وزارة الاتصالات وتقنية المعلومات
MINISTRY OF COMMUNICATIONS AND INFORMATION TECHNOLOGY
مركز استشراف التقنية
TECHNOLOGY FORESIGHT CENTER
2023

Metaverse Technology

Past and Future

TFC TALKS

First
About the Metaverse 03

Second
Real-world examples on the adoption of the metaverse 11

Third
Core and adjacent technologies of the metaverse 13

Forth
Metaverse applications in selected industries 16

Fifth
The state of metaverse application worldwide 18

Sixth
The metaverse in numbers 24

Seventh
The economic and social impact of the metaverse 26

Eighth
The metaverse in Saudi Arabia 34

Ninth
Recommendations and suggestions 38

01

About the metaverse

The metaverse is not a mere emerging technology

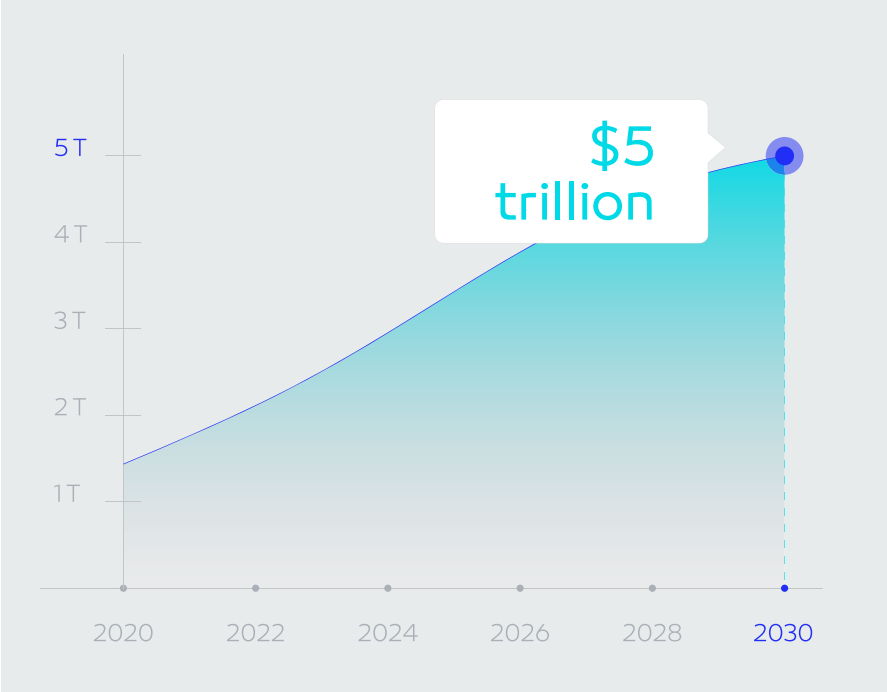
It is one that stands above decades of research in artificial intelligence[1], immersive technology and a myriad of adjacent technologies with the aim of guiding the world into the future[2].

That is the consensus perception of the technology according to international industry reports[3]. The significance of the metaverse lies in its prospects of unlocking opportunities across industries and areas of application.

$5 T

A McKinsey report issued in 2022 predicted the market value of metaverse applications to reach $5 trillion by 2030[4]. While Gartner expects that, by 2026, a quarter of the world's population will spend at least an hour a day somewhere into the metaverse[5].

The market value of metaverse applications predicted to reach $5 trillion by 2030

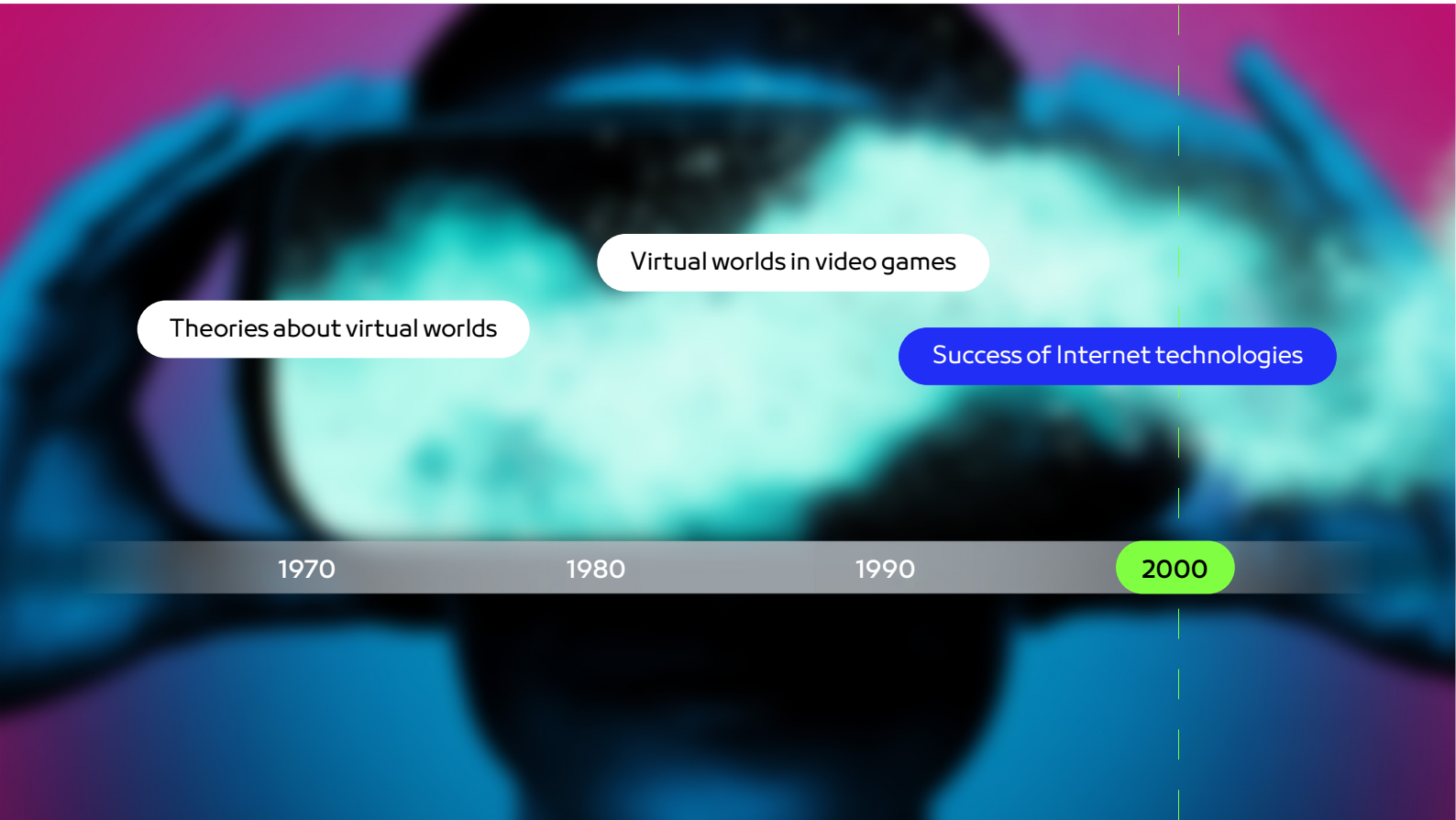


About the metaverse

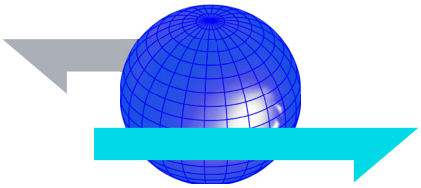
The story of the metaverse originated from a chat on the creation of virtual worlds in the mid-1970s

MIT captured the concept and developed a revolutionary hypermedia system, namely the 'Aspen Movie Map', that allowed users to Explore Colorado's Aspen resort town virtually, The concept was further expanded by video game developers in the 1990s, who designed attractive virtual worlds in which players shared experiences[6].

At the turn of the century, the success of internet allowed virtual communities to grow rapidly, leading to the era of social networks that offered enhanced social and digital interactions. A few years later, new technologies gained grounds, including the block chain, digital currencies, virtual reality and augmented reality, the Internet of Things (IoT) and artificial intelligence – leading to the emergence of the metaverse.



The term 'the metaverse' consists of two syllables:



MetaVerse

Beyond Universe

Meta" which means 'beyond' or 'transcending' (in Greek) and 'universe[7]' which represents a space or location; combined, the two syllables mean "beyond the location[8]."

Technically speaking, the metaverse refers to a slew of shared virtual spaces created by connecting physical, digital, and augmented realities into an integrated virtual world, offering an augmented digital experience and allowing individuals to interact socially and professionally through digital personas (avatars), exchange ideas beyond the bounds of a place, and create innovations in various aspects of life.

On the business level, the metaverse promises to create an independent economy that serves various industries through core and adjacent technologies, such as digital currencies and non-fungible tokens. Ajit Mohan, Vice President and Managing Director of Meta India believes that the metaverse will be the next big computing platform that facilitates business in the next decade[9].

That is, the metaverse will allow individuals to meet colleagues and friends in virtual spaces and do business meetings or shopping without leaving their physical space[10].

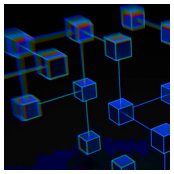
Timeline: Milestones that prompted the emergence of the metaverse[11]

1992

Science fiction novelist Neil Stephenson coins the metaverse term in his novel Snow Crash imagining characters meeting in 3D buildings and other virtual reality setting.

2003

Philip Rossdale designs the first virtual world online and named it 'Second Life'.



2009

Bitcoin invented as the first cryptocurrency operating on a blockchain platform.

2012

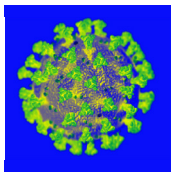
NFTs (or non-fungible tokens) emerge as unique cryptographic tokens that exist on a blockchain and cannot be replicated.

2014

Facebook acquires Oculus VR Inc. – the leader in virtual reality (VR) technologies.

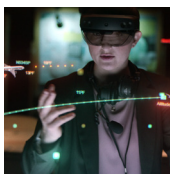
2016

The 'Pokemon Go', an augmented reality game that combines digital and real worlds, launches and garners great traction.



2020

Covid-19 prompts a search for virtual spaces for communication.



2021

Microsoft unveils Microsoft Mesh -- a platform that allows teams from different locations to meet and collaborate in augmented reality. Facebook rebrands into "Meta" to assert focus on the metaverse.

2022

The metaverse sees increasing adoption by corporations such as Wal-Mart and Samsung, and virtual real estate companies generate revenue from selling luxury virtual villas.

Advantages and benefits from the metaverse

The metaverse offers opportunities and benefits in several areas and unlocks opportunities for communication in the virtual world. The executive vice president of Gartner argues that the metaverse will transform the physical world and create continuous opportunities for organizations to expand digital business[12]

Powering an independent economy

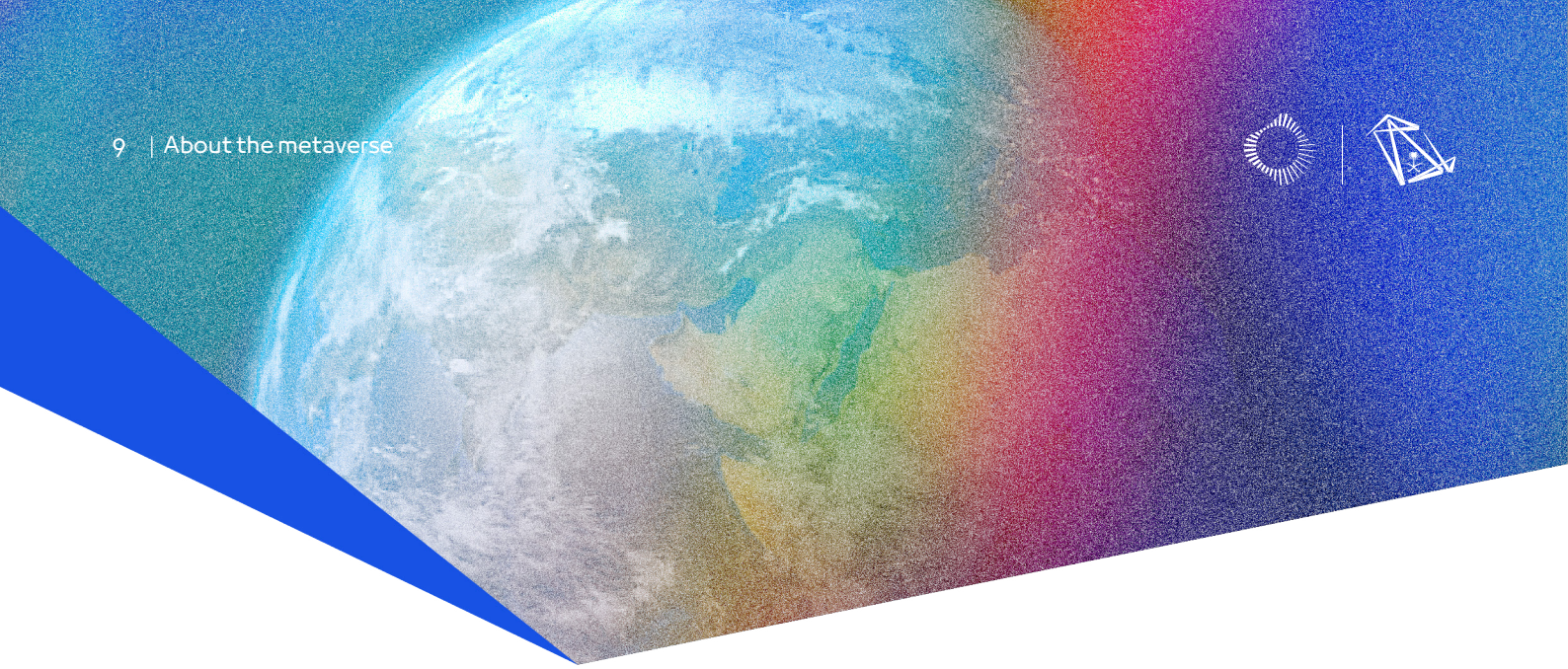
Creating innovative and expanded business models in all business sectors, where some companies sell goods and services that only exist in the digital world, and the Metaverse technology is not owned by a single vendor, but rather an independent virtual economy that is enabled through digital currencies and non-fungible tokens[13].

Boosting business performance

Improving employee experiences and powering team coordination and communication, as in virtual meetings, operating virtual training rooms, organizing virtual career fairs, and creating virtual games to train employees on handling different situations[14].

Enhancing virtual interaction

Metaverse platforms enhance corporate communication with customers and audiences beyond the boundaries of geography, and help companies deliver experiences and provide information in countless ways, and create realistic interactions for customers to attend social events[15].



The key positive changes the metaverse could bring to technology

*Aaccording to an international survey[16]

39%

Overcoming obstacles, e.g. disabilities that prevent us from doing something in real life.

37%

Enhancing creativity and imagination.

37%

Traveling the world without moving.

34%

Increasing technological literacy and skills.

34%

Connecting with new people without feeling awkward.

30%

Creating completely new job opportunities.

30%

Meeting your loved ones whenever you want.

29%

More possibilities in education.

27%

Giving opportunities for self-expression.

Drawbacks of an emerging technology

01
Customized technologies

The metaverse technology requires advanced tools and technologies to function, which is not accessible or affordable to everyone[17].

02
Privacy and security

The metaverse may imply security and privacy risks for individuals and organizations, e.g. identity theft[18].

03
Preference of the virtual world

Immersive virtual experiences may affect how people perceive real relationships and interactions, and may grow addictive[19].

04
Regulating individual interactions and business governance

The metaverse technologies require an overhaul of governance models to ensure the applicability of laws, rules and regulations on the decentralized space in which classical business intermediaries (banks, insurance companies, construction companies... etc.) may not practice their ordinary role; hence the need for flexible regulations that cope with the rapid developments in the virtual world.

02

Real-world examples on the adoption of the metaverse

Real-world examples on the adoption of the metaverse

The real world can be useful in drawing more consumers toward the virtual world. Metaverse expert Cathy Hackl argues that, in the metaverse, customers will not only be able to speak to brands as they do on social media now, but interact with them in 3D, where shoppers can dress up as avatars. Below are examples on the adoption of metaverse in the real world[20]:

The Barbados virtual embassy

Barbados became the first country to launch a virtual embassy in the metaverse, marking a new era for virtual real estate markets[21].

RALPH LAUREN

The Ralph Lauren experience

Ralph Lauren's active involvement in the virtual world helped the fashion giant connect with younger shoppers, following a collaboration with metaverse platform Zepeto and Roblox, where shoppers could create personalized 3D avatars and socialize with each other[22].

VANS WORLD

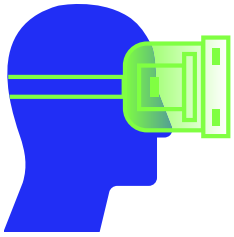
Vans World's skatepark

In 2021, Vans liaised with Roblox to build Vans World, an interactive 3D skatepark on the game platform that allows players to play, compete and communicate with others, design and buy virtual Vans skateboards and clothing. The virtual park attracted over 50 million visitors and generated additional streams of revenue for virtual sales[23].

03

Core and adjacent technologies of the metaverse

The core and adjacent technologies of the metaverse

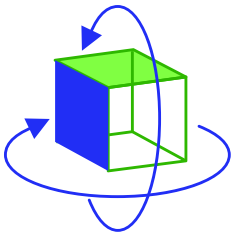


Virtual and Augmented Reality (VR and AR)

Virtual reality is a simulation of reality through living in a 3D realm designed and built entirely using a computer. Video games are the top applications of virtual reality. Headphones, glasses and special gadgets deliver immersive experiences to users by tracking and replicating the user's actions and senses. The augmented reality (AR) provides a digital experience derived from physical reality, i.e. a reality augmented by a digital experience[24].

Artificial Intelligence (AI)

Artificial intelligence (AI) plays a key role in building robots and technologies. In the metaverse, the AI can create avatars, and optimize the traits and characteristics of digital humans to bring them closer to reality. It can also be applied to secondary characters who interact with the main characters in the metaverse[25].

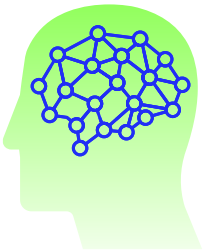


Blockchain

Blockchain is essential for creating the metaverse technology as it provides solutions for proving digital ownership, and powers secure decentralized financial transactions via digital currencies[26].

Internet of Things (IoT)

IoT is instrumental for the metaverse infrastructure. IoT sensors allow for enhanced user experiences as they interpret users' interactions in real time and in the real world, and translate them into the virtual world[27].



Brain-Computer Interfaces (BCI)

BCIs use sensors to measure human brain activity and enable brain communication with external environments. This technology will play a key role in helping users control their digital personas (avatars) and virtual environments in the metaverse, by translating thoughts and feelings using brain signals. The World Economic Forum (WEF) assesses that BCIs may offer the most comprehensive view of the metaverse[28].

3D Rendering and Modeling

3D rendering and modeling add further reality to the metaverse by creating accurate, realistic 3D models of places, buildings, and objects, thus creating unique and tradable digital assets[29].

Edge computing

Edge computing can reduce latency by distributing processing and data retrieval closer to the source in a load-balanced way, whereby it improves performance and delivers smooth user experiences for real-time user interactions[30].

04

Metaverse applications in selected industries

Metaverse applications in selected industries

01 Entertainment

The adoption of the metaverse is speeding in gaming, and virtual social communities are gaining popularity among Generation Z and Alpha, e.g. Roblox and Fortnite games that draw over 300 million players[31].

02 Education

The metaverse can transform education programs into immersive experiences and deliver more effective results, by hosting virtual courses and classes, simulating science experiments and enabling educational tours in virtual museums and landmarks[32].

03 Industry

The metaverse can assist the design, prototyping and testing of products in virtual environments, and play a vital role in industries that require health and safety measures. The technology can simulate hazardous situations and help train employees on taking the right decision[33].

04 Travel and Tourism

The metaverse can foster long-term relationships for tourism agencies and enhance the profile of destinations by operating virtual tours on cultural and historical landmarks, or hosting exhibitions that allow tourists to plan trips in a safe way and explore destinations virtually ahead of the visit[34].

05

The state of metaverse application worldwide

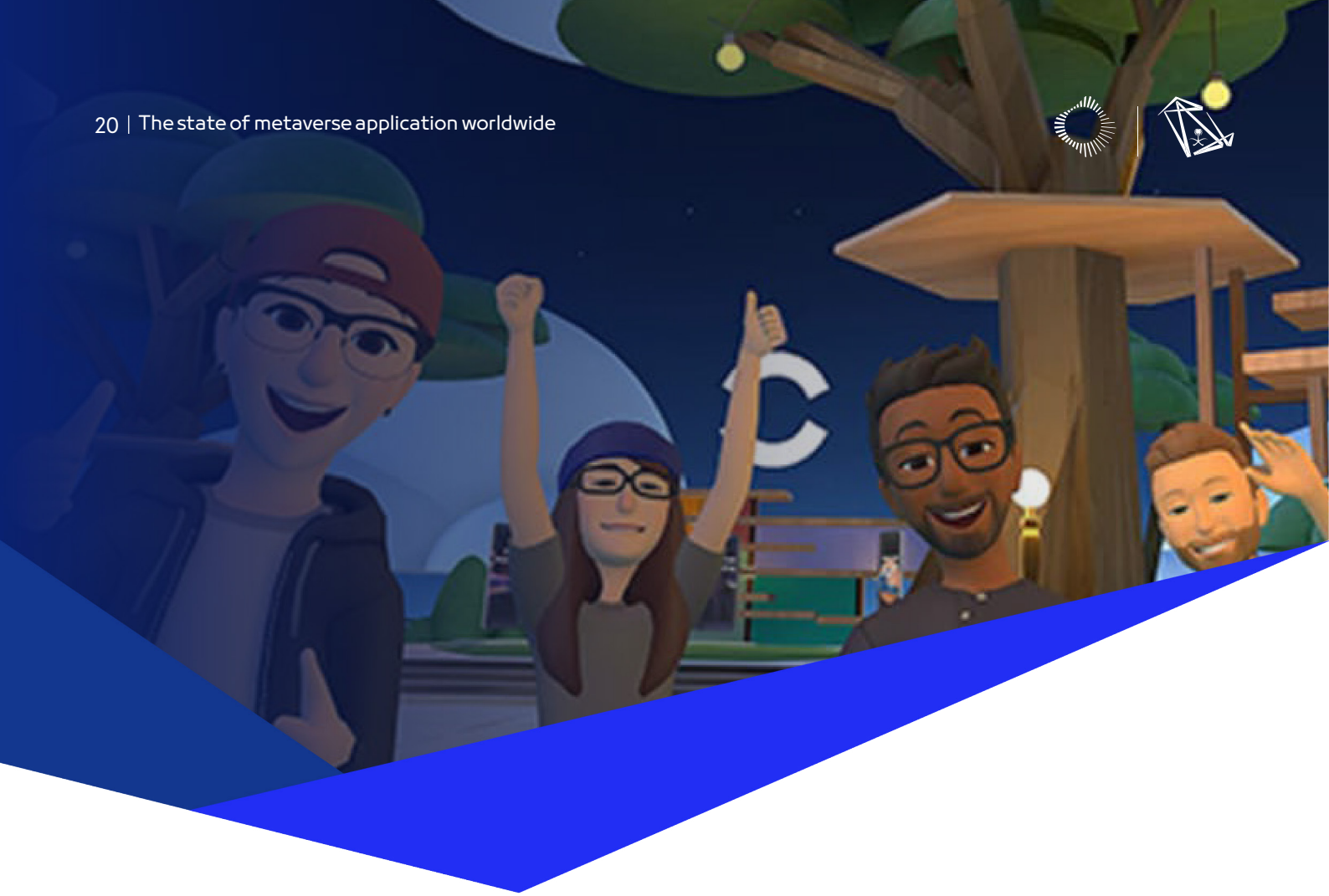
The state of metaverse application worldwide

Over the past years, the metaverse technology has drawn large international investments, especially following Facebook's rebranding into 'Meta' and its focus on metaverse applications. Most interestingly for metaverse investors is how metaverse technologies can positively affect their industries and what changes can it bring about in the long term, including:

52%

of all adults across 29 countries are familiar with Metaverse technology

The metaverse has gained popularity worldwide. Ipsos estimates that about half of adult populations (52%) in 29 countries, especially younger generations, say they are familiar with the metaverse technology, and expect it to transform entertainment, learning and work experiences in the decades ahead[36].



The USA Experience

45%

The USA accounted for over 45% of global metaverse market size in 2021.

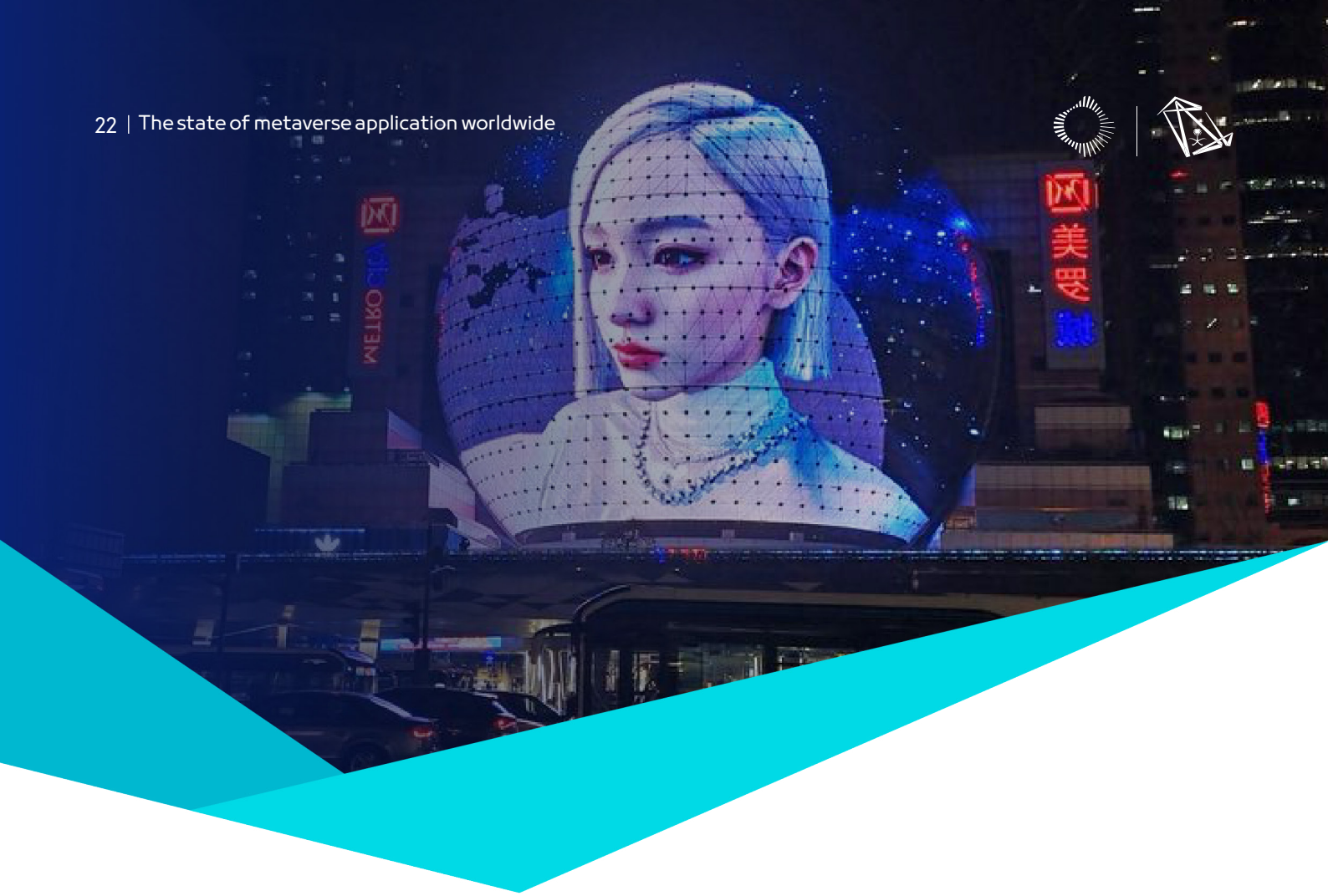
The USA, home to the world's top metaverse technology giants, accounted for over 45% of global metaverse market size in 2021. A plethora of corporations invest in the metaverse market after realizing the potential for early entrants[37].

US firms leading the metaverse sphere

Facebook rebranded into Meta in 2021 signaling a strong entry into the metaverse space. The company invested roughly US$ 10 billion to develop hardware and infrastructure for metaverse applications. CEO Mark Zuckerberg recently announced the launch of a virtual store for Meta avatars, and introduced the Meta Pay service -- a payment network for the metaverse that provides VR capabilities. Meta plans to invest in augmented reality either[38].

In January 2022, Microsoft announced plans to acquire Activision Blizzard, a developer of electronic games US$ 70 billion to secure a foothold in the metaverse. The deal will be Microsoft's largest acquisition and will allow it to develop Microsoft-powered games and software for years ahead[39].

NVIDIA is a leading global developer of graphics processing units (GPUs). Its professional line of GPUs is widely used in workstations for diverse applications. The company elected to invest in the metaverse alongside with competitors. The company thrives to create tools that the metaverse developers need to build and design virtual worlds[40].



China Experience

28B $

The metaverse industry is set to grow worldwide to US$ 28 billion in the next five years

China has a robust 5G infrastructure, giant user base, and powerful manufacturing capabilities that qualify it to become a powerhouse for metaverse applications. The metaverse industry is set to grow worldwide to US$ 28 billion in the next five years, according to Boston Consulting Group[41].

Chinese firms leading the metaverse sphere

Baidu

Chinese internet search giant Baidu was the first Chinese conglomerate to join the metaverse bandwagon in December 2021, by launching its 'Land of Hope' application. The application was launched in January 2022 and it invites users to create avatars and explore a virtual environment using scenarios based on Chinese history and future designs -- a science-fiction-inspired version of the Shaolin Temple[42].

Tencent

Tencent, the Chinese technology conglomerate and operator of chat application WeChat, introduced several updates and modifications to make its social offerings dependent on the metaverse. The company launched a new feature, called 'Super QQ Show' on the QQ platform that provides a 3D display based on an interactive space where users can interact and play games together in an immersive way[43].

ByteDance

ByteDance, owner of short-video sharing app TikTok, launched two applications, Party Island for the Chinese market and Pixsoul for Southeast Asia audiences. The two applications allow the creation of avatars and using them to communicate with other users[44].

06

The metaverse in numbers

$ 5T

Metaverse market expected to reach US$ 5 trillion by 2030[45], according to McKinsey report issued in 2022[46].

$ 47B

The global market size of the metaverse in 2022 expanded to roughly US$ 47 billion

52%

About half of adult populations (52%) in 29 countries say they are familiar with the metaverse technology[47].

46%

North America dominated the international metaverse market with a 46% share of total revenue in 2021[55].

40%

The compound annual growth rate (CAGR) of the metaverse assets market worldwide reached approximately 40% and is set to grow at a faster pace in the coming years[50].

16.58 B$

The hardware sector serving metaverse applications stood at roughly US$ 16.58 billion in 2021[51].

39%

The media and entertainment industry grabbed a lion's share of the market at 39% in 2021[54].

36%

The virtual and augmented reality industries constituted roughly 36% of the total market share of the metaverse technology[52].

27.7%

Metaverse-reliant gaming industry recorded the highest share of revenue -- over 27.17%[53].

7 Years

A McKinsey study estimates that the coronavirus pandemic advanced, by up to 7 years, the adoption of digital products and services in business, education, commerce and social interactions[49].

25%

Gartner expects that, by 2026, a quarter of the world's population will spend at least an hour a day in the metaverse for work, shopping, education or leisure purposes[48].

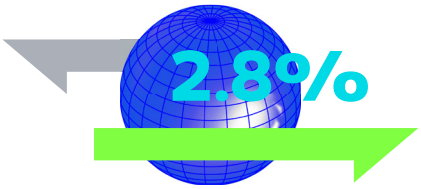
07

The economic impact of the metaverse

The economic impact of the metaverse

First: The global economy

The metaverse constitutes a revolution in the international technology industry and digital economy and will greatly affect economic growth. To understand the economic impact of the metaverse, we shall establish that this new technology is a business opportunity driven by commercial interests. The industry is set to create job opportunities, abolish cross-country restrictions, and drive the emergence of new products, services, business models, professions, and job opportunities – an obvious propeller of economy growth.



The Chief Executive Officer of NVIDIA Jensen Huang predicted that the virtual economy may outpace the real global economy in a decade, but Analysis Group experts disagreed with him, arguing that if the metaverse had a success similar to mobile phone technologies (launched decades earlier), its contribution to global GDP can reach up to 2.8% in ten years[56].

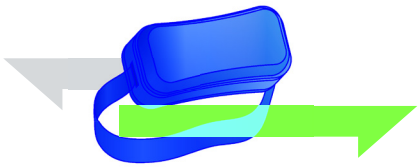
With the growth of virtual economy, the metaverse will grow; and as production and commerce constitute an integral part of the metaverse prototypes created, including entertainment, fashion and cryptocurrency. For example, some fashion houses like Gucci, Ralph Lauren, Louis Vuitton, Paco Rabanne, Valentino and Burberry launched digital fashion collections.

There are experiments to use advertisements for brands that use video games and augmented reality technologies to draw consumers to digital platforms, and introduce people to virtual environments. Meta's patent applications show that ads and sponsored content will be a tenant of the company's metaverse development strategy[57].

Second: The growth of metaverse technology

Companies worldwide seek to develop their own digital systems and distinct applications. Metaverse pioneers race to build virtual environments that help everyone accomplish their goals. Conglomerates, especially into the high-tech industry such as Lenovo, take interest in switching to the metaverse[58], and companies like McDonald's and Nike announced plans to tap the metaverse[59].

It is likely that, in the near future, people may spend long time in virtual reality, shopping in virtual malls, communicating on virtual forums, and doing work tasks online – all using customized avatars.
The metaverse will also be used for business, education, medical treatment and relaxation – for almost all human needs. So, the metaverse economy is currently under construction. Business giants are acquiring significant market shares of the emerging industry, and metaverse innovations will affect the real economy, leading to a change to its infrastructure and management. The development of the metaverse can conserve resources and reduce waste, as it minimizes physical consumption



In business, the metaverse can increase opportunities for digital labor platforms that work effectively. A report by the International Labor Organization titled: 'The Role of Digital Labor Platforms in Transforming the World of Work' published in 2021[60] noted an increase in job opportunities created through digital platforms. The report stated that the number of digital labor platforms has seen a fivefold increase between 2010 and 2020, alongside with a remarkable increase in demand and supply for labor. The report's key conclusions can be summarized in the following points:.

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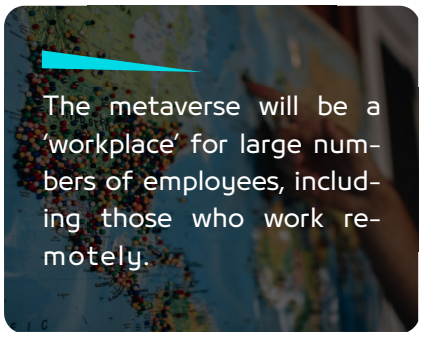
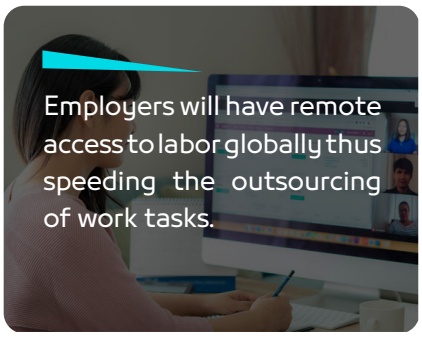
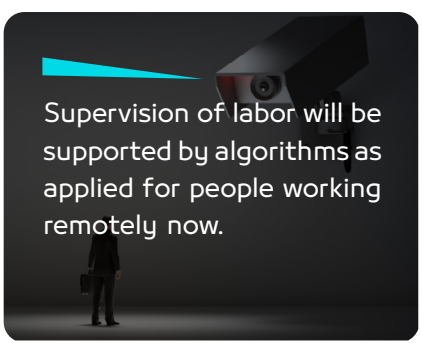
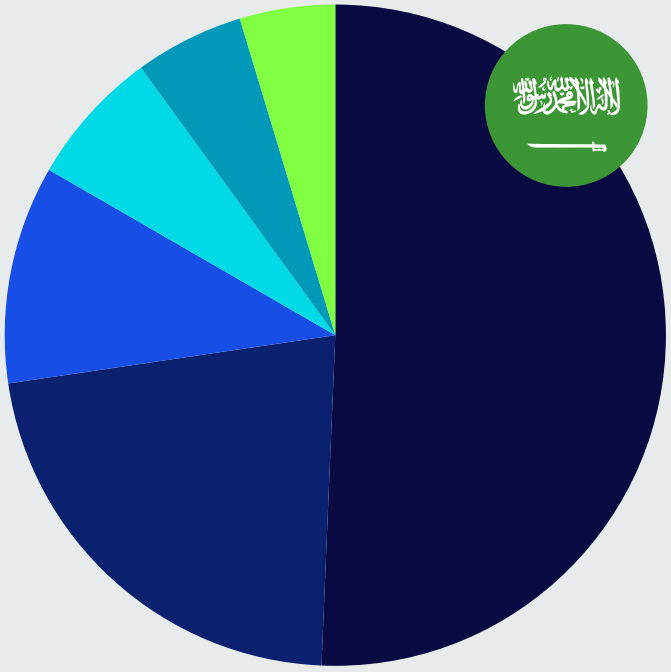






Third: Volume of the metaverse industry in the GCC and Saudi Arabia per se

The metaverse drew large investments and will continue to receive investments going forward. The Gulf Cooperation Council (GCC) countries actively participate in the metaverse economy. Dubai launched the 'Dubai Metaverse' strategy to turn Dubai into one of the world's top 10 metaverse economies and a global hub for the metaverse community. The strategy aims to build on Dubai's achievement of attracting more than 1,000 companies in the fields of blockchain and metaverse. It also promotes Dubai's ambitions to support more than 40,000 virtual jobs by 2030[61].



51% KSA

22% UAE

11% Qatar

7% Kuwiat

5% Oman

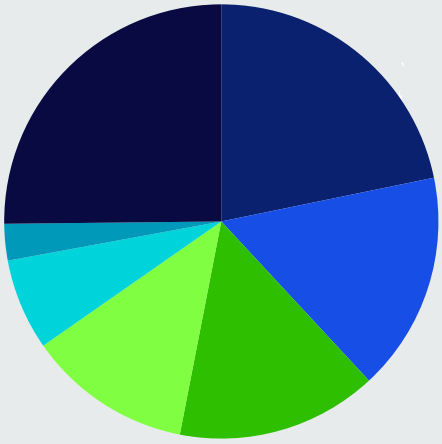
4% Bahrain

Fourth: Impact on selected industries

The GCC countries' investments will be reflected on the income-generating sectors including travel and tourism sectors that account for about 22% of total investments in the metaverses by 2030[62].

This impact on travel and tourism sectors can be understood in the light of the significance of the sector for GCC countries. Saudi Arabia, for instance, seeks to raise the contribution of the travel sector to around 10% of gross domestic product, by welcoming 100 million tourists by 2030.

These efforts culminated in the World Tourism Organization announcing in October 2022 that Saudi Arabia led Arab countries by attracting 18 million visitors between early 2022 and September 2022, the UAE ranking second with 14.8 million tourists, and Morocco in the third place with 11 million.



25%
Othe sectors

22%
Travel and tourism sector

16%
Games sector

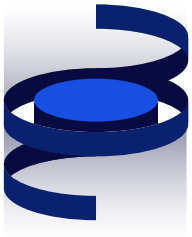
15%
Retail and e -commerce sector

12%
Banking sector and financial services

7%
Real estate sector

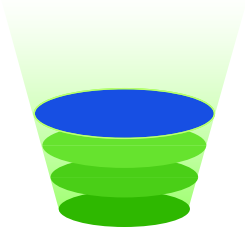
3%
Government services

In the sections below, we will touch upon some of the potential impacts of the metaverse on selected economic sectors:



01 Direct Impacts

The growth of the metaverse will have an immediate on the industries that produce infrastructure to enable the metaverse itself (e.g. providers of hardware, software, payment systems, and broadband services). For instance, the graphics processors and AR/VR hardware will see major overhauls to optimize the metaverse services. Shared software platforms will be built to allow movement into the metaverse. Blockchain technologies used to authenticate virtual ownership and payments will flourish. These impacts will be evident into the industries that are direct participants into the development of the metaverse infrastructure and technology.



02 Indirect Impacts

The next band of industries on the beneficiary list would include gaming, social networking, online retail and education. These industries are likely to earn a dividend from a 'spillover' effect in the form of new products supported and marketed in the metaverse, or new demand for their technical expertise – in a similar way to what the advent of the internet has served industries across the corners of the economy.

The gaming industry already commands the largest share of consumer spending on augmented reality / virtual reality, with over US$ 3 billion spent worldwide in 2020[63]. Phil Spencer, Microsoft Gaming Chief Executive Officer, says that video games are a form of the metaverse known (and used) by people for many years.

The potential of the metaverse is not limited to games. In Saudi Arabia, for instance, the metaverse can foster economic growth by enabling remote work in the health, education and manufacturing sectors; such sectors have seen tremendous developments since the launch of Vision 2030 indeed[64].

$ 3B+

The gaming industry already commands the largest share of consumer spending on augmented reality / virtual reality, with over US$ 3 billion spent worldwide in 2020.

Technology advancement will further allow manufacturers [65] to minimize the times for production and consumption of energy and raw materials. The use of automation and simulation can also help manufacturers design prototypes and products[66].

03 Incentivizing

Just as computers, mobile phones, and the internet have had wide-ranging effects on businesses and consumers that were impossible to predict, the metaverse can have stimulating effects on the economy in the form of accelerated growth and productivity, and contributions beyond and above adjacency. These impacts can offer opportunity for synergies with traditional businesses, create jobs and impact consumers in new ways. Early examples of this can be seen in the application of augmented reality / virtual reality in mental health treatment and sports[67].

Fifth: The metaverse's impact on Society

The metaverse is a new phase of development for the cyberspace as it seeks to consolidate all digital channels. Thus, the creation of metaverse applications is a development of the internet technologies in how audiences interact with the technology. That gives a hint of how social life can be impacted and transformed with the emergence of technologies of this sort[68].

The metaverse will spark developments in the area of education and skills acquisition, as it becomes available worldwide.

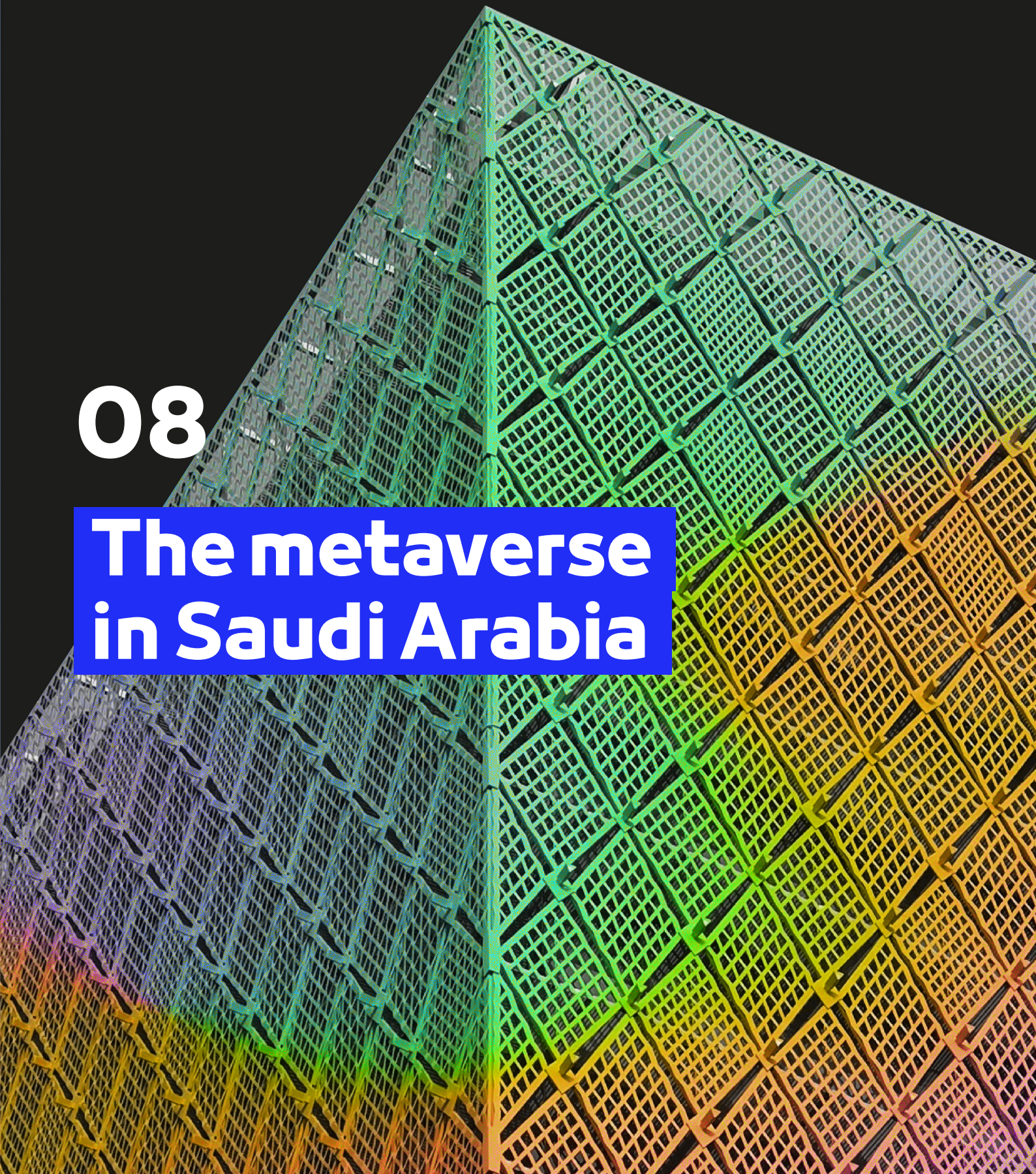
The metaverse will spark developments in the area of education and skills acquisition, as it becomes available worldwide. It will create attractive educational tools allowing learners to attend lectures at the best universities and study in a safe environment. It will also require a transition to 5G and possibly 5G mobile communications to fuel advanced communication capabilities.

Scientists believe that training human attention and self-control in an environment that combines physical and digital worlds (like the metaverse) delivers great results for human learning and education. Saudi Arabia set an example in this regard during Covid-19 time when it utilized mixed reality education tools to deliver quality education to students. The advent of the metaverse can spark a paradigm shift in education, according to Brookings Institution researchers who maintain that: Technologies, not educators, create and define educational opportunities[69].

The metaverse development strategy targets mainly the young generation who use interactive computer games. At present, the role of video games in daily life has already increased (especially on mobile platforms), and interactive games are integrating mixed reality. Users appreciate any new attempts to create multi-functional game platforms, thus, the number of platforms developing companies is on the increase.

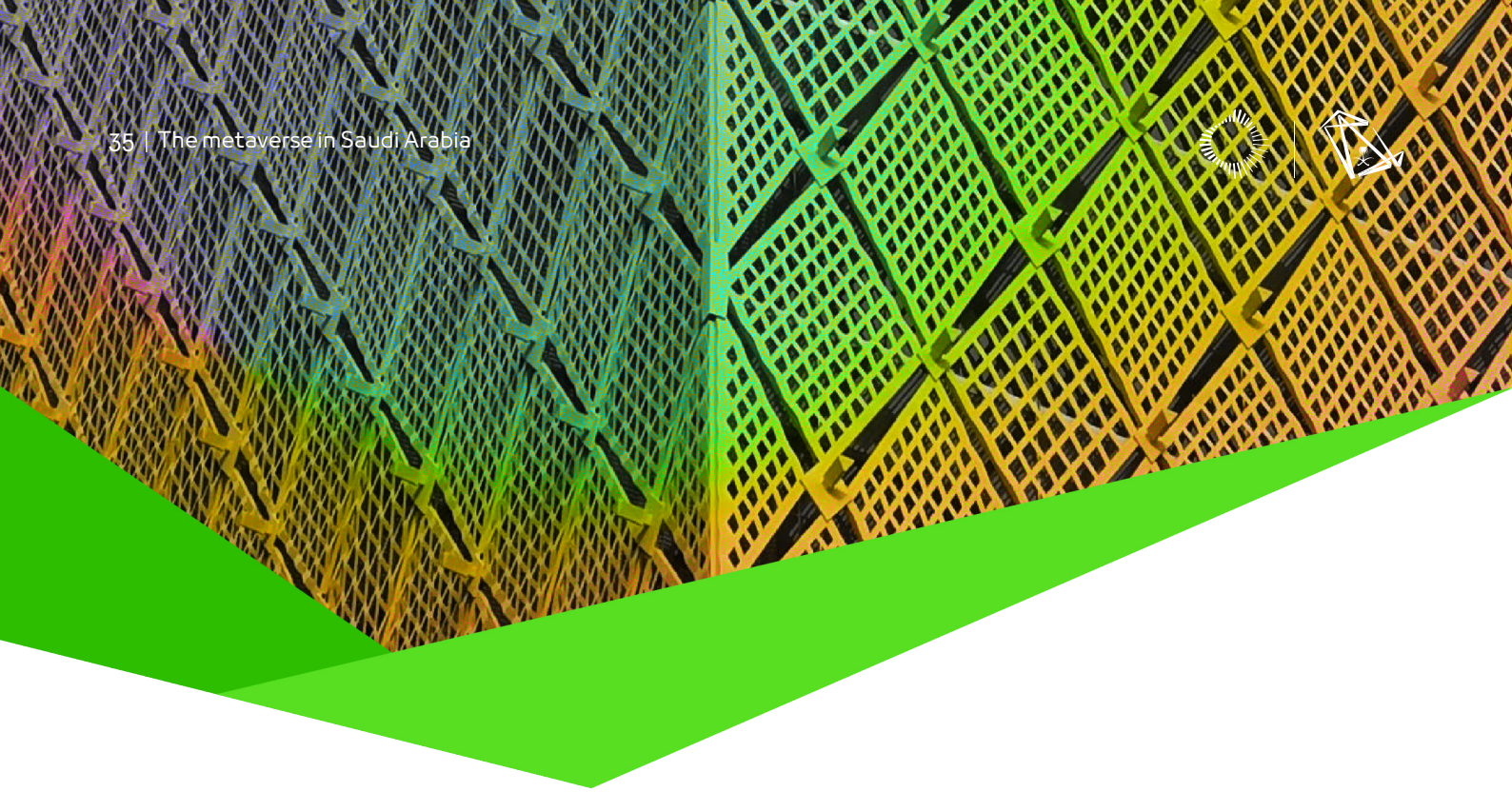
Social communication will change, as people in the metaverse will interact not only with other people's avatars, but also with agents of the AI-created avatars. Over time, humans will perceive communication in the digital environment as real, and thus will accept interactions with avatars. Sociologists frequently beg the question: Can the metaverse expand the boundaries of interaction and the sensibilities of its participants to create a new basic human reality – thus increasing the social interaction gap?[70]

According to a social research, children often see AI virtual assistants as humans. This may entail safety issues for children as if they get immersed into the metaverse[71]. Though usage restrictions may apply to children, they remain the category most interested in gaming and hence caution is exercised in this regard[72].



08

The metaverse in Saudi Arabia



The Saudi Arabia Experience

Saudi Arabia is leading the adoption of the metaverse in the GCC region.

Metaverse users are called **metazens.**

Saudi Arabia is leading the adoption of the metaverse in the GCC region. PwC states that the metaverse will contribute US$ 15 billion to GCC economies by 2030, and Saudi Arabia will grab a share of about US$ 7.6 billion into that (more than a half). Saudi Arabia allocated major investments to the metaverse as the country pursues ambitious digital transformation[73].

The metaverse users are called metazens. The average age of 39% of metazens is between 25 and 34 years; 40% of whom hold a bachelor's degree, and 77% live in urban areas[74].

Given the fact that 65% of Saudi Arabia's population are under 35 years old, mostly live in urban areas, and are highly educated, there is obvious reasons to believe that Saudi Arabia will be a hub for metaverse technology adoption[75].

Giga projects reliant on the metaverse in Saudi Arabia

NEOM - The Line

NEOM's The Line project uses data to build NEOM city. Its goal is to put people and the environment first, and it strives to enable digital connection to physical objects, compute and analyze objects, and contextualize them to drive new decisions. The Line focuses on consolidating technologies, e.g. artificial intelligence, robotics, the Internet of Things, and blockchain, and drive customizable solutions and services that serve the future needs of people. NEOM is developing XVRS technology -- the first 3D digital twin of a physical place (the NEOM community). The XVRS will contain next-generation digital assets that users can interact with in the real world[76].

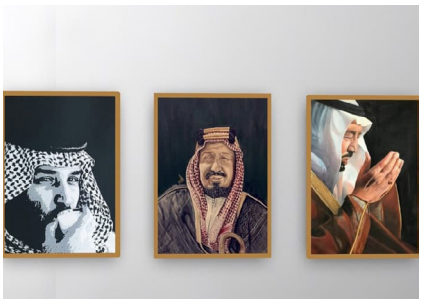
Al-Ula

Al-Ula has made its foray into the metaverse with an immersive 3D model of Hegra's Tomb of Lihyan, son of Kuza, marking the first time a UNESCO World Heritage Site has been recreated for the metaverse.
The landmark will be available to online visitors on Decentraland, a virtual world platform that allows users to buy and visit virtual plots of land.
Visitors will be able to take a 360-degree tour of the 72-feet tall tomb, set among a realistic recreation of AlUla's desert landscape.
The immersive experience will allow visitors to explore the site and activate information points to learn more about the history and story of the tomb. The innovation will help raise awareness of Al-Ula's 200,000-year long history[77].

Qiddiya project

Set to be the largest theme park in the world, nearly three times the size of Walt Disney World in the USA, Qiddiya plans to attract nearly twice its annual target of 14 million visitors to 28 million visitors by providing entertainment facilities that combine mix realities in major live events[78].

Saudi events utilizing metaverse technologies



The Art of Solitude exhibition

The Saudi Ministry of Culture held an art exhibition supporting the concept of the virtual world, titled 'The Art of Isolation' in 2020, as part of the 'Mayadeen' initiatives through a partnership between the Ministry and telecom operator, stc.

The goal of the exhibition was to encourage Saudi artists to showcase their masterpieces through electronic platforms, providing visitors with a realistic simulation and allowing them to navigate through the exhibition halls virtually. The exhibition was the first of its kind in Saudi Arabia, and provided immersive experiences to visitors sitting in the comfort of their homes[79].

Virtual exhibition marking Saudi Arabia's National Day

In 2022, Saudi Arabia hosted a virtual exhibition marking the National Day. The exhibition showcased students' artwork, photos and paintings. It highlighted the history of founding of the Kingdom of Saudi Arabia. Participants could manage their visits and contributions through a Saudi virtual reality system named 'VRSA' – a smart interactive Saudi-invented 3D technology deployed for this purpose[80].

09

Recommendations and suggestions

Recommendations and suggestions for the government and private sectors

In this report, we discussed the concept of the metaverse, tackled the timeline of its key milestones, introduced notable examples of its applications across industries, and cited the top global firms leading the way in the metaverse space. We also touched on the state of the metaverse adoption in Saudi Arabia, its potential economic impacts on the global, regional, and national levels, and potential downsides of such emerging technology either.

The rapid development of metaverse technologies prompts governments worldwide to handle with caution the impacts on society and economy as they mull the advantages of adopting the technology. The adoption of the metaverse promises obvious merits; and for governments to be able to attain these merits, they are encouraged to advance the relationship with the top metaverse innovators and introduce mechanisms to encourage dialogue with stakeholders to build a common understanding of Web3 technologies, including the potential role of digital currencies in the metaverse.

In Saudi Arabia, the positive impacts of the metaverse can be maximized by:

01 Adopting a national strategy

Several countries have adopted national strategies focused on the metaverse. The United Arab Emirates was the first country in the MENA region to do so. This strategy can drive the growth of national economy, create jobs and spur business growth.

In Saudi Arabia, the positive impacts of the metaverse can be maximized by:

02 Fostering cooperation with the private sector

Several examples of cooperation of the government with the public sector can be mentioned here including The Swiss Blockchain Federation in Switzerland and Project Guardian in Singapore, where policy makers and regulators established channels to listen up to digital asset companies and work with stakeholders on developing policies that support growth. In the United States, financial regulators set up offices for innovation to attract innovators in the future fintech technologies.
The existence of robust channels with innovators is essential for driving innovation, building a secure and transparent system for digital economy and digital assets, and the metaverse technology to grow.

03 Hosting community debate

The mass adoption of the metaverse can reflect positively and negatively on the social fabric, which requires regulators to host community dialogues and debates to openly discuss the advantages for society and mitigate the potential disadvantages.

04 Hosting community debate

Legislation can be a significant hurdle that may face the metaverse in the future. Governments, taking proactive steps to handle legislative challenges, can attain a competitive advantage. That can be implemented by holding workshops for legislative authorities to discuss the legislative developments necessary to facilitate the use of the technology, and the level of efficiency and flexibility of Saudi legislative structures to deal with future challenges.

Levan Nanopashvili, a researcher at the Georgian Institute of Public Affairs, claims that despite the current uncertainty in dealing with metaverses, at least two things are clear: First, event-based metaverses will continue to be created until they become a reality. Second, the evolution of metaverses raises a number of issues, and these issues require legal analysis, and we anticipate that the development of the metaverses will outpace legislation.

business community

For the business community, the metaverse is set to unlock opportunities for the financial and business industries and companies from different sizes (SMEs to conglomerates). That view is validated by the fact that international technology giants and brands are increasingly acquiring footholds into the metaverse realm.

The following are opportunities businesses can attain from an early adoption of the metaverse:

01
Access to a global pool of talent:

The metaverse enables access to the best talent in the world as executives and headhunters can be at liberty to use virtual characters and hunt for, recruit and work with the best talent through virtual spaces. Companies can design their own virtual space in a distinctive way and tap the right talent to work with beyond the restrictions of place and time.

02
Creating virtual stores:

This allows businesses to communicate with customers virtually and market virtual and real products, as well as offering digital assets for sale and generating revenue. Adidas brought in over US$23 million from its unique 'Into the metaverse' NFTs within minutes of the drop.

03
Designing new customer experiences:

the metaverse incorporates advanced technologies such as augmented reality that allows customers to test real-world products virtually and preview stuff before purchase. These technologies can be used in applications to preview a specific piece of furniture and test it in a customer's home for instance.

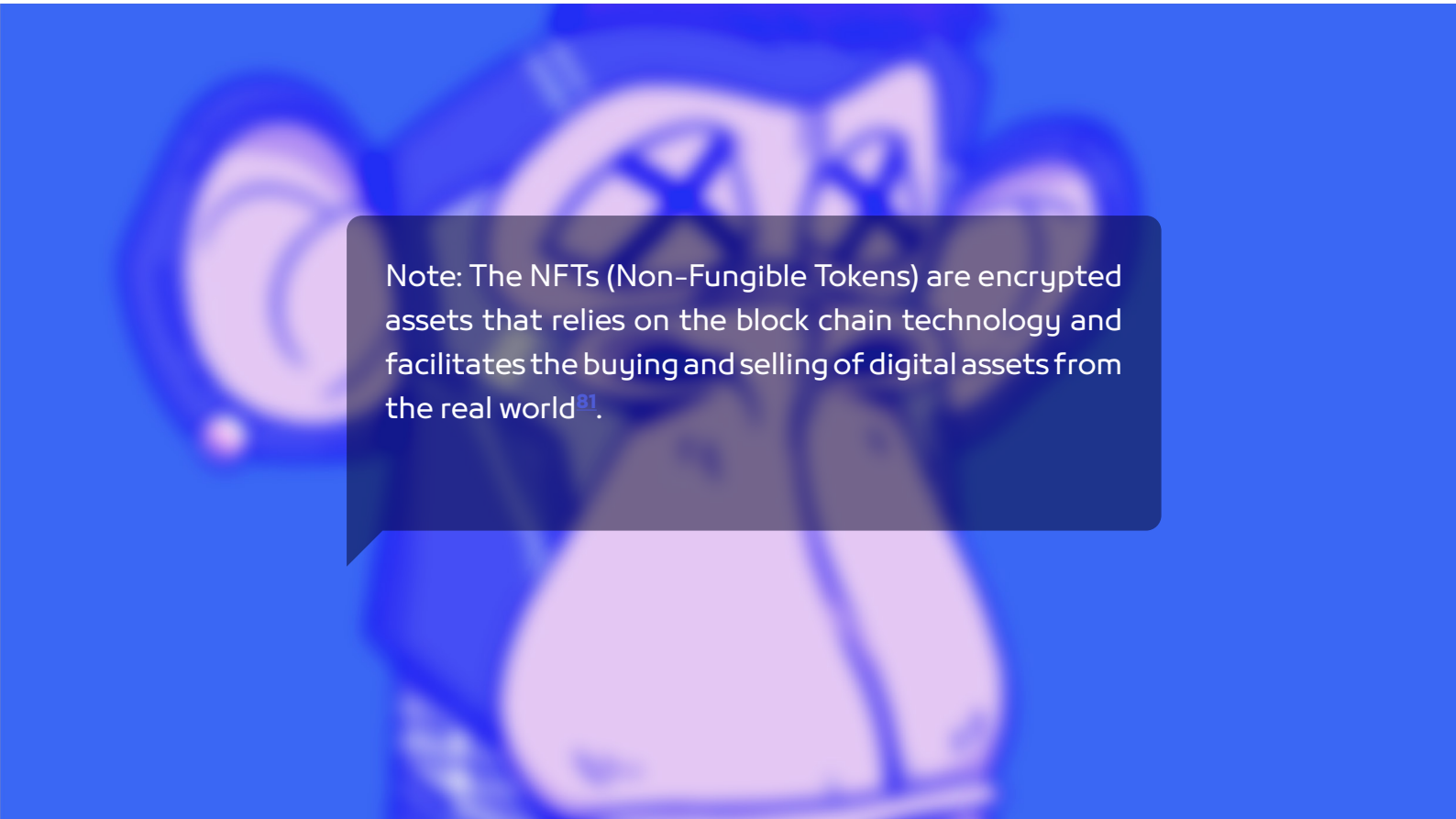
In general, companies can take advantage of the metaverse in engaging customers virtually by developing interactive settings through:

Buying digital assets in the metaverse:

Companies can buy land in marketplaces such as OpenSea or the metaverse platform.

Selling Products in the metaverse:

Metaverse platforms use currencies that users can use to buy products and companies can list their NFTs* for sale on the platform.



Note: The NFTs (Non-Fungible Tokens) are encrypted assets that relies on the block chain technology and facilitates the buying and selling of digital assets from the real world[81].

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