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**DEPARTMENT OF BUSINESS
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M.B.A.-TOURISM MANAGEMENT**

**Metaverse's features and capabilities: Transforming the
airline's marketing strategies**

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«Δηλώνω υπεύθυνα ότι η διπλωματική εργασία για τη λήψη του μεταπτυχιακού τίτλου σπουδών, του Πανεπιστημίου Πειραιώς, στη Διοίκηση Επιχειρήσεων –Μάνατζμεντ Τουρισμού: MBA-Tourism Management» με τίτλο:

Metaverse's features and capabilities: Transforming the airline's marketing strategies

έχει συγγραφεί από εμένα αποκλειστικά και στο σύνολό της. Δεν έχει υποβληθεί ούτε έχει εγκριθεί στο πλαίσιο κάποιου άλλου μεταπτυχιακού προγράμματος ή προπτυχιακού τίτλου σπουδών, στην Ελλάδα ή στο εξωτερικό, ούτε είναι εργασία ή τμήμα εργασίας ακαδημαϊκού ή επαγγελματικού χαρακτήρα.

Δηλώνω επίσης υπεύθυνα ότι οι πηγές στις οποίες ανέτρεξα για την εκπόνηση της συγκεκριμένης εργασίας, αναφέρονται στο σύνολό τους, κάνοντας πλήρη αναφορά στους συγγραφείς, τον εκδοτικό οίκο ή το περιοδικό, συμπεριλαμβανομένων και των πηγών που ενδεχομένως χρησιμοποιήθηκαν από το διαδίκτυο. Παράβαση της ανωτέρω ακαδημαϊκής μου ευθύνης αποτελεί ουσιώδη λόγο για την ανάκληση του πτυχίου μου».

Υπογραφή Μεταπτυχιακού Φοιτητή:



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ABSTRACT

The aim of this postgraduate dissertation is to present the role of metaverse in airlines marketing strategies. To fully understand how metaverse will change future marketing approaches in airlines, first one needs to comprehend what is metaverse, metaverse's features and capabilities. Metaverse is a concept still in its infancy; therefore, the research about how metaverse will transform airline marketing strategies is still in process. The first chapter of the thesis is giving a definition of the metaverse. This chapter also explains what web 3.0 and its advantages, and disadvantages. In the end of the chapter, the impact of pandemic on tourism and airline industry, and some real examples of metaverse technology in the aviation sector are presented as well. The next chapter 'Metaverse' studies metaverse's features and capabilities of metaverse as well as the risks and challenges in a more detailed analysis. Furthermore, the chapter 'Metaverse Tourism' presents metaverse technology in the tourism industry and how this will have an impact on tourism operators and the travel experience. However, the main question of this thesis remains to understand how metaverse technology can integrate with airline marketing strategies. The chapter 'Metaverse Marketing & Airlines' explains digital marketing practises in airlines, loyalty programmes, and what defines quality of service in the aviation sector. Then how metaverse will change and improve airline's digital marketing practices as well as potential risks and challenges from adopting such technologies in company's marketing strategies. Last, the research context includes future suggestions for research purposes, research limitations, and conclusions.

Keywords: metaverse, airlines marketing, metaverse airlines, metaverse tourism

ΠΕΡΙΛΗΨΗ

Ο σκοπός της παρούσας διπλωματικής εργασίας είναι να παρουσιάσει τον ρόλο του metaverse στις στρατηγικές μάρκετινγκ των αεροπορικών εταιριών. Πριν γίνει κατανοητό πως το metaverse θα διαμορφώσει τις πρακτικές μάρκετινγκ των αεροπορικών εταιριών, πρέπει πρώτα να ερευνηθεί τι είναι το metaverse, τα χαρακτηριστικά του και οι δυνατότητες του. Το metaverse είναι ακόμα σε πρώιμο στάδιο οπότε η έρευνα για το πως το metaverse θα μεταμορφώσει τις στρατηγικές μάρκετινγκ των αεροπορικών εταιριών είναι ακόμα σε εξέλιξη. Το πρώτο κεφάλαιο της διπλωματικής διατριβής ορίζει τι είναι το metaverse. Στην συνέχεια του ίδιου κεφαλαίου εξηγείται τί είναι το Δίκτυο 3.0 (WEB 3.0) καθώς και τα πλεονεκτήματα και μειονεκτήματα του. Στην συνέχεια του ίδιου κεφαλαίου, η διπλωματική εργασία εστιάζει στο αντίκτυπο της πανδημίας στην τουριστική και την εναέρια βιομηχανία. Τέλος γίνεται η αναφορά σε ορισμένα αληθινά παραδείγματα αεροπορικών εταιριών που ενσωμάτωσαν τεχνολογίες metaverse. Στο κεφάλαιο «Metaverse» γίνεται πιο λεπτομερής ανάλυση των χαρακτηριστικών και των δυνατοτήτων του metaverse, καθώς και των κινδύνων ή προκλήσεων που αντιμετωπίζει. Στην συνέχεια, το κεφάλαιο «Metaverse Tourism» παρουσιάζει πως επιδρά η τεχνολογία του metaverse με την τουριστική βιομηχανία και τι σημαίνει αυτό για τους τουριστικούς παρόχους και την ταξιδιωτική εμπειρία. Ωστόσο, το κύριο ερώτημα της παρούσας διπλωματικής εργασίας είναι να εξηγήσει πως η τεχνολογία του metaverse θα ενσωματωθεί με τις στρατηγικές μάρκετινγκ των αεροπορικών εταιριών. Το κεφάλαιο «Metaverse Marketing & Airlines» εξηγεί πώς διαχειρίζονται και αξιοποιούν οι αεροπορικές εταιρίες το ψηφιακό μάρκετινγκ, τα προγράμματα πιστότητας και τι ορίζει την ποιότητα υπηρεσιών στην αεροπορική βιομηχανία. Έπειτα, αναλύεται πως το metaverse θα διαμορφώσει και θα βελτιώσει τις πρακτικές ψηφιακού μάρκετινγκ στις αεροπορικές εταιρίες, καθώς και τα ρίσκα και κινδύνους από την υιοθέτηση τέτοιων τεχνολογιών στις στρατηγικές μάρκετινγκ των αεροπορικών εταιριών. Τέλος, στα πλαίσια της έρευνας παρατίθενται μελλοντικές προτάσεις για μελλοντική έρευνα, οι περιορισμοί της εργασίας και τα συμπεράσματα.

Λέξεις κλειδιά: metaverse, μάρκετινγκ αεροπορικών, metaverse αεροπορικές, metaverse τουρισμός

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1. INTRODUCTION/PURPOSE OF THIS MASTER'S THESIS

The purpose of this diploma thesis is to learn more about the potential, impact, and business usage of metaverse in airlines marketing strategies. To fully understand how metaverse will integrate with marketing science in the aviation industry, one needs to understand what metaverse, metaverse's features, capabilities, and risks. Then how airlines use digital marketing and loyalty programmes to differ from competition, what is quality of service in airline industry, and what factors depends on. Last, there are some proposals for future marketing approaches using metaverse technology in the airline industry, as well as potential risks using metaverse marketing.

Air transport is a critical industry to support the global economy. The airline industry is a very competitive environment, including many air carriers offering similar services. Therefore, customers have a variety of choices to choose from for the same routes. Thus, high barriers of entry have always been a feature of the airline sector, such as structural barriers (slots) or strategic barriers (loyalty programmes). For that reason, marketing strategies in airlines play an important role in shaping competition in the industry.

The pandemic shocked the whole world, especially the aviation industry. The travel and hospitality sector struggled to overcome the consequences of the crisis. During the pandemic, many industries, including the aviation sector, adopted innovative technologies, and tried to adjust to rapid environmental changes to survive. During the pandemic, metaverse became famous again after Meta's announcement. The Metaverse promises new marketing and business opportunities for airlines thanks to its nature using immersive technologies. Therefore, metaverse's potential for business usage is huge, and is expected to transform current business approaches and create new business models.

To conclude, the forecast for the aviation sector brings hope. The aviation industry has experienced its most difficult two years ever, yet the sector as a whole has shown incredible endurance. The general idea is that the pandemic is passed for now and that the vaccine policy along with a global effort to manage limitations will 'reset' the industry towards 2019 air travel or even higher. However, it has been observed throughout 2021 that people still want to fly and the desire to use airline services remains the same. At the same time,

metaverse has the ability to improve airline marketing strategies, airline's services, and customer experience. The metaverse market is expected to grow rapidly in the near future, and companies from various industries are already investing in the metaverse.

2.METHODOLOGY

The research question of this thesis is how metaverse will integrate with marketing science in airlines. Literature review and desk-based study by reviewing existing academic and industry literature and publication used to answer the main question of the thesis. Papers from various databases were reviewed to collect the data. The databases used for this research were Google Scholar, Science Direct, Springer, Taylor & Francis, Emerald, AIS eLibrary, MIT Press Direct, IEEE Xplore, Oxford Academic, and Sage Journals databases. 'Metaverse' OR 'metaverse airlines' OR 'metaverse marketing' OR 'metaverse tourism' were used as keywords. The final list of papers formed after excluding papers not relevant to the topic and duplicates. The metaverse concept is still in its infancy. The authors are writing about the metaverse but have raised significant interest during the pandemic, as proven in Figure 1. Comparing metaverse keyword results with virtual and augmented reality on Google Trends, one can see the shift in interest in those concepts from 2004 to 2022.

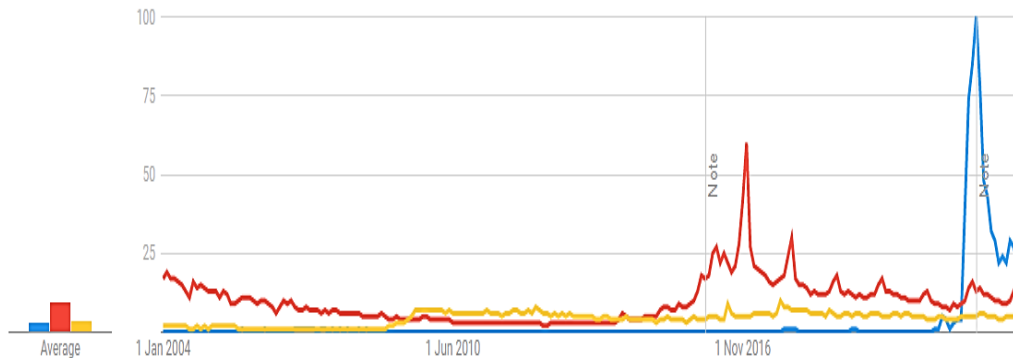


Figure 1. Comparison of metaverse search results with virtual and augmented reality in Google Trends from 2004 to 2022. Source: trends.google.com. December 2022.

3. INTRODUCING THE METAVERSE AND POST-PANDEMIC AIRLINE INDUSTRY

3.1 DEFINING METAVERSE AND WEB 3.0

In 1992, the term “metaverse” first introduced by Neal Stephenson’s science fiction “Snow Crash”. The word ‘metaverse’ is a compound of two words, Meta (Greek word meaning post, after) and Universe. An immersive environment that blurs the lines between time and place by tricking users' visual senses, employing a global and shared digital media network (Jaynes et al., 2003). An always logged-in world based on social networking, as users can create their avatars and identities. An open 3D Internet where education, gaming, healthcare, and tourism industries among others will be the first to benefit from it. Metaverse provides a phygital (physical + digital) or hybrid experiences, while users can interact and communicate in real time. The metaverse has the ability to seamlessly unite our virtual and physical worlds into one, and thus disappears the barriers between them. Users should be able to work, socialise, play, do shopping, and even relax in these online spaces, while at the same time generating unique content and offering value to the metaverse ecosystem. Key characteristics of the metaverse are the advanced ability of visualisation and the enhanced co-presence. Combining these two unique features, virtual environments disappear physical constraints such as distances and time. To create the metaverse, there is the need to develop an open-source technology with open code, like the blockchain technology, that gives the ability to users to enter the virtual worlds and make virtual transactions and create and use hyperlinks. The promise of metaverse for user engagement, amusement, e-marketing, virtual trade with the use of NFTs, cryptocurrencies, and blockchain technology has been recognised by investors and businesses. Businesses must be aware of the metaverse technology and how to implement immersive technologies in their business models. According to Schenker 2019, digital platforms will constitute a total 30% of worldwide economic activity by 2025. The metaverse forces companies to be more creative and innovative on products and services. The 3D universe also creates new ways for users to socially interact and engage with each other but also with firms. Therefore, metaverse has big business and marketing potential.

Metaverse is considered the next generation of the Internet, Web 3.0 or Spatial Web (Arbanas et al., 2023). Using a movie example, Web 1.0 might be compared to the black-and-white film era, Web 2.0 to the colour-based three-dimensional times, and Web 3.0 to immersive journeys in the metaverse. In the Web 3.0 era, users can not only read but also create and interact with content. Users may share user-generated content and support economic activities thanks to blockchain technology. Therefore, the fundamental ideas of decentralisation and transparency form the foundation of Web 3.0. However, WEB 3.0 has several advantages and disadvantages.

Benefits of WEB 3.0:

- Enhanced cyber security: Blockchain technology is used to build Web 3.0 applications. Blockchain makes it difficult for hackers to collect data because it is stored in decentralised networks. Therefore, privacy and security have been enhanced because metaverse applications allow consumers to control their data more effectively.
- Efficiency: Web 3.0 applications can automate processes and make fast decisions. It is cost-effective and time-saving and it is particularly important for companies.
- Transparency: Web 3.0 also includes transparency features. This will help companies prevent corruption and fraud.
- Access is now easier: Metaverse applications are available to anyone with an Internet connection, anywhere, anytime (ubiquitous).

Drawbacks of WEB 3.0:

- Scalability: Because blockchain technology has not been tested yet in the metaverse, scaling it might be challenging. As a result, metaverse applications might not be able to support a large user data base.
- Interoperability: There are numerous blockchain platforms. Trying to boost the cooperation among these platforms might be difficult. Therefore, some metaverse applications might not work with others, which is a significant problem in order to unlock the full potential of the metaverse.
- There are no international regulations yet regarding the use of blockchain technology.

- User adoption: Web 3.0 applications are still in their early stages and have not yet been widely used by companies or individuals. Therefore, it may be difficult to create trust between companies and stakeholders for the use of metaverse applications.
- Lack of standards: Metaverse applications do not rely on international standards. This may increase uncertainty. There is still a lot of room for the creation and adjustment of new metaverse standards.

The metaverse became famous again, during covid, after Meta's (former Facebook) announcement about company's re-brand, new vision and the upcoming metaverse concept. The pandemic created new opportunities, such as remote work and accelerated approaches to adopt innovative technological solutions, such as virtual meetings instead of travelling, among all generations. Therefore, in the post-covid period people are more familiar with such technologies than before. This makes it easier for individuals and societies to better understand the metaverse concept and start creating proper actions to be able in the future to adopt immersive technologies across all sections (social, business, environmental, and other). According to Emergen Research 2021, the metaverse market in 2020 will reach \$48 billion, and in 2028 will reach \$ 829 billion.

3.2 METAVERSE'S EARLY APPLICATION IN THE AVIATION INDUSTRY

The aviation industry is one of the most affected sectors in COVID-19, facing major issues such as increasing interest rates, a lack of qualified personnel, fuel prices, and online meetings. Travel bans, curfews, quarantines, and tests required to enter or leave a country also have an impact on national tourism, creating unstable and unpredictable business and travel conditions. According to Statista, as a result of the coronavirus pandemic, there were 72.4 percent fewer foreign tourists arriving globally in 2020 than there were the year before. Almost 427 million foreign tourists visited the world in 2021, up 5.4 percent from the previous year.

Table 1: Change in international tourist arrivals during the coronavirus (COVID-19) pandemic around the world from 2019 to 2021. Source: www.statista.com

2019	1,465.5	3.6
2020	405.2	-72.4
2021	426.9	5.4

However, the tourism industry responded to Covid with diversification strategies, refunds, cuts, and new marketing techniques (Rogerson, 2021; Sharma et al., 2021). Visitors are the part of the tourism industry that has proven to be the strongest, as they have shown how flexible they are, switching to national vacations and to alternative solutions. Furthermore, the attraction of virtual travel has increased and has contributed to the expansion of games encouraged by pandemic curfews. (King et al., 2020). Travel bans or covid restrictions could also encourage virtual travel. This shows a growing curiosity about the metaverse concept and the opportunity to give its users the ability to escape reality. For instance, Qatar Airways, which introduced Qverse, a virtual reality platform, became one of the first businesses to enter the metaverse ecosystem. In addition, Boeing is looking for ways to use the metaverse to speed up the production of aircraft. Boeing would be able to use simulations to guarantee secure and productive construction by building a digital three-dimensional version of the aircraft, while at the same time saving significant costs. Furthermore, virtual queuing at LAX (Los Angeles International Airport) and immersive online shopping at London's Heathrow Airport prove that the metaverse has still a lot of room to develop in the aviation industry. Furthermore, with the launch of Planies, a collection of nonfungible tokens (NFTs) which will be connected to airline's loyalty program, AirBaltic, the first carrier to use cryptocurrencies as ticket payment, also made history as the first airline to issue NFT. In addition, TravelX and Air Europa have partnered to distribute blockchain content. Finally, Vueling is trying to open up a new distribution channel for the airline by offering metaverse fares that can be used in real life. The aviation industry therefore has nothing to lose by implementing and testing metaverse technologies. Airports and airlines are using virtual reality and other immersive technologies to expand their products and services. Airlines want to discover the advantages that metaverse can

offer to customer experience, from improved manufacturing and metaverse operations to immersive customer interactions and novel marketing practises.

In conclusion, the aviation industry should be aware of the potential in the tourism industry and should focus on how to successfully adopt metaverse technology in the industry. This diploma thesis aims to provide more information about the capabilities, implications, and applications of metaverse technology in airline marketing strategies. But to understand how metaverse will integrate with airline marketing approaches, one needs to understand the nature of metaverse, some critical immersive technologies that support the metaverse ecosystem such as augmented reality, virtual reality extended reality, and mixed reality, other features such as blockchain, avatars, non-fungible tokens, artificial intelligence, and metaverse's risks and challenges of metaverse.

4. UNDERSTANDING AR,VR,MR, AND XR

4.1 AUGMENTED REALITY (AR) FEATURES AND MARKETING POTENTIAL

The metaverse is a hyper-interactive virtual creative environment where the user can experience the mixed use of augmented reality (AR) and virtual reality (VR). Augmented and virtual reality can provide users with a variety of experiences. (Fromm et al., 2021). Users can use augmented reality technologies to experience interaction and innovation. (McLean & Wilson, 2019; Yim et al., 2017). Augmented reality enhance realism in virtual experiences because of its hardware which appears to be glasses, mobile devices, or wearables that people can wear every day, so it is simple to use and can mirror the reality well. According to Mark Zuckerberg, augmented glasses are not only important but mandatory for the metaverse. In addition, he mentioned that AR glasses combined with neural wrist-based interfaces will enrich and upgrade the AR experience. According to Earthweb, more than one billion people are expected to use AR technology in 2022, and 1.7 billion are expected to use AR-based mobile devices. Augmented reality is an interactive technology that enriches the physical world by overlaying digital content. The user has a complete sense of the physical world. The user is not immersed in a virtual

environment but viewing the augmented content while interacting with the physical environment. Therefore, augmented reality technology blends the real and the digital world and users can benefit from both worlds. The ability to fuse the two worlds can also be integrated with marketing science to create new innovative marketing strategies. Using augmented reality, brands and locations have enormous potential to interact with tourists in real time (Buhalis and Sinarta, 2019; Buhalis and Foerste, 2015). Augmented reality marketing offers value to consumers, improves brand trust, strengthens trust among stakeholders, and evaluates ethical dimensions. A famous real-life example from IKEA company that launched the “Ikea place app’ using augmented reality technology to promote its products and increase interactivity while helping the user choose the best value for money furniture. Augmented reality also creates large volumes of information about the user and the environment. Therefore, AR could introduce an advanced, and smarter way of advertising by providing to marketers more data on the user’s preferences, interests, and purchase patterns. According to ARtillery Intelligence's mobile AR prediction, immersive advertising is expected to reach \$6.7 billion by 2025, which is actually an important part of AR marketing. In addition, the global market for augmented reality (AR), virtual reality (VR), and mixed reality (MR) will reach \$30.7 billion in 2021 and nearly \$300 billion in 2024. Therefore, the market for immersive technology is expected to grow significantly in the next few years, attracting many industries to use such technologies. This sudden growth also proves the buzz around the metaverse concept. The ability to interact with other users as avatars, the visual presentation, and the transparency of how customers interact with the product (expressing their feelings) are a step forward from current marketing approaches. Engaging customers with a brand will be easier and better using AR technology, because it allows users to experience the brand in a more fun way. According to AR following graph, while the use is predicted to be higher than 45% of purchases in countries such as Saudi Arabia and the United Arab Emirates, it is significantly lower in Europe.

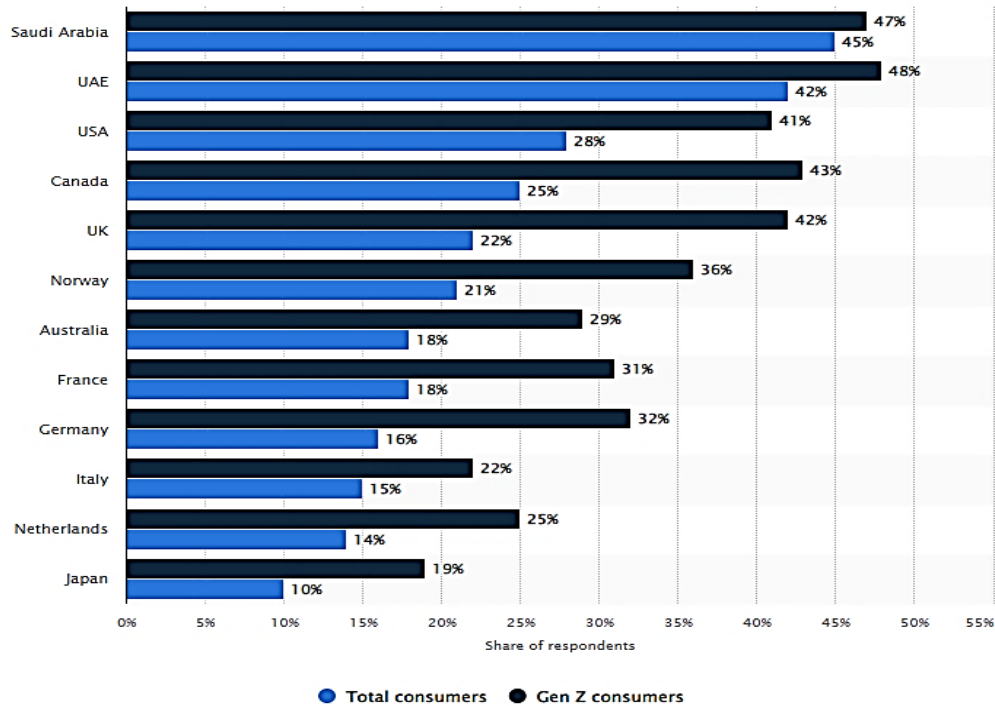


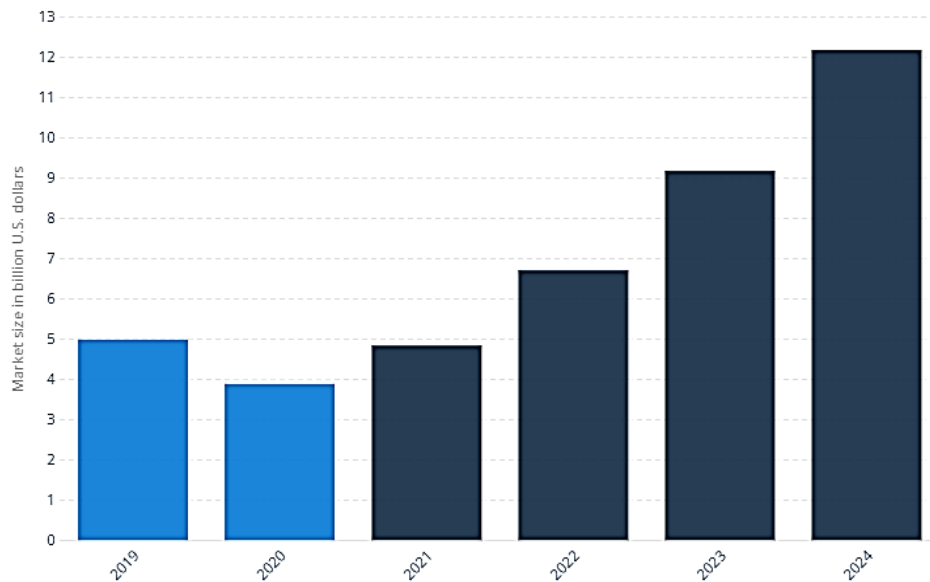
Figure 2. Forecast share of consumers who will have used AR when buying products online worldwide by 2025, by country. Source: www.statista.com

However, augmented reality technology has significant challenges. For instance, in order to fully function, AR requires a large amount of data and information and the proper computing power for this amount of data. Additionally, AR could pose serious risks, such as health issues or keep users away from the real world (distracting them from reality), if is being used for many hours. However, augmented reality across with virtual reality,, mixed reality and extended reality are key technologies to unlock the metaverse.

4.2 VIRTUAL REALITY (VR)

Military aerospace introduced virtual reality technology for flight simulation in the 1960s and 1970s. Virtual reality can create a truly immersive experience. (Suh & Prophet, 2018) and the sense of actually being in the digital universe (Heeter, 1992; Ijsselsteijn & Riva, 2003). VR creates memorable experiences that the user cannot experience in real life. For instance, the user through VR experience can practise dangerous activities such as

surgeries, can time travel or do something that is too rare or too expensive in real life. The user through VR and MR technology also expands personal limits and redefines what is “impossible”. According to Statista, the VR market is expected to grow rapidly in the near future, demonstrating the importance of incorporating immersive technologies into leisure and business.



Source: [ARtillery Intelligence](#) • Includes consumer hardware - including console and PC VR headsets, along with standalone VR headsets - as well as enterprise hardware, consumer software, enterprise software, LBVR Admissions, and advertising.

Figure 3. VR market size worldwide in 2019 and 2020, with forecasts up until 2024. Source: www.statista.com

According to EarthWeb, the European VR market is expected to exceed 20 million in 2025. In addition, sales of VR equipment are expected to reach 10 billion in 2022 and by 2024, more than 34 million VR head mount devices are expected to be adopted worldwide.

4.2.1 DIFFERENCES BETWEEN VIRTUAL REALITY AND AUGMENTED REALITY

Compared to augmented reality, virtual reality fully immerses the user, and the user has no longer sense of the physical environment which is better for longer sessions and for higher

level of immersive experiences, but it can be really exhausting if the user does not take any breaks in between. All the user's senses while using VR technology are captured in the digital universe. In other words, virtual reality technology immerses the user in a digital world, while AR simply adds data in the real world. Each technology specialises in different things.

In conclusion, virtual reality (VR) is a digital environment / space in which users immerse themselves and participate in a fully virtual experience. Users use VR equipment (helmet and controllers) to control their actions, sound, touch, and movement in the virtual space. VR experience is limited compared to metaverse. Virtual reality's objective is to interact with virtual objects, communicate, demonstrate, and play video games, while the Metaverse is a new universe with its own economy, education, social communities, laws, and regulations. Virtual reality technology is another metaverse tool.

4.3 MIXED REALITY (MR)

Mixed reality or MR means an experience that combines both augmented and virtual reality. When AR meets VR ("Augmented Virtuality"), users experience a more hybrid format. The idea behind MR is to create virtual objects that let users engage with the three-dimensional environment while immersed in a virtual world with VR or overlaid with virtual content with AR. Mixed reality technology (MR) combines both worlds by allowing the user to participate in a psychological immersion. Psychological immersion is a condition in which the user is fully absorbed in the experience. In addition, mixed reality (MR) can be considered as the updated version of AR technology. MR allows not only to display digital content in the physical environment (like AR), but also to interact with it. Although it is yet unclear how the MR will work on metaverse, it is considered that it might be the fundamental technology to start it. In short, MR is considered a seamless fusion of real objects and virtual objects, so users may struggle to distinguish between real objects and digital objects. The user can interact in real time in the digital environment while seeing interacting and living in the physical environment. Mixed reality has this unique advantage to combine these two sets in one and offer even greater immersive digital creative experience to the user.

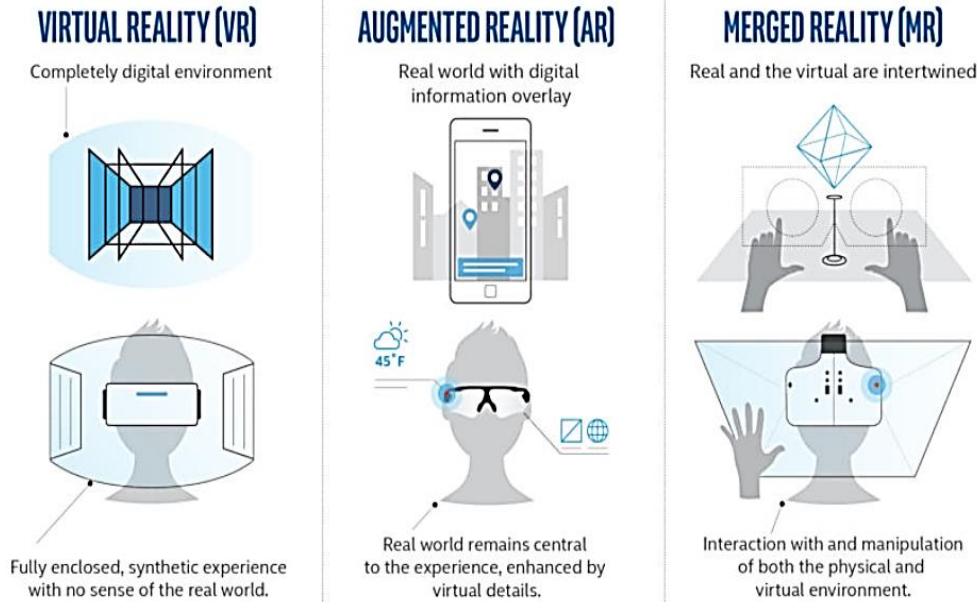


Figure 4. Core distinctions between virtual reality, augmented reality, and mixed reality. Source: www.appliedart.com

By creating new opportunities for social, financial, and cultural activities in this mixed area and causing many disturbances, MR connects the physical world with the virtual world. (Buhalis et al., 2019).

4.4. EXTENDED REALITY (XR)

The user receives an improved digital experience but more physical this time. Compared to VR and AR the user has the freedom of movement while using extended reality, which activates emotions and the user's cognition. XR technologies combine VR, AR, and MR technologies to improve immersiveness and real-time interaction between users and virtual spaces. Extended reality is similar to augmented reality, virtual reality, and mixed reality. Users will be able to enter the metaverse thanks to XR technology.

Extended reality technology, or XR, will fully work only in 3D platforms because 2D platforms have several drawbacks. First, the 2D platform does not enable an enhanced sense of presence and does not trigger an active user. Second-dimensional platforms do not engage enough with users to create an immersive experience. Finally, the second-

dimensional platform shows a low level of user emotions that have a negative impact on the user's experience. Therefore, extended reality technology works better in the metaverse ecosystem than conventional 2D platforms.

4.4.1 EXTENDED REALITY-METAVERSE RELATIONSHIP

The metaverse cannot exist without object detection. On the other hand, object detection is used via XR technology. The process of identifying an object's size, shape, location, brightness, and colours is known as object recognition. Although extended reality technology exists without the metaverse, metaverse cannot exist without XR. Extended reality is an important tool for metaverse to offer more immersive experiences to users, although extended reality is already being used even if metaverse does not exist yet.

To sum up, augmented reality, virtual reality, mixed reality, and extended reality are all critical technologies which support the metaverse. Extended reality technology is the main pillar of 3D marketing. Current marketing practises already use technologies such as AR or VR to create immersive experiences that engage with customers more than traditional marketing campaigns. Although metaverse is referred as a future golden marketing opportunity, businesses should first know how metaverse works, metaverse's features and capabilities and what risks, challenges, or open issues come along with metaverse.

5. METAVERSE

The metaverse is referred to as an immersive and sustainable shared environment. Immersive spaces mean that online environments are realistic enough to stimulate participants' mental and emotional involvement. To fully dive into the simulated environment, it is necessary to sustain disbelief. Interactive and immersive environments are the unique features of metaverse as a media platform. The metaverse will create immersive and meaningful experiences in an endless universe, allowing the review of brand experiences beyond the real world. Metaverse overcomes the two-dimensional constraints and let the user interact and engage with online content and other users, and

makes the user feel that not only participates but also belongs in the metaverse. Sustainability means supporting an independent economy. In the long term, metaverses merge the physical world and the human and online environments, blurring the boundaries between the physical world and the online world. From the micro perspective, metaverse is composed of different online societies, which are formed to collect and maintain personalized services for participants and appear as avatars.

Some main features of the metaverse are interoperability, immersive environments, sustainability, shared ecosystem, the users/avatars, IoT and other sensors, virtual service providers (VSPs), computation, and blockchain. These characteristics will help unlock not only metaverse but also the next generation of the Internet as referred “embodied internet”.

- Embodied means that the Internet has the ability to fuse the limits between the reality and the metaverse. With the help of AR technology people will be able to interact in the virtual worlds through their real location, and thus the two worlds will be one.
- Seamless/Interoperability: Interoperability is referred to as the main feature of the metaverse. The user in the metaverse should be able to travel through platforms without interruption. Thus, interoperability has the main role of boosting the ubiquity of an avatar in the metaverse.
- Shared: Metaverse is a virtual universe where users create, play, socialize, work, and interact with each other at the same time.
- Ecosystem: Each user in the metaverse will have his own virtual identity (ID). This ID is very important because services in the real world will link to services in the online world, and thus IDs will make sure that the value of services will not be cannibalised. For the metaverse, securing avatar’s id is top priority.
- Internet of Things (IoT) sensors are networks of various real objects that connect with sensors, software, and similar technologies. The best example of IoT is a home with intelligent sensors. IoT devices are categorised into general devices, such as A/C and TV, and sensing devices, such as temperature sensors. IoT is adopted in almost every industry because of its great potential and useful applications. Its vision is to link all devices with the Internet and continually improve by learning

and growing like a living being. In the metaverse, IoT sensors will be directly connected to the human senses. The Internet of Things (IoT) will provide important data like user age, preferences and provide better feedback to improve the metaverse ecosystem and user experience. By 2030, the world's IoT devices will reach 30 billion, according to Statista.

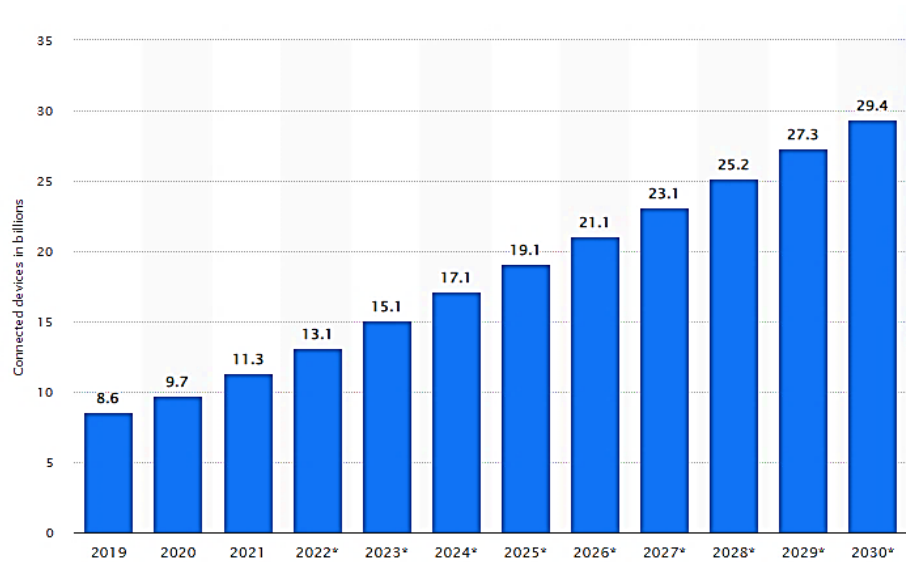


Figure 5. Number of Internet of Things (IoT) connected devices worldwide from 2019 to 2021, with forecasts from 2022 to 2030. Source: www.statista.com

- **Blockchain:** The blockchain is the backbone of the economic system. Metaverse in user perception should not differ from the actual world. This means that real wealth in the real world must fit with virtual wealth. For that reason, virtual goods in the metaverse will have a real price and a real value. The decentralised nature of the blockchain will have a crucial impact on maintaining the value of goods and services in the metaverse. Additionally, cross-chain technology will ensure safe data exchange between two worlds. According to Epic Games Tim Sweeney, metaverse should be decentralized and not have not a main authority. The architecture and structure of the metaverse should be open and transparent to avoid mistakes.

Metaverse focusses on social meaning and user-generated content and is built using a user-centred architecture. Metaverse is more like a service and a whole new world with various societies. Therefore, even when a platform is not available on VR or AR, it can still be considered as a metaverse app. It is not enough to build metaverse only for entertainment. Games like Sims are very similar to the metaverse concept, but still not the same. Unlike metaverse, Sims is a society, but only used for fun. The metaverse needs to serve an economic and social purpose beyond gaming and pleasure. Thus, it is necessary to view metaverse as an ecosystem rather than just a game. Metaverse will discover new fascinating experiences and will give the opportunity to the users to express themselves in a more dynamic and fun way. This means that the metaverse is depending on its users, but also means that if users log out from the digital ecosystem, the metaverse will still continue to develop similar to the real world. User-centric metaverse also means that in order to maintain the value of the real and the digital world, it is essential to understand that the metaverse should not be owned by one firm, which means, no central authority should control the metaverse. Many industries around the world should unite their resources and knowledge to create a shared metaverse and make it faster, better, and available to everyone. Not a single company should enjoy more benefits from it, compared to others. However, the metaverse ecosystem shall meet some requirements to function properly.

- a.** Realism: The ability of the user to feel immersed in the metaverse.
- b.** Ubiquity: Ubiquitous technology means creating an online space that makes technology available to everyone, anytime. Compared to the metaverse, reality is universal in nature. In the real world, people interact with objects around them, with humans, with things at any time, regardless of conditions. The existence of human beings in the real world is real without the need to represent a 3D digital avatar.
- c.** Standards: There is a need to develop standards that let the user communicate seamlessly between different locations and platforms, without interruptions or disconnections. Standards should be implied to build metaverse. Standards ensure and secure the procedures in the metaverse. Standards will ensure that chaos is prevented, and everything works properly. Some well-known tech companies are currently working on creating the right standards for the metaverse. Proper metaverse governance and regulations are needed to secure the ecosystem.

- d. Scalability: Which seems to be the most challenging feature of the metaverse, refers to the ability of the user to coexist and interact in the metaverse while thousands or millions of users doing the same without disconnections or any other challenges.

It is also expected that the new infinite parallel universe will host users not only on Earth.

5.1 METAVERSE COLLABORATION

Cooperation and communication are the basic foundations of the metaverse ecosystem. (Zackery et al., 2016). The metaverse will be made up of virtual teams. Metaverse will change the way people work in teams, either for business or leisure purposes. It is common knowledge that communication between teams is essential to increase team's performance. Trust plays a key role in team performance. In physical and virtual teams, trust is seen as the main success factor for achieving results (Jarvenpaa and Leidner, 1999; Zigurs, 2003). *'We describe trust as a state that involves having faith in the intentions of someone else and being willing to act based on their words or decisions'* (Hinde et al., 1991; McAllister, 1995). In virtual teams, trust is difficult due to the lack of direct interaction. Face-to-face communication appears to be the best way to build trust. Especially in digital teams, it is difficult to communicate directly with team members, and it becomes more difficult to become a leader because in order to demonstrate leadership behaviour, other important features (dress styles, body positions) that appear to have disappeared in virtual worlds need non-verbal signals. Furthermore, because there is not any face-to-face interaction, team members do not feel like they need to impress the right people (e.g. leaders).

Similarly to real human relationships, online teams can also have positive results or conflicts. The challenges of virtual teams define the complexity of boosting virtual collaboration in teams. Based on collaboration and communication, Metaverse seeks to mitigate competitive behaviour and promote teamwork. The Metaverse does not change human nature, but only enriches the way people communicate and interact. Virtual teams can even refer to events in the metaverse. Airlines can use virtual communities to engage customers in a realistic way. Metaverse teams can strengthen the presence of brands in the virtual world and communicate with stakeholders.

5.2 METAVERSE GOVERNANCE

The metaverse might not have regions, but there need to be metaverse governance which will be responsible for regulating procedures in the virtual world. Artificial intelligence will have a critical impact in creating an autonomous governance for the metaverse with automatic procedures. Metaverse governance is responsible for preserving and upgrading the whole ecosystem. It should make sure that hackers or any other threat will not exist, and the ecosystem will continue function smoothly. Details about metaverse governance and how it will be implemented are yet unclear. However, since metaverses have disappeared into physical constraints, governments in various regions have an excellent opportunity to cooperate in the new digital universe. Furthermore, the nature of metaverses will allow users to communicate directly with governments, which will promote democracy. Addressing appropriate government in the metaverse will increase the responsibility of the metaverse ecosystem and, therefore, have an impact on the well-being of users.

5.3 METAVERSE & WELL-BEING

Metaverse is ubiquitous, which will mitigate limitations between urban and rural areas. In that way, people will better manage their resources while at the same time people who live in rural areas will have the same opportunities in the metaverse as people who live in city centres. However, people and societies should concentrate on how to benefit from the use of metaverses, rather than expanding economic activity and gaining more profits. Users are more interested in how to make the use of metaverse technology more satisfying than how to increase net income. If metaverse will replace real social activities, then the consequences can be detrimental, but if metaverse will create new opportunities, for example, helping people with disabilities or promote remote studies, then the society can benefit from it. In the first scenario, choosing virtual life over real one can lead to a fake life without happiness and lacking confidence. In conclusion, every society should accelerate programmes for older people to adopt easier innovative technologies, as well as courses for children to protect them from harmful content. Metaverses should also develop

clear ethical and moral principles to maintain the stability of metaverses (false data, etc.) and avoid any potential risk.

5.4 AVATAR ORIGIN & PURPOSE

The unique feature of the metaverse is avatar technology. The word "avatar" comes from a Hindu notion that envisions a Hindu god taking the form of a human or an animal in the real world. The avatar is an alter ego. Avatars are the digital representations of users in virtual environments. Avatars are used to socialise as digital personalities of users. (Gerhard, Moore, & Hobbs, 2004; Slater & Wilbur, 1997), inspiring the ability of users to communicate and negotiate. (Gerhard et al., 2004). They communicate and cooperate with each other, socialising, working, and living in the metaverse, generating important value for the whole ecosystem. Avatars are not constrained by any physical limitation like space and time, thanks to the metaverse nature. Therefore, avatars can co-exist in the same virtual space even if the users have a great distance between them in real life. The user experience is directly influenced by avatars. Personalised avatars with a variety of details, such as vital signs and colours, allow metaverse users to have a really unique experience. The reason is that when avatars look more lifelike and expressive, the reality of the virtual environment is perceived to be higher. Avatars play an important role in determining how virtual social interactions operate in metaverse scenarios. For example, avatars must act professionally to win trust from other stakeholders in virtual working environments. The application of Avatar technology to verbal and non-verbal communication can enhance the overall user experience and create emotional relationships with users, which can be an important opportunity when thinking about new marketing practises.

5.4.1 REMOVING CULTURAL BARRIERS & ETHNIC DISTINCTIONS

The design of avatars and the name can affect user perceptions of realism, presence, and trustworthiness. For instance, talking to an avatar appeared as a robot might feel less realistic than interacting with an avatar look like a human being with human facial expressions. Due to unlimited customisation options, the avatar-to-avatar experience does

not allow racial differences (for example, choose skin colour) as the user can customize the avatar depending on the user's preference and maintain anonymity. The phenomenon of prejudice and discrimination will decrease using avatar technology in the metaverse. Cultural and ethnic differences can also be eliminated through avatar customisation possibilities.

5.4.2 AVATAR-USER RELATIONSHIP

The user controls avatar performance, actions, and expressions. Each avatar is linked to the user who controls it, so each avatar has a unique personality. On the other hand, avatar actions may not correspond to the feelings people feel in reality. For example, the avatar may laugh, but not the user. In addition, users can use the metaverse for "second opportunities". This means that users can use avatars in a way that they can reveal a new side of their personality that, for some reason can be hidden from the real world. In addition, sometimes the user feels the need to have several personalities. Therefore, the possibility of creating multiple avatars should be available to everyone.

6. METAVERSE & TOURISM

Tourism is a very important industry for the world's GDP, supporting the global economy. Historically, the travel and hospitality industry has been among the first to employ such cutting-edge technologies. The tourism industry is a very competitive sector, and these technological advances have influenced the differentiation of goods and services. Tourism business owners should be informed and familiar with immersive technologies to be able to adapt to the next generation of the Internet, as the metaverse is predicted to transform many industries. According to Technavio analysts, the metaverse market of the growth of the travel and tourism sector is expected to reach US\$188.24 billion in 2026. A survey conducted in March 2022 showed companies from various countries that had already invested in metaverse. The following figure shows the great potential of the metaverse in different industries.

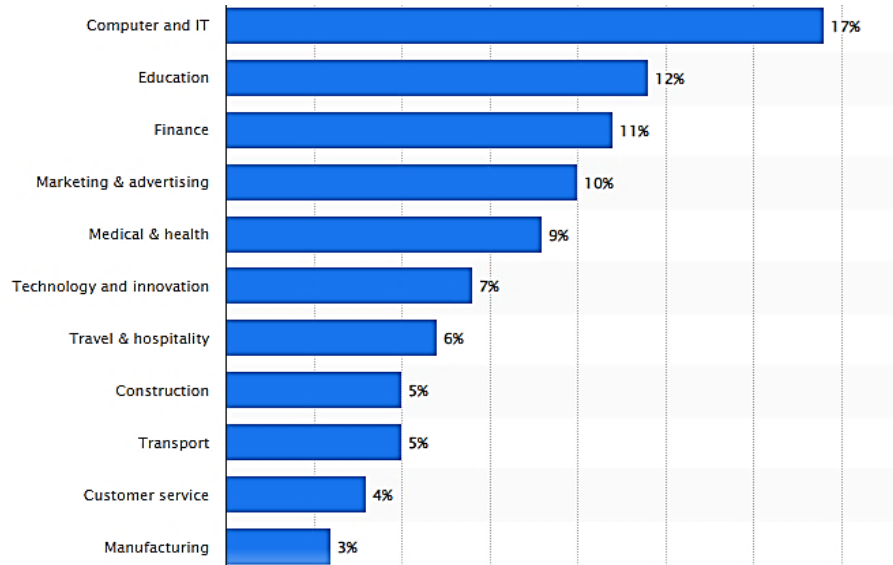


Figure 6. Leading business sectors worldwide that have already invested in the metaverse. Source: www.statista.com

The rise of the metaverse in the travel and tourism sector is the evolution of result of the AR and VR. Hotels, airlines, restaurants, and other tourism businesses should take advantage of the latest technological advances to avoid being outdated. Experience consumption will overcome physical consumption, and the example of Starwood, which was the first hospitality company to open in Second Life, proves it. Up-to-date technologies will also help the tourism industry improve and enrich travel experience in novel ways. However, traditional tourism will still exist. The metaverse will not replace traditional tourism but will only improve the way people travel today. Traditional and virtual travel will combine into one new holistic tourism experience. The metaverse community will always be online and, compared to 2D platforms, this connection will not be lost after logging out. With Metaverse, users will be able to attend events and seminars without having to travel while immersed in these events. Therefore, the metaverse is not a threat to the tourism industry, as it expects to improve the travel experience in all phases.

Real-life examples in the tourism sector using immersive technologies prove that technology is part of this industry and helps to improve customer experience as well as business practises overall. Augmented reality technology allows visitors to interact in real

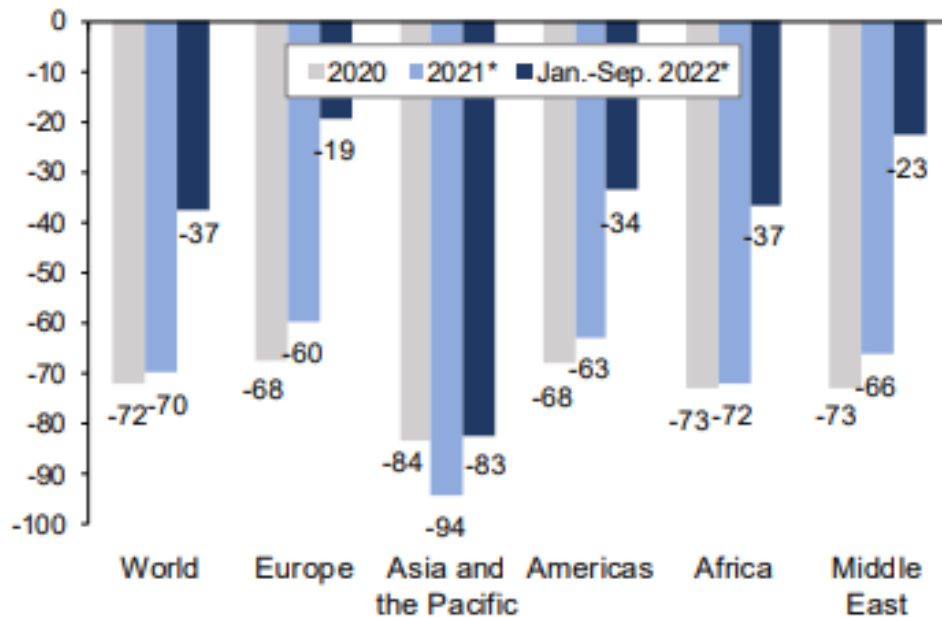
time with places, tourism products, and services. The Premier Inn placed maps in the rooms, where guests can point to them with their mobile devices and using augmented reality technology, guests can be informed about nearest attractions in the area. In addition, Hotel des Arts Saigon created an app that supports augmented reality technology and provides a panoramic tour that presents hotel facilities, amenities, and nearby attractions as well. Marriott Hotels is also experimenting with these technologies. Travelers will still find it worthwhile to take the trip to explore these locations, since it is expected that the metaverse will entice people to visit new places. For example, the famous Pokémon GO game on mobile devices! The use of AR technology has tempted many travellers around the world to travel and discover new places. This proves that the tourism and hospitality industry can benefit and reach new levels by using immersive technologies. By improving visualisation and customization, AR can simplify interactions with tourism services (Buhalis et al., 2019).

Metaverse provides a virtual parallel world that uses intelligence to enrich the real environment, goods, and services as a collaborative and shared online environment. (Buhalis and Karatay, 2022). In other words, metaverse will enrich these experiences, as it bridges both virtual and real worlds, and will upgrade the connection and interaction between individuals and businesses. For the tourism experience, what matters is that the two worlds are connected, so the traveller will enjoy benefits from both. The potential use of metaverse in the hospitality industry is endless. Hoteliers use immersive technology to advertise their services, enhance hospitality offerings, and sell virtual experiences to grow their market share, and improve the company reputation. Consequently, metaverse has revealed a new marketing universe, with many new approaches to reach potential customers for tourism operators.

6.1 METAVERSE: CREATING A TRAVEL EXPERIENCE FOR EVERYONE

Hospitality offers an intangible set of characteristics such as attitudes, services, relationships, kindness, and emotional participation (Stoyanova-Bozhkova et al., 2020). However, visitors most of the times prefer to only feel what it is like to stay in a luxurious

hotel, eat delectable meals, and take in the fancy environment rather than actually staying, sleeping, dining, drinking, or socialising there. It is possible that there are obstacles stopping them from going personally there, therefore they cannot really visit. For example, some limitations due to health risks, terrorist attacks, limited time, price, lack of travel budgets, or disabilities may make travel impossible. The outbreak and war in Ukraine have once again demonstrated that the tourism and hospitality industries are vulnerable to external environmental and internal challenges. Covid-19 has shocked the world and almost closed the tourism industry. From tourism operators, hotels to car rentals, everyone had to adjust to new changes and be flexible because consumer mind had set different priorities than before (e.g., cleanliness, safety).



Source: UNWTO

* Provisional data

Figure 7. International Tourists Arrival (% change over 2019). Source: webunwto.s3.eu-west-1.amazonaws.com

Visitors will be able to experience hospitality goods and services virtually thanks to the metaverse. Therefore, metaverse will not only provide travel incentives for people who

travel, but also virtual travel experiences for those who will not be able to travel. In the metaverse the impossible becomes possible for any traveller around the world. Travellers who could not experience an immersive experience before can now not only visit places, but also try new things and enjoy these new experiences through the metaverse. In other words, tourists can not only see places, but also participate in the process and belong to the virtual environment. Metaverse improves customer experiences from multiple perspectives, transforming the entire travel experience. Companies and users will interact and cooperate with each other in immersive online communities, while companies will collect important user data to improve their products and services. At the same time, the user experience will also be improved. According to a global Internet user survey conducted at the end of 2021, the most important advantage of the metaverse is that it helps people overcome physical constraints. According to 37% of the respondents, the second most popular benefit was improving creativity and imagination. The metaverse also offers educational and training opportunities.

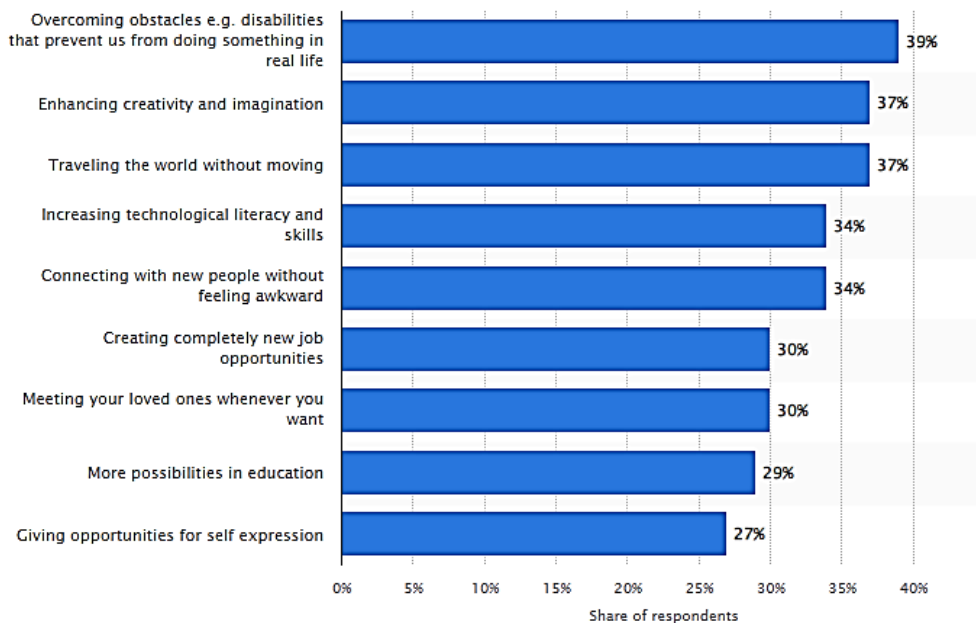


Figure 8. The leading benefits of the metaverse worldwide in 2021. Source: www.statista.com

Now is the time for hoteliers and tourism operators to design and provide an immersive experience that tourists are willing to pay. Tourism players should now more than ever create innovative experience packages to capture all of the user's senses and make the experience even more powerful. The metaverse increases flexibility in tourism services and creates online opportunities that did not exist before. Therefore, using metaverse technology, the tourism industry mitigates the risks in any future crisis similar to a pandemic.

6.2 METAVERSE IN BEFORE-DURING-POST TRAVEL EXPERIENCE

The metaverse is expected to appear in all travel phases and assist not only tourism operators but tourists as well. In the first phase, visitors can test the bed and hotel spa, engage with hotel staff, and review the quality of service; visitors will feel that they are actually in the facility, fully immersed rather than just interacting with 2D content. Therefore, customers can clearly sense the amenities they may anticipate. This will have an impact on the visitor's second thoughts, and therefore, it is possible that cancellations will be reduced due to metaverse technology. Metaverse will also provide visitor stress management approaches due to the large amount of data. Finally, games will create a real environment and an attractive atmosphere for visitors. For airlines and tourism operators, Metaverse provides rich data, automatic reservation procedures, user profiles and preferences analysis, useful market insights, and improvements to marketing strategies. During travel, the metaverse can present in three dimensions all that happens in the tourism experience. It can offer online spaces for hybrid events, can blend the two worlds, and motivate visitors to co-create their own tourism experience. The last phase refers to the experience after travel, which uses metaverses to increase loyalty, expand word-of-mouth (WOM), increase retention, and future sales.

6.3 METAVERSE AND THE FUTURE MARKETING POTENTIAL

Metaverse can not only create immersive experiences but also generate profit. Metaverse is not only a promoting channel, but an ecosystem and thus airlines can benefit from it. It

is also possible that the future consumer might change their consuming behaviour due to metaverse, and businesses should try to adapt to these new changes. These changes will affect consumer attention to tangible and intangible goods, consumer preferences, and consumer decision-making. From a marketing point of view, airlines should be proactive, aware of the future changes, and prepared for future consumers. Marketers must know how to use innovative and immersive technologies to promote, advertise, and engage customers. With the help of metaverse technology, hotels and airlines can communicate with customers more easily, both physically and digitally. Airlines and tourism operators can advertise more interactively and more fascinatingly. In conclusion, it is crucial that airlines not only understand this new phenomenon, but also design appropriate strategies to create a sustainable competitive advantage. The ability of hotels, travel agencies, airlines, and others to adapt and use metaverse will determine the level of competition among tourism operators.

7. METaverse MARKETING & AIRLINES

Commercial airlines, airports, aviation services and aircraft manufacturers worldwide form the aviation transport industry. The aviation industry supports the global economy by providing many job opportunities. In addition, the aviation industry is part of the tourism industry, and it is considered the safest and fastest means of transport across seas and national borders. From a historical point of view, the aviation industry has grown faster than most industries and doubled every 15 years. However, the pandemic was a huge worldwide crisis and caused a lot of turbulence for the aviation sector. Tourists were afraid of travelling, and most waited until the pandemic was over. This has had a negative impact on the aviation industry and has significantly reduced worldwide flights, as almost all countries were in quarantine. According to Statista, in the week starting on January 4, 2020, there were fewer scheduled flights worldwide by 43.5%.

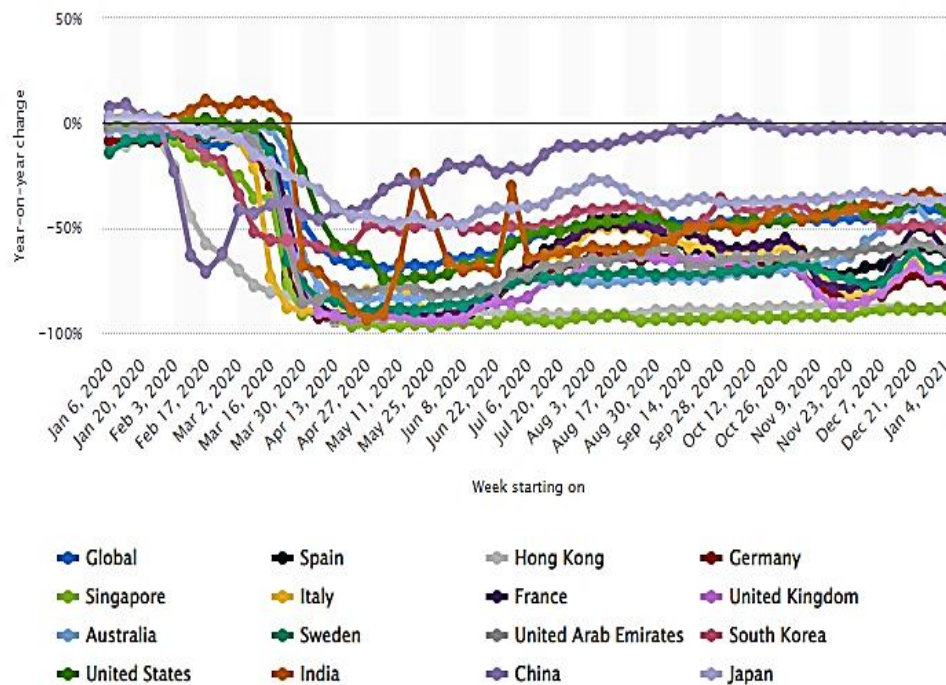


Figure 9. . Year-on-year change of weekly flight frequency of global airlines from January 6, 2020, to January 4, 2021, by country. Source: www.statista.com

The airline industry is a very competitive environment, and airlines could not just shut down their operations waiting for the pandemic to end. Airlines remained competitive by reducing and outsourcing noncore functions and reducing costs. Airlines have also tried to adapt their offerings to new pandemic trends in order to be innovative and creative. In addition, technological progress has contributed to improving the service of many airlines. With the help of new technologies, airlines have not only improved customer experience, but also been able to collect easier user data, which can generate important marketing insights. Advances in IT and mobile communication technology enable companies to provide better services, improve customer satisfaction, and strengthen customer relationships (Kitsios and Kamariotou, 2019).

At the same time with pandemic, the metaverse concept appeared and promises to create great potential for companies to expand and grow their presence in three-dimensional environments. It is crucial to comprehend how the metaverse will revolutionise the aviation

business. As the metaverse trend is growing, so are the questions about future implementations of metaverse technology in airline operations and airline's strategies. More specifically, it is interesting to see how airlines will transform their marketing strategies at the metaverse. But first we need to understand traditional airline marketing practices, airline's digital marketing approaches, and what defines the service quality in the aviation industry.

In general, airlines are called pioneers in the tourism and hospitality sectors when it comes to new marketing and revenue optimisation techniques. Airline marketing strategies must take into account customers' expectations and perceptions (Sultan and Simpson, 2000). Kandampully and Duddy (1999) have emphasised that, in order to provide better value to customers, companies must know all customer wishes and expectations both now and in the future. They continued that companies' ability to meet the needs of their clients both today and in the long term determines their competitive advantage.

First of all, airlines advertise in different ways, trying to engage current customers,, attract potential customers and increase loyalty. Airlines advertise on their websites. Especially after Covid, the presence of the Web may be crucial to consumer decision-making. In addition, the presence of airlines on social media can also influence consumer preferences. Airlines should now interact with customers through websites and social networks and update content to inform their customers. In the digital age, airlines set different priorities than a few years ago. Today, the presence of digital companies is crucial to maintaining competition. Travel is an experiential product, and airlines that provide good services and satisfy their customers could increase retention and loyal customers. If customers are not satisfied, they will probably look for alternative solutions. The competitive environment in which airlines must operate makes things more challenging. In short, today tourists have a variety of options to choose from that may be operated by the same destinations. In the future, the successful carriers will be those that provide high-quality and customer-orientated services.

7.1 AIRLINES & WEBSITE

From a user's perspective, airline's website must be relevant, helpful, and employing a user-friendly interface. Websites should provide links to access further tourist and destination information, and other travel-related services like hotel listings, information on renting a car, currency conversion rates, and visa requirements. The user should feel connected to the airline when navigating the site by providing his e-mail and registering in the airline community for the latest updates, offers, and other. Clients are now frequently looking for online reviews and evaluations of travel and tourism companies. As a result, carriers must provide high-quality content on their official websites and engage customers everywhere else. This shows the importance of effective professional websites for airlines. Finally, websites are the main official presence on the Internet of any company and should be updated regularly to differentiate it from competitors and offer visitors a better experience. Websites are not the only way airlines advertise goods and services online and communicate with customers. Social media has proven to be a powerful marketing opportunity for many companies to engage with potential customers, increase loyalty, and serve as a marketing channel since their arrival.

7.2 AIRLINES & SOCIAL MEDIA

Airlines may share valuable content on social networks that would raise the interest of potential customers. Additionally, airlines should have the top priority of answering any customer's questions and providing immediate feedback and excellent service. Social media are recognised as an ideal platform for e-WOM and are always seen as a powerful marketing tool. E-WOM is often understood as a community of people online, sharing ideas and assessment of service quality, and providing information. Today, Internet users often search for online reviews of companies' products and services before they actually try it. Online reviews improve transparency and shape user expectations of quality goods and services.

Social media helps airlines improve customer service and support by maintaining contact with customers and creating pre- and post-flight services. Social networks also provide

important insights for the airline's marketing department, helping to shape the airline's marketing strategies and understand market trends and customer behaviours. Furthermore, online reviews of airline products and services on social networks and other online platforms enhance transparency. For this reason, airlines should always focus on excellent customer service and a customer-focused attitude.

The metaverse will have a great impact on social media marketing. From a user's point of view, Metaverse can improve the user's experience by providing easier access to information about the company's products and services and online reviews. Users may be more interested in rating their experiences in metaverse than traditional 2D platforms. Furthermore, e-WOM is expected to increase in the metaverse, as users interact in a three-dimensional immersive environment. The presence of avatars will contribute to improving the customer's experience and will increase the enthusiasm of users.

From the airline's point of view, integrating the website and social media platform into a three-dimensional online space means that airlines will collect more user data faster than ever before. The metaverse will therefore have a major impact on the management of airlines and the development of future marketing strategies.

7.3 METAVERSE IN AIRLINE'S DIGITAL MARKETING

Metaverse will transform digital marketing by adding immersive 3D technology. Digital marketing in the metaverse may provide a new approach, improve collaboration and raise engagement levels that are not currently feasible with current marketing tactics. Hollensen et al. (2022) states that metaverses create and integrate more immersive user experiences than digital marketing. Companies prefer to advertise services on metaverse platforms rather than traditional publisher websites using digital marketing. The metaverse will also be the best way to reach generation X, generation Z, and Millennials. Therefore, metaverse will be a great tool for targeting groups. In conclusion, airlines should be aware of the features and capabilities and be proactive about its possible use and implementations in digital marketing approaches because metaverse will be a whole new digital universe with

huge marketing potential. In the digital era, information should be seen as an opportunity rather than a resource.

7.4 AIRLINES & LOYALTY PROGRAMS

Airlines are using loyalty programs to engage customers with the brand, increase repeat purchases, cover the expected occupancy, and generate profit. Attempts to keep customers engaged through loyalty programmes for a long period of time are known as relationship marketing. Relationship marketing aims to strengthen company and customer relationships and create competitive advantages. The name of the brand or the quality of goods and services can be some of the reasons for creating a link between the brand and consumers. Airlines use relationship marketing to create and improve frequent flight programmes. The frequent flyer programme is an airline's loyalty programme. Frequent flight programmes link passengers' needs and desires to a programme. These programmes reward frequent flyers who often use airlines and help them develop a brand preference. As a result of the frequent flight programme, airlines provide customised services to customers. These programmes are designed to increase client loyalty and retention. The aim is to remember the company's brand when customers plan to buy similar products and services. The long-term success of a brand depends on the development of brand loyalty. Successful branding in the metaverse is a key factor in creating competitive advantages.

Loyal customers are one important strength, especially during Covid-19 due to the uncertain times. Airlines use loyalty programmes as part of their marketing strategies. For example, the Chinese "infinite flight" plan allows customers to travel from the purchase date to 31 December 2020 to all major Chinese cities except Hong Kong, Macao, and Taiwan, using 3,000 roubles. Infinite Fly is a psychological game that takes place between companies and customers. From a business point of view, it has taken advantage of enormous purchases to cope with the financial crisis. However, the infinite flight plan was not a permanent solution because the infinite flight plan had a large number of seats and prevented other passengers from purchasing tickets in the future. This loyalty program was a creative idea of Chinese airlines to cover the loss during Covid-19.

Due to the high communication skills of the metaverse, people can interact more effectively with the brand than through online blogs or chat rooms. By creating loyalty programmes in the metaverse ecosystem, airlines can provide immersive content and be more effective in attracting customers. In other words, metaverse loyalty programmes help airlines improve their services and increase their effectiveness by collecting important user data. As a result, airlines can use the three-dimensional immersion nature of the metaverse to be more creative in their offerings.

Events are an important feature of the travel experience. Airline loyalty programs should exploit this opportunity to create bigger, never-offline communities through immersive online events. Events and interactive online communities are alternative solutions to maintain contact with customers, generating valuable insights, and providing fun experiences. For example, passengers can still use the 3D interactive airline platform after flying to know the airline's best recommendations for destinations (seeing, doing, upcoming concerts, highly rated museums, or other destinations). Airlines can also use immersive technologies to inform passengers of the best deals, last-minute offers, updates on connecting flights, important updates on return flights, destination information, and even weather alerts. The metaverse community may give the user the impression that one belongs to the airline community and that the airline no longer is only an air carrier. Airline can create a complete society around its brand, where customers will communicate directly with the airline and other passengers, share memories, experiences, reviews, and evaluate services. In other words, metaverse technology enables social networks, websites, and loyalty programs to integrate into a three-dimensional online ecosystem. Airlines can also collaborate with famous travel applications, tourism-related brands, and non-tourism-related brands to create communities and organise events to maintain interaction with metaverse customers. In addition, airlines can cooperate with sponsors to promote their products and services in virtual environments or create virtual deals that are available only in virtual spaces. Online immersive communities will appear as advanced and intelligent loyalty programs. The user should be able to review, buy goods and services and do everything that is done on traditional online 2D platforms. A real example in the tourism industry using metaverse technology in loyalty programmes is Marriott. The international hotel brand made the decision to produce three distinct digital works of art in the NFT

format. These NFTs serve as entrance tickets to the next Marriott Metaverse. Additionally, AirBaltic used NFT and crypto technology to improve its loyalty programme, creating new ways of issuing air tickets and improving its offer. NFTs ensure exclusivity and are therefore very important for the formation of future metaverse loyalty schemes. NFT technology is an important component of future loyalty programmes. Loyalty programs in the metaverse can engage the user in all phases of travel experience. For instance, in the post-travel experience, user could use their own NFT to access any details regarding the trip (flight number, seat number). NFTs can also serve a different purpose by announcing hot deals and special offers, for example, last trips to a particular aircraft before retirement or themed flights depending on the occasion or even the destination. For instance, London is one of the most famous destinations during Christmas, so airlines can partner with several London Christmas brands to sell tickets for special destinations using NFTs.

If airlines will exploit metaverse technology by partnering with other brands, means that for passenger it is not the same travel experience as before, because he can earn points and rewards not only for airline offerings but for other brands too. The experience of flying will change into a new and holistic experience of travel. Therefore, the development of metaverse technology is a major area of the airline's loyalty programme, and there is also a large opportunity for companies to collaborate with each other to create more competitive travel packages. Metaverse technology in loyalty programmes is expected to favour low-cost airlines because they are more flexible in adopting such technologies. Metaverse is a time and cost-saving solution for low-cost airlines. For brands to succeed engaging customers and increasing loyalty, they must add value to customer experience. If they succeed in this, they will create long-term relationships with its customers. Rewarding loyalty users through loyalty programmes in the metaverse while at the same time respecting user privacy, will create a unique connection. In general, metaverse is expected to improve loyalty programmes, immerse the user, and delivering greater value.

7.5 AIRLINES & CUSTOMER SERVICE

The aviation industry belongs to the service industry. Therefore, quality of service is essential for airlines. One possible strategy to establish loyal customers is to provide

excellent and satisfactory services. Price is no longer the exclusive factor to consider when it comes to satisfaction. The offering of high-end services has been a crucial criterion to implement in airline strategy for many low-cost aircraft companies. However, understanding what customer service in a highly competitive industry might provide airlines with a competitive advantage over its competitors.

The airline is responsible for the quality of service prior, during, and post-flight experience. Metaverse can be integrated into all phases of airlines services. Metaverse, which uses immersive technologies and can combine the two worlds, can improve airlines' ability to offer high-end goods and services by saving costs and time. Furthermore, digitalisation of services and presentation in a three-dimensional immersive environment may affect the quality of goods and services and, therefore, may affect airline competitiveness, although it is not yet clear whether this will happen. In addition, the metaverse can be integrated in all travel phases. For instance, business class could provide passengers with VR headsets for airline menus, online magazines, and other services. Metaverse offers unlimited choices to entertain users and improve the quality of airline services. Emirates has recently launched a training programme using metaverse technology. Although trainees will still have to go through traditional training procedures, employing metaverse technology will give Emirates a significant advantage over other airlines and this proves that metaverse technology is a big promise for the airlines industry. Service quality is the key to success in the aviation sector. Airlines should prepare appropriate actions, flight simulations, and programmes to train employees using metaverse technology and exploit metaverse opportunity to improve the quality of their services. One potential challenge is that metaverse gear, such as headsets, headphones, controllers are bulky and might cause dizziness if used during flight and will negatively affect customer experience.

In short, airlines that do not implement quality strategies risk of falling behind competitors, especially the airlines that use a differentiation strategy and the full-service airline. Implementing a full quality strategy using metaverse technology may be difficult. It is not yet clear how the metaverse will improve the quality of goods and services. However, Metaverse helps companies collect user data easier and more effectively create huge

marketing opportunities. Therefore, metaverse advertising is expected to be one of the most important and first implementations of metaverse marketing.

7.6 METAVERSE IN AIRLINE'S MARKETING STRATEGIES

The Metaverse is a three-dimensional space with ads. The metaverse advertising targets generation Z, generation X, and millennials, who are the most familiar with immersive technology. The greatest concern is whether metaverse technology will be available to all. If not, the metaverse will only extend the gap between generations. It is important that metaverse technology is adopted by all to fully realise its potential. Metaverse will be a virtual ecosystem in which users interact in real time while being constantly targeted by advertising campaigns. In the metaverse ecosystem, airlines can also use the famous "try before you buy". Virtual reality stores will occur in the metaverse, where users can not only see the product but also 'try' it. Advertising will be adapted from traditional (text, photos, videos) to digital and physical environment integrated into the user's environment and become more immersive. The shift from "flat" media to immersive media takes place. Advertisers using immersive technologies will not only try to attract customers' interest but also to draw their attention. Using virtual marketing technology, airlines can communicate with customers in the metaverse in a more immersive way and connect with them in ways that have never existed before. Airlines' marketers should use creativity to generate ideas that are different from those found in the real world. This allows you to develop advertising content that goes beyond reality. Metaverse is more like a feeling of being there than a simple role as a two-dimensional display.

Although metaverse will provide new marketing opportunities, it will be a very competitive environment, and companies will face various challenges with respect to advertising on 3D platforms. For example, you can walk down the streets of simulated or enhanced reality covered with flags and signs supporting various political candidates. If you don't know what you are seeing is targeted marketing, you can think that this community is largely in favour of this politician. You may even be totally unaware that other politicians' signs and banners are displaying for others who are heading down the same path as you. This may

be a potential risk for metaverse advertising. Consequently, advertising wars are expected to begin in the metaverse, and competition among airlines may increase.

Metaverse will connect “phygitality” (physically + digitally) the company with its customers creating a new hybrid relationship. Therefore, airlines will have the benefit of reaching customers in both worlds and will be able to advertise at the same time in the real and online world. It is a new, exciting, and innovative way for companies to connect with customers. Similarly to Gucci’s partnership with Roblox, airlines can create metaverse experiences to promote their brand. However, users will not be able to endure improper or disturbing experiences in the metaverse, making the user experience more crucial than ever.

Advertising is a big part of marketing science. Metaverse advertising could only use metaverse technology. Metaverse supports immersive technologies such as virtual reality, augmented reality, mixed reality, and extended reality. VR advertising in VR already gives the viewer an impactful experience, creating memories as an emotional integration effect. As a result, airlines can create meaningful and exciting experiences through virtual reality advertising, and customers can even engage emotionally with brands. Virtual reality advertising can help airlines strengthen their relationships with their customers and increase brand awareness. Furthermore, by using virtual reality technology, airlines can provide customers with more transparent strategies, philosophy, and objectives. In other words, virtual reality enables companies and customers to communicate and express themselves more easily. The presence of the airline in the metaverse means that passengers will have a 360-degree interaction with the airline before, during, and after the flight. Airlines can create new competitive advantages and new capabilities by offering immersive and emotional experiences using virtual reality technology. For example, First Airlines, based in Tokyo, uses virtual reality technology to demonstrate its services to passengers and provide them with a “real” experience. First Airlines designed a room similar to the aircraft environment, provided a VR headset to the user, and also involved real flight attendants to enhance the user's experience.

In conclusion, by establishing presence in the metaverse, interacting with people, and offering value, airlines can employ the metaverse for marketing, branding, and advertising.

Airlines should take into account the unique nature of metaverses when creating marketing, branding, and advertising strategies. (Oxford Analytica, 2019). The existing studies of Nike and Reebok show the way how the two companies have successfully the metaverse for marketing and advertising. Consequently, the metaverse allows airlines to interact digitally and physically with all stakeholders and potential customers. By using virtual reality, airlines can increase their location, area, time zone, and competence, as well as provide various immersive experiences. On the other hand, it is not yet clear whether metaverse advertising will play the same role as in real life.

7.7 AIRLINES & AVATARS

What makes advertising in the metaverse so special is the ability of creating three-dimensional representations. To communicate with customers and engage them in marketing, companies create attractive cutting-edge avatars (Hollensen et al., 2022). Three-dimensional spaces with avatars can lead to co-existence and make users feel engaged, active, and immersed. As a result, avatars are a unique opportunity for airlines to increase their presence on the metaverse and interact more naturally and realistically with customers. In the metaverse, customers do not deal with human representatives of the company. They may deal with artificial intelligence agents who are programmed to interact differently with repeated customers. This suggests that marketers can use anthropomorphic artificial intelligence agents instead of traditional metaverse influence marketing, such as virtual 3D artificial intelligence agents in VR or AR holograms. Similarly to Qatar Airways, Qverse is launched with the virtual flight attendant of the company providing personalised service to customers. It is expected that many airlines in the near future will follow similar methods by creating their own avatars. In this way, airlines can interact with customers in innovative ways, creating a hybrid relationship with the customer, both in the online and real worlds. AI avatars can provide personalised experience using user data from loyalty programmes, saving passengers' behaviour patterns and preferences. An AI avatar in the metaverse can offer tailored services in all passengers at the same time. For instance, a frequent flyer travelling for work might want a quiet lounge away from noisy environments and children, and be able access to information related to work, so the avatar

can create an experience and teleport the passenger to an environment created by airline especially for business travellers. Additionally, avatars can participate in post-flight experiences that improve airline customer service. This can be achieved by using artificial intelligence avatars to interact with customers in real time and solve any problem that has occurred. Therefore, avatar technology has great potential not only to improve loyalty programmes, but also to improve post-flight services.

Since the metaverse concept appeared during the pandemic, avatars have become a promising and necessary feature of the metaverse. According to Statista, Gen Z and Millennials are more likely to create avatars, possibly because they are more familiar with new technologies and most baby boomers are not interested.

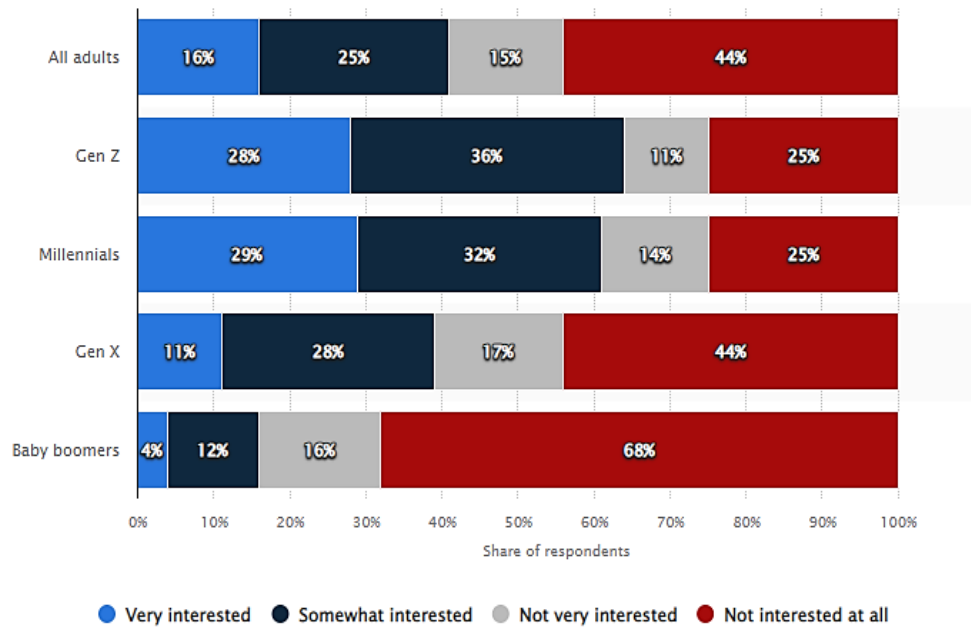


Figure 10. Share of internet users in the United States who would be interested in creating an avatar for the metaverse as of March 2022, by generation. Source: www.statista.com

Albeit metaverse concept is still in its infancy is still a challenge how metaverse will bridge the gaps among the generations and will be adopted by everyone. Avatar technology is a promising technology for airline marketing strategies, but it will not be successful unless

customers use avatar technology. It is important that both companies and individuals to be able to use immersive technologies, so both will be able to communicate and interact with each other.

7.8 METAVERSE MARKETING CHALLENGES AND RISKS

The Metaverse also presents challenges for marketers. Firstly, it is difficult for airline digital marketers who have experience using specific marketing strategies to suddenly experiment with advanced and immersive systems. For this reason, airlines need to develop special programmes to train employees to use immersive technologies. It would require considerable expenditure on specialised equipment, qualified staff, cyber security, and commitment to other corporate assets. It is critical to recognise whether society is prepared and ready to accept metaverse technology. It is also difficult to use metaverse-based digital marketing strategies for targeted groups. Depending on the company's dedication to the airline and its experiences with metaverse technologies, how well metaverse is integrated into digital marketing will be determined. The greater the power, the greater responsibility. Companies, such as airlines, may have greater responsibility for exposing these data to the metaverse by collecting important user data. Cyber security should be the top priority in order to increase the user's trust in the company's products and services in the metaverse. From the point of view of users or airlines, ensuring a safe metaverse ecosystem benefit both companies and individuals. Another important challenge for marketers is to raise awareness of both worlds' brands. Co-existence between metaverse companies will be difficult. The brands must be consistent with the company's philosophy in the real world and in the three-dimensional virtual universe. Privacy concerns regarding immersive technologies such as virtual reality, augmented reality and extended reality, are crucial in order to raise confidence among users and companies to adopt such technologies. The construction of such a system that interacts with customers at all three stages of travel will be complicated. This may also increase competition, as this system depends mainly on loyal customers and loyalty programmes vary from airline to airline. Some airlines have a larger and stronger loyalty programme, so the metaverse does not seem to be an equitable opportunity for everyone.

History shows that people in online spaces are victims of privacy threats more often than in the real world. From the user's perspective, metaverse may be able to control avatar's psychological answers and body gestures, which will give full control to metaverse, and the user might feel restricted. Furthermore, a social and emotional disease called "Cyber Syndrome" is caused by excessive Internet use. The problem of cyber syndrome is even more serious when immersive technology is established. As a result, metaverse is possible to increase cyber syndrome due to its immersive nature. Additionally, Metaverse will require users to share their location and other sensitive information to improve their services. If hackers attack systems and expose sensitive user data, this may pose a significant risk. Hackers can access user biometric information, such as fingerprints, unlock bank accounts, and share other sensitive information. Since biometric data are strictly linked to its user, this means that when stolen, the user may not be able to reset it. Furthermore, NFT, which is an important feature of the metaverse, is also facing a variety of challenges related to viruses and other cyberattacks. Cyber addiction is another threat that may have a negative impact on user psychology and can cause mental disorders such as despair and loneliness. Finally, cyberbullying refers to the practise of sending, uploading, or sharing harmful and inaccurate information. Since the metaverse is the entire universe, an algorithm should be used, especially for detection methods of cyberbullying. Metaverse should provide solutions for cyber security and privacy to eliminate threats and protect users (Zhang et al., 2022). The mental health should be top priority in the digital universe. Furthermore, since brand loyalty is based on various factors, such as service quality and customer trust in the company, it is complicated to create customer and brand trust in a metaverse due to privacy concerns. In addition, those who are not familiar with metaverses have no opportunity to benefit from virtual events and online communities. It seems impossible to reach all potential customers through immersive technology. Some customers always prefer the traditional method, so airlines should not concentrate on VR and AR marketing in full. In addition, as in today's online forums and online communities, many users may be "ghosts", who may belong to the airline's community, but provide feedback. Many passengers may also use airlines only for transportation and find it difficult to engage and interact with companies in other services. Moreover, the hybrid nature of the metaverse can also prevent the real experience. For example, in swimming, you can feel

water that cannot be perceived by the metaverse, so it is not real, no matter how close you are to reality. It is unlikely that the customer's experience in the metaverse will be the same as in real life.

Metaverse is a complex system. The real world is not yet ready to accept metaverse technology. The construction of software to maintain and improving it is quite difficult. According to Statista, users and society as a whole may experience certain unexpected effects of metaverse. According to almost half of the respondents, the greatest risk is addiction to the online or simulated worlds, followed by concerns about privacy and mental health.

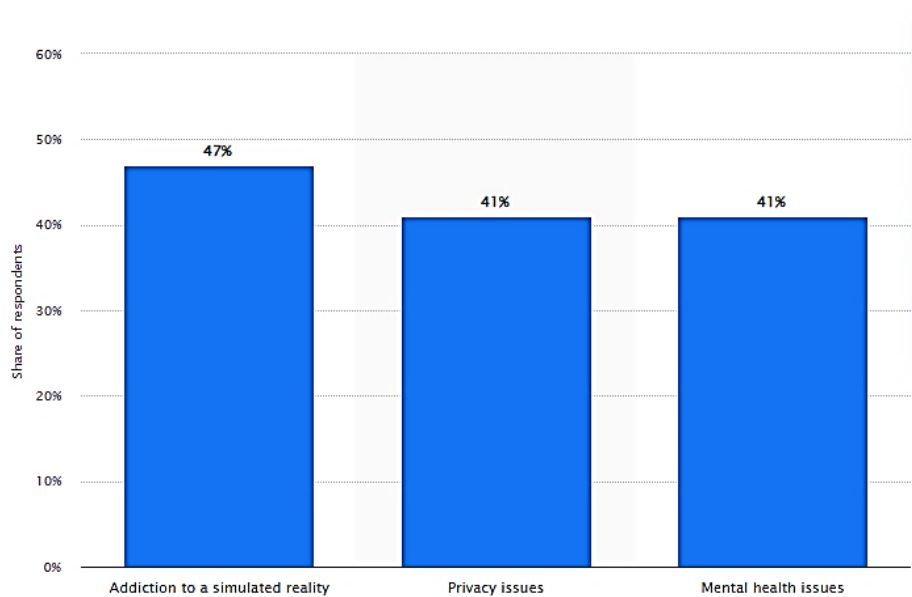


Figure 11. Dangers of the metaverse according to Internet users worldwide in 2021. Source: www.statista.com

Thus, all the above should be considered to protect user mental health in the metaverse. The metaverse will affect not only the aviation industry but the whole world. Therefore, tourism operators should be aware of possible threats and risks regarding metaverse, and their mission is to provide virtual goods and services while protecting user data.

8. FUTURE RESEARCH

8.1 FUTURE RESEARCH ON USER'S PRIVACY IN THE METAVERSE

What are the future procedures for managing and storing user data? Will airlines take the user's permission to collect and analyse data to generate marketing insights? How to prevent fraud and false information?

8.2 FUTURE RESEARCH ON BLOCKCHAIN, NFTs

Although blockchain is an essential technology for connecting virtual transactions to the real world, the issue of how to build such systems is still unresolved. Existing blockchain platforms are they able to join metaverse, or do they need to build new ones? The new currency system should be able to handle huge amounts of transactions at very high frequencies, which may be difficult to achieve. Furthermore, it is not yet clear how to organise the exchange of money between the metaverse and the real world. Finally, the massive currency inflation of decentralised economic systems based on blockchains, and artificial intelligence (AI) systems discourages users from using these technologies. Blockchain technology also lacks the right protocol to ensure scalability and interoperability. Are the current NFTs platforms ready to join metaverse? How will NFTs successfully represent the 'ownership' of goods and services? How will NFTs, ethical issues, and legal concerns in the metaverse integrate successfully with marketing science?

8.3 FUTURE RESEACH ON METAVERSE MARKETING

How can users choose whether to see ads? Future research should investigate how advertisements affect user health and ecosystem health and how to prevent harmful advertising. How to differentiate airlines' loyalty programmes in the metaverse and not provide the same rewards as competitors? Future research must also investigate how

metaverses can be integrated into marketing science, including other factors such as company size, company age, market type, industry type and new technology experience. Marketing and advertising in the virtual world should consider how to interact with consumers living in virtual environments. How does metaverse technology change brand loyalty, customer satisfaction, and user experience? What are the most important strategic decisions managers must take into account in the metaverse? How can avatar technology interpret (or not) and analyse (or not) metaverse ads? How to make use of virtual 3D representatives? Finally, it is not yet clear whether the users will be satisfied with the use of metaverse technology as in the real world.

9. LIMITATIONS

The validity of the thesis's results is influenced by some inevitable limitations. First, the concept of the metaverse is still in its infancy; therefore, there is a lack of global bibliography on the metaverse marketing of aviation. The author writes about the metaverse, but there is a lot of future research to be considered. The method used in the thesis also poses challenges in answering the main questions of the thesis.

10. CONCLUSIONS

Understanding how brand value, engagement, and strategy will change in the virtual world is crucial from the airline's perspective. Metaverse will focus on transformational experiences, will create meanings for its users, and will challenge traditional operations. From social to immersive social, the user will be absorbed in a holistic new experience. This is a unique opportunity for airlines to build strong loyalty with their customers using metaverse technology, as it is considered the biggest digital upgrade of the decade.

The metaverse will influence our society in all respects. Marketing is one of the most affected areas, as strategies and tactics are moving from traditional 2D content to a new digital universe where strategies must be implemented through an immersive environment. One of the most effective marketing strategies for airlines may be to use a three-dimensional virtual world to create an immersive experience that allows customers to explore airline products and services in a fun and interesting way. (Kevins, J. 2022). Furthermore, by exporting large amounts of data from the metaverse, marketers can better analyse customer profiles, preferences, behaviour, and needs. This may be a golden opportunity for the market to fully understand the behaviour of customers and adjust its marketing strategies or even create new innovative marketing strategies.

In addition, the metaverse is cost-effective, easy to use, and fast. Therefore, airlines can use metaverse technology to reduce costs while increasing their brand. Metaverse's marketing potential will create additional revenue opportunities for airlines, in addition to new marketing practises. The use of blockchain technology enables airlines to make significant profits. Blockchain technology will facilitate virtual and real-world transactions and can improve the experience of both users and airlines using cryptocurrency and NFT technology. For airlines, metaverse is a huge marketing opportunity and therefore important sources of future revenue.

After covid, people were more familiar with the use of apps, online meetings, and remote work than two years ago. Covid-19 has helped many countries to accelerate action to adopt new technological approaches and prepare businesses and consumers for the arrival of the metaverse. The advent of metaverse will not replace real social relations with virtual social

relationships but will bring new social relations integrated online and offline. For airlines, building strong online relationships with customers in the metaverse means tracking customers and collecting user data, which helps in the development and growth of airlines in a highly competitive environment. Airlines should understand technological progress and try to innovate with a user-focused approach. Marketing could also change significantly due to the nature of the metaverse. Customers not only participate in the travel experience, but also belong to it, be part of it and act through metaverse technology. The metaverse connects the real world with the digital world, and marketers can use this opportunity to improve customer experiences. Marketers must realise the metaverse power of bringing together two worlds and creating a marketing experience that connects two worlds at the same time. It is also crucial to recognise the business threats associated with the metaverse in the tourism industry.

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12. APPENDICES

12.1 DEFINITIONS

1. Metaverse Definition: A continuous and immersive 3D virtual network that can be used for business and leisure purposes (Collins, 2008).
2. Metaverse Definition: Independent virtual worlds with an interconnected network of 3D virtual worlds, or alternative domains that people would consider to be social and cultural activities (Dionisio et al., 2013).

Keywords: metaverse, virtual reality, augmented reality, virtual environment

3. Digital Twins (DT): The digital twin is a clone of a physical entity or system with a high degree of integrity and consciousness that interacts with the real world. In other words, Digital Twin is a digital reproduction of the real world.
4. Non-player character or NPC: Computer agents and NPCs usually represent enemies or objects, but do not control the user. However, they are not bots, they are automatic players.

Keywords: metaverse, glasses, physical environment, digital environment

12.2 METAVERSE TIMELINE

1. **1991:** The birth of the Internet.
2. **1992:** Snow Crash the famous science fiction from Neal Stephenson where the term ‘‘Metaverse’’ was used for the first time.
3. **1993:** To avoid email spamming, Proof-of-Work (PoW) invented. Later, pow was the main tool to validate and ensure transactions in the blockchain. One node is chosen to validate the next block through an election. But the truth is that validators are not actually chosen randomly at all. To become a validator, a node must deposit a certain number of coins into the network as a guarantee. Depends on the amount there is respective chance to be selected. Comparing to

PoS, in proof-of-work everyone mines and there is not an ‘election’ process. In proof-of-stake the node receives the fee as a reward from each transaction.

4. **1998:** The computer engineer WeiDei shared with the world his project B-Money. Just like blockchain, B-Money had a decentralized nature. B-Money was a cryptocurrency but never made it to launch officially.
5. **2002:** The birth of Digital Twins, which refers to digital copies of real items, and was published by Michael Grieves.
6. **2003:** The world-famous game Second Life was introduced on the world market. Developed by Philip Rosedale and Linden Labs partners. Until now, there has been a great fan base, with millions of users spending an average of four hours a day in the Second Life universe.
7. **2006:** Roblox was introduced with great success in 2006. In particular, during the covid, Roblox's fan base increased considerably and reached its third-highest gross in 2020.
8. **2009:** Bitcoin was introduced in January 2009. The creator of Bitcoin remains Satoshi Nakamoto. He also created the blockchain, which would act as a public record of Bitcoin.
9. **2011:** The famous movie ‘Ready Player One’ created by Ernest Cline and represented a virtual world.
10. **2012:** NFT or Nifty or Non-Fungible Token first appeared in December 2012 with the creation of ‘Colored Coins’ by Vitalik Buterin, also the creator of Ethereum, while he was trying to improve Bitcoin blockchain.
11. **2014:** Peter Thiel owns a company called ‘Confinity’ that merges with Elon Musk’s company ‘X.com’ to create PayPal. Three years later, eBay acquired PayPal for \$1 billion. In 2010, Peter, who was Facebook's first external investor, presented the Thiel Fellowship. The Thiel Fellowship encourages students under the age of 22 to give up school and be creative in other activities. The prize was \$10,000 offered by the Thiel Fellowship. "The Thiel Fellowship gives \$100,000 to young people who want to build new things instead of sitting in a classroom." In 2014, the winner of the award was the co-creator of Ethereum, Vitalik Buterin.

- 12. 2015:** Vitalik Buterin and Gavin Wood have published the Ethereum Network, which includes the Ethereum Blockchain. In the same year, Decentraland was also launched with an algorithm to demonstrate its effectiveness. In addition, smart contracts while in 1990s first Nick Szabo thought the idea who defined them as ‘*A set of promises, specified in digital form, including protocols with which the parties perform on these promises*’, became a trend again with the appearance of Ethereum Blockchain.
- 13. 2016:** The first game with augmented reality technology appeared. POKEMON GO became famous for creating a huge fan base around the world. In the same year, the Ethereum Blockchain was created, or Decentralized Autonomous Organizations (DAOs). DAOs are code-based, are self-decentralized, and have no CEO. DAOs are constantly improving and developing as human beings because their stakeholders approve or reject changes as well as the real world. There are no leaders and no managers who manage DAOs. They are fully independent organizations, and they cannot be closed. Its nature is similar to that of blockchain technology. They are open and transparent, allowing anyone to access the code, including other developers to correct possible errors. On the other hand, open code can cause many threats because anyone can edit code. Among the actual examples of DAOs are MakerDao, Aragon, Meta Cartel, Gitcoin, Dash and the most popular Dao.
- 14. 2017:** Fortnite the famous game using avatars and creating a whole universe for gameplay introduced to the market reaching 350 million of users worldwide.
- 15. 2018:** The introduction of Dai Stablecoin, which was compared to other cryptos at the time, linked to the US dollar, made Dai Stablecoin different from competitors. Second, as the Ethereum blockchain grows and expands, decentralized exchanges occur. In addition, the famous NFT game Axie Infinity engages users in the online reality based on myths. Until mid-2021, Axie Infinity achieved the highest NFT value among all other games to earn.
- 16. 2020:** With the outbreak of a pandemic, major technological advances have occurred, while the concept of the metaverse has attracted the interest of many people around the world as a concept of the future. In addition, decentralized

applications or decentralized applications have gained a significant value on the main blockchain platforms, over \$2 billion. In addition, Solana, a blockchain Dapp, introduced a new consensus tool called proof-of-history, which is based not only on proof of stake, but also the timetables of the blockchain. Finally, Alien Worlds is a Dapp that includes NFT characters and was developed in 2020. By 2021, Alien Worlds had over 2 million users.

12.3 METAVERSE-COUNTRIES

1. U.S. appeared to be the leader of metaverse among other countries.

- a. Amazon which implemented the virtual reality experience on its shopping process.
- b. Roblox which is now of the top games that got closest to the metaverse concept than any other game.
- c. META (former Facebook).
- d. Epic Games: With over 1 billion dollars of investments.
- e. Sketchfab: The biggest 3D model creating company and with big potential success towards the metaverse concept.
- f. Disney: Its vision to create metaverse theme parks.
- g. Snapchat: First introduced the avatars as a social media application.
- h. Nvidia: Nvidia Omniverse
- i. Microsoft
- j. Decentraland

2. China

- a. Tencent
- b. Alibaba
- c. ByteDance: It owns the famous platform Doujin and also acquired PICO which is a Chinese virtual reality firm.
- d. NetEase: A software company.

- e. Shenzhen: It is a Chinese firm that creates internet games, mobile games, and massively multiplayer online games.
- f. Wondershare Technology Group Co., Ltd

3. Japan

- a. Sony: Mechaverse is the first Japanese metaverse platform.
- b. Gree: It is operated through its subsidiary REALITY.inc.

4. Korea

- a. Samsung: Created and published the Samsung Global Metaverse Fund.
- b. SK Telecom.
- c. Urban Base: Three-dimensional platform for design and real estate.
- d. Metaverse Alliance: A united effort of Korean companies to empower the private sector in the metaverse.

4. England

- a. Sotheby's: British auctions for houses introduced the Sotheby's metaverse.
- b. Maze Theory.

5. United Arab Emirates

- a. Meta Dubai: Blockchain, AI and NFT technology will assist in creating a mirror city of the Dubai in the metaverse.
- b. Ripple: Blockchain company.

6. France, Germany, Italy

- a. Stage11: A metaverse music platform based in France.
- b. RIMOWA located in Germany.
- c. Gucci: Introduced virtual shoes (Italy). Gucci sold a virtual bag for more than 4.000 dollars. The company also opened a vault where Gucci NFTs are sold.

12.4 METAVERSE & EDUCATION

Education, including museums, will be one of the first implementations because it has great potential to exploit the metaverse. Education institutions should consider whether to be part of a new virtual universe, which unlocks innovative student recruitment and service solutions. At the same time, the first challenge is to redefine cultural experiences in museums. Metaverse will create a new customer database to study customer preferences and add more information in real time, which is an important element of the Metaverse experience. The metaverse technology in education is seen as a promising concept. The interaction between students, teachers and the environment is seamless. Teachers can better imitate physical classroom environments and virtual learning activities. In a simulated problem-based learning environment, teachers can better understand students' emotions, so they can gain greater control (Barry et al. 2015). Teachers will have extensive data on how students respond to artificial intelligence-based metaverse educational methods (Sharma and Giannakos, 2020). Teachers should also know how to use metaverse technology and apply it in the education process. Metaverse will revolutionize current education methods and create new methods and educational opportunities. In regions such as Africa where experiential teaching is challenging, metaverses may have greater impact.

12.5 METAVERSE & ENTERPRISES

Metaverse is an excellent place for simulation of real-life events and experiments and can therefore be an important tool for simulation and prediction of events. Simulation in the metaverse enhances security and safety, as well as saving resources and time compared to real practice. The correct use of the metaverse can significantly improve economic efficiency in the physical world. Meta Cities and Meta Enterprise avatars may be living under new rules and laws that may differ from actual ones. Thus, new economic models and theories will emerge in the virtual world. Real-world economic data can be valuable information sources for virtual economic systems and can help develop artificial intelligence algorithms such as machine learning, deep learning, and reinforcement learning, offering innovative solutions for creating more intelligent systems.

Metaverse is a parallel world, but it connects to the real world. Therefore, the new era of management must focus not only on the real world, but also on the virtual world. Parallel management is required to achieve an ideal economic operation. Because the virtual world has unique characteristics, the current management cannot adapt to the metaverse ecosystem. This management mode is called Meta-Management. In metaverse societies, there is no central authority (such as the Bank), but a decentralized autonomous system based on blockchain technology, changing the way enterprises operate. Companies and individuals can learn a lot from virtual economic systems that interact with a whole new digital ecosystem and communicate feedback to the real world. Real city and real enterprise managers can use the theory and processes of economics in the metaverse economic system to test and learn in the real world. The metaverse contains everything like the real world. The only difference is that the metaverse does not have physical boundaries such as time and space, which allows meta businesses to be more flexible, to communicate easier, to work more efficiently, and to develop new business models. Without these physical constraints, it is possible that business changes forever.

12.6 METAVERSE & MANUFACTURING

Metaverse applications have the potential to significantly change all production phases and related activities, especially in the fields of manufacturing and operational management (Laviola et al., 2022, Mozumder et al., 2022). For example, metaverses can be used to create, test, and simulate product design, samples, and manufacturing processes. Furthermore, it saves considerable time to design elements' functionality. Through supply chains, it is possible to increase transparency in business and manufacturing. Furthermore, because of its digital nature and simulation skills, metaverses can perform difficult tasks (such as aircraft engineering) faster than real ones. Most traditional activities and processes that have been done in the same way for decades in manufacturing and operations can change significantly due to the metaverse. In order to successfully adopt and use metaverse, companies and individuals must be aware of the resources and skills available to their organizations in the coming years.

12.7 METAVERSE & DIGITAL TWINS

A digital twin is only one aspect of the metaverse. Digital Twins will benefit from improved storage, processing and mapping improvements through metaverse technology, making communication in real time possible. Particularly in digital twins, users can mimic and predict behaviours before they occur in the real world, such as traffic, climate, or consumption of goods and services. Because it is always more environmentally friendly than real action, metaverse simulation is the preferred method of experimentation.

12.8 AR RETAILING

Compared to traditional retail, metaverse retail encourages customers to share feedback within communities and increase word-of-mouth (WOM). Virtual retail promises to further attract users in the purchase process and improve user social experience. Instead of constraining the user to a two-dimensional experience, metaverse retail introduces 3D retail, which brings a new e-retail experience with greater realism. The rich experiential context is what is most important, rather than the retail process itself. Interoperability is an important factor in the transfer of tangible goods and data from one platform to another and is therefore an important factor in the metaverse trade.

12.9 BLOCKCHAIN

Blockchain technology was first developed in 2008 by Nakamoto Satoshi Blockchain is expected to become the main technology connecting the metaverse. With the help of blockchains, cryptocurrencies and non-fungible tokens, users can create value in a real-world economic transaction. Bitcoin is a well-known example of decentralization of transactions, and it was introduced in 2009. Ethereum is the second most famous example of blockchain technology. The difference between the two is that Ethereum created smart contracts. Smart contracts are contracts written in codes rather than paper, so they are smarter ways to manage contracts. In smart contracts, no third party is required. The

blockchain stores smart contracts, so the entire system is decentralized. This method does not give anyone control over money. However, the most important feature of blockchain is that it can operate on decentralised records without centralized structures, meaning that no centralized authority controls the technology of blockchain. The whole universe of the metaverse is based on blockchain technology for accounting and transaction validation. Storage capability should be the first priority in creating a fully functional metaverse. In contrast to blockchains, any storage system that depends on centralized logic faces a situation of manipulation and lack of transparency. Blockchain can bridge the online and real economy. Metaverse could not have done so without blockchain technology, because blockchain bridges key functional gaps and provides smart solutions. Blockchain structures allow users to control and record their own data, which is the special decentralized feature of blockchain. Eliminating intermediaries (such as banks) and enabling users to use blockchains provides users with independence and security of transactions. Furthermore, blockchains also offer the possibility of seamlessly storing this sensitive information in the metaverse. Cross-chain technology is one of the technologies that allows data to be shared between the various online worlds and supports interoperability. Cross-chain technology is used as an intermediary between a blockchain and a metaverse, allowing the export of information and values from a metaverse to improve the interoperability of a blockchain technology. Blockchain technology and cross-chain technology can ensure safer identification verification processes. Furthermore, real-world transactions appear to be lower than metaverse transactions. The volume of transactions requiring digital goods and services will increase, and blockchain technology is needed to ensure the quality of these transactions and processes regardless of the volume or frequency. Blockchain technology also ensures that IoT devices can safely share and save real information in various online spaces. The greatest consequence of the lack of digital blockchain technology is that users cannot identify the value of goods and services.

Decentralised finance (DeFi) is a service based on smart contracts and NFTs that provides innovative solutions to the metaverse for new business models. Decentralized financing is independent of banks and other centralized authorities. Like smart contracts, it is based on code that behaves like a bank, is transparent to everyone, and does not require user trust. DeFi is cheaper than banks, based on blockchain technologies, cryptography, and smart

contracts. Like a blockchain, code is the law. The fundamental key to virtual economies is the token economy offered by blockchain technology. In the metaverse, everything requires computing skills and computing power. The decentralized nature of blockchain technology promises to collect and use this computing power to build a better metaverse. Metaverse is a completely new universe and blockchain's decentralized storage capabilities ensure the security of digital ecosystems because it operates autonomously, belongs to everyone and is managed. On the other hand, central networks lack resources and are unable to save enormous amounts of information due to their nature.

12.10 ARTIFICIAL INTELLIGENCE (AI)

Artificial intelligence (AI) and blockchain are one of the fundamental technologies of the metaverse. AI can help avatar's facial expressions and play an important role in increasing realistic feeling. Metaverse should provide personalized, intelligent virtual services. Artificial intelligence, such as speech recognition and content creation, will be an important facilitator of this objective. A well-known example of AI implementation is that of non-player characters in video games. The appearance of non-player characters (NPCs) has been going on for a long time. NPC is a character created by the computer itself and is usually an object that uses AI technology to work. Using AI technology, social and economic activity can occur in the metaverse because AI algorithms ensure processes. Artificial intelligence is like the brain of the metaverse, creating personalized services for its users. On the other hand, any error or threat of AI can have even worse consequences, as computers have developed consensus with the help of AI algorithms and are able to act and make decisions independently. Therefore, it is necessary to control human AI

algorithms. According to Statista, most participants believe that improving fraud detection is the most important use scenario in the financial services sector.

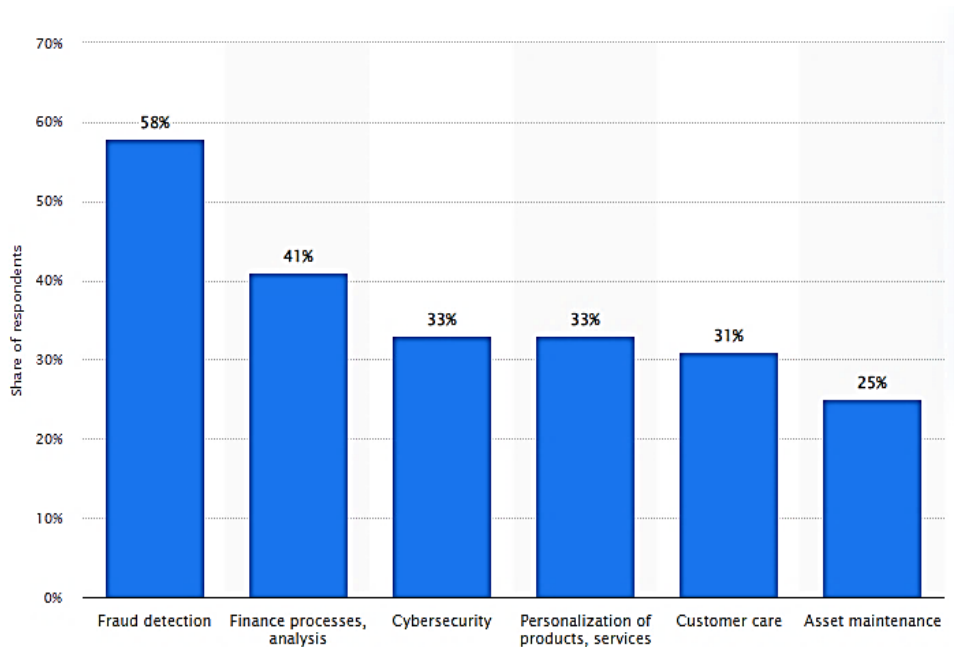


Figure 12. AI use cases in financial services industry worldwide as of 2020. Source: www.statista.com

The fusion of AI and blockchain technology will protect user data and prevent manipulation. The AI automatically identifies the attack and activates the necessary protection measures. AI can solve the challenges of privacy and security, and lastly can help improve the performance of blockchain systems. Deep learning is also part of AI technology. Machine learning is the process of creating artificial intelligence (AI) by learning algorithms based on data, and deep learning is a subset of machine learning inspired by human brain structures. Although deep learning and machine learning improve the life of people, there are some important constraints. First, they require a huge amount of data. Secondly, along with data, they require significant computing power, and the training of machines takes hours or months. Finally, in order to protect metaverse ecosystems and ensure intelligent processes, AI and blockchain technology must be

adapted. Blockchain and AI merge to create a virtual environment in which everyone can engage safely and freely in social and commercial activities outside the physical world.

12.11 NON-FUNGIBLE TOKENS (NFTs)

NFTs are unique cryptographic assets that provide evidence of user ownership of unique digital assets that cannot be duplicated. In other words, NFT ensures that objects/items belong to their owners and permanently saves transactions on the blockchain. As a result, NFTs reduce the value gap between the two worlds. NFTs and cryptocurrency are the fundamental foundations for the metaverse monetary system. Since NFTs are recorded on a blockchain, each item can be verified to be authentic. They cannot be traded or exchanged like other cryptocurrencies. NFTs allow users to buy unique digital objects, store their purchases in blockchain records, track their owners, and locate their owners easily. Two important NFT systems are Opensea and Rarible, which are provided by the Ethereum blockchain. The NFT's interest raised during the pandemic was worth \$2 billion. According to Google trends, interest in NFT accelerated during the pandemic, as shown in the diagram below.

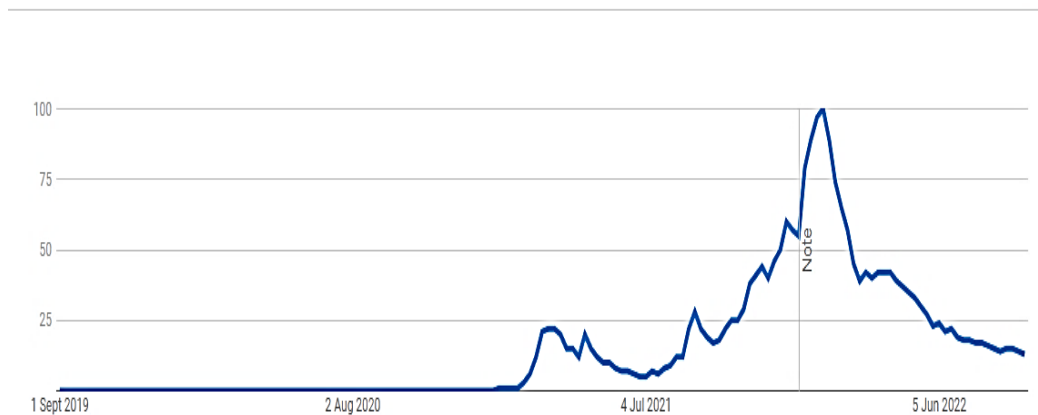


Figure 13. Worldwide interest for NFT since 2019. Source: trends.google.com

12.12 VIRTUAL SERVICE PROVIDERS

Virtual service providers update and maintain the metaverse. Metaverse allows users to create valuable content such as game, art, social apps and others, known as User-generated Content (UGC). Products that can be traded and produced by VSPs or individuals are called "virtual goods".

12.13 HEAD MOUNTED DISPLAYS

Users can participate in the metaverse using head-mounted displays (HMDs) or AR glasses. With the help of HMDs, users are immersed and no longer require equipment such as keyboards. The HMD should not be too heavy, should prevent dizziness, prevent movement injury, and neck pain, and so the user can wear it for many hours. With regard to software, speed and accuracy must be determined; otherwise, drowsiness and other side effects will increase. Some disadvantages include that HMDs are expensive, battery life is short, and weighty.

12.14 COMPUTATION (EDGE, CLOUD, FOG)

To activate the access to metaverse for everyone cloud end technology, it is necessary. Metaverse is a black hole, which means it will never require sufficient computing power. Edge computing can ensure low latency, high efficiency while securing the metaverse. Compared to other models (cloud, fog), edge computing can achieve the lowest latency. Edge computing is a good security and privacy solution, because edge technology can potentially remove very sensitive data from applications when authorizations are made. However, cloud computing continues to dominate in terms of long-term metaverse data storage and economic operations. Fog computing is essentially an independent device that stores data.

12.15 METAVERSE CASE STUDIES

- The company creates applications families and supports the creation of a fully technological ecosystem. WhatsApp was acquired for the first time in 2014 for \$900 million, the company's largest acquisition at the time. This acquisition was Facebook's strategic action to build strong barriers to market competitors (Blodget, 2014). In the same year, Facebook purchased Oculus for only \$2 billion in stocks and cash. Oculus supports Facebook's virtual reality technology and thus supports the company's long-term vision in the metaverse (Facebook, 2014). In 2021, Facebook changed the name of its brand from Facebook to Meta and its vision was changed. Meta aims not only to provide goods and services, but to build the social network of Metaverse and become the largest social enterprise of Metaverse. Meta is a company that will focus more on innovation than on its previous business model. It is also likely that the company is the largest player in the metaverse, because it focuses on changing the entire company in the metaverse (Needleman,2021). Meta announced that it needed new partnerships to create the Metaverse (O'Flaherty, 2021). Mark Zuckerberg noted that all kinds of companies, developers, and creators around the world should unite resources to create a metaverse. It is also important that the metaverse has a user-centric attitude. Meta also built Horizon platform which is the company platform to enter the metaverse. However, several factors occurred in Meta's decision to change name and vision, as well as strategy, such as bad reputation, the increasing competition, and the loss of young users. Furthermore, rapid technological advances, the appearance of a metaverse concept also seemed to have influence on Facebook's decision making.

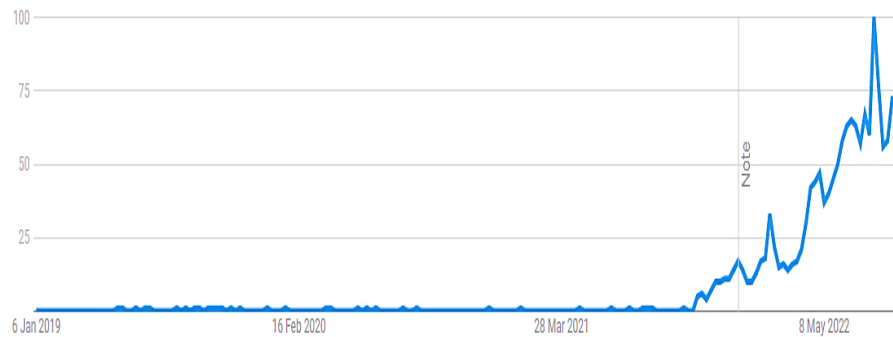


Figure 14. The worldwide impact, since Metas' announcement about the upcoming Metaverse, for its VR headset called Meta Quest, from 2019 until 9 September of 2022. Source: trends.google.com

According to Mark Zuckerberg, it will take approximately one decade until everyone starts working using a VR helmet. VR helmet will be mostly for home use while AR glasses away from home in our daily life. Finally, in order for the metaverse to work properly and to last for many years, some rules must be assumed. First of all, there should be a universal metaverse. World Web 3.0 will be destroyed due to copying tests and similar software from other companies. There will be many ways to enter the metaverse—not only through the meta platform. Secondly, everyone should be able to access the metaverse and it should be connected, managed, and hardware-free.

- Second Life was introduced by Linden Labs in June 2003. Second Life is a constant world created to allow users to express themselves. Through the user-friendly interface, users can interact with many objects in a three-dimensional world using avatars. Second Life is the first attempt to build a fully online world in which users live. Players can freely interact, participate, complete any activity as the real world, from work to socialisation, and even marriage. There are no limitations to what you can do in the online world. Second Life provides users with the ability to customize their environment infinitely. In addition, Second Life has its own economic ecosystem linked by Linden Dollar, an online currency that trades in dollars, to the real economy. Exchange rates are controlled by Linden Labs. So Second Life can

generate significant profits while providing an easy solution through cryptography technology that can cross the real and virtual economy. Second Life is considered the largest three-dimensional universe created by users so far. The unique feature is that users have the freedom to create and therefore most of the objects in the Second Life are created by users.

- Minecraft: The famous game allows users to create anything they want using the infinite 3D cubes of the world. Recently, the experience of Minecraft has been improved with VR Oculus.
- Metaverse Seoul: The government of Seoul took a strange step by choosing to participate in the metaverse, building a virtual version of Seoul in the 2030 Seoul Vision.
- Barbados is an island in the Eastern Caribbean. Barbados is prepared to cooperate with various metaverse companies on virtual environment real estate, offering services such as electronic visas, supporting teleport technology, and providing the user with the opportunity to travel anywhere without time constraints.
- ALTSpaceVR is an online space where users can complete easier and faster creative meetings and events. The idea behind ALTSpaceVR is to engage users with avatar technology. Like the metaverse, the avatars just increase the co-presence sense and thus the whole experience. ALTSpaceVR recently considered several risks to user privacy, and by following proper procedures it mitigated these risks as well as unacceptable behaviours by the avatars.
- Decentraland is based on the Ethereum technology. Given the nature of the blockchain, Decentraland is a decentralized online world where users buy and sell their land and space. Decentraland is similar to metaverse real estate, but in this example, real estate activity is limited within the boundaries of Decentraland. Decentraland has generated over 75,000 sales of online assets.
- Unity is a three-dimensional world that relies on user-generated content, which is supported by a 3D engine and a studio design.
- Unreal Engine is a very useful tool for metaverse ecosystems. By offering the MetaHuman Creator technology, you can minimize the time needed to create avatars while adding standards and increasing realism.

- Roblox: Although it is used by many as a gaming platform, it is developing as a platform that provides various important tools and functions, such as avatar generation and teleportation. Roblox has more than a million hours of game play for the general public. Users of Roblox have spent almost \$653 million on digital currencies for the game.
- The worldwide known Graphics and AI chips company Nvidia is considering in creating a metaverse platform, called Omniverse. Omniverse will provide users the ability to cooperate in the design and focus on GPU evolution.
- HoloLens 2: It is a head-mounted device with Wi-Fi and integrated computers. HoloLens 2 fully immerses the user in the experience. Compared to previous versions, it has higher computer power, better sensors, and longer battery life. Microsoft Mesh and HoloLens 2 can be used to connect users around the world. The user can keep in touch with the eyes and see other users' facial expressions. Microsoft Mesh allows you to enjoy your everyday experiences from any location and device. Microsoft Mesh's immersive capabilities combine to enable users from around the world to connect, organize online meetings, communicate by chat, collaborate on documents, etc.
- Oculus Quest 2 is a head device provided by Meta. Connected to the computer via USB or Wi-Fi, VR content is correctly operated and provides immersive experiences.