

# NFTS IN THE SCOPE OF EXTENDED REALITY TECHNOLOGY

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## ABSTRACT

In the last 10 years, the Extended Reality technology (Virtual Reality, Augmented Reality, Mixed Reality) has been developing rapidly and with these developments a lot of business has started investing in these technologies, which inspired people from different backgrounds and experiences to start working and adapting to these technologies, and coming with this raising interest in Extended Reality technology and the huge work fields that these technologies offer, a great new workspace and opportunities to people who work in the creative field. The Covid-19 pandemic caused a great digitalization movement has been started which forced a lot of people to rely on digital realities in a lot of their everyday life activities such as work and socializing activities beside entertainment, which eventually led to more and more interest in technologies that are believed to have the ability to improve the extended reality technology, such as NFTs (Non-Fungible Token). This research aims to understand the opportunities that new, modern and uprising technologies such as NFT can offer to Extended Reality technology, the effects of the developments in the field of the Extended Reality technology upon NFTs and creative work, study new ways to develop more opportunities in this field and understand the new form of HCI these technologies are creating and their impact on people's lives.

**keywords:** Extended Reality, HCI, Interdisciplinary, New media, NFT, Technology.

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## Introduction

As the world is developing at full tilt, humans are constantly searching for new ways of doing things and achieving their goals rapidly, more efficiently and harmoniously with the new developments our world is presenting. The demanding need for efficient ways to adapt to the new face of our world and some other external reasons that effect humans' daily life such as wars, pandemics, etc., is pushing people to come up with interesting new concepts and develop new technologies and most distinctive technologies of those are: Extended Reality technology, cryptocurrencies and NFTs (Petrock, 2021; Zavyalova, 2021).

Although Extended Reality technology is an old concept, it is a modern, developing technology and a long waited one, that is believed to have the ability of changing our life and offering us new opportunities in every and each aspect of people's lives, that we have never had before. NFTs and Cryptocurrencies are giving humans fast and safe way of trading, building business and offering a huge segment of the society new ways of making money and developing their business (Reinicke, 2021; finextra, 2021). Living in a capitalist world beside the constant curiosity that humans have, led these technologies to merge together in some aspects, creating a whole new HCI form that is supposed to be the main factor of the humanity's future.

## Extended Reality technology (XR) And Human-Computer Interaction (HCI)

The history of Extended Reality concept goes back in time to the 18th and 19th centuries when people creating immersive environment experiences for the viewers by painting 360-degree murals "panoramic paintings", so we can see that humanity has been long interested in provoking a sensation of immersion and creating an illusion that someone is somewhere else than the one they are actually in to simulate a certain feeling or an experience (Fig 1.).



**Fig 1. Marquard Wocher, 1814. Thun, Switzerland. Wocher Panorama "The Thun Panorama". Retrieved from: <http://www.panoramafoto.ch/wocherpanorama.htm> Accessed: 29 August 2021.**

Extended reality (XR) is an umbrella term that encompasses any sort of technology that alters reality by adding digital elements to the physical or real-world environment by any extent, blurring the line between the physical and the digital world. XR includes AR, MR, VR, and any technology—even those that have yet to be developed... (Tremosa, 2022).

Although humanity has been very interested in extended reality technics and technology and the increasing need for this kind of technology in a lot of our daily life activities like; entertainment, education and training, tourism, military and business, the technology itself could not widespread until recently due to technical problems such as the weight of devices, the very high prices of the hardware component and other software issues like lack of performance and realism. Recently, during the 2020 global COVID-19 pandemic it went viral and became very important that it is considered to be the new form of HCI "Human-Computer Interaction" that will draw the future of humanity.

Human-Computer Interaction (HCI); the study of how users interact with computer-based devices. This includes techniques for assessing elements of the effectiveness or ease of use of an interface as well the development of more intuitive and natural interfaces (Thompson et al., 2012: 4134).

## Virtual Reality (VR)

Virtual reality is an immersive, interactive (action-reaction) and dynamic 3D computer generated environment, that provides 3D user experience in a form of simulation that can be similar to or completely different from the real world to the user, by generating sounds, images and providing the users the ability to communicate and interact with the simulation elements itself using devices that is called "virtual reality headset".

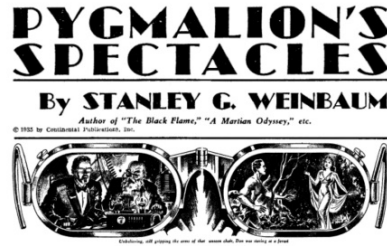


Fig 2. Stanley G. Weinbaum, 1935. Pygmalion's Spectacles. Retrieved from: <https://atomicdigital.design/blog/1935-the-pygmalion-spectacles-a-story-about-a-pair-of-glasses-and-a-virtual-world>, Accessed: 29 September 2021.

It could be said that visual reality concept was first mentioned in 1935 by science fiction writer Stanley Weinbaum in his "Pygmalion's spectacles" short story which portrayed a pair of glasses that present a movie where the user can interact and communicate with the characters in it, besides providing all senses like sight, sound, taste, smell and touch according to the movie (Fig 2), and since then, a lot of experiments were made and a lot still going in this field, but not until recent years that the technology got popular and that because of the recent and continuous developments this technology is getting, the biggest development was in 2010, when the "PR1" prototype which is considered to be the first virtual reality headset in its modern form was made by Palmer Luckey (Fig 3).



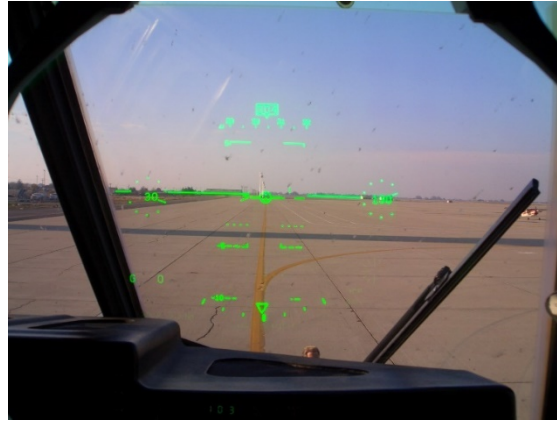
Fig 3. Palmer Luckey, 2010. PR1. Retrieved from: <https://www.destructoid.com/oculus-responds-to-zenimaxs-virtual-reality-lawsuit/>, Accessed: 03 November 2021.

The big impression by a lot of industries such as education, military and other, that this technology will present to them an easier, more efficient, and less costly way of achieving their goals, led companies and corporations like valve, HTC and Facebook to be the first companies to get into adapting and developing process of the technology. It could be said that virtual reality technology is most emerging technology in gaming and education fields.

### Augmented Reality (AR)

Augmented reality is an immersive, interactive (action-reaction) and dynamic 3D experience that combines a view of the real world with computer-generated elements such as 3D objects, visual elements, graphics, sounds, videos, or other sensory stimuli delivered via devices like cellphones and AR eyeglasses, in real time to provide an enhanced version of reality.

The primitive use of augmented reality technology concept can be traced to the world war II (1939/1945), when HUD (Head-up display) was first developed for airplanes to provide critical information to the pilot at eye level so that he/she does not need to look down at the frequently in a combat situation but the technology didn't become widely used till the 1960s, when it was being used in a lot of military technology and equipment (Fig 4).



**Fig 4. 2009. Former Castle AFB, California. C-130J Co Pilot's Head-up display Retrieved from: <https://www.destructoid.com/oculus-responds-to-zenimaxs-virtual-reality-lawsuit/>, Accessed: 03 July 2021.**

Since then a lot of developments have been lived in the field of augmented reality technology, like; the invention of head-mounted display “The Sword of Damocles” by computer scientist Ivan Sutherland in 1968 which considered to be the first AR headset and the one that paved the way for the AR we use today, or the ARQuake which was released in 2000 and was the first AR game in which the player has to wear a backpack that contains a computer and a Gyroscope, the next huge development was made in 2005 when the AR technology was introduced to cellphones through a game “AR Tennis”, and by that a new era had started for the AR technology.

In the recent years the interest in the developing augmented reality technology has been rising and by the Covid-19 pandemic it could be seen that AR technology won an important place in our daily life and this technology is most seen in the advertising, education, navigation and creative fields.

### Mixed Reality

Mixed reality can be considered to be the mixture between augmented reality and virtual reality, and its often mistaken with augmented reality technology.

Augmented reality (AR) and mixed reality (MR) are both considered immersive technologies, but they aren't the same. Mixed reality is an extension of augmented reality that allows real and virtual elements to interact in an environment (Marr, 2019).

Mixed reality is an immersive, interactive (action-reaction) and dynamic 3D environment that focuses on both the physical world and the digital world through one enhanced reality by combining real world “physical” objects with digital “computer-generated” objects, giving the user the ability to interact with them in real time using mixed reality headset device (Fig 5).



**Fig 5. Microsoft, 2022. Enhanced environment apps. Retrieved from: <https://docs.microsoft.com/en-us/windows/mixed-reality/discover/types-of-mixed-reality-apps>, Accessed: 16 February 2022.**

The term “mixed reality” was first mention and defining can be traced to a research paper published back in 1994. This paper focuses on Mixed Reality (MR) visual displays, a particular subset of Virtual Reality

(VR) related technologies that involve the merging of real and virtual worlds somewhere along the "virtuality continuum" which connects completely real environments to completely virtual ones (Milgram, Kishino, 1994: 2).

Although some mixed reality technology examples could be seen in real life, but it is not yet considered to be widely used due to its device's high prices and the fact that it's still a developing technology, it could be said the mixed reality technology is the next generation of the extended reality technologies that would be able to achieve a new form of HCI and change the world we live in.

## Metaverse

The Metaverse is an embodied version of the Internet that comprises a seamless integration of interoperable, immersive, and shard less virtual ecosystems navigable by user-controlled avatars (Lim et al., 2022: 2). Metaverse is a computer-generated online 3D virtual world, created by combining multiple technologies including extended reality technologies such as AR and VR, that provide to the user the experience of "living" in a digital universe, in which the user can interact and engage in various activities like; educational, cultural, social, political, environmental, and economic activities, using an avatar of their own creation.

Author Neal Stephenson coined the term "metaverse" in his 1992 science-fiction novel "Snow Crash," which envisions a virtual reality-based successor to the internet. In the novel, people use digital avatars of themselves to explore the online world, often as a way of escaping a dystopian reality (Huddleston Jr., 2021).

Subsequently, the Metaverse concept is old, and it could be said that it aims to merge our daily life activities in a fully digital world to create a hyper-real alternative environment where the real "physical" world elements coexist with the unreal digital world.

Although the term "metaverse" went viral in 2021 when Facebook company announced rebranding as Meta and released its own metaverse "virtual world" (Horizon Worlds), there is real examples of metaverses are already made by companies like; Microsoft, Sandbox and the most noticeable example is made by Decentraland which they created an entire virtual world and opened it to public in 2020, while this world has its own cryptocurrency "MANA", the first metaverse embassy and several activities and events are being held such as auctions, concerts, parties, shows, etc. (Fig 6).



Fig 6. Decentraland, 2021. A screenshot of a party in Decentraland in Retrieved from: <https://twitter.com/decentraland/status/1435996211782242310/photo/1>, Accessed: 07 October 2021.

## NFTs (Non-Fungible Token) And Its Relationship to Digital Creative Work

Non-fungible tokens, or NFTs, are pieces of digital content linked to the blockchain, the digital database underpinning cryptocurrencies such as Bitcoin and Ethereum. Unlike NFTs, those assets are fungible, meaning they can be replaced or exchanged with another identical one of the same value, much like a dollar bill. NFTs, on the other hand, are unique and not mutually interchangeable, which means no two NFTs are the same (Goodwin, 2021).

NFT is a new modern concept which could be considered as an evolution of fine art collecting, was first introduced to the world around 2014 and broke into mainstream media in 2021, NFTs can be any kind of “collectible” digital assets such as; pictures, designs, drawings, 3D objects, games assets, objects, videos and animations, etc., and other digital products like music and songs that exist on a blockchain, NFTs are unique and irreplaceable “one-of-a-kind” making it impossible for one non-fungible token to be equal to another since every NFT has a unique digital signature that differentiate them from each other.

NFTs created a new work field for creatives, allowing them to adapt to the future of our world, especially for designers, nevertheless as it is a developing technology, subsequently it constantly offers numerous new opportunities for creatives of all types including; video games developers, the effects of NFTs upon the gaming industry could be seen; NFTs are already integrated into some famous video games, such as “Ghost Recon Breakpoint” where the NFTs are a kind of cosmetics products for the game’s characters, In other words; players are being given more freedom with what they want their characters look like in the games, besides providing them with the ability to trade NFTs inside games the NFTs developments in the gaming industry led to a new gaming model which is “Play-To-Earn Gaming”. With this unique gaming model, which is geared to adults, participants are rewarded with cryptocurrency or NFTs just for playing games they would probably play for free (Farrington, 2021).

Nevertheless, numerous singers, musicians and musical bands, such as Kings of Leon, Akon and many other artists are adapting to this trending technology by working on NFT Music projects and releasing their music as NFTs, it could be concurred that these developments are changing the user experience and the interaction process between humans and computers and yet it is believed that this technology will be taking a bigger part of developing, shaping and changing the modern world life.

### **NFTs Relation To Extended Reality Technology And Their Effects Upon People’s Lives**

The developments in the Extended Reality technology in the last couple of years led big companies such as Meta (formerly known as Facebook) and Snapchat to start huge projects and develop new products in this field, such as Meta’s “Metaverse” or Snapchat’s “the Next Generation of Spectacles”; in which let the user review all kind of filters, animations, data and information in real time using AR Technology beside taking photos and videos (Fig 7).



**Fig 7. Spectacles by Snap, 2021. Inc. preview of The Next Generation of Spectacles”. Retrieved from: <https://newsroom.snap.com/introducing-the-next-generation-of-spectacles/>, Accessed: 07 August 2021.**

By studying the opportunities that NFT technology offers to the Extended Reality technology and analyzing the effects and values of NFTs on our life It could be said that; virtual products and Wearable NFTs (that already exists in virtual worlds and VR games), will be available to use in real world too using Extended Reality technologies such as MR and AR, which gives NFTs, and virtual products will have similar importance and value of real life products, and it could be said the NFT will be one of the most important economical assets in the metaverse.

Due to a survey we conducted in 2021 about “The user experience of virtual reality technology in developing countries” in three languages (English, Turkish and Arabic) with 145 participants (Fig 8), that have different life styles, diverse in age, backgrounds, genders and education levels, around 95% of participants believe that extended reality technology will take a critical and important place in people's lives

around the world in the coming years, consequently it could be said that most of people who are aware of the existence of this technologies already realize the impact this technologies can have on the human life style, moreover it could be concluded that using technologies such as NFTs along with Extended Reality technology gives humans the opportunity to create a whole new world "digitally" which has its own economic system, where people are able to have a whole new life separate from the real one, work, have things, do activities, socialize, study and much more.

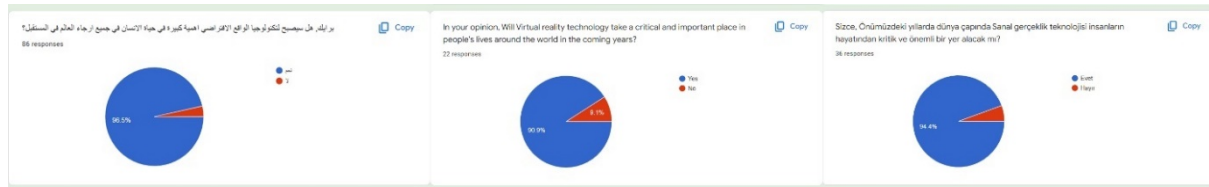


Fig 8. "The user experience of virtual reality technology in developing countries" survey, 2021.

## Conclusion

NFTs is a modern and new concept, which is still under development as it is being used and it could be predicted that such a technology would develop in many ways that it will have a great rule in shaping the world's most recent and latest global economic system, combining such a concept with the open-world and free environment the Extended Reality technology gives the "metaverses" concept a huge credibility and legitimacy and provides an genuine, original and new opportunities which could push a lot of businesses and companies to fully emigrate to the virtual world, forcing people to include these technologies in their daily life and causing a total change the native form of human life forever.

With these concepts and technologies nature, constant uprising and continues developments providing them the ability of creating and presenting a lot of new ideas, concepts, work fields and opportunities, etc., it could be speculated that these technologies will be one of the main structures of humanity's future, that being the case it could be said that to ensure an easy and safe way of merging with these technologies, the process of progressively introducing them should start right away, accordingly it could be seen that these technologies should be more integrated in the education systems around the globe assuring the upcoming generations to be the first and the most adapted to these technologies, and as it was stated before the emigration of businesses and companies to the virtual worlds being the first to adopt such technologies will help introducing them to the daily normal users like so a considerable part of people will be introduced and accustomed to these technologies.

The realization of the importance of these technologies comes with an understanding that with all the opportunities that these technologies offer, it could also cause damage to our societies, that being said the process of integrating and introducing these technologies to our life should be constantly controlled and analyzed.

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# GENİŞLETİLMİŞ GERÇEKLIK TEKNOLOJİLERİ KAPSAMINDA NFT

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## ÖZ

Son 10 yılda, genişletilmiş gerçeklik teknolojileri (Sanal Gerçeklik, Artırılmış Gerçeklik, Karma Gerçeklik) hızla gelişmektedir ve bu gelişmelerle birlikte birçok işletme bu teknolojilere yatırım yapmaya başlamıştır. Bu süreç, farklı geçmişlere ve deneyimlere sahip insanlara bu teknolojilere çalışmaya ve uyum sağlamaya başlama konusunda ilham vermektedir. Genişletilmiş gerçeklik teknolojilerine ve bu teknolojilerin sunduğu devasa çalışma alanlarına olan ilginin artmasıyla birlikte, yaratıcı endüstriler alanında çalışanlar için yeni bir çalışma alanı ve fırsatlar sunmaktadır. Covid-19 pandemisi, birçok insan için eğlencenin yanı sıra iş ve sosyalleşme faaliyetleri vb. gibi günlük yaşam aktivitelerinde dijital gerçekliklere güvenmeye zorlayan büyük bir dijitalleşme sürecinin başlamasına olanak vermiştir. Böylece, NFT (Non-Fungible Token) gibi, genişletilmiş gerçeklik teknolojilerini geliştirebilecek teknolojilere giderek daha fazla ilgi gösterilmesine yol açmıştır. Bu araştırma, NFT'nin genişletilmiş gerçeklik teknolojilerine sunabileceği fırsatları, bu alandaki gelişmelerin NFT ve yaratıcı çalışma üzerindeki etkilerini ve bu teknolojilerin yarattığı yeni HCI biçiminin insanlar üzerindeki etkilerini ortaya koymayı amaçlamaktadır.

**Anahtar Kelimeler:** Disiplinlerarası, Genişletilmiş Gerçeklik, HCI, NFT, Teknoloji, Yeni Medya.