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# Metaverse for Public Good: Embracing the Societal Impact of Metaverse Economies

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## Abstract

The metaverse is internet's next tectonic shift. Currently, there are approximately 400 million monthly users of the collection of worlds that make up the metaverse [1], with projected growth to 5 billion users worldwide by the end of the decade. This is expected to drive a total addressable metaverse market of \$8–13 trillion by 2030 [2]. According to Statista, 15% of the world's digital economy has already shifted to the metaverse [3], and many “world's first” metaverse initiatives have been launched over the past two years [4] [figure 28]. The potential applications of a metaverse for public services are vast, including remote governance, service delivery, virtual public spaces, enhanced transparency and accountability, increased social connectedness, improved access to information and education, new job opportunities, innovative forms of entertainment and creativity, and improved accessibility, to name a few. This article explores the practical applications of the metaverse for citizens and some multidisciplinary use cases from around the world. We also examine the national metaverse strategies and opportunities as well as challenges of the metaverse ecosystems, including its potential impact on society and public services. Finally, we propose some recommendations for policymakers and governments to construct forward-thinking metaverse economies.

**Keywords:** *Metaverse, Blockchain, Web3, Decentralisation, Public Services, Citizens, Government, Economy*

**JEL Classifications:** *A30, M37, M38, G23, G24, L26*

## Introduction

The metaverse ushers in a new era of digital reality and human-computer interaction by enhancing the integration of the physical and virtual worlds. In 2021, the British Blockchain Association released a summary of an open metaverse economy [figure 43] which outlined three crucial facilitators: technology, creators, and finance. Additionally, the summary detailed seven essential features, including persistency, a user-centric economy, open source, accessibility, and interoperability, et al [63]. The term “metaverse” refers broadly to an extended reality experience that brings together a range of emerging technologies, such as virtual reality, augmented reality, artificial intelligence, blockchain, Internet of things (IoT), 5G, spatial computing, cryptographic assets, and others, in a persistent environment where users can interact with each other and the digital content using 3-D rendered digital twins or avatars. These fundamental elements for constructing metaverse experiences have been in existence for several years [5]. Merriam Webster dictionary defines the metaverse as “a persistent virtual environment that allows access to and interoperability of multiple individual virtual realities” [6].

The notion of a metaverse (or “the” metaverse to describe all-encompassing metaverse ecosystems) has gained substantial

attention in recent years, primarily due to technological advancements that have enabled the creation of increasingly immersive virtual experiences [7]. The metaverse has significant potential applications in government and public services, including but not limited to remote governance, public service delivery, virtual public spaces, enhanced government transparency and accountability, increased social connectedness, improved access to information and education, new job opportunities, improved accessibility for people with disabilities, and new forms of entertainment and creativity, to name a few.

At the same time, it is crucial to proactively recognise and address the potential challenges associated with the metaverse. These challenges may include issues related to privacy, legality, security, identity, ownership, accessibility, cost, and availability of metaverse-related technologies [8]. By addressing these concerns, we can ensure that the benefits of the metaverse can be realised, while minimising any negative impacts that may arise from its adoption. Public and private sector enterprises are utilising the metaverse and its related technologies to foster growth, enhance productivity, and improve their ability to govern effectively. By leveraging the metaverse, they can make their administrative processes more efficient and provide better services to their communities.

In this article, we have examined some of the examples of public-sector and community-based use cases and practical implementations of the metaverse from around the globe [9]. We explore the real-world applications of the metaverse by highlighting national metaverse strategies and analyses the opportunities and challenges of the metaverse economy, including its potential impact on society and public services. Finally, based on our findings, we will propose recommendations for policymakers and governments to construct forward-thinking digital economies that can effectively harness the potential of the metaverse. By taking a comprehensive approach to understanding the practical implications of the metaverse, we can unlock its full potential to foster growth, enhance productivity, and improve the lives of citizens around the world.

### Preserving a Nation in the Metaverse: *The Case of Tuvalu*

*“Our land, our ocean, our culture are the most precious assets of our people and to keep them safe from harm, no matter what happens in the physical world, we will move them to the cloud,”* said Simon Kofe, Tuvalu’s foreign affairs minister at the 2022 United Nations Climate Change Conference (COP27) [10]. Tuvalu is a small country in the middle of South Pacific which is facing an existential threat due to rise in sea levels.



Figure 1: Tuvalu’s Foreign Minister Kofe at COP27

As Mr. Kofe virtually addressed world leaders [figure 1], the camera zoomed out to reveal Kofe standing in Teafualiku, the smallest islet in Tuvalu. *“Islets like this one won’t survive rapid temperature increases and rising sea levels,”* he said, *“so we’ll re-create them virtually - piece by piece, we’ll preserve our country, provide solace to our people, and remind our children and our grandchildren what our home once was”* [11].

Tuvalu’s official website now features a real-time, live update counter that tracks the progress of everything from digital twins of government buildings to public documents, to sights and sounds of local birds being uploaded and preserved in the metaverse [Figure 2].

Preserving heritage in the metaverse provides an opportunity to safeguard cultural and historical assets against threats such as climate change, natural disasters, and human activity. The

case of the dodo, a bird native to Mauritius which became extinct due to human activity 200 years ago, serves as a cautionary tale about the importance of preserving such assets in a format that can withstand the test of time. By utilising the metaverse to digitally recreate and preserve cultural heritage, future generations can experience and learn from their past in a way that was previously impossible. Additionally, the metaverse allows for the creation of interactive and immersive social experiences that can provide a deeper understanding and appreciation of a nation’s cultural heritage. Tuvalu’s innovative approach to preserving their nation’s heritage serves as a powerful example of how the metaverse can be utilised to ensure that cultural heritage is not lost, but instead continues to thrive and evolve.

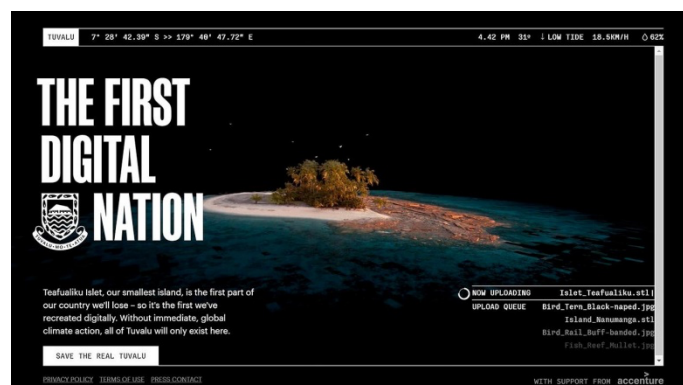


Figure 2: Tuvalu’s official website showing real-time live updates of nation’s heritage being uploaded on the metaverse: <https://www.tuvalu.tv/>

### Public Service Delivery and Remote Governance: *“The Metaverse Seoul”*

One of the potential applications of metaverse in government and public services is remote governance. A metaverse could allow government officials and citizens to interact with each other in an interactive, immersive, 3-D virtual environment, making it possible for public services to be delivered remotely, inclusively, and efficiently [12]. This could be particularly beneficial for people who live in regions where access to public spaces is limited. It can also provide a safe and inclusive environment for socialisation and community building for people who live in rural or remote areas, or for those with mobility issues. From a government’s perspective, the metaverse could be used to provide services across the “BIG 7” – Business, Education, Governance, Healthcare, Entertainment, Creative Industries, and Science & Technology. Metaverse could provide a virtual platform for citizens to interact with each other, participate in public events, and engage in discussions about public policy and governance.

As a component of its "Digital New Deal" political strategy, South Korea has been increasing its efforts in the realm of metaverse initiatives [13]. In February of 2022, the country revealed intentions to allocate roughly \$200 million in financing for metaverse projects, distributing grants to

universities and businesses to aid in the advancement of their technologies. [14]. Seoul was the first city to outline metaverse ambitions in November 2021 and in January 2022 announced that it would invest KRW 223 billion in metaverse technologies, as part of its digital transformation strategy.



**Figure 3:** Metaverse Seoul, South Korea: Mayor's office in the metaverse

The Metaverse Seoul offers a platform for government officials to share information and engage with citizens in a transparent and accountable manner [figure 3]. This is done through virtual town halls, public forums, and other interactive events, allowing citizens to meet their councillors and mayors, and hold their elected officials accountable for their actions [15].

The Mayor of Seoul has been meeting citizens in the metaverse, where people can lodge complaints and visit the virtual replica of the city [figure 4]. By 2026, the South Korean capital aims to have a metaverse environment for all administrative services, including economy, education, culture, and tourism. The South Korean government is believed to be investing around \$34 million in this project [16]. The Metaverse Seoul will also include services such as a fintech lab, a corporate support center, Seoul's top 10 tourist attractions, a youth mentoring counselling room and tax services.



**Figure 4:** Metaverse Seoul (opengov.seoul.go.kr)

### The “Cognitive Cities,” Digital Twins, and the NMOs: The Case of “The Line”

Saudi Arabia is building the world's first metaverse “cognitive city” – XVRs [figure 5], where people can travel and “live” in

the metaverse, while the city is being physically built [17]. Therefore, unlike the digital twin of a physical city like Seoul, Saudi Arabia is building a physical twin of the city that exists in the metaverse – also called NMOs or “Native Metaverse Organisations.” This innovative approach to building a smart futuristic city in the metaverse will make it possible for people from anywhere in the world to visit NEOM virtually, before making investment decisions about buying a physical real estate in The Line.



**Figure 5:** XVRs: Metaverse Cognitive City  
The Line, Saudi Arabia

### Public-Private Collaboration: The Case of Shanghai's Metaverse Pilot

At the end of 2021 Shanghai announced a 5-year plan to leverage the metaverse for public and private stakeholders [18]. Furthermore, the Chinese government also announced its ambition to grow the local metaverse industry to a whopping \$52 billion by 2025, while adding 10 globally leading enterprises and an additional 100 more new metaverse companies to the metaverse ecosystem [19]. This news was accompanied by the announcement of a new \$1.5 billion fund to support metaverse development [20].

In the Shanghai Metaverse Pilot Programme, some of the services for citizens are already up and running, such as the “Metaverse Diagnose System” at Shanghai Eye Hospital, an affiliate of Fudan University, enabling doctors to use 3D remote diagnosis equipment to treat patients. China is also building the metaverse infrastructure for Urban planning, work and education, tourism, and entertainment, fintech and payments, healthcare, government and public services, businesses, and creative industries, to name a few [21].

According to the plan [figure 6], Lin-gang, a Special Development Area and pilot zone for the city's artificial intelligence industry, the region will strive to develop the overall scale of the extended reality and metaverse industry to see revenue exceed 10 billion yuan within three to five years. Focusing on key metaverse components, technologies, terminal equipment, content supply, software, and other areas, it will build a number of public service platforms covering the whole metaverse industrial ecosystem for citizens [22].





**Figure 6:** Shanghai's XR Conference 2023, discussing China's 3-year Metaverse Plan

### Virtual Public Spaces: *Celebrating Days of National Significance in the metaverse*

A metaverse could provide a virtual platform for citizens to interact with each other, participate in public events, and engage in discussions about public policy and governance. This could be especially beneficial for people who are unable to physically attend public events, or for those who live in regions where access to public spaces is limited.

From 22 to 24 September 2022, Saudi Arabia celebrated its 92nd National Day [figure 7] in the metaverse [23]. The three-day celebration took place in Decentraland [24]. From traditional NFT (non-fungible token) outfits to an open-air museum, the immersive experience paid homage to Saudi Arabia's culture and history. Event attendees were able to explore Saudi Arabia's civilisation, tradition, art, and history [figure 8]. Furthermore, the visitors were able to buy wearable NFTs inspired by Saudi national attire, as well as Proof of Attendance Protocol NFTs (POAPs).



**Figure 7:** Saudi Arabia's National Day in the metaverse

During the period of UK's national mourning following the death of Her Majesty the Queen, a tribute was paid to her at

the BBA's metaverse headquarters [25]. A minute's silence was also observed at in the honour of The Queen [figure 9].



**Figure 8:** BBA president, Prof Naseem Naqvi, in his digital avatar, visiting Saudi Arabia's National Day in the Decentraland Metaverse



**Figure 9:** Official national mourning, The Queen, BBA's Metaverse Headquarters, 10 September 2022

### Metaverse Economic Zones – The “MEZs”: *The Case of Japan*

Japan has recently launched the Metaverse Economic Zones or “MEZ”s, which are a consortium of technology giants coming together to build a metaverse for citizens [26]. These include major Japanese technology, manufacturing, and finance firms collaborating to create the infrastructure for an open metaverse towards Japan's national Web3 strategy [figure 10]. The Metaverse Economic Zones features “Auto-learning Avatars,” which collect users' information to provide a personalised metaverse experience, as well as “Multi-Magic Passport” that will enable identification and payment methods to facilitate interoperability within the metaverse space for the users. This is particularly relevant since most centralised metaverses such as Roblox or Minecraft, a user is unable to transport its digital assets, payments, history, data, and identity to the other platforms since the platforms are not interoperable and do not talk to each other [27].

In November 2022, Japan's Digital Ministry announced plans to create a decentralized autonomous organization (DAO) to help government agencies enter Web3 [28].



## National Metaverse Strategy: The Case of Dubai

The UAE has set its sights beyond just competing in the metaverse arena and instead aims to be the dominant player in the region. This goal is evidenced by their published 5-year metaverse roadmap [figure 11] and plans to generate 40,000 virtual jobs, contributing approximately \$4 billion USD to the economy [29].



Figure 10: Metaverse Economic Zones, MEZs, Japan

Dubai's metaverse strategy includes attracting 1,000 metaverse-related companies in the sector by 2030. A new metaverse accelerator has also been launched in Dubai, a city that is also home to a growing number of blockchain venture funds with active investing interest in the metaverse [30].



Figure 11: Dubai's Metaverse Strategy

In May of 2022, Dubai's Virtual Assets Regulatory Authority (VARA) became the first government regulatory authority to enter the metaverse [figure 12] when it launched its headquarters (VARA Hq) in the Sandbox [31].



Figure 12: UAE announcing the launch of Metaverse VARA Headquarters

In recent times, devising metaverse policies to stimulate economic growth at a national level has become increasingly paramount [figure 13]. Various countries have developed their own distinct metaverse strategies [32] with different goals and scopes. These strategies have been shaped by various socioeconomic and political factors, resulting in different patterns and approaches to metaverse development, as highlighted in table below:

Country	Key elements of the metaverse strategy	Sample projects/goals
China	<ul style="list-style-type: none"> <li>The country has a strategic approach: "use the virtual to enhance the real, use the virtual to strengthen the real."</li> <li>CICIR analyzed the metaverse's national security challenges.</li> <li>The country is reported to be studying a registration system for metaverse users.</li> <li>Shanghai: the metaverse as among the four "frontiers for exploration."</li> </ul>	<ul style="list-style-type: none"> <li>The country is developing a teaching center with immersive technology to foster CCP values.</li> <li>Shanghai: US\$1.5 billion investment. Goal: to develop 10 leading companies and 100 small-sized firms and launch 100 products and services by 2025.</li> </ul>
Saudi Arabia	<ul style="list-style-type: none"> <li>The metaverse is a key part of Vision 2030.</li> <li>The country launched the National Gaming and Esports Strategy.</li> </ul>	<ul style="list-style-type: none"> <li>The US\$500 billion futuristic megacity NEOM will have its own metaverse.</li> <li>Gaming and esports market: US\$6.8 billion by 2030, 39,000 jobs.</li> </ul>
South Korea	<ul style="list-style-type: none"> <li>The country launched K-metaverse 2022.</li> <li>2022: investment of US\$185 million in metaverse-related projects.</li> </ul>	<ul style="list-style-type: none"> <li>The country plans to select 70 K-metaverse companies and provide them with customized supports.</li> <li>2021: Seoul announced a five-year plan to build the city's digital twin; a beta test run of its first stage was in August 2022.</li> </ul>
The UAE	<ul style="list-style-type: none"> <li>The country plans to measure economic success using gross metaverse product</li> <li>The country plans to focus on tourism, education, government services, retail and real estate.</li> <li>The country plans to launch a task force to evaluate opportunities for exporting culture.</li> <li>Dubai: aims to make the city among the world's top-10 metaverse economies. Goal: attract more than 1,000 blockchain and metaverse companies and support more than 40,000 virtual jobs by 2030.</li> </ul>	<ul style="list-style-type: none"> <li>The Ministry of Economy: plans to have its headquarters in the metaverse.</li> <li>Dubai city's digital twin will be in the metaverse.</li> <li>Sharjah: has plans for the "Virtual Transaction Centre—Metaverse."</li> </ul>

CICIR: China Institute of Contemporary International Relations; CCP: Chinese Communist Party.

Figure 13: National Metaverse Strategies Computing's Economics,

<https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=10042106>

## Government Communication through the Metaverse:

*Emmanuel Macron of France and Mayor of Orlando of USA*

Government leaders have started delivering their speeches in the metaverse. In 2022, French President Emmanuel Macron delivered his presidential speech in Decentraland [33] addressing the business communities, and to quote him:

*"We are reindustrializing the nation – The metamorphosis is always scary, but formidable. the innovations will make the great revolutions of tomorrow!"* [figure 14]



Figure 14: President of France in the metaverse

In December 2022, the Mayor of Orlando Florida in USA became the first US politician to deliver a speech [figure 15] in the metaverse [34]. Here is what he had to say:

*“Consider this your personal invitation from the mayor of Orlando. We want to share what we’re building here in the Metaverse - There are currently some 2,500 open IT and tech jobs in Orlando, and we want you in Orlando.”*

### Education, Learning, and Training in the Metaverse:

Universities have started incorporating metaverse in their curriculum. This includes both teaching about the metaverse (offering courses, research) [35] as well as hosting lectures inside a metaverse environment [36] [figure 16]. Japan built a metaverse-based educational environment to encourage students who cannot afford to attend in-person lectures. Toda, Japan’s city in the Saitama prefecture, is solving the problem of growing absenteeism by utilising metaverse tools [37]. Students far away from school can attend class daily and explore their campus from their comfort zone. To enable metaverse schooling and fulfil attendance sheets via participating in the virtual classrooms, candidates must first obtain approval from their respective institutions.



Figure 15: Mayor of Orlando in the metaverse



Figure 16: Kwangwoon University Metaverse platform, South Korea

Improving accessibility to knowledge and information is another benefit of the metaverse. It can provide citizens with access to a wealth of information and educational resources [figure 17]. Virtual libraries, museums, and universities can be established, allowing people to learn and explore from anywhere in the world [38]. This can be

especially beneficial for people who live in regions where access to educational resources is limited.



Figure 17: JBBA Blockchain Research Infographics gallery in the metaverse



Figure 18: Metaverse for Learning and Education

Learning in the metaverse offers some unique advantages in the field of research and education. The experience is immersive and kinetic environment such that students can roam and interact with objects, and with each other. This can be used to experience the history of World War 1 in the battlefield, studying human body by becoming a red blood cell in the arteries, be with the molecules to experience the chemical reaction, or experience how it feels like to be with a dinosaur [39] [figure 18].

The British Blockchain Association is assisting universities and businesses to take their first step into the metaverse [figure 19]. The learning offered is practical and hands-on, involving visits to various types of metaverses (decentralised, centralised, and hybrid). Participants gain knowledge on NFT-gating, avatar management, the history and future of metaverse economies, and other relevant materials. These masterclasses have been meticulously curated to provide a comprehensive and all-encompassing learning experience for delegates. In addition, a Proof of Attendance (POAP) NFT certificate is issued on the blockchain [figure 20] to serve as a permanent, immutable record of the learning achievement [40]. The students have rated these masterclasses “outstanding.” The monthly member networking forums of the BBA have also moved to the metaverse [figure 21 and 22].





**Figure 19:** BBA Metaverse Headquarters, hosting Epoka University



**Figure 20:** POAP NFTs in the Metaverse for Attendees



**Figure 21:** The British Blockchain Association's Member Forum at the BBA's Metaverse Headquarters



**Figure 22:** The British Blockchain Association's Metaverse Headquarters in Spatial: <https://bit.ly/3Ya1kSS>

## Improved Emergency Response

To enhance emergency response efforts, metaverse has the potential to facilitate coordination and efficiency. The use of virtual simulations can help to train emergency responders [figure 23]. Additionally, virtual command centres could be established to manage real-time response efforts. By integrating data from multiple sources such as aircraft, sensors, maps, and databases, an augmented-reality layer of information can be displayed over live drone camera feeds. This provides first responders with the ability to identify roads and powerlines obscured by fire or floodwater, track their own vehicles and personnel, and even tag individuals who may be in danger or suspected criminals [41].



**Figure 23:** Metaverse for emergency response system

## Faith and Religious Practices in the Metaverse

In the metaverse, virtual 3-D synagogues and churches have been established [figure 24], offering visitors the opportunity to learn about different faiths, their histories, and collect NFTs related to various religious items. An example of this can be seen in the Decentraland Metaverse [42], where a virtual synagogue has been constructed (Figure 24)



**Figure 24:** Prof Naqvi at a Synagogue in the metaverse



## Increased Social Connectedness

In a metaverse, citizens can have access to a persistent virtual environment where they can interact with each other regardless of their location. This is particularly advantageous for individuals residing in remote areas or those who have difficulty accessing public spaces in person. Within the metaverse, individuals can participate in virtual events, attend concerts, and socialise with friends and family, all within a secure and inclusive environment.

As an example, Harvard Business School hosted an alumni reunion [43] within the metaverse. This event brought together Harvard alumni from 28 different countries, providing them with an opportunity to connect virtually, without the need for air travel [Figure 25]. By utilising the metaverse, such gatherings can reduce the carbon footprint of air travel, while also overcoming other challenges such as visa requirements, costs, COVID-19 restrictions, work absences, and jet lag.



Figure 25: Harvard University Alumni Reunion

## Legal Proceedings in the Metaverse

Colombian courts have conducted a pioneering legal hearing using metaverse technology [44]. Magistrate María Victoria Quiñones Triana of the Magdalena court approved the use of Horizon Worlds technology provided by Meta and virtual avatars to represent participants in the proceedings [figure 26]. According to Magistrate Triana, “the metaverse is a technological tool that can facilitate access to the administration of justice. The use of information technology in the development of judicial proceedings has the essential purpose of facilitating and expediting these processes.”



Figure 26: Colombian Court Hearing in the Metaverse

## Weddings in the Metaverse

Marriage ceremonies and weddings have taken place in the metaverse, with one of the first legal metaverse weddings occurring in February 2022. The nuptials of Candice and Ryan Hurley were held in the Decentraland metaverse, officiated by Arizona Supreme Court Justice Clint Bolick and facilitated by the Rose Law Group [figure 27]. The virtual ceremony took place at a modified property in Decentraland, designed to resemble a mountain town wedding venue, with the bride's and groom's avatars and thousands of attendees in attendance. Instead of traditional wedding favours, the couple gifted NFTs featuring their dog, Pepper, to guests. Following this milestone event, numerous official weddings have taken place in the metaverse [45–47].



Figure 27: Candice and Ryan Hurley's wedding in the metaverse



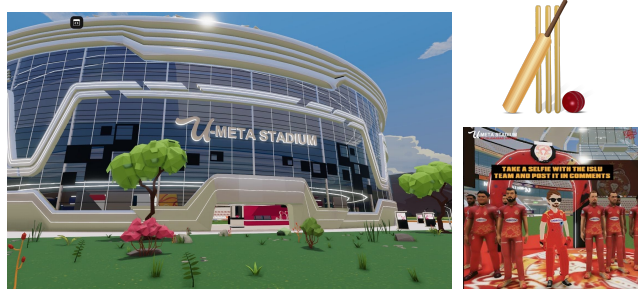
Figure 28: World's First Metaverse Initiatives

## Sports in the Metaverse

In February 2023, the Islamabad United cricket team from the Pakistan Super League became the first cricket team to join the metaverse. They created a virtual stadium that was built to scale in Decentraland, and it had a twin stadium that was available on Android. Through interactive experiences and challenges, fans could get closer to the cricket action and their favourite team players [figure 29]. Visitors could also explore



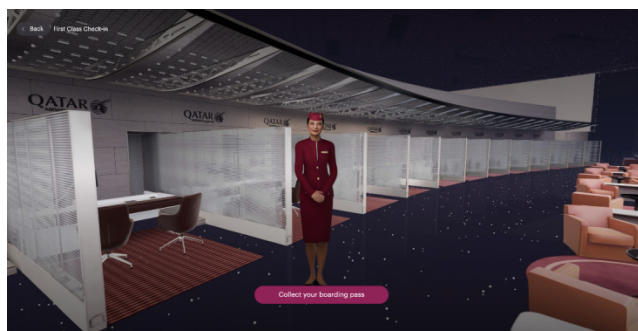
and interact with different areas within the stadium, including the locker room, players' lounge, and fans conference room. Those who participated and completed challenges were rewarded with official Islamabad United digital kits, club memorabilia, digital assets, and offers from sponsors. This experience provided a unique and exciting way for fans to engage with their favourite cricket team and players [48].



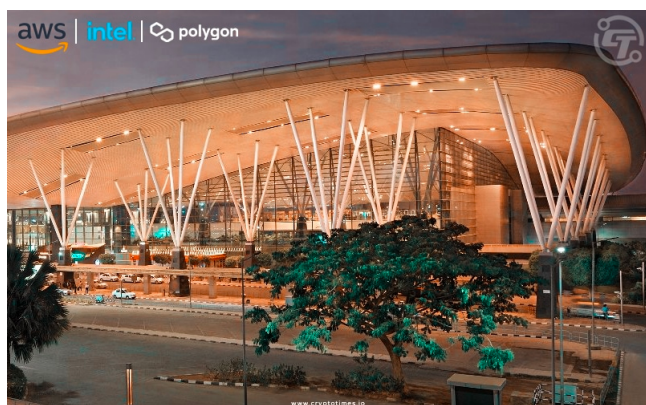
**Figure 29:** Islamabad United Pakistan Super League Cricket Stadium in Decentraland Metaverse

### Travelling and Tourism in the Metaverse

The travel and tourism industry has the potential to be revolutionised by the metaverse. Metaverse technologies are already starting to reshape the industry, from enhancing boarding experiences to immersive virtual reality travel and from extended reality employee training to augmented reality guided tours [49], [50] [figure 30 and 31].



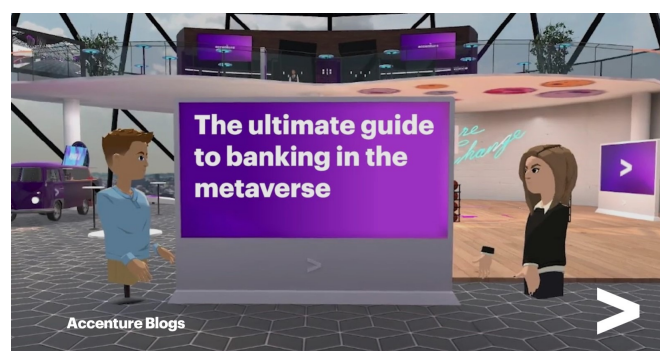
**Figure 30:** QVERSE: Qatar Airways Lounge in the metaverse



**Figure 31:** Bangalore International Airport (BIAL) in the Metaverse

### Banking in the Metaverse

Banks are beginning to explore the potential of the metaverse. According to a 2022 survey by Accenture [51] 67% of global banking executives believe that the metaverse will have a positive impact on their organisations [figure 32]. Additionally, 47% of bankers believe that customers will use AR/VR as an alternative channel for transactions by 2030, while 38% believe it will be a breakthrough or transformational. The survey also found that 92% of respondents agreed that future digital platforms need to offer unified experiences that enable interoperability of customers' data across different platforms and spaces. JP Morgan and HSBC were among the first banks to launch their metaverse headquarters in 2022, followed by Union Bank of India, Bank of Poland, Sygnum, and others.



**Figure 32:** Accenture's guide to banking in the metaverse

Commercial Bank International has recently launched its metaverse branch – the first UAE bank to launch a branch in Decentraland. With 24/7 accessibility, minimal carbon footprint compared to a brick & mortar branch, both trad-fi and de-fi services (crypto and fiat) products & services tailor-made to be used within the metaverse economies, metaverse enables persistent, real-time, inclusive, and open access to traditional and crypto finance, and the possibilities are endless [figure 33].



**Figure 33:** Commercial Bank International's metaverse ATM

PKO Bank Polski has launched its headquarters in the metaverse [52] [figure 34]:



**Figure 34: Bank Polski in the Metaverse**

JP Morgan was one of the first banks in the world to launch its metaverse headquarters in the Decentraland [53] [figure 35]:



**Figure 35: JP Morgan in Decentraland Metaverse**

### Law Enforcement in the Metaverse:

Law enforcement agencies are recognising the potential of the metaverse, and INTERPOL has recently established its headquarters within this virtual environment to train and educate its staff worldwide [54] [figure 36].



**Figure 36: INTERPOL's office in the metaverse**

### World Economic Forum in the metaverse:

The World Economic Forum (WEF) has recently announced its foray into the metaverse by partnering with Microsoft and Accenture to launch the Global Collaboration Village metaverse [figure 37]. This initiative aims to create a virtual space where individuals and organisations can participate in collaborative activities throughout the year, rather than just

during a few days each year at Davos. The project is expected to offer a unique experience, leveraging metaverse technologies to promote cross-border collaboration, networking, and knowledge sharing [55].



**Figure 37: World Economic Forum in the Metaverse**

### Enhanced Job Opportunities

A metaverse can provide citizens with new job opportunities in fields such as virtual event planning, digital content creation, and virtual architecture. This can be especially beneficial for people who live in regions with limited job opportunities, or for those who are unable to work in traditional office environments [56].

Some of the job opportunities that would exist solely in the metaverse:

1. Metaverse avatar clothing designers
2. Metaverse architects, coders, and designers
3. Metaverse event directors
4. Metaverse safety managers and moderators
5. Metaverse research scientists
6. Metaverse marketing specialists
7. Metaverse virtual tour guides
8. Metaverse virtual real-estate agents

### Improved Accessibility for People with Disabilities

A metaverse has the potential to serve as a comprehensive platform for individuals with disabilities to engage with each other and avail public services. By designing virtual environments to be inclusive and accessible to persons with disabilities, the barriers to their participation in social and economic activities can be eradicated. The metaverse can also usher in a new era of job opportunities for individuals with disabilities, previously beyond their reach. Additionally, virtual medical consultations and telemedicine services offered within the metaverse could offer disabled individuals the convenience of accessing healthcare services from the comfort of their own homes [57] [figure 38].

The metaverse has the potential to revolutionise the delivery of education to disabled individuals and late-life learners, by providing a wider range of high-quality educational pathways. Immersive technologies allow for the delivery of higher education in an engaging manner, without requiring physical attendance. This mode of delivery eliminates some of the obstacles that prevent many individuals from accessing



education, such as having to move away from home or travel to a physical campus. A recent Microsoft survey of 31,102 participants across generations revealed that only 16% did not anticipate carrying out at least some of their job duties as “metawork” in the near future, indicating a growing trend towards virtual work and the potential for the metaverse to transform the workforce.



**Figure 38:** Source: Five ways the metaverse could be revolutionary for people with disabilities (Brunel University, London)

### New Forms of Entertainment and Creativity:

From Justin Bieber to Ariana Grande to Travis Scott, most mainstream artists have now performed in the metaverse. In April 2020, during the pandemic-induced lockdowns, Travis Scott's performance in Fortnite's metaverse attracted nearly 28 million viewers [figure 39] highlighting the potential of the metaverse as a platform for mass-entertainment [58].



**Figure 39:** Travis Scott in Fortnite Metaverse

Several fashion and sports brands such as Gucci, Luis Vuitton, Dolce Gabbana, Nike, Prada, Zara, Ralph Lauren, Givenchy, Dior, and others have forayed into the metaverse. Decentraland recently hosted the 2023 Metaverse Fashion Week, allowing participants from around the globe to explore and network with others through their avatars [59].

A metaverse also provides a platform for citizens to express their creativity and participate in new forms of entertainment. Virtual games, virtual reality movies and experiences, and virtual concerts [figure 40] can be enjoyed by people of all ages and interests. However, it is important to consider the potential challenges associated with a metaverse. Issues related to privacy, security, and accessibility must be addressed to ensure that all

citizens can safely and comfortably participate in virtual environments. Additionally, the cost of accessing a metaverse and the availability of technology must also be considered, to ensure that all citizens have equal access to its benefits.



**Figure 40:** Metaverse Fashion Week, Decentraland Metaverse

### Art in the Metaverse

Many art galleries from around the world have established their presence in the metaverse [figure 41]. Sotheby's, the world's largest brokers of fine and decorative art, and collectibles have opened their digital twin in the Decentraland metaverse [60], [61].

Many art galleries have opened up in the metaverse, showcasing culture, heritage, tradition, and history from around the globe [figure 42].



**Figure 41:** Prof Naseem Naqvi at Sotheby's in the metaverse



**Figure 42:** Prof Naseem Naqvi at an art gallery in the Decentraland metaverse

## Challenges and Limitations

The emergence of metaverse-centric economies holds immense potential for growth and innovation, as organisations strive to create novel products and services for their consumers. However, this shift also brings along several challenges [62] including the need for new hardware and software infrastructures, privacy and security concerns, and the possibility of monopolies to emerge in the metaverse.

While the benefits of the metaverse for public services are considerable, it is crucial to consider the various challenges and limitations that must be addressed when developing extended reality applications. This includes accessibility concerns and providing equal access to the Metaverse for all citizens, regardless of their socioeconomic status. It is also important to approach the development of the Metaverse in a responsible and ethical manner, considering its potential long-term impact on society and the environment.

### *Access*

While the metaverse has the potential to enhance access to public services, it is important to recognise that not everyone has access to the technology needed to participate in the Metaverse, such as high-speed internet (latency and bandwidth), cost of VR and/or AR devices, and access to education and training resources. The cost of such technologies and the lack of necessary knowledge and awareness for end-users are additional challenges that must be addressed to ensure equitable access to the metaverse.

### *Interoperability*

Interoperability is a critical aspect of the metaverse. Supporters of decentralised metaverse (Web3 metaverse) argue that open source decentralised metaverses such as Decentraland or Sandbox can enable better interoperability and self-sovereignty compared to centralised metaverses such as Roblox or Fortnite. One of the key advantages of Web3 metaverses is that their underlying infrastructure is built on public blockchains such as Ethereum. This enables efficient management of **C**ommunication, **H**istory, **I**ntity, **D**ata, **D**igital Assets, **E**ntitlements, **R**ights, and **s**ocial contacts (**CHIDDERS**) across various platforms. This is in contrast to centralised metaverses such as Roblox or Fortnite, where interoperability between different platforms is limited, and data management is often fragmented. With Web3 metaverses, there is a unified system for managing and sharing data, digital assets, and identity information, which can improve the efficiency and effectiveness of communication and interactions within the metaverse.

Furthermore, the use of public blockchains provides a transparent and secure platform for managing **CHIDDERS**, ensuring that user data and digital assets are protected and that users have control over their information using private keys and self-sovereign identities. This enhances trust and confidence in the metaverse, making it more attractive to users. Overall, the use of public blockchains in Web3 metaverses enables efficient and secure management of

**CHIDDERS**, providing a strong foundation for the development of a decentralised and interoperable metaverse ecosystems.

### *Privacy and Security*

Metaverse can be vulnerable to cyberattacks and data breaches, and this poses a significant risk to the privacy and security of citizens using the metaverse for public services. Hackers may try to exploit vulnerabilities in the underlying technology or infrastructure of the metaverse, or they may use social engineering tactics to trick users into revealing sensitive information. A cyberattack or data breach in the metaverse could have serious consequences. It could compromise the personal data of users, such as their identity, communication, assets, financial information, and other sensitive data. It could also disrupt public services that rely on the metaverse, potentially causing widespread disruption and harm.

To address these risks, it is important to implement strong cybersecurity measures and protocols in the metaverse. This includes using encryption or zero-knowledge proofs to protect data in transit and at rest, implementing multi-factor authentication, regularly patching, and updating software and systems, and providing user education and awareness training to prevent social engineering attacks.

Additionally, it is important to have robust incident response plans in place in case of a cyberattack or data breach. This includes having the capability to detect and respond to security incidents quickly using digital forensic toolboxes and communicating with users about any potential impacts or risks.

### *Digital Divide*

The metaverse is a digital environment, which means that it may not be accessible to everyone, particularly those who do not have the skills or resources to navigate digital platforms. This could create a digital divide between those who have access to the metaverse and those who do not.

### *Infrastructure*

The metaverse may require sufficiently advanced technological infrastructures, including high-speed internet, powerful computing systems, and sophisticated software. This could be a barrier to implementation, particularly in countries or areas with poor access to internet.

### *User Adoption*

The success of the metaverse for public services will depend on user adoption. It is important to consider how citizens will engage with the metaverse and what factors might incentivise, motivate, or discourage them from using it.

### *Cost*

The development and maintenance of the metaverse infrastructure could be expensive, which could be a barrier to implementation for some governments or organisations.



### Ethics and Regulation

The metaverse raises significant ethical and regulatory questions, particularly around issues such as digital identity, data ownership, and digital citizenship. It is important to develop clear ethical and regulatory frameworks to ensure that the metaverse is used in a responsible and accountable way.

### Training and Education

One of the key challenges associated with establishing metaverse-centric economies is the need for adequate training and education of all stakeholders.

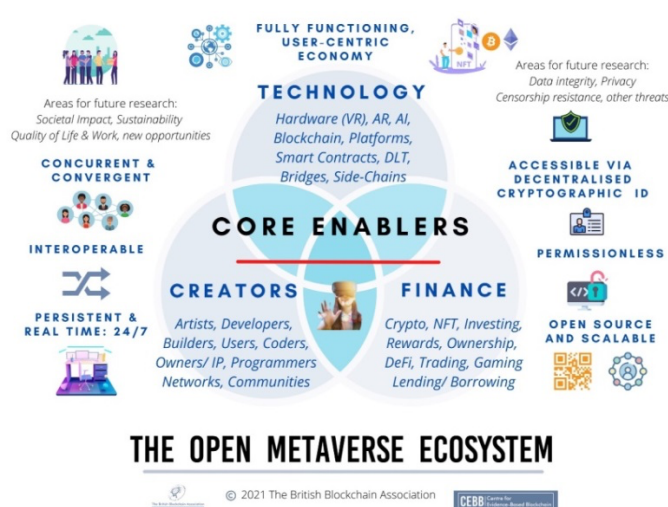


Figure 43: The Open Metaverse, The BBA, 2021[63]

### Recommendations

#### Foster Quadruple Helix Metaverse Ecosystems and Public–Private Partnerships

In order for the metaverse to bring benefits to both citizens and society, close collaboration between the government, academia, and enterprises is necessary as they are the other three players in the “Quadruple Helix.”

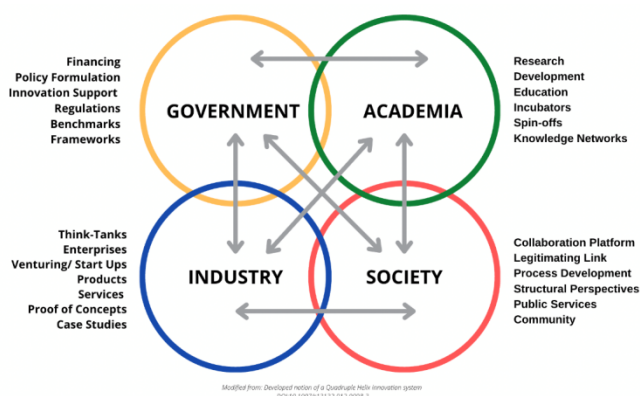


Figure 44: Quadruple Helix Innovation Ecosystems

### Devise a National Metaverse Roadmap

All governments should begin to work towards their national metaverse roadmap. A roadmap may take the form of a series of recommendations or a blueprint to devise a 5–10-year national metaverse strategy. When devising such framework, it is paramount to have a futuristic but pragmatic vision of the metaverse. This may be achieved by garnering collaboration with other countries that have already demonstrated practical impact of metaverse applications and use their outcomes to build bespoke standards and benchmarks.

### Establish and Nurture Metaverse Economic Zones

Governments and public services should allow metaverse economic zones and metaverse “sandboxes” to build evidence base for metaverse economies, as well as an impetus for future research. The case of Japan can be used as a prototype example.

### Appraise the Effectiveness of Metaverse Programmes

As with any public service, it is important to evaluate the effectiveness of metaverse-based services. Metrics such as user satisfaction, accessibility, and efficiency should be tracked and analysed to ensure that the service is meeting its intended goals.

### Set Up a National Steering Committee to Spearhead Metaverse Development

Government and public services should take proactive steps to establish a multidisciplinary metaverse think-tank for the advancement of metaverse. This think-tank should utilise emerging evidence to devise consensus among stakeholders and identify any barriers to metaverse adoption.

### Identify and Support Metaverse Centres of Excellence

Government should build a national repository of organisations and thought leaders in the metaverse space. All metaverse centres of excellence should be adequately supported, and their work acknowledged.

### Incorporate Metaverse in the Postgraduate Curriculum at Colleges and Universities

More than two dozen universities in the world are now offering courses on applied metaverse and the list is growing. Students of today are the CEOs and CTOs of the Web3 metaverse ecosystems of tomorrow. Hence, it is vital that necessary steps should be taken to include metaverse taster sessions, diplomas, master's, and doctorate programmes at all major universities to train a metaverse-savvy future digital workforce.

### Evaluate the Social Impact of Metaverse Applications

It is prudent that all metaverse experiments and use cases are regularly evaluated over time to ensure they are safe, effective, and remain credible and fit-for-purpose. Government must ensure that all metaverse funding is evidence-based and achieves the desired impact on end-users. This data should be incorporated into national budgeting processes.

### Devise Interoperable Standards and Frameworks

For a thriving metaverse economy, it is crucial to establish open, fair, decentralised, interoperable, and user-friendly standards. The British Blockchain Association is leading the charge in these discussions, collaborating with other standards-setting organisations, and participating in forums like the Metaverse Standards Forum, among others. While regulation is necessary and inevitable, we must strive for fewer bureaucratic obstacles and more opportunities for experimentation and exploration in the metaverse. Overly restrictive policies could stifle innovation and hinder the introduction of new ideas, services, and innovative products.

### Explore Use Cases and Initiate Pilot Programmes

Our suggestion is to establish pilot programmes and build systems that explore potential metaverse use cases. We recommend creating a public repository that catalogues all successful metaverse pilot programmes, providing consumers with the opportunity to explore them. Public service employees can leverage the metaverse to conduct virtual meetings, training sessions, and conferences, resulting in cost and time savings, as well as facilitating more frequent and efficient collaboration. Additionally, the metaverse can be utilised to offer virtual public services, such as providing information on government amenities, e-voting, land registration processes, e-residency applications, access to government-held citizen documents, applying for driving licences, seeking real-time virtual assistance from government employees, making it easier for citizens to access these services thereby increasing end-user satisfaction.

### Incorporate Accessibility Features into Project Planning

The metaverse can be designed to include accessibility features such as VR and AR devices specially designed for disabled groups, text-to-speech, closed captioning, and alternative accessibility infrastructure for disabled citizens. This can make it easier for people with disabilities to access metaverse-based public services.

### Foster Collaboration between Native Metaverse Organisations (NMOs)

The NMOs can facilitate interoperable collaboration between multidisciplinary metaverse stakeholders including government agencies, enterprises, academia, and society. By providing shared virtual workspaces, these interactions can help to break down physical barriers and silos, improve communication and coordination between agencies, and provide a venue for persistent, dynamic, immersive, and real-time cooperation.

### Consider Data Privacy and Cybersecurity Aspects of Metaverse Ecosystems

Like any technology, it is crucial to prioritise data privacy and security when utilising the metaverse for public good. It is essential to implement sufficient safeguards and protocols to ensure the protection of citizens' personal information, assets, identity, and communication.

### Involve Citizens in the Design Process

The metaverse offers an opportunity to involve citizens in the design of public services. Citizen feedback can be collected through virtual town halls, shared public spaces, and at dedicated community events. The feedback mechanisms must be put in place to allow for a user-centred and user-driven approach to service delivery in the metaverse, as evidenced by auto-learning avatars in Japan's Metaverse Economic Zones.

### Conclusion

The promise of the metaverse for public good presents a new frontier to build socially responsible virtual economies. Metaverse offers a unique opportunity to create a more equitable and accessible web, and a tool for economic development and social progress. With careful planning and development, the metaverse has the potential to revolutionise the way public services are delivered, making them more efficient and effective for citizens. Careful consideration must be given to the potential challenges and risks associated with the metaverse, to ensure that the metaverse is built on evidence-based frameworks, and is safe, secure, and accessible to all. With thoughtful development, metaverse has the potential to transform the way users will interact and participate in a digital economy. By harnessing the power of metaverse for public good and community building, by incorporating accessibility features, and by involving all stakeholders in the design process, the metaverse can help to create more efficient, effective, and user centric Web3 economies.

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