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Metaverse: challenges and opportunities for the Arab region

Summary

The metaverse is one of the newest manifestations of the modern-day Internet, providing a virtual space where people, businesses and Governments can seamlessly interact. The socioeconomic impact of this direction in technological development will be far reaching. It is therefore important to consider the opportunities and challenges that it would offer the Arab region, so as to take the necessary steps to effectively boost metaverse use while ensuring that the necessary legal, security and ethical considerations are in place for those entering the metaverse.

The present document highlights the potential opportunities that the metaverse could have, and the challenges that it may bring. It concludes with areas for development in the Arab region, and policy recommendations that Arab countries should consider for an effective and safe metaverse experience for their peoples.

Contents

Introduction

1. The nascent metaverse provides aims to provide seamless interaction between the physical and digital worlds. It creates a space where people can immerse themselves in social or economic experiences. Since the launch of the Internet, users have created digital spaces to communicate, interact and share information. The metaverse is the next logical step, backed by technological developments such as extended reality technologies (including virtual, augmented and mixed reality),[1] digital currencies, blockchain, financial technology (fintech), and artificial intelligence (AI).[2] The envisioned metaverse is built using blockchain-enabled products and services, and is rooted in Web 3.0 principles, namely decentralization, community ownership, and digital identify self-ownership.[3]

2. The metaverse will change the way people communicate, play and work together. The overall impetus behind its development is people's growing demand for more immersive experiences provided by technology. Metaverse development is also driven by the economic avenues that it offers for new markets and types of products. The support of large technology companies, such as Microsoft and Meta, has increased interest in this new technology, driving its development.

3. The COVID-19 pandemic and resulting lockdowns limited in-person social interaction, while forcing most to work from home. This situation has further hastened metaverse development as it offers the possibility to continue daily life, albeit digitally, through immersive technologies.

4. The potentials of the metaverse are endless, limited only by imagination. However, a great deal of development is still needed to achieve an interoperable and fully accessible metaverse. Currently, activities that can be done via the metaverse are mostly siloed, limiting users to specific platforms, sometimes even to specific activities. Nonetheless, this new direction in digital development requires strategies, plans and programmes to ensure that Arab countries are ready to enter the metaverse once it becomes widely available.

I. Underlying metaverse technologies

5. The metaverse environment is built on the convergence of several technologies, including semantic web technologies, high performance connectivity, edge computing, extended reality devices, the Internet of Things, AI, robotics and blockchain. However, the technology is part of a broader value chain, which can be divided into seven layers, as shown in the figure below. These layers cover all aspects of the metaverse, from the experiences that people seek to the underlaying infrastructure technologies that make the metaverse possible.[4]

6. Building the metaverse through the seven-layered value chain, each layer with specific related technologies, generates a vision of an immersive end result built on decentralization and powered by a creator economy that offers a variety of social and economic experiences and opportunities.

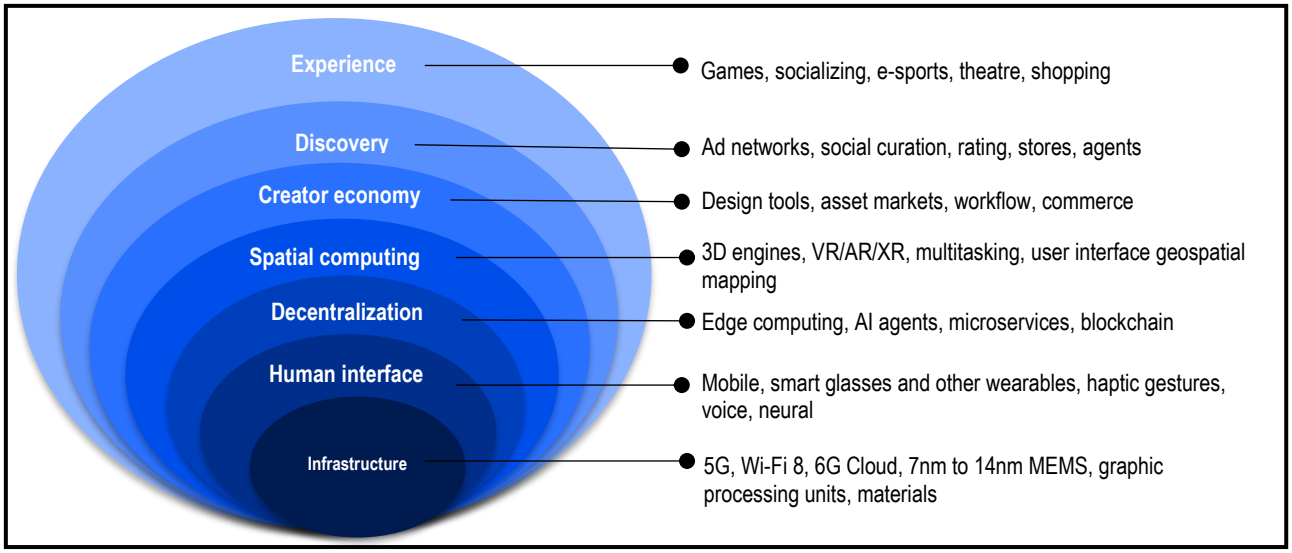
[1] Extended reality is an umbrella term for technologies that merge the virtual and physical worlds to create an immersive experience. Such technologies include virtual reality, which is a fully simulated digital environment that requires virtual reality technologies; augmented reality which overlays digital objects on the physical world using augmented reality technologies or tablets and smartphones; and mixed or hybrid reality where digital and physical world objects co-exist and interact, requiring special headsets and large processing capacities. (See Bernard Marr, What is extended reality technology? A simple explanation for anyone, 2019).

[2] Elena Canorea, What is behind the metaverse?, 2021.

[3] Chris Liquin and Aleyna Dogan, A tale of 2 metaverses: here's why Web3 might look more like Web2.5 in the medium-term, 2022.

[4] Jon Radoff, The metaverse value-chain,2021.

Seven layers of the metaverse



Source: Jon Radoff, The metaverse value-chain, 2021.

7. As shown in the figure, the metaverse is not dependent on one single technology, but rather various technologies that support its layers. One technology that stands out, however, is extended reality in the form of virtual and augmented reality. This technology brings the virtual world into the real world by blurring the boundaries between the two, and supporting interaction and immersion with computer-generated data and information.[5] In some cases, it involves specialized equipment such as goggles, but it is also possible to experience extended reality through smartphones.

8. Another area of technology that requires serious consideration is infrastructure, as it forms the backbone of any technological development, including the metaverse. The data processing needed to ensure immersive experiences for users requires appropriate infrastructure, so that processing time is near to real time.

9. Companies involved in metaverse development are currently focusing on the experience layer, especially immersion in the metaverse. What is available today is "single" metaverses, limiting users to the platform that they initially chose to enter the metaverse. This means that there is no interoperability between platforms, so any goods purchased cannot be taken to other platforms. This is an important consideration when considering investing in the metaverse.

II. Economic and social opportunities for development

10. The metaverse brings with it a variety of opportunities focused on furthering social development and economic growth at the national and local levels.

11. As it stands, the value of the metaverse is set to rise to around $800 billion by 2024, up from $47 billion in 2020. In 2021, the Web 2.0 metaverse[6] was valued at $14.8 trillion.[7] Global spending on augmented and

[5] Maja Matijasevic and others, Interconnection model for networked virtual reality applications, 1999.

[6] The Web 2.0 metaverse is the current mainstream digital world, based on platforms and products provided by tech companies using ad-supported business models. It allows user-created content, but the digital and physical worlds remain separate, and revenue is mainly made from sold advertising space and targeted ads. Traditional social media is a good example of the Web 2.0 metaverse. Source: Chris Liquin and Aleyna Dogan, A tale of 2 metaverses: here's why Web3 might look more like Web2.5 in the medium-term, 2022.

[7] Geri Mileva, *50+ metaverse statistics: market size and growth*, 2022.

virtual reality technologies is expected to increase to $72.8 billion by 2024.[8] During the peak of the COVID-19 pandemic in 2021, the value of non-fungible tokens (NFTs)[9] increased to $2.5 billion.[10] A 2021 survey of global Internet users showed that over half of respondents would join the metaverse for virtual work and networking opportunities, while 44 per cent would enter the metaverse to invest in cryptocurrencies and NFTs.[11]

12. The survey also revealed that 39 per cent of respondents believe that the greatest benefit of the metaverse would be overcoming obstacles, such as better accessibility for people with disabilities. Other benefits considered were enhanced creativity and imagination (37 per cent), e-travel (37 per cent), connecting with others, new job opportunities, education and better self-expression.[12]

13. Areas that countries and institutions in the Arab region could consider for metaverse development include virtual smart city navigation, applications for citizen participation and engagement, e-tourism, e-event management, hybrid workplaces, medical screening, courts and judicial services, and simulated engagement in sports events and hobbies.

A. Economic growth

14. The metaverse will have an impact on economic growth through developments in employment, industries and infrastructure. It is expected to result in extensive income generation, creating its own virtual economy that contributes to economic growth.[13] Traditional industries will expand their products and services to deliver new virtual products or virtual versions of physical products. For example, Coca-Cola auctioned off its first NFT for more than $575,000.[14] The metaverse could also be utilized to test new developments using digital twins and simulators. Moreover, the metaverse will give rise to new specialized industries and jobs needed to deliver specific products and services, such as avatars and skins.

15. Industries selling technologies in the metaverse, such as extended reality devices, will have larger markets and increased sales. For example, the global shipment of augmented and virtual reality devices is expected to reach about 76.7 million by 2024.[15] Digital infrastructure development will also be essential, giving rise to large projects that provide the computing power needed for the metaverse.[16]

16. In addition to income, the metaverse provides the opportunity to build a transborder economic system, where everyone contributes and benefits equitably and inclusively. Furthermore, a more transparent and inclusive international financial and monetary system can be created through the metaverse using blockchain, which would be more democratic than current systems. The metaverse can build a global digital economy that ensures products, information and services continue to circulate, regardless of events in the physical world, such as COVID-19 lockdowns that disrupted the global supply chain.[17]

[8] Vijay Chander, Investing in the metaverse: new opportunities in virtual worlds, 2021.

[9] A non-fungible token is digital data that represents a unique asset, like digital art, content, media or fashion, and is stored in a blockchain. It can only have one owner at a time. Ownership is transferable, meaning that NFTs can be sold and traded.

[10] Michael Golomb, Rise of a new disruptor: how NFTs are revolutionizing the art and entertainment worlds, 2021.

[11] J. Johnson, Main reasons for joining the metaverse worldwide, 2021.

[12] J. Johnson, Leading benefits of the metaverse worldwide 2021, 2022.

[13] Kieron Allen, How will the metaverse impact the global economy?, 2022.

[14] Geri Mileva, *50+ metaverse statistics: market size and growth*, 2022.

[15] Ibid.

[16] Kieron Allen, How will the metaverse impact the global economy?, 2022.

[17] Pei San Fan Metaverse: A chance to build a better world, 2021.

B. Employment

17. In the metaverse, companies and industries will have access to a workforce distributed across the world, while workers can be employed in their home countries, which would not lose their economic contributions.[18]

18. Workers will have access to full office suits in the metaverse, enhancing virtual work environments and interaction with colleagues. In this virtual environment, workers can adapt their workspace to suit their needs and personality, thus creating satisfactory work experiences for all. The metaverse also provides opportunities for workers to develop their skills and capacity. Virtual classrooms offer numerous possibilities for new training methods and tools, such as digital twins and simulation options. Better training means that people can get better paying jobs, thus driving economic development.[19]

19. In 2021, Meta announced that it would create 10,000 jobs in Europe in the next five years to build the metaverse.[20] In Dubai, the expectation is that metaverse development will create 42,000 new jobs by 2030.[21] Workforce reskilling and re-training will be essential: it is estimated that 1 billion people would have to be retrained by 2030, because technological developments will change the nature of their jobs.[22]

20. The metaverse will expand the creator economy beyond services currently provided by platforms such as Tik Tok, YouTube and Instagram. It offers a new avenue for creators and influencers, not just to make their products and art accessible, but also to monetize it through NFTs and blockchain. Creators are essential in metaverse development given that they build new business models, but they also strengthen interaction with users and companies to build brands in the metaverse.[23]

C. Urban development

21. When applied to urban planning and real estate, the metaverse will allow virtual visits of future buildings and offices. This experience in a virtual world could help gain insights from people before the real-world development is implemented.[24] This is of special interest in the era of smart city development. Simulations that can be run in the metaverse will allow testing of new building methods, materials and smart city technologies before rolling them out in the physical world. This would not only be cost and time saving by identifying potential issues early, but it would also better protect citizens from potential hazards.

D. Social and health impact

22. If decentralized development by content creators continues, the metaverse will be a forum where a person's gender, age, location, physical attributes or economic status will be of no significance. The focus will completely be on a person's capabilities and the quality of what they deliver. The metaverse could therefore help to eradicate inequality, creating an inclusive society for all. The lessons learned in the metaverse on equality and inclusiveness could also be translated to the physical world.[25]

23. In the health-care sector, the metaverse can enhance the quality of training for medical professionals through the simulation of medical operations.[26] Remote treatment through virtual consultations in the form of telemedicine already exists and has proven to be more effective for diagnoses of minor issues, provided a

[18] Kieron Allen, How will the metaverse impact the global economy?, 2022.

[19] Ibid.

[20] Nick Clegg and Javier Olivan, *Investing in European talent to help build the metaverse*, 2021.

[21] Anup Oommen, Dubai's metaverse sector to support 42,000 virtual jobs and add $4 billion to its economy by 2030, 2022.

[22] Saadia Zahidi, We need a global reskilling revolution – here's why, 2020.

[23] Freya Savla, Metaverse and the future of the creator economy: The metaverse mothers a new era of content, 2022.

[24] Randeep Sudan and others, Can the metaverse offer benefits for developing countries?, 2022.

[25] Brenda K. Tsai, Building an inclusive metaverse starts now: here's how, 2022.

[26] Randeep Sudan and others, Can the metaverse offer benefits for developing countries?, 2022.

physical exam is not needed. The percentage of health facilities in the United States of America offering such services has increased from 43 per cent in 2020 to 95 per cent today. Such services will continue in the metaverse: a person could consult with a physician in a different country, making it easy to gain access to specialists. Mental health services can also be administered via the metaverse. Digital twins, in the form of patients, can be used to predict recovery from surgery and reactions to medicines, resulting in better outcomes. Blockchain technologies will offer improved security for personal medical data and information that need to be shared among physicians. Moreover, the metaverse offers physicians and practitioners the opportunity to collaborate and provide treatment packages that would otherwise not be possible owing to the limitations of health-care systems.[27]

24. The metaverse provides an opportunity to promote gender equality and strengthen the fight against gender-based violence. In the metaverse, a user selects an avatar that presents that person's identity and is used to interact with the environment and other users. Providing the possibility for users to customize an avatar makes it possible to promote gender equality, given that the characteristics used to build an avatar's identity may not necessarily include traditional sex, gender and sociodemographic characteristics.[28] Furthermore, through the metaverse, campaigns, programmes and trainings can be launched to reach a wider audience so as to raise awareness of gender-based violence. The issue of gender equality is complicated and should be considered in the design phase of the metaverse to ensure that all persons have safe and equal access.

E. Governance

25. Government service delivery will benefit from the metaverse, creating virtual worlds where citizens can interact with officials and make use of services. Politicians and Governments could also use the metaverse to campaign for causes and elections.[29]

26. At the global level, the metaverse can help to reform and improve the global governance system by making it more equitable and inclusive, and by giving everyone the same rights to safeguard the metaverse. Such a system would hopefully translate into reforms in the physical global governance system, leading to greater collaboration between countries to resolve issues such as climate change and food security. The metaverse also offers a space where exchanges can be made that are not possible in the physical world, which could help resolve conflict and other issues between countries.[30]

F. Education and culture

27. In education, the metaverse will bring new teaching methods and enhance e-learning experiences. The three-dimensional environment could facilitate self-training with digital twins that closely resemble the real world. It could improve the quality of virtual learning, with teachers and students using avatars and other virtual replicas.[31]

28. A 2021 survey of global Internet users showed that 48 per cent of respondents would join the metaverse to enjoy art and attend live entertainment.[32] Respondents also said that the metaverse should be a safe place, and were in favour of censoring, regulating or restricting content related to suicide, animal abuse, hate speech, harassment, and alcohol and drugs.

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[27] Bernard Marr, The amazing possibilities of healthcare in the metaverse, 2022.

[28] A. Robertson, Gender-Equality in the Metaverse: A World of No Discrimination?, 2022.

[29] Randeep Sudan and others, Can the metaverse offer benefits for developing countries?, 2022.

[30] Pei San Fan Metaverse: A chance to build a better world, 2021.

[31] Randeep Sudan and others, Can the metaverse offer benefits for developing countries?, 2022.

[32] J. Johnson, Main reasons for joining the metaverse worldwide, 2021.

29. The social and economic impact of the metaverse can be far reaching. The table below provides a summary of the opportunities that the metaverse offers and the specific Sustainable Development Goals (SDGs) that it could help achieve.

Metaverse opportunities for sustainable development

SDG	Role of the metaverse
SDG 3: Good health and well-being	• Providing medical training through the metaverse, especially to developing country professionals and those in rural areas. • Conducting surgical procedures through augmented reality and robotics. • Promoting wellness through virtual trainers and better fitness programmes.
SDG 4: Delivering quality education	• Attending virtual schools and universities. • Interacting with people from different backgrounds in a school setting, thus increasing tolerance and inclusion. • Building practical skills through the ability to easily simulate and test aspects in the metaverse. • Improving accessibility to education facilities for people with disabilities, those in rural areas and girls on an equal basis.
SDG 5: Gender equality	• Launching awareness raising programmes on sexual harassment and gender-based violence. • Strengthening gender equality through avatars. • Providing new job opportunities for women.
SDG 8: Decent work and economic growth	• Offering new types of jobs necessary in the metaverse, including creating virtual products such as avatar skins and accessories. • Working from home in virtual offices that enable interaction with colleagues and clients.
SDG9: Building industry through innovation	• Developing new industries delivering virtual products necessary in metaverse. • Conducting innovative testing and simulations in a digital environment. • Providing opportunities for small, micro and medium-sized entities to develop and sell innovative products in a new market.
SDG16: Building stronger institutions	• Delivering government services through virtual offices and officials. • Providing court and judicial services. • Reporting crimes and visiting law enforcement offices.

Source: Compiled by ESCWA.

III. Challenges facing the metaverse

30. Even though the metaverse has the potential to positively impact socioeconomic development, there are possible adverse effects that should be considered and addressed. These challenges are technical, regulatory or ethical in nature, but are complexly interrelated so tackling one affects the others.

A. Technical challenges

31. National technology infrastructure needs to be ready, especially in terms of technologies considered as the building blocks of metaverse applications. The technology necessary to enter the metaverse may also be

out of reach for some countries and people. In the Arab region, not all individuals have access to the technologies necessary to participate in the metaverse, they may not have the digital skills required to use the technologies should they have access, and those who do not have access to such technologies or skills will therefore not experience the benefits of the metaverse. The consequence of this will be an exacerbated digital divide that follows people from the physical world into the metaverse, with the danger of greater exclusion at the social, economic and political levels of daily life.[33]

B. Security and privacy

32. Cybersecurity is a great concern in the metaverse, especially regarding identity theft, child online safety, data protection and privacy. Living online places people at risk given that cybercriminals could erase or steal identities. Security architecture at the user level in the metaverse is not an extensively explored area. However, this level can inherit security solutions from other market-established or market-emerging technologies.[34] The online safety of children is already a concern that could worsen in a metaverse environment where parents cannot see what children are looking at.

33. Implications for national security need to be taken into consideration. Augmented and virtual reality can present falsified realities in real time. For example, digital overlays could be altered to make a person appear somewhere they are not, or even to distort the information that military personnel or officials receive on the ground during a crisis.[35]

34. Extended reality devices require a large amount of information about individuals and their surroundings to deliver immersive and engaging experiences. A great deal of personal data is therefore at risk of being accessed, stolen or misused, especially if personal data protection is not updated to consider the particularities of the metaverse. Individuals and organizations could be financially, reputationally, psychologically and physically vulnerable to attack or damage.[36]

35. Users' properties, such as land, apartments or other assets, could be assigned to different users in the metaverse, or could be reshaped without the permission of the real owner. As in the physical world, content creation needs to respect social norms, culture and regulations. Therefore, virtual activities and products need to be protected by ownership rights in the metaverse.

36. Crimes and the laws that govern them, such as harassment, also require attention in the metaverse, as the definition of crimes would necessarily have to change to include, for example, different forms of touch that would be considered harassment in a virtual context.[37] Gender considerations are important in the development of the metaverse, since virtual harassment and gender-based violence are real problems that women currently encounter in gaming environments. In 2017, 49 per cent of female virtual reality users reported that they had been virtually harassed. In a virtual world, the normal cues that would warn a person about the possible negative intentions of another are absent. It is also important to remember that any form of harassment and violence in the virtual world can translate into the physical world. It is therefore crucial to develop elements such as body sovereignty, which is a virtual reality design practice currently being developed that involves creating comprehensive safety features for social virtual reality experiences. If the safety of women, children

[33] Mayank Sharma, *How the Metaverse Could Worsen the Digital Divide: Connecting the connected, but what about the rest?*, 2022.

[34] Junfeng Xie and others, A survey of blockchain technology applied to smart cities: research issues and challenges, 2019; Olga B. Mora and others, A use case in cybersecurity based in blockchain to deal with the security and privacy of citizens and smart cities cyberinfrastructures, 2018.

[35] XR Safety Initiative, Virtual worlds: real risks and challenges: first XR data classification roundtable report, 2021.

[36] XR Safety Initiative, Virtual worlds: real risks and challenges: first XR data classification roundtable report, 2021.

[37] Bernard Marr, *7 important problems and disadvantages of the metaverse*, 2022.

and persons with disabilities cannot be guaranteed in the metaverse, its development and reach will be restricted meaning that it will not translate into the inclusive phenomenon it is envisioned to be.[38]

37. The physical and emotional well-being of children also need to be protected across extended reality experiences, putting more pressure on parents to educate their children and teach them how to differentiate between the virtual and real worlds.

C. Ethical challenges

38. The development of a new avenue of rights, namely neuro rights,[39] needs to be considered. These should include the right to personal identity, the right to free will, the right to mental privacy, the right to equal access to mental augmentation, and the right to protection from algorithmic bias. This is necessary in the metaverse where technology will be able to interface directly with a person's brain and alter things such as moods, emotions and imagery.[40]

39. Physical and emotional user reality can also be manipulated by creating avatars with different behaviours, meaning that names and shapes of users could be abused. Deepfakes, for example, could take the form of face re-enactment where software manipulates an individual's facial features; face generation where a new face is created that does not relate to a specific individual; face swapping where one person's face is swapped with another; and speech synthesis where voices are recreated. Even dead people could be revived in the metaverse.

IV. Metaverse development examples

40. To date, metaverse developments are mostly associated with private companies. Some Governments have begun to strategically move towards benefitting from the metaverse. Actions taken so far include introducing innovative concepts, strengthening an enabling framework to foster the development of the metaverse nationally and globally for economic growth, relying on the metaverse to develop planning, providing advanced services, and improving interaction with citizens. Governments should be the regulatory authority that ensures and safeguards the rights of people in the metaverse, such as privacy rights and data protection,[41] as well as the ethical use of the metaverse. In creating the metaverse ecosystem, Governments should develop avenues that target the private sector and entrepreneurs, so that they have opportunities to invest and participate in the development of the metaverse. In addition to building the metaverse ecosystem, Governments could also be content creators, building their own platforms to enter the metaverse. The following section provides examples of government programmes in the metaverse.

A. Republic of Korea

41. In January 2022, the South Korean Ministry of Science and ICT announced a pan-government strategy on the metaverse as a way for the country to respond to disruptive innovation and new technologies. The strategy resulted in a five-year plan to be achieved by 2026, with a $464 million for 2022. Metaverse development will be led by the private sector, and the Government will offer support to developers.

42. The national strategy for the metaverse has the following four main pillars: creating a sustainable metaverse ecosystem based on public-private partnerships; training developers and creators who will enrich the metaverse economy; developing the metaverse industry to lead business transformation and job creation;

[38] Anugraha Sundaravelu, The metaverse is not designed for women, 2022.

[39] Neuro rights is a new area of human rights that focuses on protecting a person's brain and its activity. Advances in neurotechnology can result in monitoring, reading and even altering brain activity, and its commonplace inclusion in metaverse developments necessitates mechanisms to safeguard those entering the metaverse and those using extended reality devices.

[40] XR Safety Initiative, Virtual worlds: real risks and challenges: first XR data classification roundtable report, 2021.

[41] Sagar Vishnoi, How the metaverse will redefine politics and Governments, 2021.

and creating rules and regulations for ethical conduct, while protecting digital assets and copyrights to ensure a healthy metaverse.[42]

43. Through the strategy, the Republic of Korea expects to achieve the creation of metaverse economy-based technology, to provide open opportunities for everyone to innovate and grow, and to become a leading and exemplary country in the new metaverse era.

44. The city of Seoul has also created a comprehensive plan for the metaverse. The Metaverse Seoul strategy will be implemented in three phases starting in 2022. The end goal is to provide virtual places in the economy and in the education and the tourism sectors for seven administrative services, including handling civil complaints, supporting companies, and re-animating popular tourist attractions or destroyed historical resources. The strategy aims to implement a general civil service office online by 2023, named Metaverse 120 Centre, where citizens will interact with avatars of officials to resolve their issues and answer questions.[43]

B. Dubai, the United Arab Emirates

45. Metaverse Dubai invests heavily in experimenting with total immersion. This immersion goes beyond sensations, visuals and haptics to involve whole lifestyles. Dubai pioneered a method of total immersion in the metaverse by creating a platform that covers digital real estate, NFTs, blockchain trading, and other lifestyle aspects. In addition, Metaverse Dubai has already instigated rules regarding Hex purchases and acquisition (a single Hex is a cryptocurrency token representing an NFT lot in the metaverse).[44]

46. In July 2022, Dubai launched its Metaverse Strategy aimed at turning Dubai into one of the world's top 10 metaverse economies.[45] This strategy seeks to attract more than 1,000 companies in the fields of blockchain and metaverse, and to create over 40,000 virtual jobs by 2030. It also hopes to foster innovation and enhance the metaverse's economic contributions through research and development collaborations. Furthermore, the Government wishes to support metaverse education and content creation, and to create new governmental work models and development in vital sectors, including tourism, education, retail, remote work, health care, and the legal sector.

47. In early 2022, Dubai issued law No. 4 on the regulation of virtual assets to promote and encourage the digital assets market.[46] This law lays the foundation for creating a regulated onshore industry for virtual assets in Dubai. The Government hopes that this law will enable the city to become an international hub for virtual assets. A new authority known as the Dubai Virtual Assets Regulatory Authority will be created for the application of this law.

C. Other examples

48. Barbados will become the first sovereign nation with an embassy in the metaverse. By building a digital embassy, Barbados can gain more international presence, as a public open metaverse does not abide by time and space restrictions thus alleviating the need to create many embassies in the real world. The projects to develop the embassy involve the purchasing of digital land, architecture for the buildings, and facilities to deliver e-services.[47]

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[42] Ministry of Science and ICT, MSIT to announce pan-government strategy on metaverse, 2022; Kan Heyong-woo, Korea aims to become 5th-largest metaverse market by 2026, 2022.

[43] Seoul Metropolitan Government, Press release: Seoul to provide public services through its own metaverse platform, 2021.

[44] Metaverse Dubai, Metaverse Dubai introduces the world's first virtual mega city based on real-world map of Dubai prime areas, 2021.

[45] Alexandra Lester and Lucy Nash, *Dubai launches metaverse strategy*, 2022.

[46] Peter Hodgins and Dino Wilkinson, *Dubai issues law and establishes new regulator for virtual assets*, 2022.

[47] Andrew Thurman, Barbados to become the first sovereign nation with an embassy in the metaverse, 2021.

49. The city of Santa Monica in California worked with the developers of a social wallet mobile app, FlickPlay. Via their mobile phones, users can chase tokens spread around the city, and get drawn to storefronts, which creates foot traffic for shops and other establishments. Users can then exchange the collected tokens for digital collectibles, drawing on the scarcity factor of NFTs to monetize and increase the value of these digital collectibles.[48]

50. In other countries, cities, states and Governments have started creating digital twins of their physical spaces to simulate reality in a virtual space to solve citizen problems, from the most mundane to the most pressing, especially in the urban, transport and energy sectors.[49] Relying on feedback collected from real-world sensors and Internet of Things devices, combined with artificial intelligence models, they are driving simulations of how situations may play out in the real world. Governments entering the metaverse will rely heavily on the Internet of Things, three-dimensional visualization, open data and mobile data to test real-world applications safely and cost-effectively in a virtual environment. For example, before a Government invests money in building a new road or laying piping in a city, it can explore and test the consequences of such moves in the metaverse.

V. Recommendations

51. Deciding to develop the metaverse at the country level is not an easy decision to make, and Governments should complete the due diligence to ensure they can deliver. However, for the metaverse to develop and become the immersive experience sought by users, its decentralization and user-creator economy should not be unnecessarily restricted.

52. The following issues should be considered before entering the metaverse:

(a) Arab countries should be aware of the potential opportunities, applications and requirements of the metaverse, so as to make their own decision on how to use this phenomenon for social and economic development;

(b) Arab countries should conduct a readiness and feasibility assessment to determine if they are ready to move towards metaverse development, including evaluating technological infrastructure, existing privacy laws, and legal and regulatory frameworks. The assessment should identify areas of concerns that need attention before metaverse development is considered;

(c) Based on the assessment, a metaverse strategy or plan could be formulated that aligns with a country's needs and national priorities. The development of the strategy should bring together all stakeholders, such as policymakers, industry leaders, entrepreneurs, civil society, and current and potential users across diverse communities, including persons with disabilities, women and young people, to voice their needs and vision for the metaverse;

(d) Metaverse technologies, such as extended reality devices, require massive amounts of data to provide the immersive experience sought by users, meaning that data stewardship is essential to providing the required environment. This entails the formulation of data strategies that focus on the collection and management of data needed to create the metaverse;

(e) Countries should encourage inclusiveness and reform laws to be inclusive. For example, online safety laws and legislation should be reviewed and expanded to include immersive technologies. This should include any other laws that could be exploited by cybercriminals, so that everyone is safeguarded in the metaverse;

[48] Decerry Donato, Santa Monica Is using the metaverse to gamify its shopping district, 2021.

[49] Robin Raskin, *How governments are solving real problems in the metaverse*, 2022.

(f) Decision makers and policymakers should adopt basic virtual reality or augmented reality to experience it for themselves first. This creates awareness among those that make the decisions related to metaverse development;

(g) Countries should enhance technology accessibility, either in the form of access programmes or central access points, such as public libraries. In the long term, it is necessary to work on programmes that provide individual ownership of necessary technologies;

(h) Countries should implement awareness-raising programmes for citizens and institutions to understand what the metaverse is and how it will impact their daily lives, and to build the skills and knowledge needed to navigate the metaverse, including safeguarding themselves and their families;

(i) Countries should create opportunities for the private sector to contribute to metaverse development by funding its development, and providing sandboxing for testing and simulation, for example. The private sector should also drive the entire endeavour based on business models rather than funding from governmental and non-governmental organizations;

(j) Countries should participate in regional dialogues, workshops and meetings to discuss and share their experiences in operationalizing the metaverse, especially regarding legislation formulation, strategy and action plan development, and initiative implementation.
