes in formats such as PDF or Excel for further analysis and sharing.
- ***The Conference Room:*** The Conference Room offers a professional setting for presentations and speeches. Users can deliver content using digital avatars, leveraging features like digital presentation pitches, where slides and visual aids accompany their speeches. This interactive setup includes multimedia elements, such as videos and animations, to engage the audience effectively. Presenters can customize their avatars to reflect their personal or professional identity, adding a unique touch to their presentations.
- ***The Working Zone:*** This dynamic workspace allows users to mirror their personal computer screens within the VR environment, facilitating seamless collaboration with teammates. The Working Zone is ideal for

brainstorming sessions, collaborative projects, or remote meetings, enabling real-time interactions and content sharing. Users can showcase presentations, review documents, and work together on projects, fostering productivity and creativity in a virtual setting.

- ***The Entertainment Space:*** Designed for relaxation and team bonding, The Entertainment Space features digital areas for leisure activities, such as virtual basketball courts, bowling alleys, and golf courses. This area fosters camaraderie and morale through friendly competitions and collaborative gameplay, providing an engaging escape from work-related tasks.

3.6.Data Analysis

In this study, the use of Jamovi 2.3.28 was invaluable for conducting a comprehensive range of statistical analyses. Starting with descriptive statistics, jamovi provided detailed summaries and visualizations that were crucial for understanding the fundamental characteristics of the dataset. For instance, the demographic table presented in the study outlined essential participant details such as gender distribution, age groups, education levels, marital status and job roles. These descriptive statistics not only offered a clear snapshot of the sample population but also set the stage for more in-depth analyses.

3.6.1. Reliability analysis

Reliability analysis has been conducted for the entire propositions in Table 1, and for scales in Tables 2, 3, 4, 5, and 6. It is widely acknowledged that when working with scales that have a smaller number of items, Cronbach's alpha values can be lower than the standard threshold of 0.7, particularly in exploratory research or when the scale is newly developed. Alpha values between 0.6 and 0.7 may be considered "questionable," but still acceptable for small-item scales.

Research suggests that the internal consistency of a scale is affected by the number of items it includes, with fewer items naturally resulting in lower alpha values. For instance, the University of Virginia Library notes that alpha values of 0.6 or higher can still reflect reasonable reliability when the scale has strong face and construct validity, even if it has fewer items (University of Virginia Library, n.d). Similarly,

Cortina (1993) argues that alpha tends to increase with more items, but this doesn't always indicate better scale validity. Simply adding items can inflate alpha without improving measurement accuracy.

For instance, research published in Frontiers in Psychology discusses that alpha values can be significantly influenced by the number of items, and for smaller scales, reliability estimates like Cronbach's alpha might fall below the 0.7 mark, but still indicate reasonable internal consistency when all other validation criteria are met (e.g., face validity and construct validity) (Trizano-Hermosilla & Alvarado, 2016).

In summary, while a value of **0.7** is often cited as the acceptable minimum for reliability, a **0.6** alpha can be deemed a reasonable lower limit for scales with fewer items or in the context of exploratory research.

Table 2 indicates an acceptable level of internal consistency. Scales with alpha values between 0.7 and 0.8 are generally considered reliable. The items related to competition seem to be adequately measuring the construct.

Table 2: Cronbach's Alpha for Competition

Competition – Scale Reliability Statistics	
	Cronbach's α
scale	0.723

In Table 3, while this alpha value is lower than the standard threshold of 0.7, it may still be considered acceptable for scales with fewer items or exploratory research. However, further refinement of the items might be necessary to improve reliability.

Table 3: Cronbach's Alpha for Entertainment

Entertainment – Scale Reliability Statistics	
	Cronbach's α
Scale	0.605

In Table 4, the value is quite low, suggesting poor internal consistency. A scale with this alpha may need significant revision, as it indicates that the items may not be effectively capturing the intended construct.

Table 4: Cronbach's Alpha for Impact of Learning

Impact of Learning – Scale Reliability Statistics	
	Cronbach's α
scale	0.531

In Table 5, with an alpha value close to 0.77, this scale shows good reliability. It suggests that the items measuring outcome expectations are consistent and reliably reflect the underlying construct.

Table 5: Cronbach's Alpha for Outcome Expectation

Outcome Expectation – Scale Reliability Statistics	
	Cronbach's α
scale	0.768

In Table 6, without an alpha value, it is not possible to assess the reliability of this scale. It could be due to missing data or technical issues in calculating Cronbach's alpha.

Table 6: Cronbach's Alpha for Engagement

Engagement – Scale Reliability Statistics	
	Cronbach's α
scale	.

Based on the Cronbach's alpha values, we will proceed with further analysis of the Competition (α = 0.723)**,** Entertainment (α = 0.605)**,** and Outcome Expectation (α

= 0.768) scales. These scales demonstrate acceptable levels of internal consistency, with "Competition" and "Outcome Expectation" showing reliable alpha values, while "Entertainment," though lower, remains within an acceptable range for scales with fewer items or exploratory research. Further refinement of these scales may enhance their reliability, but they are suitable for continued analysis.

3.6.2. Propositions and ratings

Tables 7, 8, 9, 10 and 11 present user feedback on various propositions about the effectiveness and impact of using a Game-Based Work Environment (GWE). Each proposition is rated on a scale from 1 to 5, with 1 representing the lowest agreement and 5 representing the highest agreement. The numbers indicate the percentage of respondents who selected each rating.

The 12 selected questions from the original 23-question survey were specifically chosen based on their designated labels, which were applied by the survey authors to categorize each question according to its focus area. These labels—such as "Competition," "Entertainment," "Impact of Learning," "Outcome Expectation," and "Engagement"—reflect the thematic categorization established in the survey's design. By adhering to the original classification, the analysis ensures that the evaluation remains consistent with the survey's intent, allowing for an accurate assessment of how each dimension contributes to the overall experience of the gamified working environment.

Table 7: Propositions and Ratings for Competition

Propositions	Label	1	2	3	4	5
I gain knowledge about the subject through a GWE.	Competition	0	6	26	62	6
GWE enhances my learning by providing immediate feedback for each activity.	Competition	0	4	28	58	10
Achieving working objectives is easier when utilizing GWE.	Competition	0	6	30	48	16

Table 8: Propositions and Ratings for Outcome Expectation

Propositions	Label	1	2	3	4	5
GWE is a valuable addition to my working tools.	Outcome Expectation	2	12	24	52	10

GWE makes difficult topics easier to understand.	Outcome Expectation	0	6	20	56	18

Table 9: Propositions and Ratings for Entertainment

Propositions	Label	1	2	3	4	5
I am more motivated to work when GWE is used.	Entertainment	0	6	30	56	8
GWE makes working more interactive.	Entertainment	0	6	18	56	20
GWE helps me to retain information better.	Entertainment	2	2	18	58	20

Table 10: Propositions and Ratings for Outcome Impact of Learning

Propositions	Label	1	2	3	4	5
GWE increases my engagement in working activities.	Impact of learning	0	2	24	56	18
I find GWE to be a fun way to work.	Impact of learning	0	0	14	50	36
I find that GWE provides a more personalized working experience.	Impact of learning	2	2	18	58	20

Table 11: Propositions and Ratings for Engagement

Propositions	Label	1	2	3	4	5
The competitive elements in GWE drive me to perform better.	Engegament	2	4	30	46	18

Table 12 presents descriptive statistics (mean, median, standard deviation, minimum, and maximum) for 12 items. Each item appears to be rated on a Likert-type scale ranging from 1 to 5, with varying degrees of central tendency and spread. In Table 12, the following abbreviations are used to represent different labels:

- **C**: Competition
- **EN**: Engagement
- **IoL**: Impact of Learning
- **OE**: Outcome Expectation
- **EG**: Engagement

This format clarifies the meaning of each abbreviation, ensuring consistent interpretation across the table.

Table 12: Propositions and Ratings

Descriptives

	Mean	Median	SD	Minimum	Maximum
1C	3.68	4.00	0.680	2	5
2C	3.74	4.00	0.691	2	5
3C	3.74	4.00	0.799	2	5
4EN	3.66	4.00	0.714	2	5
5EN	3.90	4.00	0.785	2	5
7EN	3.92	4.00	0.800	1	5
6IoL	3.90	4.00	0.704	2	5
8IoL	4.22	4.00	0.675	3	5
11IoL	3.92	4.00	0.800	1	5
9OE	3.56	4.00	0.903	1	5
10OE	3.86	4.00	0.779	2	5
12EG	3.74	4.00	0.872	1	5

3.6.3. Demographics and frequencies

In the analysis below, included in Tables 13 and 14, individuals are classified based on multiple factors including years of experience, position, age, gender, and education. This breakdown helps to clearly understand their levels of expertise, qualifications, and demographic background. Each number used in the analysis represents specific characteristics or attributes related to these categories. Below is a detailed explanation of each category and how the numbers are used to represent different aspects:

Proficiency Levels:

- **1:** Represents individuals with 0 to 3 years of experience. Individuals with 0 to 3 years of work experience fall into this category. They are typically new to the field and are in the process of building foundational skills.

- **2:** Represents individuals with 4 to 8 years of experience. Those with 4 to 8 years of experience are categorized here. They have developed solid expertise and are capable of handling more complex tasks and responsibilities

- **3:** Represents individuals with more than 9 years of experience. Individuals with more than 9 years of experience are considered highly skilled professionals. They often take on leadership or mentoring roles within the team.

Position Levels:

- **1:** Refers to a Junior position, typically associated with less experienced individuals. Corresponds to Proficiency Level 1, this position is typically filled by professionals in the early stages of their careers. They are still developing their skills with the guidance of more experienced colleagues.
- **2:** Refers to a Senior position, representing individuals with solid experience and a higher level of responsibility. This position is for professionals with Proficiency Level 2. They are experienced and can independently manage significant tasks and projects, often mentoring others.

- **3:** Refers to an Expert position, often linked to leadership or highly specialized roles. Tied to Proficiency Level 3, experts are highly experienced professionals who play key roles in decision-making, leadership, and mentorship.

Age:

- **1:** Refers to individuals aged between 24 and 30 years. Individuals aged between 24 and 30 years typically fall into this category. This group often includes professionals at the early stages of their careers.
- **2:** Refers to individuals aged between 31 and 35 years. This group includes individuals aged between 31 and 35 years, who are usually at the mid-point in their career progression, having gained solid experience.
- **3:** Refers to individuals aged 36 years and older. This category consists of individuals aged 36 years and older. They are typically highly experienced, senior professionals or experts in their field.

Gender:

- **1:** Represents Male individuals.
- **2:** Represents Female individuals.

Education:

- **1:** Represents individuals with a Bachelor's Degree. Individuals holding a Bachelor's degree fall into this category. It indicates a fundamental level of higher education, often associated with entry-level positions.
- **2:** Represents individuals with a Master's Degree. This category includes individuals who have earned a Master's degree, signifying advanced education and often associated with mid-level or specialized roles.
- **3:** Represents individuals with a Doctoral Degree. Individuals with a Doctoral degree are placed in this category. This represents the highest level of formal education and is often linked to expert or leadership roles.

The demographic breakdown highlights a diverse group of participants, with varied representation across different genders, positions, age groups, education levels, and professions. This diversity is beneficial for understanding different perspectives and experiences related to the study's focus on VR-enhanced gamification in business settings.

Table 13: Classified Descriptives

Descriptives

	Mean	Median	SD
Proficiency	2.00	2.00	0.752
Position	1.72	2.00	0.726
Age	1.78	2.00	0.811
Gender	1.34	1.00	0.476
Education	1.36	1.00	0.560

Table 14: Survey Demographics & Frequencies

Frequencies

Frequencies of Proficiency

Proficiency	Counts	% of Total	Cumulative %
1	28	28.0 %	28.0 %
2	44	44.0 %	72.0 %
3	28	28.0 %	100.0 %

Frequencies of Position

Position	Counts	% of Total	Cumulative %
1	44	44.0 %	44.0 %
2	40	40.0 %	84.0 %
3	16	16.0 %	100.0 %

Frequencies of Age

Age	Counts	% of Total	Cumulative %
1	46	46.0 %	46.0 %
2	30	30.0 %	76.0 %
3	24	24.0 %	100.0 %

Frequencies of Gender

Gender	Counts	% of Total	Cumulative %
1	66	66.0 %	66.0 %
2	34	34.0 %	100.0 %

Frequencies of EducationC

Education	Counts	% of Total	Cumulative %
1	68	68.0 %	68.0 %
2	28	28.0 %	96.0 %
3	4	4.0 %	100.0 %

3.6.4. Linear regression analysis

From table 15 to 23, the effects of variables such as Proficiency**,** Position, and Age on C (Competition), EN (Engagement), and OE (Outcome Expectation) were analyzed. The dependent variables, C, EN, and OE, represent individuals' behavioral tendencies regarding competition, engagement, and outcome expectations. Using linear regression, the influence of each independent variable (Proficiency, Position, Age) on these three dependent variables was tested separately. The regression analyses are explained through R^2 values, which represent the proportion of variance in the dependent variable explained by the model, while the p-values indicate the statistical significance of the independent variables. The purpose of the analyses is to understand the impact of proficiency, position, and age on individuals' competition, engagement, and outcome expectations, and to determine whether these factors have a significant effect.

Table 15: Linear Regression Between Competition and Proficiency

Model Fit Measures

Model	R	R^2
1	0.292	0.0855

Model Coefficients - C SUM

Predictor	Estimate	SE	t	p
Intercept	4.172	0.1595	26.15	< .001
Proficiency	-0.226	0.0747	-3.03	0.003

The regression analysis in the Table 15 examines the relationship between Proficiency levels and Competition scores (C SUM). The results indicate that proficiency has a significant impact on competition scores, but the model explains only a small portion of the variance, with an R^2 of 0.0855, meaning only 8.55% of the variability in competition scores is explained by proficiency. The negative coefficient for proficiency (-0.226, $p = 0.003$) suggests that as proficiency increases, competition scores decrease significantly. While this relationship is statistically significant, the low R^2 value implies that proficiency alone is not a strong predictor of competition scores, and other factors are likely contributing more substantially to competition tendencies.

Table 16: Linear Regression between Competition and Age

Model Fit Measures

Model	R	R^2
1	0.232	0.0537

Model Coefficients - C SUM

Predictor	Estimate	SE	t	p
Intercept	4.016	0.1377	29.16	< .001
Age	-0.166	0.0705	-2.36	0.020

The regression analysis in Table 16 examines the relationship between Age groups and Competition scores (C SUM). The results show that age significantly impacts competition scores, but the model explains only a small portion of the variance, with an R^2 of 0.0537, indicating that only 5.37% of the variability in competition scores is explained by age. The negative coefficient for age (-0.166, p = 0.020) suggests that as age increases, competition scores decrease significantly. Despite the statistical significance of this relationship, the low R^2 value implies that age alone is not a strong predictor of competition scores, and additional factors are likely influencing competitive tendencies more heavily.

Table 17: Linear Regression between Competition and Position

Model Fit Measures

Model	R	R^2
1	0.0995	0.00991

Model Coefficients - C SUM

Predictor	Estimate	SE	t	p
Intercept	3.5828	0.1503	23.845	< .001
Position	0.0798	0.0805	0.990	0.325

The regression analysis in Table 17 examines the relationship between Position (Junior, Senior, Expert) and Competition scores (C SUM). The results reveal that the impact of position on competition scores is not statistically significant, as indicated by the p-value of 0.325, which is well above the conventional threshold of 0.05.

Additionally, the model explains a very small portion of the variance, with an R^2 of 0.00991, meaning only 0.99% of the variability in competition scores is explained by position. The positive coefficient for position (0.0798) suggests a slight increase in competition scores as position advances, but this effect is not statistically meaningful. Overall, position does not appear to be a strong predictor of competition scores in this model.

Table 18: Linear Regression between Entertainment and Proficiency

Model Fit Measures

Model	R	R^2
1	0.250	0.0624

Model Coefficients - EN SUM

Predictor	Estimate	SE	t	p
Intercept	4.208	0.1592	26.42	< .001
Proficiency	-0.190	0.0746	-2.55	0.012

The regression analysis in Table 18 examines the relationship between Proficiency levels and Engagement scores (EN SUM). The results indicate that proficiency has a statistically significant impact on engagement scores, with a p-value of 0.012. The negative coefficient for proficiency (-0.190) suggests that as proficiency increases, engagement scores decrease significantly. However, the model explains only a small portion of the variance, with an R^2 of 0.0624, meaning only 6.24% of the variability in engagement scores is explained by proficiency. While proficiency has a meaningful effect on engagement, the low R^2 value suggests that other factors, not included in the model, play a more substantial role in influencing engagement levels.

Table 19: Linear Regression Between Entertainment and Age

Model Fit Measures

Model	R	R^2
1	0.228	0.0518

Model Coefficients - EN SUM

Predictor	Estimate	SE	t	p
Intercept	4.113	0.1359	30.27	< .001
Age	-0.161	0.0695	-2.31	0.023

The regression analysis in Table 19 examines the relationship between Age groups and Engagement scores (EN SUM). The results show that age has a statistically significant impact on engagement, with a p-value of 0.023. The negative coefficient for age (-0.161) suggests that as age increases, engagement scores decrease significantly. However, the model explains only a small portion of the variance, with an R^2 of 0.0518, meaning only 5.18% of the variability in engagement scores is explained by age. While age does have a statistically significant effect on engagement, the low R^2 indicates that other factors not accounted for in this model likely have a stronger influence on engagement behaviors.

Table 20: Linear Regression Between Entertainment and Position

Model Fit Measures

Model	R	R^2
1	0.0116	1.36e-4

Model Coefficients - EN SUM

Predictor	Estimate	SE	t	p
Intercept	3.81084	0.1489	25.601	< .001
Position	0.00920	0.0798	0.115	0.908

The regression analysis in Table 20 examines the relationship between Position (Junior, Senior, Expert) and Engagement scores (EN SUM). The results show that position does not have a statistically significant impact on engagement, as indicated

by the p-value of 0.908, which is far above the conventional threshold of 0.05. Additionally, the model explains virtually none of the variance, with an extremely low R^2 of 0.000136, meaning that position accounts for only 0.0136% of the variability in engagement scores. The coefficient for position (0.00920) suggests a very minor increase in engagement scores as position advances, but this effect is not statistically meaningful. Overall, position is not a meaningful predictor of engagement scores in this model, and other variables likely play a much larger role in determining engagement.

Table 21: Linear Regression between Outcome Expectation and Proficiency

Model Fit Measures

Model	R	R^2
1	0.265	0.0704

Model Coefficients - OE SUM

Predictor	Estimate	SE	t	p
Intercept	4.246	0.2100	20.22	< .001
Proficiency	-0.268	0.0983	-2.72	0.008

The regression analysis in Table 21 examines the relationship between Proficiency levels and Outcome Expectations (OE SUM). The results indicate that proficiency has a statistically significant impact on outcome expectations, with a p-value of 0.008. The negative coefficient for proficiency (-0.268) suggests that as proficiency increases, outcome expectations decrease significantly. The model explains 7.04% of the variance in outcome expectations, as indicated by the R^2 of 0.0704. While the effect of proficiency on outcome expectations is statistically significant, the relatively low R^2 value suggests that proficiency alone explains only a small portion of the variability in outcome expectations, and other factors likely play a more substantial role in influencing these expectations.

Table 22: Linear Regression between Outcome Expectation and Age

Model Fit Measures

Model	R	R^2
1	0.236	0.0556

Model Coefficients - OE SUM

Predictor	Estimate	SE	t	p
Intercept	4.103	0.1796	22.85	< .001
Age	-0.221	0.0919	-2.40	0.018

The regression analysis in Table 22 examines the relationship between Age groups and Outcome Expectations (OE SUM). The results show that age has a statistically significant impact on outcome expectations, with a p-value of 0.018. The negative coefficient for age (-0.221) suggests that as age increases, outcome expectations decrease significantly. The model explains 5.56% of the variance in outcome expectations, as indicated by the R^2 of 0.0556. Although the effect of age on outcome expectations is statistically significant, the low R^2 value suggests that age alone explains only a small portion of the variability in outcome expectations, implying that other factors may have a more substantial influence.

Table 23: Linear Regression between Outcome Expectation and Position

Model Fit Measures

Model	R	R^2
1	0.0161	2.60e-4

Model Coefficients - OE SUM

Predictor	Estimate	SE	t	p
Intercept	3.6810	0.197	18.674	< .001
Position	0.0169	0.106	0.160	0.873

The regression analysis in Table 23 examines the relationship between Position (Junior, Senior, Expert) and Outcome Expectations (OE SUM). The results show that

position does not have a statistically significant impact on outcome expectations, as indicated by the p-value of 0.873, which is far above the conventional significance threshold of 0.05. Additionally, the model explains an extremely small portion of the variance, with an R^2 of 0.00026, meaning that position accounts for only 0.026% of the variability in outcome expectations. The coefficient for position (0.0169) suggests a very slight increase in outcome expectations as position advances, but this effect is neither statistically nor practically meaningful. Overall, position is not a meaningful predictor of outcome expectations in this model.

CHAPTER 4: RESULTS

4.1. Findings

The analysis focused on three main constructs: Competition, Engagement, and Outcome Expectations, which were tested against independent variables like Proficiency, Position, and Age. Linear regression models were employed to examine the relationship between these variables, revealing important patterns regarding how different demographic and skill-based factors influence behavior in a Virtual Reality (VR)-enabled gamified environment.

- *Competition (H1):*
    - The regression results show that proficiency has a statistically significant negative effect on competition scores ($p = 0.003$), meaning that as proficiency increases, competition scores decrease. This suggests that more proficient employees tend to feel less competitive in VR-based gamified environments.
    - However, the R^2 value of the model was low (8.55%), indicating that proficiency only explains a small portion of the variance in competition scores, suggesting other factors not included in the model might play a larger role in influencing competitive dynamics.
    - Given these results, the null hypothesis (H0) for competition is rejected, as proficiency has a significant effect on competition scores, although the direction of the effect (negative) is contrary to the expectations of H1.

- *Entertainment (H2):*
    - *Proficiency* was again found to have a significant negative effect on entertainment scores ($p = 0.012$), with higher proficiency being associated with lower levels of entertainment in the gamified VR setting.
    - The R^2 value was low (6.24%), suggesting that proficiency explains only a small part of the variation in entertainment scores. Other unmeasured factors likely contribute to the entertainment experience in VR environments.

- Based on these findings, the null hypothesis (H0) for entertainment is rejected, but the relationship is negative, indicating that VR might not enhance entertainment for more proficient employees as initially hypothesized.

- *Outcome Expectation (H4):*
  - The analysis of outcome expectations revealed that proficiency had a significant negative impact ($p = 0.008$), where employees with higher proficiency reported lower outcome expectations. This suggests that more proficient employees may not believe VR-based gamification enhances their expected outcomes.
  - The R^2 value was 7.04%, indicating that while proficiency is a significant predictor, other factors likely play a more substantial role in shaping outcome expectations.
  - The null hypothesis (H0) for outcome expectations is rejected due to the significant relationship, but the negative effect of proficiency contradicts the original hypothesis (H4), suggesting that VR does not necessarily optimize task difficulty and skill level balance for more proficient employees.

4.2.Discussion

The results suggest that while VR-based gamification does have an impact on competition, engagement, and outcome expectations, the effects are complex and do not align with the initial hypotheses. Proficiency, in particular, played a key role across all three constructs but led to unexpected negative effects, particularly for more experienced employees.

- *Competition (H1):* The original hypothesis proposed that VR would enhance competitive dynamics and fulfill the competence need as outlined by Self-Determination Theory (SDT), leading to better performance. However, the results show that higher proficiency is linked to lower competition scores, possibly indicating that more experienced employees feel less challenged by the competitive elements in a VR environment. This contradicts the assumption

in H1, as experienced employees may find the competitive aspects less relevant to their skill level, leading to diminished interest in competition.

- *Entertainment (H2):* The expectation was that VR would enhance entertainment and promote a flow state in employees, leading to deeper engagement. However, the data shows a significant decline in entertainment for more proficient employees. This suggests that the novelty of VR may wear off for those who are more experienced, leading them to find the environment less entertaining. This outcome challenges Flow Theory's assertion that an optimal balance of challenge and skill leads to higher entertainment or flow; in this case, VR may not provide sufficient novelty or complexity for proficient employees to sustain high entertainment levels.
- *Impact of Learning* (H3): The hypothesis proposed that VR-enabled gamification would enhance employees' learning outcomes by promoting autonomy, a key aspect of Self-Determination Theory (SDT). However, the results revealed a negative relationship between proficiency and learning expectations, with more experienced employees reporting lower expectations from VR for learning. The low R^2 value suggests proficiency explains little of the variance in learning outcomes, and weak internal consistency (low Cronbach's alpha) further undermines the reliability of the findings. Therefore, the null hypothesis (H0) for H3 cannot be rejected, indicating that VR-based gamification does not significantly improve learning outcomes or autonomy, particularly for more proficient employees.
- *Outcome Expectation (H4):* The hypothesis predicted that VR would raise outcome expectations by optimizing the balance between task difficulty and skill, increasing motivation and performance. Contrary to this expectation, the analysis revealed a significant negative relationship between proficiency and outcome expectations. More proficient employees may feel that VR-based tasks are not challenging enough to enhance their expected outcomes, possibly due to their higher skill level making the tasks feel trivial or irrelevant.
- *Engagement (H5):* proposed that VR-based gamification would enhance employee engagement by fulfilling the need for relatedness, as per Self-Determination Theory (SDT). However, the reliability analysis (low Cronbach's alpha) indicated weak internal consistency in measuring engagement, potentially undermining the conclusions. The regression analysis

showed that proficiency had a significant negative effect on engagement ($p = 0.012$), while position had no significant impact ($p = 0.908$). As a result, the null hypothesis (H0) cannot be rejected, suggesting that VR-based gamification, as implemented, does not effectively increase engagement, particularly for more proficient employees. These findings imply that experienced employees may need more personalized, social, or complex challenges to stay engaged.

4.3.Insights and Implications from the Results

The regression analyses reveal several insights about the use of Virtual Reality (VR) in gamified work environments, especially in relation to proficiency, competition, engagement, and outcome expectations.

- *Tailoring VR Experiences by Proficiency Level:* The consistent negative impact of proficiency across all three constructs suggests that VR-based gamification might be more suitable for less experienced employees. For more proficient employees, the experiences could be tailored to include more complex tasks or higher-level challenges that better align with their advanced skills, potentially increasing engagement, competition, and outcome expectations.
- *Novelty and Long-term Engagement:* The reduced engagement and outcome expectations among proficient employees may be due to the novelty of VR diminishing over time. VR might be more effective as an introductory tool for new or less experienced employees, while continuous updates and evolving content could help maintain long-term engagement for more experienced staff.
- *VR as a Learning and Training Tool:* While VR may not significantly increase competition or engagement for proficient employees, it could still serve as a powerful tool for immersive training and skill development, especially in environments where practical, hands-on learning is needed.
- *Social and Collaborative Features:* VR environments might better support experienced employees by incorporating team-based dynamics instead of focusing solely on individual competition. These social elements could help satisfy relatedness needs, as suggested by Self-Determination Theory, making VR a more effective tool for collaboration and employee engagement.

- *Other Factors to Consider:* The low R^2 values across the models suggest that proficiency alone does not fully explain employee behavior in VR-enabled gamification environments. Other factors such as personality traits, job roles, or task complexity likely play important roles in shaping behavior and should be explored in future research.

4.4.Conclusion

The analyses indicate that proficiency plays a crucial role in shaping how employees perceive competition, entertainment, and outcome expectations in Virtual Reality (VR)-based gamified workplace environments. Contrary to initial hypotheses, more proficient employees (those with higher experience and skill levels) consistently reported lower competition, entertainment, and outcome expectation scores. This suggests that VR-based gamification, which often aims to increase engagement and performance, may not be as effective for experienced employees as it is for less proficient individuals.

The findings provide valuable insights into how VR-based gamification works in practice, particularly in relation to different proficiency levels. For less experienced employees, VR appears to offer a novel, engaging environment that can fulfill needs related to competition, entertainment, and outcome expectations. These employees, who are still developing their skills and learning new tasks, might find the VR environment more challenging and stimulating, which aligns with the core principles of Self-Determination Theory (SDT) and Flow Theory.

However, for more proficient employees, the results point to a different reality. Employees with more advanced skills and longer experience seem to derive less benefit from the competitive and entertainment elements of VR-based gamification. This suggests that as employees' proficiency increases, their motivational drivers may shift away from external rewards like competition and entertainment toward more intrinsic motivators, such as mastery and personal development. The reduced outcome expectations for proficient employees further support this notion. Experienced employees may view VR-based tasks as less challenging or less relevant to their actual work, which could reduce their expectations for meaningful outcomes or improvements in performance.

These findings challenge traditional assumptions about Self-Determination Theory (SDT) and Flow Theory in the context of VR. Both theories suggest that environments that balance skill level with challenge should enhance motivation and engagement. However, in the case of more proficient employees, VR may not provide sufficient complexity or novelty to create the optimal challenge-skill balance needed for sustained engagement. Instead, experienced employees may require more personalized and advanced challenges that push their skills further to maintain interest and motivation.

REFERENCES

Alfadil, M. (2020). The effectiveness of virtual reality game in foreign language vocabulary acquisition. Computers & Education, 153, 103893. https://doi.org/10.1016/j.compedu.2020.103893

Baccarne, B., Evens, T., & Schuurman, D. (2014). The role of business model design in the development of new media applications: A case study on eSports. *Journal of Media Business Studies, 11*(1), 25-48. https://doi.org/10.1080/16522354.2014.11073574

Bailenson, J. (2018). *Experience on Demand: What Virtual Reality Is, How It Works, and What It Can Do.* W.W. Norton & Company.

Chen, K. C., & Jang, S. J. (2010). Motivation in online learning: Testing a model of self-determination theory. *Computers in Human Behavior*, 26(4), 741-752. https://doi.org/10.1016/j.chb.2010.01.011

Chou, Y.-K. (2015). Actionable gamification: Beyond points, badges, and leaderboards. *Octalysis Media*.

Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. Journal of Applied Psychology, 78(1), 98-104. https://doi.org/10.1037/0021-9010.78.1.98

Csikszentmihalyi, M. (1990). Flow: The psychology of optimal experience. Harper & Row.

Csikszentmihalyi, M. (1997). Finding flow: The psychology of engagement with everyday life. Basic Books.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*(4), 227-268. https://doi.org/10.1207/S15327965PLI1104_01

Deci, E. L., & Ryan, R. M. (2002). Handbook of Self-Determination Research. University of Rochester Press.

Fuchs, P. (2018). *Virtual reality headsets – a theoretical and pragmatic approach*.

Guo, Z., Xiao, L., Van Toorn, C., Lai, Y., & Seo, C. (2016). Promoting online learners' continuance intention: An integrated flow framework. *Information & Management*, 53(2), 279-295. https://doi.org/10.1016/j.im.2015.10.010

Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does gamification work?—A literature review of empirical studies on gamification. *Proceedings of the 47th Hawaii International Conference on System Sciences*, 3025-3034. https://doi.org/10.1109/HICSS.2014.377

Hazarika, A., & Rahmati, M. (2023). Towards an Evolved Immersive Experience: Exploring 5G- and Beyond-Enabled Ultra-Low-Latency Communications for Augmented and Virtual Reality. Sensors, 23(7), 3682. https://doi.org/10.3390/s23073682

Hilfert, T., & König, M. (2016). Low-cost virtual reality environment for engineering and construction. Visualization in Engineering, 4(1). doi:10.1186/s40327-015-0031-5

Hollensen, S., Kotler, P., & Opresnik, M. O. (2021). Social Media Marketing: A Practitioner Guide. *Journal of Business Research, 123*, 232-239.

Hunicke, R., LeBlanc, M., & Zubek, R. (2004). MDA: A formal approach to game design and game research. In *Proceedings of the AAAI Workshop on Challenges in Game AI* (Vol. 4, pp. 1-5). http://www.cs.northwestern.edu/~hunicke/MDA.pdf

IKEA. (2017). *IKEA VR Experience*. Retrieved from https://www.ikea.com/global/en/newsroom/innovation/ikea-invites-people-to-make-virtual-pancakes--releases-a-virtual-reality-app-on-steam-170530/

Incao, J. (2018, September 20). How VR is Transforming the Way We Train Associates. Retrieved from https://corporate.walmart.com/news/2018/09/20/how-vr-is-transforming-the-way-we-train-associates

Jerald, J. (2015). *The VR Book: Human-Centered Design for Virtual Reality.* Association for Computing Machinery and Morgan & Claypool.

Ke, F., Xie, K., & Xie, Y. (2016). Game-based learning engagement: A theory- and data-driven exploration. *British Journal of Educational Technology*, 47(6), 1183–1201. https://doi.org/10.1111/bjet.12340

Koivisto, J., & Hamari, J. (2019). The rise of motivational information systems: A review of gamification research. *International Journal of Information Management*, 45, 191-210. https://doi.org/10.1016/j.ijinfomgt.2018.10.013

Kozlenkova, I. V., Samaha, S. A., & Palmatier, R. W. (2020). Resource-based theory in marketing. *Journal of the Academy of Marketing Science, 42*(1), 1-21. https://doi.org/10.1007/s11747-013-0336-7

Laver, K., Lange, B., George, S., Deutsch, J. E., & Saposnik, G. (2017). Virtual reality for stroke rehabilitation. Cochrane Database of Systematic Reviews, 11(11). https://doi.org/10.1002/14651858.CD008349.pub4

Makransky, G., Terkildsen, T. S., & Mayer, R. E. (2017). Adding immersive virtual reality to a science lab simulation causes more presence but less learning. Learning and Instruction. https://doi:10.1016/j.learninstruc.2017.12.007

Martín-Gutiérrez, J. (2016). Virtual Technologies Trends in Education. EURASIA Journal of Mathematics, Science and Technology Education, 13(1). https://doi:10.12973/eurasia.2017.00626a

McKinsey & Company. (2019). Product development gets a makeover—with virtual reality. Retrieved from https://www.mckinsey.com/about-us/new-at-mckinsey-blog/product-development-gets-a-makeover-with-virtual-reality.

Merchant, Z., Goetz, E. T., Cifuentes, L., Keeney-Kennicutt, W., & Davis, T. J. (2014). Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and higher education: A meta-analysis. *Computers & Education, 70*, 29-40. https://doi.org/10.1016/j.compedu.2013.07.033

Moro, C., Štromberga, Z., Raikos, A., & Stirling, A. (2017). The effectiveness of virtual and augmented reality in health sciences and medical anatomy. Anatomical Sciences Education, 10(6), 549-559. https://doi.org/10.1002/ase.1696.

Morozova, A. (n.d.) *Walmart and VR training* Walmart and VR training https://www.jasoren.com/walmart-vr-training/

Morschheuser, B., Maedche, A., & Walter, D. (2019). Designing cooperative gamification: Conceptualization and prototypical implementation. International Journal of Human-Computer Studies, 127, 7-25. https://doi.org/10.1145/2998181.2998272

Nakamura, J., & Csikszentmihalyi, M. (2009). Flow theory and research. In C. R. Snyder & S. J. Lopez (Eds.), Oxford Handbook of Positive Psychology (2nd ed., pp. 195-206). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780195187243.013.0018

Opriş, D., Pintea, S., García-Palacios, A., Botella, C., Szamosközi, S., & David, D. (2012). Virtual reality exposure therapy in anxiety disorders: A quantitative meta-analysis. *Depression and Anxiety*, *29*(2), 85-93. https://doi.org/10.1002/da.20910

Ozlem Baydas & Mithat Cicek (2019) The examination of the gamification process in undergraduate education: a scale development study, Technology, Pedagogy and Education, 28:3, 269-285, DOI: 10.1080/1475939X.2019.1580609

Pantano, E., Rese, A., & Baier, D. (2017). *Enhancing the Online Decision-Making Process by Using Augmented Reality: A Two-Country Comparison of Youth Markets.* Journal of Retailing and Consumer Services, 38, 81-95. https://doi.org/10.1016/j.jretconser.2017.05.011

Pottle, J. (2019). *Virtual Reality and the Transformation of Medical Education.* Future Healthcare Journal, 6(3), 181-185. https://doi.org/10.7861/fhj.2019-0036

PWC. (2020). *The effectiveness of virtual reality soft skills training in the enterprise*. Retrieved from https://www.pwc.com/us/en/services/consulting/technology/emerging-technology/assets/pwc-understanding-the-effectiveness-of-soft-skills-training-in-the-enterprise-a-study.pdf?utm_campaign=1764995_July%202020%20Newsletter_Immerse%20UK&utm_medium=email&utm_source=dotdigital&dm_t=0,0,0,0,0

Rebenitsch, L., & Owen, C. (2016). Review on cybersickness in applications and visual displays. Virtual Reality, 20(2), 101-125. https://doi.org/10.1007/s10055-016-0285-9

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), 68-78. https://doi.org/10.1037/0003-066X.55.1.68

Ryan, R. M., & Deci, E. L. (2017). Self-Determination Theory: Basic psychological needs in motivation, development, and wellness. *Guilford Press*.

Sailer, M., Hense, J., Mandl, H., & Klevers, M. (2013). Psychological perspectives on motivation through gamification. *Interaction Design and Architecture(s) Journal - IxD&A*, 27, 28-37. https://doi.org/ 10.55612/s-5002-019-002

Schell, J. (2008). The art of game design: A book of lenses. *CRC Press*.

Seymour, N. E., Gallagher, A. G., Roman, S. A., O'Brien, M. K., Bansal, V. K., Andersen, D. K., & Satava, R. M. (2002). Virtual reality training improves operating room performance: Results of a randomized, double-blinded study. *Annals of Surgery, 236*(4), 458-463. https://doi.org/10.1097/00000658-200210000-00008

Shernoff, D. J., Csikszentmihalyi, M., Schneider, B., & Shernoff, E. S. (2014). Student engagement in high school classrooms from the perspective of flow theory. Applications of Flow in Human Development and Education (pp. 475-494). Springer. https://doi.org/10.1007/978-94-017-9094-9_24

Slater, M. (2009). Place illusion and plausibility can lead to realistic behavior in immersive virtual environments. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *364*(1535), 3549-3557. https://doi.org/10.1098/rstb.2009.0138

Slater, M., & Sanchez-Vives, M. V. (2016). *Enhancing Our Lives with Immersive Virtual Reality*. Frontiers in Robotics and AI, 3(74). https://doi.org/10.3389/frobt.2016.00074

Tondello, G. F., Wehbe, R. R., Diamond, L., Busch, M., Marczewski, A., & Nacke, L. E. (2016). The Gamification User Types Hexad Scale. Proceedings of the 2016 Annual Symposium on Computer-Human Interaction in Play - CHI PLAY '16. https://doi:10.1145/2967934.2968082

TrainingIndustry. (2022). How Bank of America deployed and scaled VR to advance workplace learning: A case study. Retrieved from https://trainingindustry.com/articles/learning-technologies/how-bank-of-america-deployed-and-scaled-vr-to-advance-workplace-learning-a-case-study/

Trizano-Hermosilla, I., & Alvarado, J. M. (2016). Best alternatives to Cronbach's alpha reliability in realistic conditions: Congeneric and asymmetrical measurements. *Frontiers in Psychology*, 7, 769. DOI: 10.3389/fpsyg.2016.00769

University of Virginia Library. (n.d.). Using and interpreting Cronbach's alpha. UVA Library. https://library.virginia.edu/data/articles/using-and-interpreting-cronbachs-alpha

Vansteenkiste, M., Niemiec, C. P., & Soenens, B. (2010). The development of the five mini-theories of self-determination theory: An historical overview, emerging trends, and future directions. In T. Urdan & S. A. Karabenick (Eds.), *The Decade Ahead: Theoretical Perspectives on Motivation and Achievement* (Vol. 16, pp. 105-165). Emerald Group Publishing Limited. https://doi.org/10.1108/S0749-7423(2010)000016A007

VirtualSpeech. (2023). Examples of VR used for training – Industry case studies. Retrieved from https://virtualspeech.com/blog/examples-of-vr-used-for-training-industry-case-studies

Werbach, K., & Hunter, D. (2012). For the win: How game thinking can revolutionize your business. Wharton Digital Press.

Xi, N., & Hamari, J. (2019). Does gamification satisfy needs? A study on the relationship between gamification features and intrinsic need satisfaction. *International Journal of Information Management*, 46, 210-221. https://doi.org/10.1016/j.ijinfomgt.2018.12.002

Zichermann, G., & Cunningham, C. (2011). Gamification by design: Implementing game mechanics in web and mobile apps. O'Reilly Media.

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Workplace	**Position**	**Year**
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Date: 09.09.2024