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EXPLORING THE INTENTION TO USE THE METAVERSE: A STUDY OF FORTNITE THROUGH UTAUT

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Dissertação apresentada ao IADE - Faculdade de Design, Tecnologia e Comunicação da Universidade Europeia, para cumprimento dos requisitos necessários à obtenção do grau de Mestre em Marketing e Inovação realizada sob a orientação científica do Doutor Joaquim António Aurélio Casaca, professor auxiliar do IADE - Faculdade de Design Tecnologia e Comunicação da Universidade Europeia.

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palavras-chave Metaverso; Videojogos; Gaming; Fortnite; UTAUT.

resumo

O “metaverso” tornou-se um conceito de grande destaque, especialmente desde 2021, quando Mark Zuckerberg apresentou a *Meta*, o novo nome do *Facebook* que conectaria pessoas de maneiras inovadoras, criaria comunidades e faria crescer negócios através do “metaverso”.

Apesar do entusiasmo, ainda existem muitas perguntas sem resposta sobre este tópico. Este estudo foca-se em analisar os fatores que influenciam a intenção do uso da tecnologia pelos utilizadores, usando uma versão adaptada do modelo *Unified Theory of Acceptance and Use of Technology* (UTAUT).

O *Fortnite* destaca-se como um exemplo proeminente de um “metaverso”, oferecendo perceções únicas sobre as interações dos utilizadores dentro de um ambiente virtual, beneficiando de uma grande base de utilizadores, o que enriquece a vertente empírica deste estudo.

Para abordar estas questões, foi utilizado um questionário difundido em várias redes sociais e fóruns especializados no *Fortnite*, recolhendo respostas de utilizadores ativos do jogo. O estudo identifica os fatores que impulsionam a intenção dos utilizadores de usar o “metaverso” dentro do *Fortnite*, e os resultados refletem o papel significativo dos constructos do UTAUT, destacando-se a adição de fatores emocionais e de autoestima, considerando-se pioneiro por essa integração. Os resultados refletem o papel significativo dos constructos do UTAUT, especificamente a expectativa de desempenho (*Performance Expectancy* - PE), a influência social (*Social Influence* - SI) e a expectativa de esforço (*Effort Expectancy*

- EE), aprimorados pela adição de fatores emocionais e de autoestima. As condições facilitadoras (*Facilitating Conditions* - FC) não apresentaram um impacto significativo na intenção de uso. Estas descobertas oferecem perceções valiosas sobre como aumentar o envolvimento dos utilizadores com o "metaverso", destacando que emoções positivas e autoestima elevada podem catalisar a intenção de uso, enquanto emoções negativas podem dificultar essa intenção.

Keywords Metaverse; Gaming; Fortnite; UTAUT; Technology Acceptance.

abstract

The metaverse has become a big word specially since 2021 when Mark Zuckerberg present Meta, the new naming of Facebook that would connect people in novel ways, create communities and grow businesses, through the metaverse.

Despite the enthusiasm, there are still a lot of unanswered questions about this topic. This study focusses on the factors influencing user intention to use the technology, using an adapted version of Unified Theory of Acceptance and Use of Technology (UTAUT) model.

Fortnite stands out as a prominent example of a usable metaverse, offering unique insights into user interactions and acceptance within a virtual environment, benefiting from a large user base, which enriches the data of this empirical study.

To address these questions, a survey was distributed across social media platforms and forums specialized in Fortnite, collecting responses from active users of the game.

The study identifies the factors that drive users' intention to use the metaverse within Fortnite. The results reflect the significant role of UTAUT constructs, with a particular emphasis on the addition of emotional and self-esteem factors, being considered pioneering for this integration.

The findings highlight the significant role of UTAUT constructs, specifically performance expectancy (PE), social influence (SI), and effort expectancy (EE), enhanced by the addition of emotional and self-esteem factors. Facilitating

conditions (FC) did not show a significant impact on the intention to use. These discoveries offer valuable insights on how to increase user engagement with the metaverse, highlighting that positive emotions and high self-esteem can catalyze the intention to use, while negative emotions may hinder this intention.

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Introduction

The rapid evolution of technology has profoundly impacted various aspects of human life, driving the development of new digital environments and platforms that transform how people interact, work, and entertain themselves. One of the most notable advancements in this domain is the concept of the metaverse, a term that gained attention during the COVID-19 pandemic. Initially popularized by Neal Stephenson's science fiction work, the metaverse refers to a three-dimensional digital world where users, represented by avatars, engage in immersive and interactive experiences.

Despite the enthusiasm surrounding this technology, many unanswered questions remain about it. One of the central questions is to understand if there will be one big metaverse merged in a unique centralized platform, or several ones, meaning different immersive and open universes where people, or avatars controlled by people, can coexist (Canavarro & Moreira, 2024). Virtual and immersive environments such as videogames (Fortnite, Roblox, The Sandbox, Decentraland, etc.) are currently the most concrete examples we have of what is defined as the metaverse, also called its antecessors (Dwivedi et al., 2022), and we are still far from this holistic approach in which there is only one metaverse where people can coexist.

Fortnite stands out due to its substantial user base and its evolution from a survival video game to a comprehensive social space. Fortnite has evolved from a survival videogame to a social space where users can attend concerts, participate in cultural events, and interact in novel ways. This is one of the reasons that places this game/platform on the top line when discussing metaverse use. Fortnite's popularity and its organic transformation (Sullivan, 2022) underscores the metaverse's potential to redefine social norms and practices and the pioneering role the game is playing in the development of the metaverse, with its large user base and innovative features, is an excellent opportunity for empirical studies. As a gaming platform, Fortnite introduces specific psychological dynamics, prompting the inclusion of emotional and psychological factors, such as emotions and self-esteem, in this research. These additions aim to uncover patterns and relationships that traditional models might overlook. The incorporation of social interactions, and the immersive experience sets a backdrop against which the UTAUT constructs may be explored within a real-world scenario. Given this context, the primary research questions guiding this study

are: What are the key factors that drive user intention to use metaverse applications? How do emotional and psychological factors, such as emotions and self-esteem, impact this intention? How does the integration of gaming elements in Fortnite influence the intention to use it as a metaverse platform?

Therefore, the main goals of this research are: 1) to identify the key factors that drive user intention to use metaverse applications; 2) to examine the influence of emotional and psychological factors, particularly emotions and self-esteem, on user intention to engage with the metaverse, and to elucidate the mechanisms through which these factors affect acceptance; 3) to assess how the integration of a gaming platform can enhance the user intention to engage with the metaverse.

In order to gather accurate data from a relevant audience, a Google Forms survey was conducted. The survey utilized, on its vast majority, a five-point Likert scale to capture participants' levels of agreement or disagreement with various statements related to the constructs under investigation. Data collection was running for almost 2 months, utilizing multiple distribution channels, including social media platforms like Instagram, Facebook, and specialized forums on Reddit, to reach a specific and engaged audience. Out of the initial 172 responses, 96 were confirmed to be actively engaged with Fortnite, providing the solid basis for data analysis.

To analyze the data and validate the research questions, Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed. This statistical technique is well-suited for exploratory research and theory development, as it allows for the examination of complex relationships between observed and latent variables. PLS-SEM was used to assess the measurement model, ensuring the reliability and validity of the constructs, and to evaluate the structural model to test the hypothesized relationships. This methodological approach not only validated the research questions but also provided insightful findings into the factors influencing user intentions to use metaverse applications, particularly within the context of Fortnite.

The conclusions of the analysis reveal that performance expectancy, effort expectancy, and social influence significantly influence user intention to use the metaverse. Positive emotions and self-esteem were also found to enhance behavioral intention and effort expectancy, while negative emotions had a negative impact on the intention to use, making the metaverse seem harder to handle. However, facilitating conditions did not significantly affect behavioral intention,

suggesting that users may not view software and hardware readiness as crucial for their intention to use the metaverse.

The first chapter covers the theoretical framework, beginning with the definition and concepts of the metaverse, also including the discussion on gaming and the specific context of Fortnite, followed by a comprehensive explanation of the Unified Theory of Acceptance and Use of Technology (UTAUT), and finished by the theoretical support of the proposed model, building all the research hypothesis. The second chapter introduces the research methodology, the sample analyzed, its characteristics, data collection and the measurement items used in the survey. The third chapter presents the data analysis, discussing the methods used and the results obtained from the empirical study. The final chapter concludes the dissertation with a discussion of the findings, contributions to theory and practice, limitations of the study, and suggestions for future research.

1. Literature review

1.1. The Metaverse

1.1.1. What is it?

The metaverse has become a big word nowadays, especially after COVID-19 pandemic that affected the world in 2020. However, and although it may seem like it, the term "metaverse" was not originally created by Mark Zuckerberg and it didn't show up when *Facebook* took the renaming to *Meta*. Neal Stephenson, who's known as a science fiction author, mentioned it as a "three-dimensional digital world" where instead of real people, we have avatars interacting with each other in this simulated environment (Bolger, 2021).

In order to define properly the term, we have to accept that a static definition is yet to be found. It is still a hard task to manage to define this term as it is very dynamic and continuously evolving, which can assume different forms when explained by different investigators (Ritterbusch & Teichmann, 2023). We need to have in mind that its definition can vary based on point of view and purpose (Dwivedi et al., 2022).

Metaverse can be defined as "a crossword of "meta" - meaning transcendency - and "universe", which describes a three-dimensional online environment where users, represented by avatars, interact with each other in virtual spaces decoupled from the real physical world.". The shortest and the most commonly accepted definition is "a virtual replication of the real world dedicated for users to interact with each other" (Ritterbusch & Teichmann, 2023, p. 6).

The metaverse is able to connect digital and physical worlds (Buhalis et al., 2022), being a space where real and unreal can coexist (Park et al. 2022), which gives a new set of opportunities to explore in terms of experiences. It can be described as a new immersive and interactive way to interact on the internet (Dwivedi et al., 2022). This disruptive nature of the metaverse is likely to blur some lines between physical and digital world from what we know and see nowadays. It allows us to imagine a new dimension of reality, where these boundaries are dissolved and the user merge seamlessly with the digital universe (Dwivedi et al., 2022).

Dwivedi et al. (2022) defines the metaverse based on four different types: environment, interface, interaction and social value.

Environment includes realistic, unrealistic and fused environments. Realistic reflects physical elements and geography in the real world. For example, avatars cannot exist in 2 places simultaneously, and the flow of actions occurs in a similar pace according to what happens outside the virtual world. Although it can be limited in the sensations able to provide, such as atmosphere, smell and tactile, it can be very useful for some activities like museum visits. Unrealistic environment erases these time and space barriers. It can be freely use without any constraints that could not make sense outside of a simulated environment, like gravity, allowing users to have completely new experiences and explore opportunities that are not possible in the real world, such as visiting another planet, for example. It requires a polished environment with different type of users, having a distinguished way to see the world, as the sense of reality is not really present here. The fused environment, on the other hand, it compiles both already mentioned environments, adding virtual elements to a realistic world.

Interface can be built around 3D, immersive and physical methods. 3D is not a fundamental topic to build a metaverse environment, but it is still present in many definitions of the topic, as shown previously and also stated below by (Ramadhan et al., 2023). Most metaverse environments includes 3D as it increases realism, but it is also something that requires a higher level of software and hardware in order to render it. The immersive element is crucial to influence user involvement with metaverse. The immersive side is brought by physical tools like VR glasses to simulate end user's senses. This immersive side biggest disadvantage is how easy it can lead to user disconnection from reality. Also, adding into this feeling caught in metaverse can also be brought to reality, creating a confusion between what is real and what is virtual. Physical elements are important to increase the immersive side of metaverse, enhancing the user's experience. As we are still in a very early scenario where these physical elements can really provide the realism that they promise, it is still very difficult to mirror actions and feelings from the real world, such as hugs and handshakes.

Interaction is classified by the authors into three different types: social networking, collaboration and persona dialog.

It is this interaction that maintains the community and the environment. The collaboration between users creating value to the metaverse and keeps it developing as a real society does. Persona dialog includes both interactions user to user and user-NPC (non-player characters). It is important to mention that in the metaverse not only avatar to avatar conversations is possible but also interactions between the user's avatar and animals, which adds a relatively big layer of exaggeration, that can lead to violent expressions and interactions.

The metaverse can bring up many questions regarding the social value that it potentially adds up to the society, being sustainability and interdisciplinary studies the main factors that can contribute to this topic. The metaverse can be a place where people can create things and reach levels of self-improvement and care that they cannot do in the real world for some reason, showing in the virtual world a face that does not exist outside of it. Interdisciplinary research gives its contribute by giving tools for metaverse to develop as a solid environment with an organized community, very far away from a simple three-dimensional playground where avatars can play and interact. Physical, phycological, financial, philosophical and many other field laws simply cannot be applied here the same way it is in the real world.

For Ramadhan et al. (2023), a metaverse has three different points that serve as criteria to determine if a technology can or cannot be labeled as "metaverse", and these are:

1. It must be a **shared virtual space** - the metaverse must be a virtual space where people interact, communicate and collaborate, so they must be sharing the same place, in order to make that possible.
2. Represented in a **3D environment** - it must be represented in a 3D context, which can be 100% immersive (VR), and to some extent augmented (AR).
3. Accessed with using **specialized software or hardware** - as stated before, by using specific devices like VR headsets and AR devices, the experience can be enhanced.

The immersive side is brought to the user by the 3D character of the platforms that should be used with the help of devices like VR headsets and haptic gloves.

Ramadhan et al. (2023) also states that there are seven key concepts that contributes for its set up: virtual worlds, avatars, virtual reality, augmented reality, social media, virtual economy and virtual reality commerce. Given the similarity of these two concepts - virtual worlds and virtual reality - and their potential to resemblance, a distinction is essential. The main difference spotted

between relies on the idea that virtual worlds encompass a broader category of environments, while virtual reality is the technology itself that aims to immerse user in the computer-generated environment. Virtual reality can be used within the many virtual worlds to enrich overall metaverse's experience, which is also something explained in the Table 1.

Table 1

The Components of Metaverse

Component	Definition	Relation with Metaverse
Virtual Worlds	Computer-generated, immersive and interactive environments, that users can access it through specialized hardware to enhance their experience. It offers interactive environments that cater to diverse activities, encompassing social interactions, gaming, and educational pursuits.	Virtual worlds are components of the broader metaverse concept, contributing to its interconnected digital landscape that can be seamlessly accessed and navigated by users. It implies that different virtual worlds, platforms, and experiences are linked together, allowing users to move between them and interact across a unified digital realm.
Avatars	Digital representations or personas that users adopt and customize to interact and navigate within virtual environments, providing a personalized and expressive means of interaction.	Allows users to have an individual representation in the metaverse environment.
Virtual Reality	The technology responsible to deliver the experience that simulates the physical reality in computer-generated environment.	The virtual reality is what makes metaverse the digital mirror of the physical world, enhancing the immersion and interactivity of the

		technology, making it feel more lifelike and engaging for users.
Augmented Reality	Technology able to overlay digital information - images, videos, or data - in the user's view of the real world, using devices like smartphones or AR glasses. The physical world, as the user sees it, is improved with the addition of these virtual elements.	AR enriches the metaverse experience, by adding context and information to the virtual environments, making the metaverse more immersive, and interactive.
Social Media	Digital platform that allows users to communicate and interact between each other.	Social media, and the networking possible to obtain from it, takes the essence of our current social media platforms we use every day to a different context, where virtual spaces are connected instead of real ones. It stands as a fundamental force fostering connections and enhancing the current social experiences within a metaverse landscape that is developing even faster than our well-known world. The crucial question about the social value of the metaverse is that if there is a new value or some kind of addition to the society on the top of what we currently already have.
Virtual Economy	The use of virtual currency in order to buy, sell or trade goods and services.	Virtual economy is crucial in a virtual universe. It takes an integral part of metaverse, providing users

		the ability to create, trade and exchange value, enabling users to engage in economic activities that contribute to the immersive and interconnected digital landscape of the metaverse itself. It can be also a way for users to monetize their activities in the metaverse. we can see already a few signs of this cultural change concerning the human behavior. We can take the gaming industry as a good example to analyze the social dynamics and behaviors, as it is the main propeller of the metaverse. Today, on those platforms, we can already trade virtual assets, such as accessories for avatars (Fernandez & Hui, 2022).
Virtual Reality Commerce	The use of virtual reality technology, such as VR glasses, to promote and smooth commerce activities.	In the metaverse, users can navigate through virtual stores, browse different types of virtual products/services, and make purchases with the help of virtual currencies. This feature leverages the immersive and interactive nature of the metaverse, taking the experience to the next level.

Note. Adapted from Ramadhan et al. (2023)

1.1.2. Metaverse now and then

Back in 2006, the metaverse was generally studied and mentioned as the "Second Life environment" (Park & Kim, 2022), Linden Lab's most iconic product ever. However, the current scenario is very different, as we have a lot of new platforms that changes the way metaverse is viewed and experienced, like Roblox, Zepeto (Dwivedi et al., 2022) and Fortnite. For Ramadhan et al. (2023), examples of metaverses includes virtual worlds - such as Second Life and World of Warcraft, tailored for socializing, gaming and/or learning. On the other hand, in the augmented reality field, something that has evolved during the years, games like Pokémon Go and Ingress have entered in the metaverse topic as it superimposes digital content onto reality. In addition to it, the new Apple product - Vision Pro - shifted the world's perception of how augmented reality can be used for socializing, collaboration, and much more.

Dwivedi et al. (2022) and Park & Kim (2022) finds some different differences between the "old" metaverse and the current one:

1. It offers more immersion and realism, due to the fast development of deep learning technologies that can increase the accuracy of vision and language recognition.
2. It's more convenient due to the ability to be accessed from mobile devices and it is not exclusively relied on PC, as before. We cannot deny the usage time increase on social media (e.g., TikTok, YouTube), which also hypes up the producers/content creators, and creates this positive flow of content, advertisement and investment.
3. Security evolution in terms of blockchain and virtual currency, such as Dime and Bitcoin, have boosted the economic efficiency and stability of metaverse services. The virtual currency in metaverse adds another layer of connection with the real world, giving people deeper social meaning.
4. Due to new restrictions on offline social activities, like the impact of Covid-19, as stated before, the interest in the virtual world and in the metaverse has highly increased.

Park & Kim (2022, p.1) also states that "unlike previous studies on the Metaverse based on Second Life, the current Metaverse is based on the social value of Generation Z that online and offline selves are not different". Roblox, already referred as one of the most important platforms concerning the metaverse, has 150 million monthly active subscribers, used by 2/3 of American

children aged 9-12, and 1/3 aged under 16. Inside Roblox, there are 50 million games accumulating 3 billion hours of monthly usage (Park & Kim, 2022).

The new era of the metaverse started in 2021, when Mark Zuckerberg presented *Meta*, and announced that it would be responsible for connecting people in order to find new communities and create new businesses (Canavarro & Moreira, 2024).

"The next platform will be even more immersive — an embodied internet where you're in the experience, not just looking at it. We call this the metaverse, and it will touch every product we build. (…) Today we're seen as a social media company. (…) Over time, I hope we are seen as a metaverse company, and I want to anchor our work and our identity on what we're building towards." (Zuckerberg, 2021, p.1).

People also changed a lot of their habits, after the global pandemic, and a big part of that transformation was about digitalization of products and services consumed, with a huge increase of e-commerce market - this is also why it is important to study their emotions, feelings, intentions and behaviors. Still, and as mentioned, metaverse requires not only a switch in terms of mentality, but also more and more software and hardware resources. The scenario of everyone having VR glasses and haptic gloves at home might seem quite distant yet. Nevertheless, this market is expected to get to 250 billion US dollars by the year 2028 (Ritterbusch & Teichmann, 2023a).

As it is perceived, the metaverse can be used to do an infinite number of different things. Users can go shopping (digital or physical goods), try the products on their avatar, learn new things, travel, play, socialize, and many more. This opens a brand-new universe for brands to create exclusive experiences. Speaking on the brands' side, this represents different strategies to reach and engage their audience. It is indeed relevant to connect this online shopping increasing with the solutions metaverse has to offer, such as 3D product selection, cryptocurrency payment, etc. (Toraman, 2022). In terms of how to enter in the metaverse world and engage with their communities, some companies may go down the path of having their own platform, as others prefers to use support from other platforms, like Decentraland, Fortnite, Roblox or VRChat, which can be also called the "antecedents of the metaverse" (Dwivedi et al., 2022).

Sunsilk, a shampoo brand, created the "Sunsilk City" in Roblox environment where users have access to a beach, sports fields, and gardens to sharpen their creativity. The players can create new hairstyles in their own salon while learning about Sunsilk products. Apart from that, this whole city is also used as a source of inspiration to women to follow her dreams as it has different

games and courses to encourage them to follow and fight for her dreams and know their importance in society (Wongkitrungrueng & Suprawan, 2023) - so it is possible to add messages as a different layer to what brands can do with metaverse and impact the world or their communities.

Following the evolution of technologies topic, specifically the ones associated with the metaverse, there is an innovation brought by Apple, and with release date scheduled in early 2024, that has the potential to change our current point of view on this matter. The Apple "Vision Pro" is an innovation that can combine the concepts of virtual reality (VR) and augmented reality (AR), exemplifying how the excitement and adoption of technologies can shift quite unpredictably within the current market landscape.

1.1.3. Metaverse and Web3

The ordinary and expected evolution of things brought us to this new era called Web 3.0. It all started on Web 1.0, where we for the first time had an internet connection, which suffered a significant enough transformation to be called a new era - Web 2.0, where people actually created communities online, being this a new way to be connected. Nowadays, we are witnessing a similar transformation in information technology which we are naturally calling it Web 3.0 or "spatial web". This last and recent one has the ability to bring a new way to be online and connected to other people all over the world and erase the hurdles between digital content and physical objects (Cook et al., 2020), in a deeper sense rather than the "phygital" concept.

On the other hand, we have an open and free nature of Metaverse that allows us to dig in some new ways to make transactions - "a new economy that may be a kind of virtual real economy" (Ritterbusch & Teichmann, 2023, p. 5), where new goods are traded, with new types of currencies and there could be either new service areas appearing.

The cryptocurrencies are often associated with the concept of a new decentralized Metaverse economy. For Ritterbusch & Teichmann, (2023), it can the bridge between Metaverse and the real world. Cryptocurrency is already a reality, with people using it everyday - either to use it or only for an investment perspective - so the general idea about this is to have a specific type of coin to use in the Metaverse and that could be traded for a physical currency at any moment, through an exchange market in the platform (Ritterbusch & Teichmann, 2023a).

In a more tangible way, there are already some application fields identified, such as health, education, finance, tourism, banking, etc. (Toraman, 2022). We can see some movements in the industry as well already, like *Facebook*, that was recently - in 2021 - renamed to *Meta*, precisely in order to catch and, eventually, lead this movement. In addition to this idea, *Meta* invested 10 billion United States dollars (USD), to develop this cutting edge technology focusing in delivering the best experience possible to the users (Dwivedi et al., 2022). Following this movement, *Microsoft*, *Alphabet*, *Nvidia* and *Decentraland Foundation* invested in the same technology.

About the market itself, it is expected that with the a normal implementation and adoption of the technology, the *metaverse* market size grow to values floating between 8 trillion and 13 trillion US dollars (Ritterbusch & Teichmann, 2023a).

As the metaverse is integrated with Web3, there are some key factors that distinguish it from the "old-fashioned" Web2, that we are currently living in. This new universe gives limitless options to sharp and improve the customer/user experience, rather than the current way of doing digital marketing, in which the focus is to target people in a personalized way and track all the touchpoints during the customer journey. This enhancement of features does not mean that digital marketing will be replaced by the metaverse, but rather that it can enjoy unique opportunities with its arrival (Dwivedi et al., 2022) , such as measurability, new ways to avoid consumer aversion to advertising, metaverse based virtual marketing, metaverse based virtual product selling, and new opportunities to content creators.

1.1.4. Applications of the metaverse

The metaverse is commonly associated to the gaming as well as work and collaboration environments/industries (Park & Kim, 2022). Nevertheless, the authors claim a framework is needed to map all the different applications to a better understanding and distinguish between reality and virtual reality. This framework is based on different fundamental points, representing an application: simulation, game, office, social, marketing and education.

Sun et al. (2022) refers six main application areas of the metaverse: education, smart city, culture, medicine, business and manufacturing. Wang et al. (2023) research goes in the same direction, as the mentioned application areas are: Smart City, Entertainment and Game industry,

Remote office/virtual meetings, Digital sightseeing/tourism/exhibition, Psychotherapy, Education, Economy, Social and Culture.

Dwivedi et al. (2022) states that the applications of the metaverse can be split into metaverse as a tool and metaverse as a target. The first one aims to solve problems, as the second one refers to the ability of the tool to develop and generate profit. The metaverse as a tool is when we use the metaverse for tasks that are difficult to do in the real world, which allows better management of both human and financial resources. A couple examples we can include in this group are exploring remote areas, training recruits for war zones, simulating social phenomena, aircraft engineering, and much more. The metaverse as a target, on the other hand, is when the technology itself is seen as a purpose/goal. Instead of using it to help on completing some kind of task, the technology is a key to generate a new market, income/profit, and new opportunities. Within the metaverse as a tool we can mention office/work, social life, education and healthcare, as the metaverse as a target includes gaming, business, role playing and real estate (Dwivedi et al., 2022).

After analyzing different types of articles and authors around the topic, what goes as a filtered and objective list of metaverse applications includes work, social life, education, healthcare, gaming, business, tourism and real estate.

In the work environment, the rise of remote work contributed for many companies around the world to create new virtual ways to collaborate and work together, allowing users/colleagues to meet in these virtual spaces (Dwivedi et al., 2022). The current solutions for online collaboration have a lack in terms of sense of space. The metaverse can supplement that gap with spatial audio technology to provide speech and footsteps according to distance inside the virtual world. Representative examples of that are Branch, Gather and Teamflow (Park & Kim, 2022). The metaverse office, as Dwivedi et al. (2022) calls it, provides an user experience capable of replacing the real world's offices, with the help of the already mentioned sense of space. The main challenge with this application is with security, as a lot of information data must remain secret and secure.

The social life can be related to metaverse supported on 2 different points, being them the ability to connect and build network through the metaverse, but also that sociology and social problems can be alleviated with the help of this new technology. People are socializing already through the internet, and it is not expected for people to disregard this need due to humans being

fundamentally social animals, but the metaverse can bring some advantages as it integrates the offline and social network experiences into one (Dwivedi et al., 2022). Apart from transforming social networking, the metaverse can be also helpful in terms of hosting social events that are mainly attended offline now such as museums and concerts, even though we can already see some online transition already happening there. The main advantages are within the current limitations we can face, such as capacity and time constraints, felt for example in a crowded museum or concert. There is still a huge difference in the feeling of an offline attendance but there is already studies being conducted to evaluate how are these experiences evolving and potentially enhanced (Park & Kim, 2022). On the other hand, avatars can change their skin color and gender, just like in any game, and that can be helpful to reduce discrimination and preconceived social ideas and judgments. The abundance of resources in the metaverse, which contrasts with the limitation of it in the real world, can be helpful to reduce competitiveness and give users the utopia of community and equal interests. In the metaverse, in the beginning it could be harder to see cultural patterns and behaviors, since that emerge from long times of cultural and regional patterns in the world. The metaverse, on the other hand, is not bounded with these cultural constraints. Even if the virtual world tries to mirror the real one, over time, there is the potential of it to diverge from the offline world, generating its own distinct world, with its own cultural expressions and norms (Dwivedi et al., 2022). In this avatar environment, where everything can be tracked, social problems can be effectively simulated, and more investigations/researches can take place "in the form of surveys and role-play" (Park & Kim, 2022).

Education is the third concept in the list and is one of the most popular areas in terms of metaverse application having a high potential for popularization in practice (Park & Kim, 2022). The limitations brought by the global pandemic dramatically accelerated and led to the increase of digital content. The immersive side of the technology applied to education can be more effective than the audiovisual side we have now (Dwivedi et al., 2022). Park & Kim, (2022) also share the vision where education has a highly increase in terms of student performance, as the practical side is added to the theoretical one. There are some examples shared by both authors. For example, it must be really hard for some students to really understand by visualizing how radiation behaves and spreads. Rather than just preconceived it and, in some cases, see it drawn in paper, with the metaverse, this can be analyzed by experiencing it in the metaverse, which increases the absorbed information, triggered by engagement and immersion.

On the healthcare side of things, COVID-19 was the trigger to the digitalization of healthcare industry, forcing us to seek other solutions rather than putting physically the doctor and patient in the same room. Due to that, we can say healthcare may undergo some changes, namely in terms of telemedicine that is already a commonplace nowadays, with the advantages we know in terms of convenience for both the doctor and the patient. Metaverse can also bring new and enhance current experiences in the healthcare system. The patient information can be monitored inside the metaverse, and it can also bring some advantages in terms of psychiatric group therapy as it "reduces time and solves spaces problems" (Dwivedi et al., 2022). Seeing a doctor physically can be very time consuming, and we could also see (with the COVID-19 era) how effective telemedicine can be and become. Apart from that, healthcare professionals can use the metaverse to systemize complex organ surgeries, for example, in a hierarchical way, which helps in reducing human errors. The idea is to have a more structured and organized approach to surgical procedures, making it smoother to plan and execute surgeries with greater precision and safety for the patient (Dwivedi et al., 2022). Metaverse would be able to work seamlessly across platforms and hospitals, so data can still be transferred as efficient as nowadays. It is crucial that this integration and migration is very well accomplished, having in mind that it could depend on the evolution of other sibling technologies, such as AR, VR, AI, high-speed network connection, high-end hardware, etc. Obviously, it brings some challenges, in terms of data security and institutional arrangements, for example to substitute the current treatment for drugs, as we are talking about people's life and their problems, so the ethical part must be fundamental in order to make this technology useful in practice (Bansal et al., 2022).

Gaming is considered the founder of metaverse (Oliveira & Cruz, 2023) and we can say it is the most suitable application for metaverse, as it is there where we can actually see what the outcomes are of having a virtual reality where people/avatars socialize with each other and enjoy different experiences in a digital environment, and where we can track what are the reactions and behaviors upon new challenges brought by it. It is through games that we can actually understand what practically the metaverse can be. Gaming offers a new reality, a new world, where the social rules and the day-to-day can be transformed. Currently, we can say that games and real life are completely separated worlds, but the metaverse can bring this overlap between two different worlds, blurring some lines with the additional gaming experiences that may be reflected in user's real life - gamifying the day-to-day process, like going to work (Dwivedi et al., 2022). Also, a very

valid point raised by Dwivedi et al. (2022) is the new market that is opened by the integration needed from our current videogames and the transition needed for it to be used in the metaverse. What matters to understand is that beyond only entertainment, games can help to simplify complex tasks (Park & Kim, 2022), gamifying them in the metaverse, which means bringing the joy and fun so present in the gaming industry (Oliveira & Cruz, 2023). The gaming experience has brought us a very tiny line between what is gaming and what is not. We can access the metaverse the same way we currently do to play a videogame - augmented and virtual reality devices, game consoles, laptops, mobile phones, etc. and this is what gives this clearer vision about the metaverse, if we compare it to the gaming universe (Oliveira & Cruz, 2023).

Business-wise, digitalization, transformation and innovation are keywords for business subsistence (Vig, 2023). As mentioned, the metaverse bring new experiences, touchpoints and interactions, which opens a whole different new range of opportunities to the companies. Supported on other technologies like VR and AR, a digital immersive customer journey is built, where customers can virtually test and try different products, transfiguring the customer experience. Digital events can take place, such as art exhibitions, business fairs, product launches, or concerts, where brands can be present re-shaping their experience. “The metaverse is where companies utilize their potential as a new market” (Dwivedi et al., 2022). According to Mehta et al. (2023), metaverse is one of the innovations - which is called “digital transformation” in their article - that are more impactful in business. With the advantages of less resources needed to reach the customers in the digital environment, and with a most likely younger hot market, new models of business can arise in the metaverse, with companies exploring a new market opening, and taking advantage of it (Dwivedi et al., 2022). So far, brands like Nike, Gucci, McDonald’s are already taking the pole position in this reality shift, whereas Google, Microsoft, Meta and Nvidia are the main investors in the technology (Vig, 2023). Apart from security and privacy issues, companies can face also some constraints when wondering if they should or not jump and surf this new wave, due to the relevance for their audience to be there (Vig, 2023). It is expected that brands with younger audiences to be the first ones to make their moves into the metaverse world.

Tourism is also an area where metaverse can influence, mainly facilitating the relationship between the traveler and the business part which takes care of the whole trip plan (Buhalis et al., 2023). It can give travelers new tools and ways to plan their holidays, making informed decisions

based on this simulated reality brought by the metaverse. At the time being, it surely lacks the sensory details of being physically in the desired place, but the goal of this integration is not to completely replace it, but to give an easier way to customers to make the correct decision.

Real Estate is another great topic that can be explored in the metaverse by their users by several reasons. With the metaverse emerging so fast, quickly the urge of buying metaverse properties, also called “land” burst. Earth2 is a platform where people can buy and/or sell properties as we do in the real world (Dwivedi et al., 2022). Apart from that, new opportunities arise in the way Real Estate is being accomplished, even in the real world. Buyers can visit a house - or their 3D rendered version - that they have interest in, being there with the seller, without leaving the current place, and see with a great level of detail the house and all of the facilities, without physically leaving their place (Nesaif & Shagufta, 2023).

Further than this, studies were conducted in this field, and led to findings concerning the behavior change influenced by the innovation and ease of use of the technology for this goal, showing that the users have are more willing to visit a property after this experience rather than just seeing static images (Nesaif & Shagufta, 2023), showing that the metaverse can actually influence and change the way real estate is currently operating. In super competitive house markets, like Dubai for example, that also holds the passion for high-end technology, the metaverse can play an important role to meet high expectations of this very specific and demanding market.

1.1.5. Downsides, Challenges and Threaths

Building such a vast digital universe must bring new challenges. Fernandez & Hui (2022) split this development in three different areas: privacy, governance and ethical design.

Dwivedi et al. (2022) extends the challenges to the sustainability, meaning this that the metaverse should be accessible to everyone. It should not be too resource demanding, being accessible also in low-end devices, so it can be getting to as many users as possible, lowering the entrance barriers. This sustainability goes further to the interface where AR and VR can be supported by holograms and lenses, so it enhances the immersive experience, and these should be commercialized so we can have a more homogenic environment for every user. The interactions

in the metaverse should also be something taken in consideration, in cases for example of users that don't master the English language - most used for interaction in digital world - to have a real time translation, which makes the technology a bit more inclusive to everyone. Also, NPCs should be supported by artificial intelligence, so interactions with users can seem as realistic as possible.

Apart from that, Dwivedi et al. (2022) refers privacy and security as a big part of the metaverse challenges. As we have now hackers and other type of evil-minded people on the internet - and it is so easy to find them -, the metaverse should be taking this as a central matter in question. Cybersecurity cannot be disregarded since we are still in the digital world, and people's safety should still be a critical priority for developers. The authors highlight several different types of security to have in mind: data security, privacy, software and hardware security, and network security.

Data security is, as the name stands, the attention to maintain safe the huge amount of data that users can generate, such as personal messages and information, corporate and sensitive data, and other type of communication that should not be hacked (like voice recordings, for instance), as this is expected to be shared in real time, as it is also nowadays the case. Better measures of security, like encryption and authentication are almost mandatory to fight this issue. This is also related with the privacy concept, where privacy policies and responsibilities should be implemented by the platform providers/managers in order to make it a safe place for users (Dwivedi et al., 2022).

All of this threats already mentioned, can be spotted as malwares, exposing users to malicious content. It happened for example in Roblox that hackers infected the platform with ransomware, while spreading racist and sensational messages to users, asking for money to unlock it again, so it is a crucial concerning from software developers to have their platforms secure as much as possible, so that the technology can be used for the good things detailed above and not to become a place where no one feels safe. The same must happen with hardware devices, since these plays also a crucial part in the metaverse experience. Authors highlight how these can be remotely controlled by hackers and therefore how important it is to maintain it up to date and always following every safety measure (Dwivedi et al., 2022).

In summary, security and privacy play as an important role in the metaverse as now in the internet that we know and use. It should be mandatory to have it and through every stage of the technology development and commercialization, implementing for example the "security by

design" approach, that basically means everything must be designed already ensuring privacy and security are maintained. To do this effectively, Dwivedi et al. (2022) suggests advanced protection technologies, like automated and flexible data access control using artificial intelligence. While metaverse shares the same security and privacy concerns with our current IT services and devices, it's essential to create a tailored strategy to address its unique features, rather than just relying on existing measures. Additionally, and not less important, it is fundamental to set-up protection strategies towards copyright of content created in the metaverse.

1.1.6. What if the metaverse becomes more attractive than the reality?

When we talk about technology, and its development into new realities, it should be more than fair to analyze how it could be negatively impacting the user's life. Nowadays, we already know how addictive technology can be, and how the companies work towards keeping people glued to their phone and to a specific app for hours straight.

According to Bojic (2022), metaverse can reach a point where it becomes more attractive than reality. Some studies presented on Bojic (2022) shows some indications on this vulnerability of humans towards technology. We are now more intense when consuming media, we tend to deprecate the old ways of consuming media when we are used to use this new and faster way brought by technology advance, and with the developments of VR, gaming is becoming more immersive and consequently more addictive. Metaverse is following this new media trend, and therefore can become an issue when developed and rolled-out for the masses, if that will ever be the case.

1.1.7. Will it be mainstream?

The idea of metaverse is to fully overlap physical and virtual worlds, reaching a development phase called "surreality". The future seems to be closer to a paradigm where the digital environment and life will be integrated into the physical one so much that will dominate it and not the other way around, as we currently see it. However, the possibility of metaverse to become mainstream is related to many different things. We are still very far away from the

metaverse being present for the masses. Bojic (2022) analyzes the power that technology has and how the addiction of people towards it can be very harmful being controlled by big tech companies.

The massive adoption of the metaverse could show many different undesirable consequences for the society as we currently know. Several different authors that focused their research work in these problems that may arise from the metaverse has emphasized social issues like abusive behavior towards each other, bullying, sexual content display, racism, threats, exploitation of minors, and addiction to the simulated reality.

1.2. Gaming

1.2.1. Definition

Gaming per se can be related with the activity of playing a single game. Playing a game can be a way of having fun with your friends and that, connected with competition, challenges, cooperation towards an action, is what keep people tied to them (Liang, 2022).

Although the action of playing a game goes back to 3500 BC, it has evolved a lot since then. The natural evolution of this strong connection can - and did for part of the population - become an addiction and is also due to that a whole industry become to build around it. The technology evolution also changed the way people played games, bringing a different way to play and have fun - through videogames. It has evolved so much that today gaming is usually related with the action of playing an electronic game, being it now part of popular culture as well (Cole et al., 2023). Those (video)games can be played from many different devices such as a laptop, consoles, mobile phone and tablets. This ease of use, apart what was already stated, contributes for its popularity, and this can be measured. According to Von der Heiden et al. (2019), the hours passed playing electronic games increased from 5,1 to 6,5 weekly hours in 6 years - from 2011 to 2017, and it is something that more than two billion people all over the world do (Von der Heiden et al., 2019).

As initially stated in the first paragraph of this topic, it is crucial to understand that gaming is more than this definition, it is a social experience. Apart from the recreation and fun, people play, especially online games, to interact with their friends, and it is also important to notice that it is algo being used for learning, for example (Cole et al., 2023). Following that trend, nowadays,

gaming has gained a lot of brand's attention as a good and innovative way to interact with their customers.

1.2.2. Video-Gaming and Metaverse

As stated already, gaming industry it is one of the most common and reliable applications of the metaverse, being even considered the creator of the metaverse (Oliveira & Cruz, 2023).

Gaming has been around for a long time now evolving according to the players wants and needs to interact more with other people/gamers (Oliveira & Cruz, 2023) by becoming more realistic and immersive with technology evolution. The social side of gaming is truly relevant if we understand people play because they are able to connect through videogames with other people that share the same esteem for a specific game.

This industry has become more relevant over the years in terms of freeing people from the boundaries established in the real world, by giving the users endless possibilities and experiences in the digital environment. This unique experience and this feeling of freedom that keep users engaged is one of the factors that explains how the industry has evolved so much over the years (Oliveira & Cruz, 2023). In fact, there are companies using games to engage players in innovative ways. Fornite is one of them and will be explained in the next chapter. The other one, also closely explored, is Roblox. IKEA, the very famous Swedish furniture brand, has come up with "the co-worker game", which will allow players to experience IKEA from inside, without having to leave their desk/laptop. The idea is that players will be allowed to work on IKEA in the virtual world, using Roblox, performing tasks such as serving virtual meatballs and redesigning showroom floors. IKEA UK is offering to pay English players for their time in the game, mirroring real-world employment and career progression opportunities within the virtual environment. It is a bold move to integrate gaming into brand strategy, aiming to provide a new way to explore career opportunities at IKEA. The virtual store not only promotes IKEA's products and services but also reinforces the company's philosophy of career flexibility and growth, both in the virtual and real world. This initiative is a practical example of how the metaverse can diffuse digital and physical environments, being an approach that demonstrates the potential of the metaverse to create

immersive brand experiences that blend digital interactions with real-world elements. Darren Taylor, Country People and Culture Manager of IKEA UK and Ireland has said: “We’re excited to be the first brand to launch paid work on Roblox to showcase how we do careers differently, bringing our unique careers philosophy to life. At IKEA, there is no set route to career progression. Our co-workers are able to change roles, switch departments, and grow in any direction they choose, both in the game or in the real world. There are many ways to learn and grow at IKEA, and that's what IKEA on Roblox is all about.” (IKEA UK, 2024).

“The gaming world offers alternative worlds that distance the social rules and quotidian” (Oliveira & Cruz, 2023) is the perfect sentence to flawlessly connect gaming and the main topic of this document – the metaverse.

1.2.3. Fortnite

Fortnite, already highlighted as one of the many different ways to be in the metaverse, is a videogame created by Epic Games and released in 2017, where a maximum of 100 players in the same gaming session are dropped into an island that reveals itself as a battleground. They must fight each other until only one player remains standing - being this one the winner of the game. This is the main version of the game, the one that made it famous at the first place, called Battle Royale (Jungherr & Schlarb, 2022).

It is one of the most famous games in this market, getting around 60 to 80 million active players a month and registered 350 million players back in May 2020. It is a free game, being the income (17 billion US dollars) generated through in-game purchases of outfits, accessories or specific maps/modes (Jungherr & Schlarb, 2022). It is not possible to get any competitive advantage from spending real money in the game. The list of impressive records beaten by this Battle Royale game are almost endless. In 2020, 15.3 million players got online at the same time(Fortnite, 2020).

The question is: “How does a survival game can be transformed in a digital environment where avatars can interact and have a good time interacting with each other?” The answer to this was given by Epic Games CEO, Tim Sweeney. Fortnite became much more complex than a battle

royale game, being considered a metaverse that grew organically. The players started staying in Fortnite's 3D world even after finishing their matches, simply to socialize with friends. Epic Games, realizing this phenomenon, created events such as concerts and movie previews inside the game (Sullivan, 2022), that not only kept this people entertained but brought even more curios individuals.

There are already some events in Fortnite we can rely on, with giant names of the music industry, such as Travis Scott, Ariana Grande, Marshmello and Diplo. Although it is known by the Battle Royale, there were some developments added to the game that led to some evolution regarding on how you can use and play the game. With the new add-ons where players can build their own servers, adjust the rules and the personalize completely their experience, new realities and new virtual worlds are being generated. "Party Royale" is the name of the revolution. In this mode, there is no goal of survival or combat. It was specifically created for the players to interact, attend events, or give themselves some kind of cultural richness by watching movies through their avatar. By adding this leisure layer into the game, Fortnite was able to call the attention of a whole new audience that will never open the game for the shooter mode (Jungherr & Schlarb, 2022). (Jungherr & Schlarb, 2022), in their research, shows how Fortnite can be a crucial vehicle to reach the virtual world where people communicate with each other through avatars - the metaverse.

Back in 2020 Fortnite was the host of Travis Scott's digital concert called 'Astronomical'. More than 12 million people gathered to attend this massive and innovative event. Even though this was a recorded concert, not a live performance as for example Marshmello's - the first ever Fortnite concert -, there was a big hype around the event converted in millions and millions of people seeing, sharing and talking about it, and this was also an opportunity to share with the world a (at that time) new single with another big name of the hip-hop industry Kid Cudi. Instead of a real performance, the artist avatar landed on the Fortnite map, performing "Sicko Mode", while the fans were bouncing and dancing to the distinctive beat of one of his most famous songs. It was such a game changer in terms of what it was possible, and how complex we can go in the digital events environment that it only lasted for less than 10 minutes (G. Park, 2020). A few months later, Ariana Grande also performed in Fortnite, enhancing even more the experience of attending to a concert through a digital platform. After these kind of events, new add-ons were added to the game, such as emotions, outfits and other kind of accessories that could be used in the game afterwards.

Where things get interesting is when we get to know Fortnite's almost unique characteristics, and the endless opportunities that a single platform can provide. Epic Games are very open to share their popular game with external companies and brands. There are various examples of partnerships that Fortnite already did, and musical artists, as shown above, are not the only way Fortnite can generate hype and attention. Tim Sweeney admits it can be a shared space for people, creators, and brands that is not yet fully ready, that has its challenges (Canavarro & Moreira, 2024) but, as we can see, that is taking some shape already.

Amazon is getting in the "game", there are a lot of in-game purchases users can get that completely transform the way Fortnite can be used, flawlessly in any platform a user can reach, thanks to their cloud gaming service called "Luna" (Amazon, 2023), that allow monthly paying users to play a diverse number of games, across devices.

Also, adding into that, there is a new feature within the game - LEGO Fortnite (The Fortnite Team, 2023)- where users can build their own world, and get as creative as their minds allow to, everything based on the famous danish bricks. This seems to be the very beginning of a Battle Royale game opening to a digital social universe itself, a platform where you can find anything to do, and everyone to chat with, after you impersonate your avatar.

The list goes beyond other digital games, also getting into famous movies and TV shows, such as Marvel, DC Comics, Stranger Things, Star Wars, Rick and Morty and Naruto. Fortnite and Balenciaga is an example that marks the fusion of the game with the fashion industry and collaborations with famous celebrities in sports (with the NBA player LeBron James, the Formula 1 driver Lewis Hamilton, and the football player Neymar Jr.) contributed to this long history of very iconic crossovers of the game platform.

These are only a few examples of partnerships that really shifts the way this platform is being perceived by their community, and gaming enthusiastics in general. This difference is what makes Fortnite so interesting in the metaverse perspective, bringing the social part and, most important, attention, hype, and desire to be in this world.

1.3. Unified Theory of Acceptance and Use of Technology

1.3.1. Description of the model

The Unified Theory of Acceptance and Use of Technology (UTAUT) is a unified framework, proposed in 2003 by Venkatesh et al. (2003) that provides results and insights related to a user intention to adopt a technology, as well as the behavior associated to that action (Teng et al., 2022).

It is a framework that follows the evolution of other eight theories and models related to acceptance and use of technology - the model of PC utilization (MPCU), the theories of reasoned action (TRA), planned behavior (TPB), diffusion (IDT) and social cognitive (SCT) theories, as well as the motivational (MM) and technology acceptance model (TAM) (Lee & Kim, 2022), as shown in the Table 2.

Table 2

Models related with UTAUT

Framework	Definition/Usage	Core Constructs
Technology Acceptance Model (TAM)	The TAM model is one of the most reliable predictors/explainers of user acceptance of information technology (Sulaiman et al., 2023). It was proposed by Fred Davis in 1986 and was refined from TRA. According to this framework, the adoption success of a new technology relies on how practical and easy the technology seems to be and also on user's level of interest and behavior towards the technology (Saleh et al., 2022).	Perceived Usefulness; Perceived Ease of Use

Model of PC Utilization (MPCU)	Model brought by (Thompson et al., 1991), adopted from the theory of human behavior (1997) from Triandis. The MPCU is an enhanced version of the human behavior model used for information science and applied it to PC utilization (Mohamed et al., 2021). Venkatesh et al. (2003) refers this model as relevant to be used in individual acceptance and adoption of multiple technologies.	Job-fit; Complexity; Long-term consequences; Affect Towards Life; Social Factors; Facilitating Conditions
Theories of Reasoned Action (TRA)	The Theory of Reasoned Action, developed (Fishbein & Ajzen, 1977) and considered the most relevant theories related to human behavior, says "the behavior of a person is determined by his or her behavioral intention (BI) to perform the behavior."	Attitude Toward Behavior; Subjective Norm
Theory of Planned Behavior (TPB)	Comes from TRA with a new core construct added - behavioral control. TPB claims that to execute an action/behavior, the person should have control on the possibility to execute it. The new construct is related with the "the perceived ease or difficulty of performing the behavior" (Ajzen, 1991).	Attitude Toward Behavior; Subjective Norm; Perceived Behavioral Control

Innovation Diffusion Theory (IDT)	The IDT was developed by Everett Rogers in 1962. The theory explains how an innovation spreads, relating its adoption rate by the population (Call & Herber, 2022). Not every innovation follows the same path, as it vary a lot in terms of years necessary for an innovation to be successfully adopted, if at all (Mohamed et al., 2021).	Relative Advantage; Ease of Use; Image; Visibility; Compatibility; Results; Demonstrability; Voluntariness of Use
Social Cognitive Theory (SCT)	SCT is one of the most relevant theories to study human behavior, as well as why certain behaviors are adopted in first place (Cao et al., 2023). It was firstly developed for computer usage, but its inner characteristics and constructs embedded made it relevant to be used in acceptance of information technology (IT) (Mohamed et al., 2021). It is a theory based on the idea that people behavior is highly influenced both by environment (social pressures and unique circumstances) and personal factors as feelings and thoughts as well as demographic characteristics (Compeau & Higgins, 1995). For this theory, personal cognitions, human behavior and their environments are three factores interacting with each other which affects how the behavior changes/flows (Cao et al., 2023).	Outcome Expectation-Performance; Outcome Expectation-Personal; Self-efficacy; Affect; Anxiety

Motivational Model (MM)	MM is used to understand how people can react in different situations/contexts. This model uses intrinsic and extrinsic motivations as shapers of human behavior, as it's actually the core constructs of the model itself (Mohamed et al., 2021). These are the main drivers of people's intention to use a new platform/technology.	Intrinsic Motivation; Extrinsic Motivation

The UTAUT comes in as relevant as the other ones mentioned above were lacking in terms of harmonization and had a few limitations. As an example, TAM - one of the most used frameworks for technology acceptance - has limitations on a few levels such as it ignores the relationship between usage intention and attitude; it overlooks the personal perspective of users of new systems/technologies and for that reason neglects those individuals' indicators, focusing more on external factors (Chao, 2019). Adding these limitations and unifying the core constructs of the other models UTAUT rises. Nevertheless, there are a lot of researches that were made correlating both "Metaverse" as topic, and TAM as the model used, referred in the Table 3.

Table 3

Articles including "Metaverse" and "TAM" model

Article title	**Authors**	**Journal Name, Volume (Issue), Page Range**
User Acceptance of Metaverse: Insights from Technology Acceptance Model (TAM) and Planned Behavior Theory (PBT)	Yavuz Toraman	Emerging Markets Journal, Vol. 12 No. 1 (2022)
Influencing Factors of Usage Intention of Metaverse Education Application Platform: Empirical	Wang, GF; Shin, C	Sustainability, Vol. 14 (24)

Evidence Based on PPM and TAM Models		
A study of factors influencing Chinese college students' intention of using metaverse technology for basketball learning: Extending the technology acceptance model	Ren, LF (Ren, Longfei); Yang, FF (Yang, Fangfang); Gu, C (Gu, Chao); Sun, J (Sun, Jie); Liu, YF (Liu, Yunfeng)	Frontiers in Psychology, Vol. 13
User Acceptance of Digital Turkish Lira (DTL): Investigation in the Framework of Technology Acceptance Model (TAM) and Planned Behaviour Theory (PBT)	Toraman, Y (Toraman, Yavuz)	SOSYOEKONOMI, Volume 30; Issue 54; Page 357-376
User Acceptance of Metaverse: An Analysis for e-Commerce in the Framework of Technology Acceptance Model (TAM)	Toraman, Y (Toraman, Yavuz) ; Gecit, BB (Gecit, Baris Batuhan)	SOSYOEKONOMI, Volume 31; Issue 55; Page 85-104
Metaverse system adoption in education: a systematic literature review	Alfaisal, R (Alfaisal, Raghad) ; Hashim, H (Hashim, Haslinda) ; Azizan, UH (Azizan, Ummu Husna)	JOURNAL OF COMPUTERS IN EDUCATION
Prediction of User's Intention to Use Metaverse System in Medical	Almarzouqi, A (Almarzouqi, Amina) ; Aburayya, A (Aburayya,	IEEE ACCESS, Vol. 10, Page 43421-43434

Education: A Hybrid SEM-ML Learning Approach	Ahmad) ; Salloum, SA (Salloum, Said A.)	
Enhancing the Prediction of User Satisfaction with Metaverse Service Through Machine Learning	Lee, SH (Lee, Seon Hong) ; Lee, H (Lee, Haein) ; Kim, JH (Kim, Jang Hyun)	CMC-COMPUTERS MATERIALS & CONTINUA, Vol. 72 Issue 3, Page 4983-4997
Extending the Technology Acceptance Model (TAM) to Predict University Students' Intentions to Use Metaverse-Based Learning Platforms	Ahmad Samed Al-Adwan, Na Li, Amer Al-Adwan, Ghazanfar Ali Abbasi, Nour Awni Albelbis & Akhmad Habibi	Education and Information Technologies

1.3.2. UTAUT Constructs

The UTAUT has its own core constructs, as it is influenced by four independent variables performance expectancy (PE), effort expectancy (EE), social influence (SI) and facilitating conditions (FC) (Teng et al., 2022), as shown in the Table 4.

Table 4

UTAUT constructs

Constructs	**Definition**	**References**
Performance expectancy (PE)	Directly related to the degree of the benefits provided from using a technology, when	(Lee & Kim, 2022) (Venkatesh et al., 2012)

	performing certain defined tasks.	
Effort expectancy (EE)	The ease of use of a given technology, from the users' perspective, mirroring how easily the information system can be exploited.	(Lee & Kim, 2022)
Social influence (SI)	As the name implies, social influence refers to the importance the user gives to what others think regarding whether or not they should use a particular technology. The usage of a particular technology can be influenced by suggestions and opinions of others - love or close ones - that comes as an addition of user's inner motivation.	(Lee & Kim, 2022)
Facilitating conditions (FC)	The user's comprehension that the conditions and resources are met and available. When the person perceives to have enough conditions to use the technology/information system, it is more likely for them to actually use it. It is what (Lee & Kim, 2022) calls behavioral intention - "willingness to use information system" - that influences the	(Lee & Kim, 2022)

	person to take action and lead the intention to the actual behavior.

UTAUT is one of the most widely used frameworks when the object of study is related to the acceptance of new technologies. Bibliometric data indicate that the pioneer paper was cited more than 12,000 times (Wan et al., 2020), and has been used as fundamental theory in more than 800 papers since 2003 (Lee & Kim, 2022), which indicates a high level of credibility. The relevance of this model is also brought by the fact of its core constructs being moderated by users' age, experience, age and voluntariness of use and by its inherent power and effectiveness - having 70% explanatory power instead of 17% to 42% brought by its predecessors (Teng et al., 2022).

According to Venkatesh et al. (2016) research, UTAUT has been integrated with many different technologies, such as virtual worlds, online discussion forums, agile IS, online shopping, biometrics, mobile banking, RFID, social networking, E-government technology and E-learning.

However, the scenario changes somewhat when we try to intersect the model with the technology under study in this paper - metaverse. The Table 5 shows the result of the manual and individual search for scientific articles that include these themes.

Table 5

List of articles relating 'Metaverse' and 'UTAUT'

Authors	**Article title**	**Journal Name, Volume (Issue), Page Range**
Lee, Un-Kon; Kim, Hyekyung	UTAUT in Metaverse: An "Ifland" Case	Journal Of Theoretical And Applied Electronic Commerce Research, 17(2), 613-635
Teng, Zhuoqi; Cai, Yan;	Factors Affecting Learners' Adoption of an Educational Metaverse Platform: An	Mobile Information Systems, 2022

Gao, Yu; Zhang, Xiying; Li, Xinlong	Empirical Study Based on an Extended UTAUT Model	
Dr.Aysha Khalil; Dr.Ambreen Haqdad; Dr. Naveed Sultana	Educational Metaverse For Teaching And Learning In Higher Education of Pakistan	Journal of Positive School Psychology, 2023, Vol. 7, No. 2, 1183-1197
Raghad Alfaisal; Haslinda Hashim; Ummu Husna Azizan	Metaverse system adoption in education: a systematic literature review	Journal of Computers in Education (2022)
Guo, Y (Guo, Yue); Barnes, S (Barnes, Stuart)	Purchase behavior in virtual worlds: An empirical investigation in Second Life	Information & Management, 48 (7), 303-312
Ibrahim Arpaci, Kasim Karatas, Ismail Kusci, Mostafa Al-Emran,	Understanding the social sustainability of the Metaverse by integrating UTAUT2 and big five personality traits: A hybrid SEM-ANN approach	Technology in Society, 71, 2022, 102120,
Sediyaningsih, S (Sediyaningsih, Sri); Ristiyono, MP (Ristiyono, Mohammad Pandu); Launggu, K (Launggu, Kani); Juma, PO (Juma, Peter Ochieng)	De-contextual communication: Factors influencing usage intentions of metaverse technology in digital library services	HELIYON, Volume 9, Issue 10
Wiangkham, A (Wiangkham, Attasit); Vongvit, R (Vongvit, Rattawut)	Exploring the Drivers for the Adoption of Metaverse Technology in Engineering Education using PLS-SEM and ANFIS	EDUCATION AND INFORMATION TECHNOLOGIES

Alkhwaldi, AF (Alkhwaldi, Abeer F.)	Understanding learners' intention toward Metaverse in higher education institutions from a developing country perspective: UTAUT and ISS integrated model	KYBERNETES
Nguyen, LT (Nguyen, Luan-Thanh); Duc, DTV (Duc, Dang Thi Viet); Dang, TQ (Dang, Tri-Quan); Nguyen, DP (Nguyen, Dang Phong)	Metaverse Banking Service: Are We Ready to Adopt? A Deep Learning-Based Dual-Stage SEM-ANN Analysis	HUMAN BEHAVIOR AND EMERGING TECHNOLOGIES
Al-Emran, M (Al-Emran, Mostafa)	Beyond technology acceptance: Development and evaluation of technology-environmental, economic, and social sustainability theory	TECHNOLOGY IN SOCIETY, Volume 75

1.3.3. An extended UTAUT model

For this specific research, the model is being updated with some slight shifts to the variables we know and mentioned as UTAUT constructs. To the previously analyzed constructs, its being added emotions and self-esteem as new ones for this study and deprecating social influence.

1.3.3.1. Self-esteem

Self-esteem is the very strongly related with the individual's perception and evaluation of their own worth and respect. Monteiro et al. (2022, p.2) relates self-esteem positively with "well-being, life satisfaction, positive affects, engagement and satisfaction with one's work" and, on the other hand it is inversely related with "negative affects, depression and anxiety, and risk for obesity". Self-esteem is also defined by Čerešník et al. (2022) as the emotional understanding of self-concept, meaning the mental representation of the own person. Both referenced authors refer

the relationship between self-esteem, success and well-being. If a person is well-succeeded, the self-esteem tends to rise, meaning that more positive thoughts are expected about him/herself.

The most widely used measure of self-esteem is still the Rosenborg's Self-Esteem Scale (RSES), being cited more that 40,000 times in Google Scholar researches and making it to almost 50% of empirical studies made on the self-esteem topic, making it very reliable to understand this social component (Monteiro et al., 2022).

Being self-esteem this reflection of the individual's own image, it plays a very important role when transferred to the metaverse topic. How does this pride and self-recognition is translated when the person - in this case turned into a user - finds him/herself in this innovative world? How can self-esteem play its role and influence the ease of acceptance of the technology? Can someone feel better about him/herself for being in the metaverse, or in any other known digital form of socializing?

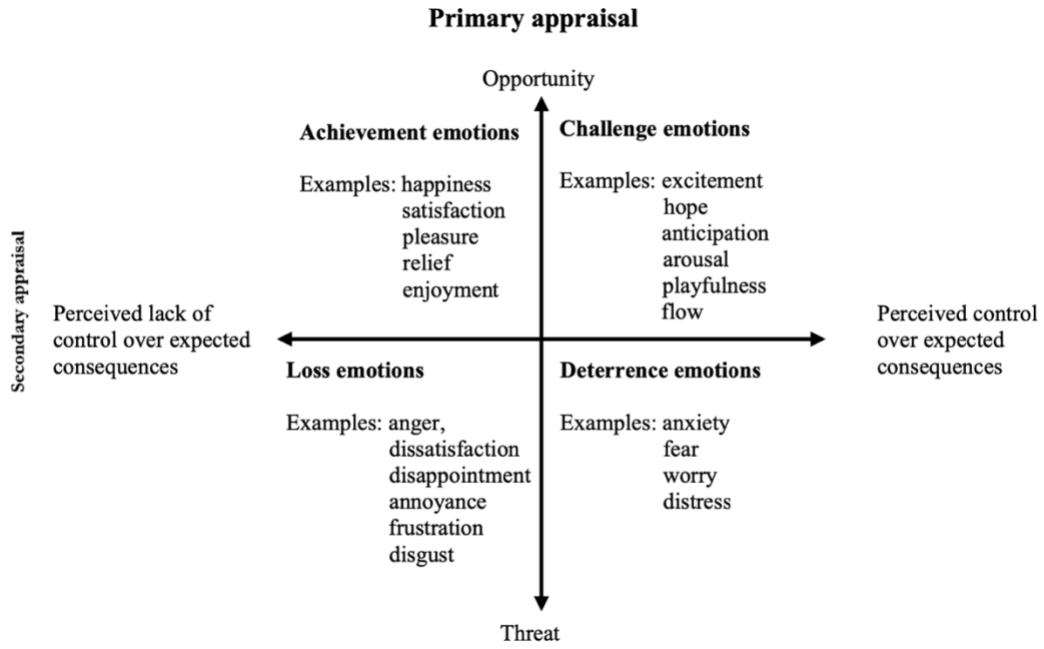
The self-esteem also plays its part when connected to gaming. The way that nowadays our very sophisticated videogames are built, allows users to develop skills, seeking for challenges, overtakes them and get rewards for that. This process is very important to keep players motivated to play, but also, and even more important to support this topic, this journey of obtaining more skills while playing a game helps the player to build beliefs about himself - emerging these representations of how effective the player can be regarding performing a task or upskilling his avatar, for example. These beliefs, what Hayes (2010) calls self-efficiency, helps building their own self-esteem, by applying these rules of endurance in order to get to a final goal.

1.3.3.2. Emotions

Emotions can be defined as a phycological state that can lead to a variety of behaviors when the individual is confronted with some kind of trigger. As mentioned in Self-Esteem topic, emotions can also affect actions, when in present of any event revealed as relevant to the person (Abikari et al., 2022). The same authors cite a framework developed by Beaudry & Pinsonneault (2010) where emotions can be related with the acceptance of technology - IT applications. Figure 1 is divided into a main and secondary approach. The primary one is associated with the user perception of whether the technology can be an opportunity or a threat, as the secondary relates to the same perspective of the control (or the lack of it) over the expected outcomes of it.

Figure 1

Framefork for classifying emotions in Beaudry and Pinsonneault (2010)



Note. From "The other side of acceptance: Studying the direct and indirect effects of emotions on information technology use" by Beaudry, A., & Pinsonneault, A., 2010, MIS quarterly, 689-710, p. 694 (https://doi.org/10.2307/25750701).

This matrix come together to form four categories of emotions: loss, deterrence, challenge, and achievement. It is crucial to understand that it's not the technology that triggers the emotion just by itself, but it is rather how the individual understands/perceives the technology. What this means is that different individuals can have different emotional reactions to the same technology event or input. This idea also related with the fact that any technology can potentially trigger a range of different emotions within an individual, among a group, and across different groups (Beaudry & Pinsonneault, 2010).

Emotions can be related with the action of playing a videogame as well. There are studies that focused resources on the good side, its benefits and how it can be used as therapy, as other researchers have highlighted its potential harms to the players' life (Von der Heiden et al., 2019). The problem of addiction to videogames is something that a lot of studies have been focusing on,

and it led to American Psychiatric Association to define it as “Internet Gaming Disorder”, which was related to a Gambling Disorder (Von der Heiden et al., 2019).

Sensation-seeking is a concept brought by Hayes (2010). The author refers that people are attracted by sensations, which can be more positive like excitement or a bit more into the negative side like anxiety. The example provided in the book is the amount of excitement a fairground can sound to a very large group of the population. Surely a game cannot provide the same level of emotions to a person, but the level of absorption (being the game very mentally demanding in terms of concentration and skill set needed) can be related in the way of how thrilling it can be for the person in charge of the control. This absorption is purely emotional, being affected by a lot of factors, like the background music, the haptic feedback which is possible to receive from the devices, being them wired or not, and the level of realism that, for example, an augmented reality-based game can bring. Being them good or bad, emotions are what keeps the players attached to their games, and Hayes (2010) states gaming can be often more beneficial than harmful.

1.4. Theoretical support of the proposed model

1.4.1. Emotions

UTAUT, as previously shown, is a model that can help explain why users accept a certain technology or information system. Since the metaverse is part of this information system environment, it is relevant to use the model for this research scenario. The constructs detailed in Table 4 are the main concepts to support the first hypothesis.

Regarding emotions, it is important to understand that different emotions may lead into different actions or behaviors. Emotions can change people’s behaviors and their propensity to take a certain action (Beaudry & Pinsonneault, 2010).

Emotions can occur (and consequently lead to different insights) prior or during the usage of a certain technology/information system. According to Beaudry & Pinsonneault (2010), these prior emotions are still unexplored, but it can play a crucial role in the usage of the technology itself and carry on until the end of its use, defining the whole experience. According to Beaudry & Pinsonneault (2010), 1) emotions felt prior to the usage of a technology are expected to influence the user’s feelings, attitudes and behaviors towards it when actually using; 2) In what the authors call the “anticipation phase”, the emotions are activated based on how the person feels/perceives

the impact the technology will eventually have; 3) It is more likely an emotion to be triggered before the usage of an IS, based on the expectations on how the experience will be, how it will affect themselves and what they think they can do about it.

Apart from the timing of the emotion trigger, there are also different types of emotions that, in order to simplify the huge number of emotions a human being can feel, even if it is regarding a new technology or information system, we can split them into two big groups: positive emotions and negative emotions. Beaudry & Pinsonneault (2010) splits it into four groups, instead of two: achievement emotions (happiness, satisfaction, pleasure, relief, enjoyment), challenge emotions (excitement, hope, anticipation, arousal, playfulness, flow), loss emotions (anger, dissatisfaction, disappointment, annoyed frustration, disgust) and deterrence emotions (anxiety, fear, worry, distress).

Emotions can influence the user's perception of technology usefulness. Negative emotions tend to foster a more cautious and skeptic attitude, while positive emotions typically encourage a more receptive and even exploratory approach towards technology (Gerli et al., 2022). Negative emotions - deterrence and loss - have a significantly stronger impact in effort expectancy than the positive ones (Abikari et al., 2022).

Therefore, the following hypothesis were set:

H1: Positive emotions positively affect effort expectancy.

H2: Negative emotions negatively affect effort expectancy.

1.4.2. Self-esteem

Self-esteem is the individual perceived image of oneself. People with high self-esteem tend to seek acceptance from others and have a strong desire for recognition, being this also why people with higher self-esteem being more likely to buy certain products, such as electric cars, and the demand for luxury products can be also affected by high levels of self-esteem (Y. Yang et al., 2023).

It has been shown that self-esteem plays a role in technology use (Jackson et al., 2010). Kim & Kim (2022) relates self-esteem with two concepts - readiness for change (RC) and technology readiness (TR). RC is how prepared a person is to accept and adapt to changes, and TR is how open someone is ready to accept and use new technologies. The authors tested the

correlations between these three concepts, having RC as a mediation effect between self-esteem and TR, showing a positive relation between those, meaning that increasing self-esteem will lead to higher levels of RC and TR. The core idea is that a high level of self-esteem, meaning a high level of confidence on one's abilities to deal with technological challenges, for example, increase the RC, as people believe that they can easily adapt to new ways of doing things. As this openness increases, they are more likely as well to be technologically ready (TR).

Thus, the following hypothesis are proposed:

H3: Self-esteem positively affect effort expectancy.

1.4.3. Performance Expectancy

The performance expectancy is the individual's degree of confidence that using technology will be beneficial for the one. It can be related with the belief that using a certain system information will lead to an improved performance or efficiency when realizing a certain task (F. Yang et al., 2022). It is considered the most reliable indicator regarding behavioral intention prediction (Venkatesh et al., 2012). The metaverse has unique features that gives users more exciting media experiences, compared to what the market can offer nowadays. As previously mentioned, metaverse users can interact in the same digital space, akin to the real-world interactions, turning communication much more effective, accurate, and rapid. These unique features of this communication will provide improvements in decision making (by obtaining accurate information more quickly) and enhance productivity of users (Lee & Kim, 2022), especially in a world that is demanding more of this pace in information acquisition (Szymkowiak et al., 2021). This could mean that the perception of higher levels of efficiency and productivity brought by the metaverse can bring more people to this technology. Therefore, we can raise the following hypothesis:

H4**:** Performance expectancy positively affect behavioral intention.

1.4.4. Effort Expectancy

Knowing the possible metaverse outcomes, it is also very important for a technology to be intended to use, to be easy enough to understand and handle. If an individual perceives that the platform is easy to use, that it doesn't impose significant entry barriers, their behavioral intention will be positively influenced by this. It was found that the likelihood of banking customers using their mobile technology strongly relies on how easy they perceive it is to use (F. Yang et al., 2022) , which can lead to the idea that metaverse users will be happier when they find the platform is easier to use (Lee & Kim, 2022). According to this idea, the hypothesis 2 was built as shown below:

H5: Effort expectancy positively affect user behavioral intention.

1.4.5. Social Influence

The inner motivation to adopt a new technology can be supported by an external force called, in this domain, the social influence. It is related to the way an individual can be influenced by their surrounding people to adopt or use an information system.

Positive recommendations of the user's relatives and/or friends can play a big part in the individual's decision to adopt a new technology (Nguyen et al., 2023). Also, engaging in conversations on social media platforms and online communities focused on the metaverse or gaming topics can significantly impact how individuals perceive and decide to adopt new technologies. Actively participating in discussions, reviewing content, watching streamers, videos on YouTube, and interacting with user-generated materials exposes individuals to a variety of perspectives, experiences, and recommendations related to metaverse and the gaming metaverse here represented by Fortnite. These interactions play a crucial role in shaping attitudes and influencing individuals' intentions to embrace metaverse worlds. Previous research on technological adoption underscores the positive impact of social influence on people's likelihood to adopt new technologies (Nguyen et al., 2023). Therefore, the hypothesis 3 was built as follows:

H6: Social influence positively affect user behavioral intention.

1.4.6. Facilitating Conditions

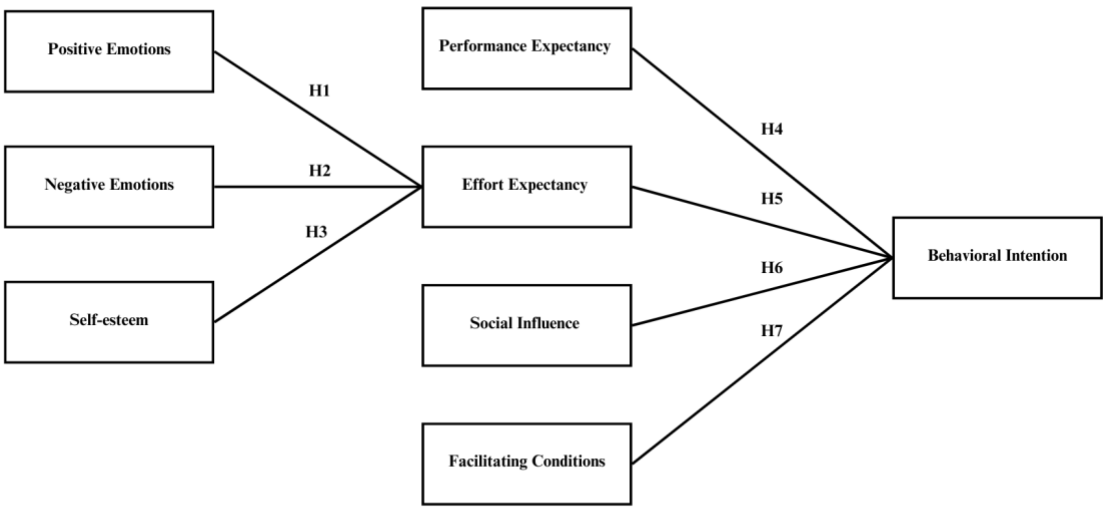
As spell out before, the user's comprehension that the necessary conditions and resources are met and available is what we call the facilitating conditions. When the user acknowledges to have enough conditions to use the technology/information system, it is more likely for them to actually use it. It is what triggers the behavioral intention, what is responsible for influencing the user to take action and lead the intention to the actual behavior. The facilitating conditions here can be related to the readiness of software and hardware needed for a smooth use of the metaverse, in this case. It is evident, based on previous researches, that FC is a key aspect influencing users' likelihood to adopt metaverse technology (Wiangkham & Vongvit, 2023). Thus, the hypothesis 4 was built as follows:

H7: Facilitating conditions positively affect user behavioral intention.

In the Figure 2 is illustrated the conceptual model used for this investigation, based on UTAUT.

Figure 2

Research conceptual model



2. Research Methodology

2.1. Sample and data collection

In this primary research, the relevant data was gathered using a Google Forms questionnaire, specifically designed for individuals familiar with the video game Fortnite – a niche yet widely recognized topic. The questionnaire, structured based on predefined constructs and items detailed earlier, employed a five-point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree), allowing clear and quantifiable expressions of agreement or disagreement.

The data collection period spanned from March 6, 2024, to April 22, 2024, during which the questionnaire was disseminated through various channels to reach a broad and engaged audience. It was shared on social media platforms such as Instagram, Facebook, and niche Fortnite-related forums on Reddit, and it was also handed directly to close friends known to have played or are currently playing the game. This multifaceted approach to distribution contributed significantly to the robust initial participation rate, with a total of 172 respondents completing the crucial screening question. This underscores the high level of interest and engagement in the topic despite its specialized focus.

The screening was straightforward, asking respondents, 'Have you played Fortnite or engaged with the game in any form?' Only those answering 'yes' proceeded with the questionnaire, ensuring that the data collected was highly relevant to the study's target demographic. Out of the initial responses, 96 confirmed their active engagement with Fortnite, providing a solid basis for the subsequent data analysis. This level of participation not only enhances the robustness of the analysis but also ensures the results are directly applicable and particularly significant to the niche audience being studied.

2.2. Sample characteristics

The sample used and characterized in Table 6 was the 96 positive and relevant to the research responses. From those 96 people, the sample comprised mostly male contributors with a

70,8%, with the females only 28,1% of the whole sample, with an additional 1 person identifying as “other”.

Occupation-wise, most of the inquired people are working full-time (60,4%). Students are the next significant group, with 31,3%, which indicates the younger age profile of the audience. The rest of the data shows only 1% of part-time workers, with 7,3% marking “other” as option. There is no representative data of retired people, which follows the trend of the next category in analysis, the age.

Age data corroborates the youthful demographic, with an average age of 24 years and a range from 18 to 34 years. This indicates that the game is most popular among young adults, who likely find it appealing due to its dynamic gameplay and cultural relevance among peers, suggesting that Fortnite/metaverse primarily attracts a younger, educationally engaged or fully employed audience.

Finally, the majority of respondents play video games weekly, with a significant number playing once a month and daily, indicating a high level of engagement with video gaming among the sample. This engaged public prefers action games, followed by adventure and sports games. This preference for action and adventure aligns very well with the dynamic and interactive nature of Fortnite.

Table 6

Sample demographics

Category	Frequency	Percentage
Gender		
Male	68	70,8%
Female	27	28,1%
Other	1	1%
Occupation		
Full-time	58	60,4%
Part-time	1	1%
Student	30	31,3%

Retired	0	0%
Other	7	7,3%
	Average	**Min-Max**
Age	24	18-34
How often do you play video games?		
Never	2	2.1%
Once a year	9	9.4%
Once a month	26	27.1%
Weekly	40	41.7%
Daily	17	17.7%
Several times a day	2	2.1%
What is your favorite type of video game?		
Action	32	33.3%
Adventure	23	24%
Simulation	9	9.4%
Strategy	10	10.4%
Sports	20	20.8%
Other	2	2.1%

Concerning the familiarity and engagement habits with the metaverse, the survey results indicate a high level of familiarity with the term "metaverse" among the respondents, with 91.7% (88 out of 96) indicating they are familiarized of the concept. This widespread awareness suggests that the metaverse has become a well-known idea among the gaming community, likely driven by its frequent discussion in media and online platforms.

When asked about their primary sources of information regarding the metaverse, 59.6% of respondents (53 individuals) cited social media as their main source. Video games such as Fortnite and Roblox were the second most common source, with 19.1% (17 respondents) gaining their knowledge from these immersive platforms. Other sources included YouTube (11.2%), news articles (6.7%), and technology blogs (2.2%).

Going more in depth into the practical use of platforms, a substantial majority, 68.8% (66 respondents), reported having used platforms or experiences that could be considered part of the metaverse, such as Roblox or Decentraland, apart from Fortnite.

Regarding the specific platforms used, Roblox emerged as the most popular, with 65.6% (21 out of 32) of those who have used metaverse platforms reporting it as their choice. Other platforms mentioned include Spatial, used by 6.3% (2 respondents), and Decentraland, used by 3.1% (1 respondent). Additionally, 25% (8 respondents) reported using other metaverse platforms.

Regarding hopes and concerns, respondents express high hopes for the metaverse, particularly in enhancing social connections (28.1%) and providing new entertainment experiences (20.8%). They also anticipate advancements in AI and VR (13.5%) and innovation that the metaverse can bring (13.5%). However, significant concerns include social and ethical issues such as addiction and social isolation (40.6%), accessibility to the required hardware and software (19.8%), and the negative impact on jobs and young people (10.4% each). These insights, shared in Table 7, underscore both the potential and the challenges that the metaverse presents, highlighting the need for careful development and regulation.

Table 7

Sample characteristics

Category	Frequency	Percentage
Are you familiar with the term 'metaverse'?	96 responses	
Yes	88	91.7%
No	8	8.3%
If yes, what was your primary source of information about the metaverse?	88 responses	
News articles	6	6.7%
Social media	53	59.6%
Video games (e.g. Fortnite, Roblox)	17	19.1%
Technology blogs	2	2.2%

YouTube	10	11.2%
Apart from Fortnite, have you ever used any platform or experience that could be considered a metaverse, such as Roblox, Decentraland, etc.?	96 responses	
Yes	66	68.8%
No	30	31.3%
If yes, which platform(s) have you used?	32 responses	
Roblox	21	65.6%
Decentraland	1	3.1%
Spatial	2	6.3%
Other	8	25%
What are your hopes and expectations for the future of the metaverse?		
Social connection and communication	27	28.1%
Accessibility	3	3.1%
Collaboration and learning	10	10.4%
Entertainment and experiences	20	20.8%
Innovation	13	13.5%
Improved hardware and software	7	7.3%
Advancements in artificial intelligence and virtual reality	13	13.5%
Empowering individuals and communities	2	2.1%
Other	1	1%
What are your biggest concerns or reservations about the metaverse at this stage?		
Accessibility (Cost and access to hardware and software)	19	19.8%
Social and Ethical Issues (Addiction and mental health impacts, Social isolation, Misinformation, Potential misuse, etc.)	39	40.6%

Technical Concerns (performance issues, Interoperability, Compatibility, Technical limitations and glitches, etc.)	8	8.3%
Lack of regulation and clear guidelines	10	10.4%
Negative impact on jobs and the future of work	6	6.3%
Negative impact on children and young people	10	10.4%
Inclusivity (Accessibility for people with disabilities)	2	2.1%
Other	2	2.1%

2.3. Measurement Instruments

As the original (Venkatesh et al., 2003) article has been numerously cited in previous studies, the same measurement items have also been employed in this research (Lee & Kim, 2022), for the main constructs. The measurement items for PE, EE, SI, FC, BI and UB were mainly adapted from (Lee & Kim, 2022; Ramírez-Correa et al., 2019).

For the self-esteem part of the inquiry, Rosenberg's self-esteem scale (RSE) was adopted to measure how positive or negative the audience feels about themselves. This scale is widely used to measure self-esteem, has been cited more than 40,000 times, making it to almost 50% of empirical studies made on the self-esteem topic, thus being one of the most reliable scales to measure self-esteem (Monteiro et al., 2022). This scale consists of a 10-item scale answered using a 4-point Likert scale format, from "strongly disagree" to "strongly agree".

Regarding emotions, since it's been considered both positive and negative ones, it can be measured by The Positive and Negative Affect Schedule (PANAS), also a widely used tool for assessing in this case emotions. This scale comprises 20 items, 10 for positive and 10 for negative emotions. The answerer should then rate the intensity of their emotions during a specific period using a Likert scale ranging from 1 (very slightly or not at all) to 5 (extremely) (Tran, 2020).

All the measurement items are gathered in Table 8.

Table 8

Model constructs and its Measurement Items

Constructs	Measurement Item	Source
Performance Expectancy (PE)	(PE1) Using the metaverse will improve my productivity. (PE2) Using metaverse will help me make better decisions. (PE3) I find using the metaverse useful in my daily life. (PE4) Using the metaverse increases my chances of achieving things that are important to me.	(Lee & Kim, 2022) (Venkatesh et al., 2003) (Im et al., 2011)
Effort Expectancy (EE)	(EE1) I find it easy to use the metaverse. (EE2) Learning to use the metaverse is easy for me. (EE3) My interaction with the metaverse is clear and understandable.	(Lee & Kim, 2022) (Venkatesh et al., 2003) (Im et al., 2011) (Ramírez-Correa et al., 2019)
Social Influence (SI)	(SI1) People who are important to me think I should use the metaverse. (SI2) People around me supports the use of the metaverse. (SI3) If people whose opinions I value think I should use metaverse, I will use it.	(Lee & Kim, 2022) (Venkatesh et al., 2003) (Im et al., 2011) (Abikari et al., 2022)
Facilitating Conditions (FC)	(FC1) I have the resources to use the metaverse. (FC2) I have enough knowledge to use the metaverse. (FC3) The metaverse is compatible with the devices I normally use.	(Lee & Kim, 2022) (Venkatesh et al., 2003) (Im et al., 2011) (Ramírez-Correa et al., 2019)

	(FC4) I can get help from others when I struggle with the metaverse.	
Positive Emotions (PEM)	**Achievement emotions (towards using the metaverse)** (PE1) Happiness (PE2) Satisfaction (PE3) Pleasure (PE4) Relief (PE5) Enjoyment **Challenge emotions (towards using the metaverse)** (PE6) Excitement (PE7) Hope (PE8) Anticipation (PE9) Arousal (PE10) Playfulness (PE11) Flow	(Abikari et al., 2023)
Negative Emotions (NEM)	**Loss Emotions (towards using the metaverse)** (NE1) Anger (NE2) Dissatisfaction (NE3) Disappointment (NE4) Annoyed (NE5) Frustration (NE6) Disgust **Deterrence emotions (towards using the metaverse)** (NE7) Anxiety (NE8) Fear (NE9) Worry (NE10) Distress	(Abikari et al., 2023)

Self-Esteem (SE)	(SE1) I am satisfied with myself. (SE2) Overall, I feel I have several good qualities. (SE3) All things considered, I think I am a failure. (SE4) I think I am capable of doing things as well as most people. (SE5) I think I don't have much to be proud of. (SE6) I have a positive attitude towards myself. (SE7) Overall, I am satisfied with myself. (SE8) I wish I could have more respect for myself. (SE9) Sometimes I feel useless. (SE10) Sometimes I think I'm not good for anything.	(Monteiro et al., 2022) (Hutz & Zanon, 2011)
Behavioral Intention (BI)	(BI1) I intend to use the metaverse in the next 12 months. (BI2) I predict I would use the metaverse in the next 12 months. (BI3) I plan to use the in the next 12 months.	(Ramírez-Correa et al., 2019)

3. Data analysis and Results

The analysis of the UTAUT model used in this investigation was performed using the SmartPLS software, version 4.1.0.2 (Ringle et al., 2024), to conduct Partial Least Squares Structural Equation Modeling (PLS-SEM) and obtain the results for the investigation model.

3.1. Measurement models

The analysis started with the relationship between constructs and its items. The Table 9 shows the convergent validity (indicator reliability), the internal consistency reliability and the discriminant validity through HTMT. SE construct was conducted in the survey with 10 items, but 5 of them were deprecated since its loadings were negative and, therefore, not relevant for the model analysis.

Almost all the loadings are above the threshold value of 0.708, which indicates a sufficient level of indicator reliability. The smallest indicator reliability is the one from PEM9, with a value of 0.434, as the highest indicators come from the items referred to BI construct - BI1, BI2 and BI3. The Average Variance Extracted (AVE) has a higher value than the 0.5 minimum required for all constructs, meaning they all have high levels of convergent validity, since this is the measure the degree to which items within a specific construct correlate positively and share a substantial amount of variance (Hair & Alamer, 2022). Since the ρA values for all constructs exceed the threshold of 0.70, it indicates that each construct has a high degree of internal consistency reliability (Hair & Alamer, 2022). The same applies to Cronbach's Alpha and ρ_C values, since it is above 0.70, showing high level of consistency reliability.

Summarizing, all outer loadings for the reflective constructs were above the threshold of 0.708, indicating sufficient levels of indicator reliability. The smallest indicator reliability was observed for NEM5 with a value of 0.305, while the highest reliabilities were noted for BI1, BI2, and BI3. All constructs had AVE values above the minimum required value of 0.50, confirming high levels of convergent validity.

Table 9

Results of the measurement models

Latent Variable	Indicators	Convergent Validity			Internal Consistency Reliability			Discriminant Validity
		Loadings	Indicator Reliability	AVE	Cronbach's Alpha	Reliability ρ_A	Composite Reliability ρ_C	HTMT Significantly lower than 0.90?
BI	BI1	0.985	0.970	0.968	0.984	0.984	0.989	YES
	BI2	0.983	0.966					
	BI3	0.984	0.968					
EE	EE1	0.897	0.805	0.822	0.891	0.892	0.932	YES
	EE2	0.926	0.856					
	EE3	0.896	0.805					
FC	FC1	0.844	0.712	0.617	0.847	0.856	0.889	YES
	FC2	0.829	0.687					
	FC3	0.767	0.588					
	FC4	0.792	0.627					
	FC5	0.685	0.469					
NEM	NEM1	0.668	0.446	0.560	0.927	0.883	0.926	YES
	NEM2	0.819	0.584					
	NEM3	0.765	0.671					
	NEM4	0.681	0.585					
	NEM5	0.552	0.464					
	NEM6	0.808	0.305					
	NEM7	0.679	0.653					
	NEM8	0.851	0.461					
	NEM9	0.842	0.724					
	NEM10	0.764	0.709					

PE	PE1	0.670	0.449	0.593	0.772	0.789	0.852	YES
	PE2	0.762	0.581					
	PE3	0.764	0.584					
	PE4	0.870	0.757					
PEM	PEM1	0.894	0.799	0.702	0.957	0.971	0.963	YES
	PEM2	0.901	0.686					
	PEM3	0.896	0.669					
	PEM4	0.823	0.812					
	PEM5	0.904	0.803					
	PEM6	0.905	0.677					
	PEM7	0.659	0.817					
	PEM8	0.774	0.819					
	PEM9	0.777	0.434					
	PEM10	0.828	0.599					
	PEM11	0.818	0.604					
SE	SE1	0.923	0.852	0.700	0.893	0.942	0.920	YES
	SE2	0.867	0.752					
	SE4	0.680	0.462					
	SE6	0.814	0.663					
	SE7	0.879	0.773					
SI	SI	0.817	0.667	0.602	0.780	0.804	0.857	YES
	SI	0.668	0.446					
	SI	0.851	0.724					
	SI	0.756	0.572					

Following that, in order to analyze the discriminant validity of constructs, the Heterotrait-monotrait ratio (HTMT) was conducted, and the results are presented in the Table 10. It was assessed the discriminant validity of the constructs using the Heterotrait-Monotrait ratio (HTMT). The Table 10 displays the HTMT values for all construct pairs along with their bootstrap confidence intervals. To determine if the HTMT values significantly differ from the threshold, a

bootstrapping procedure was conducted to calculate the confidence intervals. This test examines the right tail of the bootstrap distribution to confirm that the HTMT values are significantly below the threshold value of 0.90, with a 5% error probability (Hair & Alamer, 2022). The threshold value for HTMT is 0.90, and having this value in mind the validity has been established between all the reflective constructs, since the values are below the cut-off value.

Table 10

Heterotrait-monotrait (HTMT) values

	BI	EE	FC	NEM	PE	PEM	SE	SI
BI								
EE	0.759 [0.649; 0.857]							
FC	0.545 [0.380; 0.705]	0.717 [0.537; 0.856]						
NEM	0.177 [0.114; 0.335]	0.258 [0.171; 0.432]	0.170 [0.154; 0.345]					
PE	0.736 [0.618; 0.837]	0.773 [0.631; 0.888]	0.557 [0.319; 0.759]	0.174 [0.157; 0.373]				
PEM	0.762 [0.668; 0.841]	0.629 [0.492; 0.755]	0.664 [0.514; 0.795]	0.300 [0.221; 0.442]	0.721 [0.582; 0.840]			
SE	0.157 [0.062; 0.350]	0.369 [0.194; 0.558]	0.145 [0.106; 0.359]	0.251 [0.137; 0.512]	0.268 [0.184; 0.495]	0.143 [0.106; 0.347]		
SI	0.717 [0.578;	0.735	0.729	0.152	0.804	0.786	0.138	

	0.839]	[0.569; 0.871]	[0.532; 0.866]	[0.147; 0.327]	[0.630; 0.944]	[0.660; 0.896]	[0.126; 0.325]	

3.2. Structural Model

For the structural model analysis, we need to first focus on the variance inflation factor (VIF). A value that is equal or higher than 5 suggests a high level of collinearity among constructs (Hair & Alamer, 2022). Having a closer look to the Table 11, we can see there isn't a clear sign of collinearity between the constructs of the model. Then, it was examinated the significance and relevance of the structural model relationships by checking the path coefficients. All the value are between -1 and +1, as suggested in (Hair & Alamer, 2022). Then, with the help of bootstrapping procedure, we could gather some more information, such as t-values, p-values, 95% confidence interval and the significance. A t-value greater than 1.96 (for a 95% confidence level) and a p-value less than 0.05 indicate that the relationship is statistically significant. The results show that most path relationships are significant, except for the path from FC to BI, meaning that the predictor has impact in the outcome, confirming all the hypothesis except H7.

Table 11

Significance Testing Results of the Structural Model Path Coefficcients

	VIF	Path Coefficient	T Values	P values	95% confidence interval	Significance ($p < 0.05$)?
EE -> BI	2.279	0.396	4.005	0.000	[0.188; 0.581]	Yes
FC -> BI	1.915	0.020	0.210	0.834	[-0.169; 0.211]	No
NEM -> EE	1.131	-0.366	3.483	0.000	[-0.480; 0.018]	Yes

PE -> BI	1.946	0.253	2.846	0.004	[0.095; 0.444]	Yes
PEM -> EE	1.053	0.629	11.069	0.000	[0.491; 0.716]	Yes
SE -> EE	1.127	0.162	2.155	0.031	[0.028; 0.322]	Yes
SI -> BI	2.106	0.234	2.543	0.011	[0.049; 0.410]	Yes

The Table 12 presents the explanatory power of the model by examining the R^2 and f^2 values for each predictor-outcome relationship.

The R^2 value represents the proportion of variance in the dependent variable that is explained by the independent variables in the model, meaning that R^2 value of 0.609 means that 60.9% of the variance in Behavioral Intention is explained by its predictors (EE, FC, PE, SI), and a value of 0.553 indicates that 55.3% of the variance in Effort Expectancy is explained by its predictors (NEM, PEM, SE).

The f^2 value measures the impact of a specific predictor on the R^2 value of a dependent variable. It indicates the effect size of the predictor. The cut-off value in this case is 0.02, being the predictors with less than that with negligible effect on the predictor, as we can see in the FC-BI relationship, while Positive Emotions (PEM) has a large effect on Effort Expectancy (EE). The overall model demonstrates good explanatory power, with R^2 values of 0.609 for BI and 0.553 for EE, suggesting that the predictors adequately explain the variance in these constructs.

Table 12

Explanatory Power

Predictor	Outcome	f^2	R^2
EE	BI	0.176	0.609
FC	BI	0.001	0.609
NEM	EE	0.266	0.553

PE	BI	0.084	0.609
PEM	EE	0.842	0.553
SE	EE	0.052	0.553
SI	BI	0.067	0.609

The structural model was then evaluated by examining collinearity statistics (VIF values), path coefficients, t-values, p-values, and 95% confidence intervals, with most path relationships being statistically significant, except for the path from FC to BI.

The data analysis confirms that most of the hypothesized relationships in the UTAUT model are significant. Performance expectancy, effort expectancy, social influence, positive emotions, negative emotions, and self-esteem significantly influence its outcomes. However, facilitating conditions did not have a significant effect on behavioral intention in this particular model. Overall, the model demonstrates good explanatory power, with substantial portions of the variance in behavioral intention and effort expectancy explained by the predictors.

3.3. Mediation

Finally, the mediation was performed on the Effort Expectancy (EE) construct based on all its determinants - Positive Emotions (PEM), Negative Emotions (NEM), and Self-Esteem (SE). This way, it was tested the significance of the indirect effect of Positive and Negative Emotions and Self-esteem on Behavioral Intention (BI) via Effort Expectancy. The indirect effect is the product of PEM (following along NEM and SE) to EE and then from EE to BI. In order to test the significance of the indirect effect, the bootstrap routine was run (Hair & Alamer, 2022).

In the Table 13 it is distinguished the direct and indirect effects of EE construct. The direct effect of EE on BI is strong (0.396) and significant ($p < 0.05$), with a 95% confidence interval not including zero (Hair & Alamer, 2022), indicating a strong relationship between EE and BI.

Looking at the indirect effect, on the other side, we can also say that it is significant as the 95% confidence interval doesn´t include zero for all three constructs – PEM, NEM, and SE.

Therefore, it can be concluded that EE partially mediates the relationship as both direct and indirect effects are valuable.

To further confirm the type of partial mediation, it was then calculated the product of the direct effect and the indirect effect. For PEM (0.396 * 0.249 = 0.0986) and SE (0.396 * 0.064 = 0.0253) we can conclude we are facing a complementary mediation, since the values are positive, meaning also their product. In the other hand, NEM works as a competitive mediator since its product is negative (0.396 * -0.145 = -0.0574) (Hair & Alamer, 2022). In resume, EE acts as a complementary mediator for PEM and SE, and as a competitive mediator for NEM.

This analysis of the indirect effects reveals that EE partially mediates the relationships between PEM, NEM, SE, and BI. For PEM and SE, the complementary mediation means that PEM and SE increase EE, which in turn positively affects BI, thus contributing to an overall positive impact. In contrast, NEM demonstrates a competitive mediation effect, which indicates that while NEM might have a direct impact on BI, its influence through EE reduces this impact, showcasing a more complex interaction between these constructs.

Overall, EE significantly mediates the effects of PEM, NEM, and SE on BI, highlighting its vital role in understanding how these emotional and psychological factors translate into behavioral intentions. These findings underscore the importance of considering both direct and indirect pathways in comprehensively understanding the determinants of Behavioral Intention.

Table 13

Mediation analysis

	Direct Effect	95% Confidence Interval (with Bias Correction) of the Direct	Significance ($p < 0.05$)?	Indirect Effect (via EE)	95% Confidence Interval (With bias correction) of	Significance ($p<0.05$)?

		effect			the indirect effect	
EE > BI	0.396	[0.188; 0.581]	Yes			
PEM > BI				0.249	[0.131; 0.415]	Yes (0.000)
NEM > BI				-0.145	[-0.252; -0.032]	Yes (0.013)
SE > BI				0.064	[0.014; 0.134]	Yes (0.038)

4. Conclusion

This study aimed to explore the determinants of user behavioral intention towards the metaverse using an extended Unified Theory of Acceptance and Use of Technology (UTAUT) model, replying to the research question: "What are the key factors that drive user intention to use metaverse applications?". The research focused on various constructs including performance expectancy, effort expectancy, social influence and facilitating conditions, adding three new ones into what was called an extended model – positive emotions, negative emotions, and self-esteem. The findings provide significant insights into the factors influencing the adoption and use of metaverse technologies, especially for the last three ones.

The data analysis reveals that most of the hypothesized relationships in the extended UTAUT model are significant. Performance expectancy, effort expectancy, social influence, positive emotions, and self-esteem were found to significantly and positively influence behavioral intention and effort expectancy, accordingly. Maghaydah et al. (2024) refers performance expectancy and effort expectancy as key factors to influence the intention of using the metaverse. (Alkhwaldi, 2023; Cho & Kim, 2024) also states performance expectancy positively influences behavioral intention, but not effort expectancy. Aranyossy (2022), on the other hand, found that the common UTAUT constructs – performance expectancy, effort expectancy, social influence, and facilitating conditions – are not relevant for behavioral intention, which is only aligned with this research in the facilitating conditions construct, since this was the only construct that was not found relevant and significant among all the other ones. Social influence is not relevant according to Cho & Kim (2024).

Negative emotions were also found significant but on the negative side, showing that negative emotions make the metaverse seem harder to use, by demonstrating a negative influence on effort expectancy. However, facilitating conditions did not show a significant effect on behavioral intention, being the construct which deviates from many previous researches (Alkhwaldi, 2023; Cho & Kim, 2024; Maghaydah et al., 2024) and suggests that users may not perceive the readiness of necessary resources as a crucial factor in their intention to use the metaverse, rejecting H7, although it follows some previous research (Aranyossy, 2022). Nevertheless, this can be explained by some studies perspective - (Chao, 2019) - referring FC to a construct that affects use behavior

instead of the behavioral intention. Since the current model was adapted, and use behavior was deprecated, it could be an explanation for this finding.

Replying to one of the research questions – "How do emotional and psychological factors, such as emotions and self-esteem, impact this intention?" – it can be said that one of the key contributions of this research is, as mentioned above, the integration of emotions and self-esteem into the UTAUT model, bringing psychological factors into the research. Positive emotions were found to enhance effort expectancy significantly, supporting H1, while negative emotions had a negative impact on effort expectancy, supporting H2. These findings follow previous studies on the same topic, as for example (Gerli et al., 2022; Maghaydah et al., 2024). Self-esteem positively influenced effort expectancy, supporting H3, and aligning with the idea that individuals with higher self-esteem are more likely to adapt to new technologies due to their confidence in handling technological challenges, confirming the hypothesis and also the previous studies on this topic, such as (Kim & Kim, 2022).

The mediation analysis insights on how positive emotions, negative emotions, and self-esteem influence behavioral intention towards using the metaverse, mediated through the effort expectancy construct. The analysis revealed that positive emotions significantly enhance effort expectancy, which also positively affects behavioral intention. This indicates that users who experience positive emotions are more likely to find the metaverse easier to use, thereby increasing their intention to engage with it. Similarly, self-esteem was found to positively influence effort expectancy, suggesting that individuals with higher self-esteem perceive the metaverse as more user-friendly/easier to use, which enhances their intention to use the metaverse. In both cases, effort expectancy acts as a complementary mediator, strengthening the positive relationship between these psychological factors and behavioral intention.

On the other hand, negative emotions were found to negatively impact effort expectancy, making the metaverse seem more difficult to use, which reduces behavioral intention. This competitive mediation that can be seen in this case, suggests that while negative emotions have a direct effect in the intention of using the metaverse, it is by decreasing it, being a negative direct effect that weakens the intention of the user, exacerbating his/her reluctance. The mediation analysis underscores the crucial role of effort expectancy in translating these emotional and psychological factors into behavioral intentions, highlighting the importance of addressing both

direct and indirect effects and showing how different factors can influence in different ways the user's intention, being a good way to understand how the user engagement with the metaverse can be shaped.

By adding these psychological factors, we can also understand "how does the integration of gaming elements in Fortnite influence the intention to use it as a metaverse platform?". First, the emotions – so intrinsically connected with videogames – are a relevant and significant predictor of the intention to use the metaverse, based on the previous results. The established Fortnite community is also familiar with the current set-up of hardware and software setup. This familiarity can be influencing the little relevance facilitating conditions had in this research, as users feel comfortable with the current technology, and don't feel advancements in these fields are a crucial factor. Additionally, positive emotions play a crucial role in enhancing behavioral intention. The familiar and enjoyable gaming experiences in Fortnite evoke these positive emotions, triggering the intention to use the metaverse. The psychological factors brought into this research are important to connect and justify these relations.

Moreover, Fortnite's gaming elements can also be helpful explaining other constructs, such as performancy expectancy and social influence. Positive recommendations and interactions within these online gaming communities and social interactions through events and gatherings, can be related with the relevancy of social influence in this research, while the versatile nature of Fortnite, which includes both gaming and social features, could enhance performance expectancy. Users might perceive that the platform helps them achieve various goals, help them overcome some difficulties they have in real life, increasing their intention to adopt and use its metaverse/social features. Collectively, we can say that adding gaming elements to this model enriches the study, the results and the perspective we can have from them.

4.1. Contributions to theory and practice

The findings of this research make significant contributions to both the theorical and practical perspectives.

The main theoretical contribution is related with the addition of psychological factors into the Unified Theory of Acceptance and Use of Technology (UTAUT), enhancing the already studied framework, moving beyond the traditional approach, and providing a more nuanced view of how internal psychological factors influence technology adoption. Additionally, this dissertation provides once again, through empirical validation, the robustness of the UTAUT model, across different technological domains.

On the practical side, the emotions and self-esteem contributions underscore the importance of creating user experiences that foster positive emotions and boost self-esteem. The integration of gamification elements, such as rewards and interactive challenges, in metaverse platforms can be a key factor to gather more people around the digital environment. The insights also suggest that focusing on confidence-boosting aspects might be a good way of promoting engagement around the metaverse, promoting psychological factors related with the user's identity and life satisfaction, from the digital to the physical world.

Moreover, business strategies can adopt innovative strategies to attract people to the metaverse, developing more appealing and engaging platforms, that can be more rewarding to an increasingly demanding audience. Hosting virtual events, such as concerts, conferences, and product launches, can also attract a broader audience and provide unique experiences, as we saw in the example of Fortnite.

4.2. Limitations and future studies

One of the primary limitations of this research was the relatively small sample size. Although it was collected a considerably larger number of responses, only a subset of these were analyzed in order to catch only the engaged population with both metaverse and Fortnite. Nevertheless,

future studies with larger, more diverse and even more focused samples will be essential to validate and extend these findings.

Additionally, the rapid evolution of the digital environment can be a significant challenge to these types of studies. The metaverse, as a concept and part of the rapid technological development environment, is still in its early stages and continuously evolving. This dynamic nature made it difficult to collect a substantial amount of previous research in the same area. The lack of established literature about the metaverse, although it is increasing (Dwivedi et al., 2022), means that this study is somewhat exploratory, relying heavily on emerging trends and preliminary data. As the metaverse continues to develop, further research will be necessary to build a more robust understanding of its implications, applications, and adoption.

Since PE, EE, SI and FC are broad and generalist constructs of UTAUT model, interviews can be conducted to properly understand the results gathered from the survey (Lee & Kim, 2022).

Lastly, and although this study found that facilitating conditions (FC) were not significant, it is important to consider the rapid advancements in hardware and software that could influence future user acceptance of the metaverse. Innovations such as the Apple Vision Pro, Ray-Ban Meta Smart Glasses, and the Spacetop VR laptop represent significant leaps in technology that could enhance user experiences and increase the intention to use metaverse platforms. These developments are likely to follow current trends and significantly impact user engagement and adoption. Therefore, future studies should explore how these and other emerging technologies might affect the factors influencing metaverse adoption. Investigating the role of these technological advancements could provide deeper insights into the evolving dynamics of metaverse use and acceptance.

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