Singapore

Potential 2035 economic impact of the metaverse

US$9-17B per year

Singapore

With a small population and few natural resources, Singapore's transformation into a global economic hub within five decades has been driven by political stability, robust regulatory frameworks, and a plug-and-play business environment that is open to investors. Yet, with an ageing population and consequently a smaller workforce, there is a strong imperative to enhance this strategy by moving its workforce up the value chain while simultaneously attracting more talent from beyond its shores.

A strategy for the metaverse would build on Singapore's existing economic roadmaps, and early investments could pay off in the long term. The metaverse provides Singapore with an opportunity to position itself as an early value-adding innovator to attract tech talent globally to its shores. Attracting high-skilled tech workers aligns well with the country's strategy of focusing on "quality rather than quantity" when it comes to foreign talent.[1]

Beyond attracting talent, the country can also leverage on its reputation, as one of the best places in the world to do business,[2] to make early pivots with specialized strategies to attract top metaverse companies and investors to Singapore. Apart from top companies, other players such as content creators will prove crucial to build an ecosystem. Priming these key players to place Singapore at the top of their minds will allow the small nation-state to remain competitive as the world moves into the next internet.

To reap these benefits, the country has many factors in its advantage. Its regulatory framework provides credibility and stability that complements the dynamic and fluid nature of the nascent metaverse. In 2022, Singapore announced that rules to tackle online harm through minimising local access to harmful material are expected to roll out as early as 2023.[3]

As a global financial hub, Singapore has been a fertile ground for financial innovations in the cryptocurrency, web3 and digital assets space. There is also a Research, Innovation and Enterprise (RIE) strategy in place to invest in forefront technologies such as AI, cybersecurity, trust technologies, and quantum technology.[4] Singapore stands in good stead to support the technological developments that will enable the metaverse to materialize.

These stellar credentials have already led to HoYoverse, the creator of one of the highest grossing games in history Genshin Impact to pick Singapore as its base of operations for their metaverse subsidiary. With the current landscape, Singapore is well-positioned to become an attractive location for these developments – digital natives will find it welcoming to live, work, and play in the metaverse here.

> " Whilst we cannot as yet be certain of the final state at this point on what the metaverse will evolve into, many are confident of its future. "

Edwin Tong, Minister for Culture Community and Youth and Second Minister for Law, at TechLaw.Fest, July 2022

1. Michelle Jamrisko, "'Quality' labour: Singapore wants foreign skills, to protect jobs," Aljazeera, August 28, 2020.
2. Business Times, "Singapore in 2nd place for ease of doing business: World Bank," accessed October 19, 2022.
3. Irene Tham, "Rules to tackle online harm in Singapore could be rolled out as early as 2023," Straits Times, September 29, 2022.
4. National Research Foundation, "Smart Nation and Digital Economy," accessed October 5, 2022.
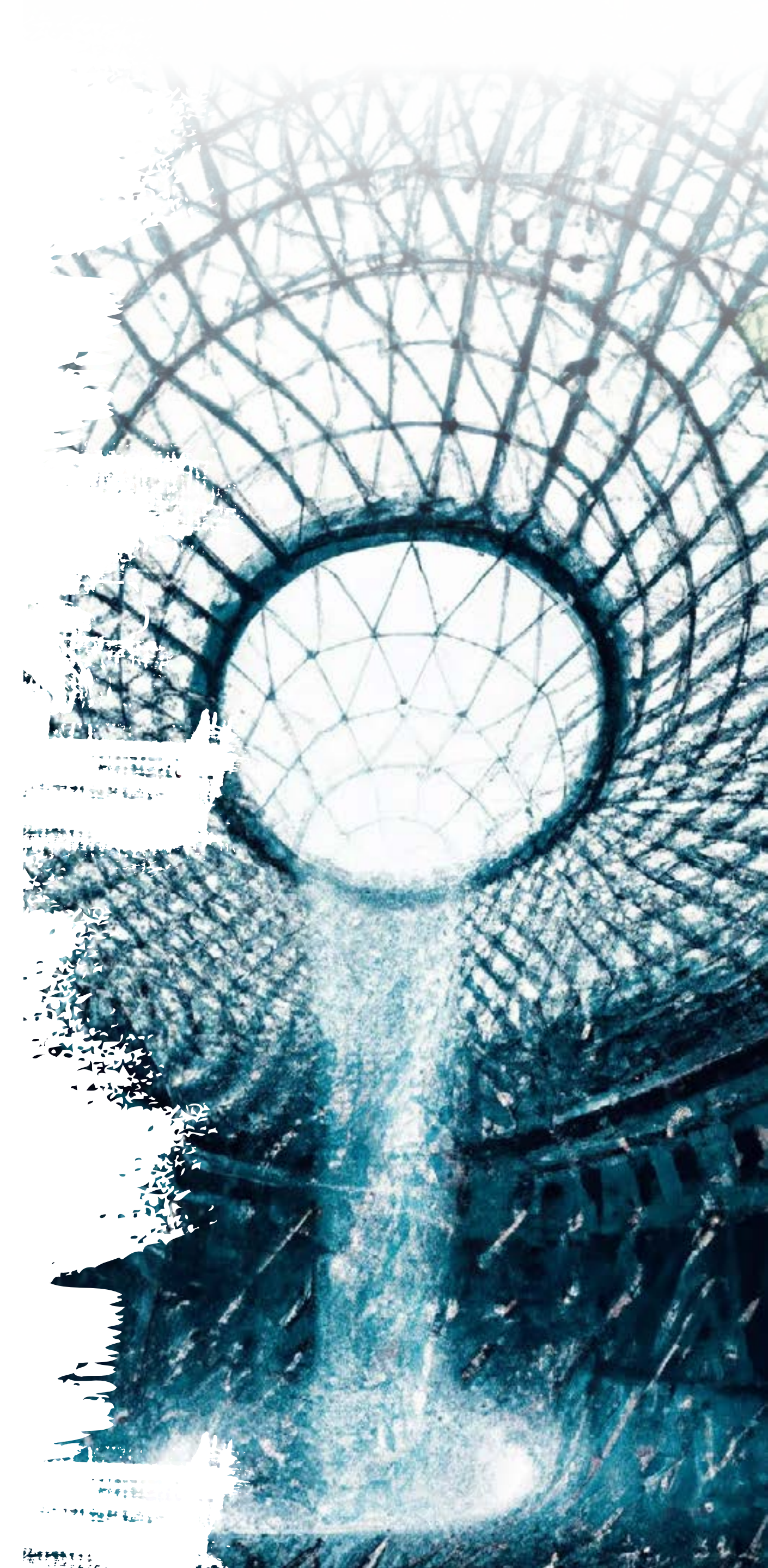
Macroeconomic Determinants

- Service-based economy (73.6% of GVA), with the three largest sectoral contributors to Singapore's economy being manufacturing (22.3% of GVA), followed by wholesale and retail (19.3%), and financial and insurance activities (14.6%). These sectors have had early use cases for metaverse technologies such as digital twins for resource deployment, digital clothing, and new payment forms. The impact that the metaverse will have on these key sectors cannot be underestimated.

- Ranked 8th in the world on the Global Innovation Index 2021, suggesting a strong propensity for innovation.

- GDP per capita stood at US$94,506, suggesting that affordability of required immersive hardware on average may be less of a limiting factor on the economic impact of the metaverse.

- World's 10th largest exporter of creative goods, generating US$743 billion in profits.[5] This stands Singapore in good stead for the content-heavy metaverse.

SINGAPORE IN NUMBERS

Potential 2035 economic impact of the metaverse:

US$9-17B per year, 1.3-2.4% of GDP

2020 GDP:

US$330B

Per capita
(Constant 2017 US$):

**US$94,506
(high income)**

Population:

5.6M

100% urban

25% below 25

55% with basic digital skills

0% unbanked

Key sectors:

Manufacturing
22.3% of GVA

Wholesale & Retail Trade
19.3% of GVA

Financial and insurance activities
8% of GVA

ICT sector:
5.6% of GVA

Global innovation index: **#8**/132

EIU business environment ranking: **#1**/99

Digital readiness index: **#1**/141

5. Pitchaya Sirivunnabood and Herlyn Gail A. Alegre, "Supporting the creative economy for sustainable development in Southeast Asia," Asia Pathways, September 3, 2021.

Sources: World Bank World Development Indicators 2020, Our World in Data 2017, ITU Digital Development Dataset 2019, World Bank Global Findex, Singapore National Statistics

Technology Fundamentals

- The country, ranked first on the Digital Readiness Index, has one of the highest smartphone penetration rates[6] in the world. The metaverse is likely to be accessible to a large proportion of the population.

- More than 60% of Asia Pacific's data center supply is housed in Singapore, indicating the nation-state's potential to support the data and computing-intensive metaverse.[7] Sustainable development of these data centers is also a priority to the small nation-state which is keenly aware of the land and energy demands of data centers. After a 3-year moratorium on the development of data centers in Singapore, the government lifted it in 2022 with new policies that calibrate data center development through sustainable energy sources and more efficient cooling methods.[8]

- A global financial hub, Singapore has a robust digital payments infrastructure which gained traction during the COVID-19 pandemic – 95% of the population aged above 15 have made or received a digital payment.[9] The country launched the world's first unified payment QR code in 2018 and has since pursued aspirations to be interoperable with other digital payments across the region. Thus far, the Monetary Authority of Singapore (MAS) has explored or begun link-ups with digital payment systems in India, Philippines, and Thailand.

Radar chart axes:
- 5G Coverage (%): 74
- Fixed Broadband Subscriptions per 100 inhabitants: 26
- Active Mobile Broadband Subscriptions per 100 inhabitants: 144
- ICT Goods Imports (% of merchandise trade): 33
- ICT Goods Exports (% of merchandise trade): 34
- International Bandwidth per internet user: 95

Legend:
— **Singapore**
— **Asia Average (Selected economies)**

6. Today Online, "Smartphone penetration in Singapore the highest globally: Survey," accessed September 29, 2022.
7. International Trade Administration, "Singapore new data centers," accessed October 19, 2022.
8. Clara Chong, "Singapore pilots sustainable way to grow data centre capacity," The Straits Times, July 20, 2022.
9. World Bank, "The Global Findex Database 2021," accessed October 5, 2022.7.
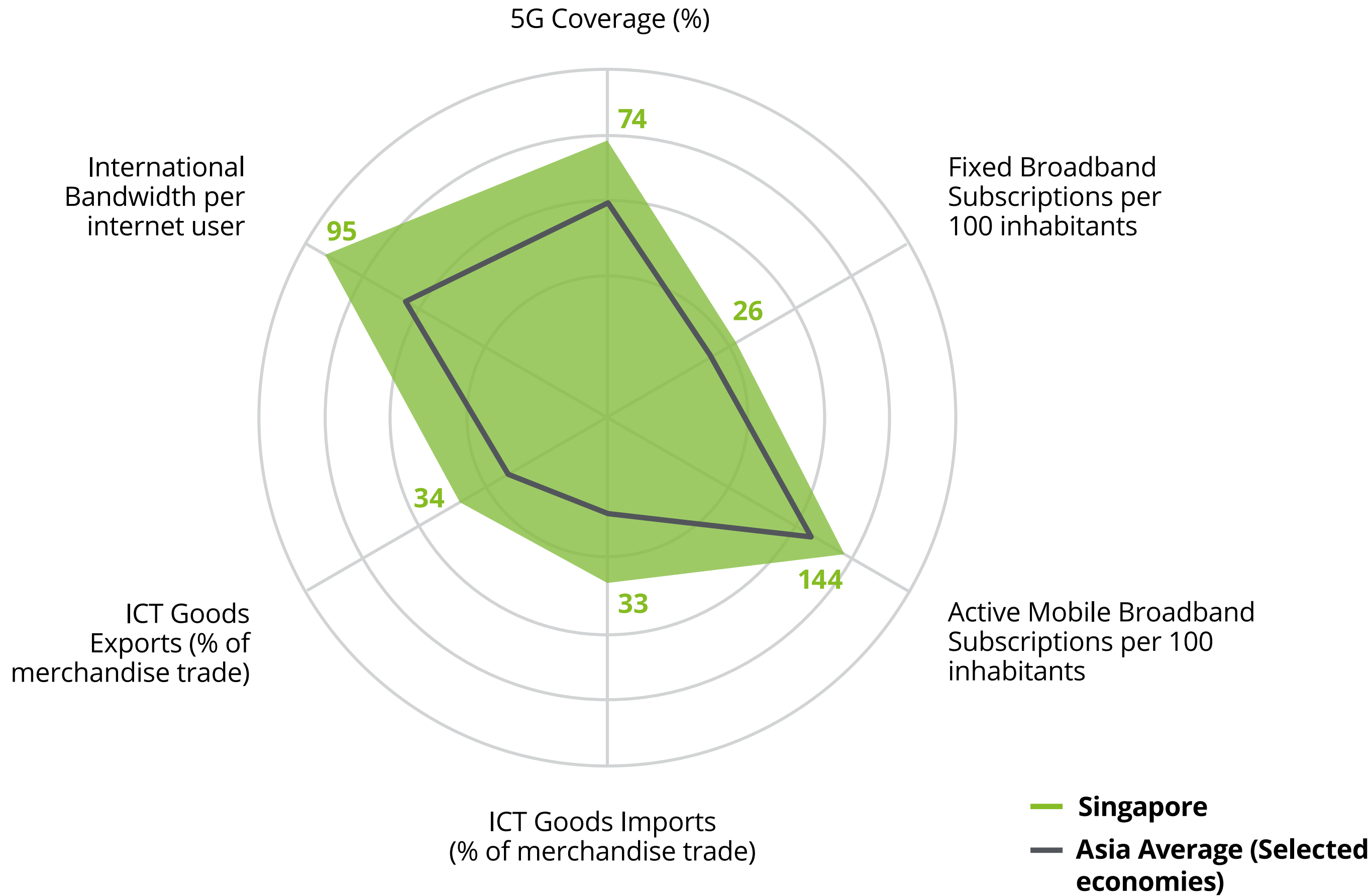
Sources: GSMA Mobile Connectivity Index 2021, ITU Digital Development Dashboard 2020, UNCTADStat 2019

Ecosystem Enablers

Social acceptance

Nearly 16% of Singaporeans currently own cryptocurrencies, ahead of the 11.4% global average surveyed.[10] This indicates potential openness towards digital assets and the metaverse. However, it is crucial to also look at the attitudes of the population towards technology at large – Roland Berger's Digital Inclusion Index 2021 found that attitudes towards digital advancement have become more conservative in Singapore. This apprehension towards new technologies was attributed to the rise of internet scams and concerns over personal data security.[11] Singapore's regulatory efforts to create a safe online environment are crucial to addressing these fears.

Singapore is highly ranked on global measures of cybersecurity literacy[12] and introduced the Personal Data Protection Act (PDPA) to provide a baseline standard of protection for personal data with requirements governing the collection, use, disclosure and care of such data.[13] As more personal and environmental data is collected in the metaverse, these guardrails will need to be enhanced. Already leading with progressive regulations on cryptocurrencies and digital assets to balance risks with innovation, Singapore's moves will be closely watched by the region.

Competition within the Metaverse

A thriving metaverse is one that includes many stakeholders competing in the product, service, or experience they offer to consumers or other businesses/ platforms engaged in the metaverse. Singapore's vibrant tech sector ranges from corporations such as MiHoYo to metaverse-related startups such as BuzzAR and Brytehall that seek to create new niches in avatar engines and NFTs respectively. Singapore is the top-ranked ecosystem for start-ups in the Asian region and the country is fertile ground for rapid innovation.[14] Notably, 59% of technology MNCs have their Asian regional headquarters based in Singapore.[15]

Singapore also has advantages in digital content creation, as a leading exporter of creative goods. For example, Lucasfilm's ILMxLAB opened its first international studio in Singapore with an emphasis on immersive real-time storytelling.[16] These existing building blocks are optimistic signals for the growth of a rich metaverse ecosystem.

Digital skills

The potential of corporates and start-ups in the metaverse rests on a deep bench of digital talent. Singapore's ability to upskill Singaporean workers as well as attract top talent from beyond its shores is critical. To that end, the government introduced special work visas in 2022, including Tech.Pass and a broader Overseas Networks and Expertise (One) Pass, to attract the world's best talent to its shores.[17]

For Singaporeans, the government launched a national movement, SkillsFuture Singapore, to encourage lifelong learning in areas such as digital skills training, as well as a TechSkills Accelerator (TeSA) to support students and professionals at various stages of their careers to upskill or make transitions to tech roles.[18] Private sector stakeholders have also launched similar programs. As part of Meta's Upskill 2022 initiative, the company launched the region's first Meta Immersive Learning Academy, an educational program that enable beginner AR and VR creators to build their skills and capabilities.[19]

These concerted efforts will raise talent across various parts of the metaverse ecosystem, through upskilling its small population and attracting the top talent from abroad.

10. Ann Williams, "Nearly 16% of Singaporeans surveyed currently own cryptocurrency," Straits Times, October 25, 2021.
11. Roland Berger, Bridging the digital divide: Improving digital inclusion in Southeast Asia, 2021.
12. Lester Wong, "International study ranks Singapore second for cyber-security literacy among population," Straits Times, October 23, 2020.
13. PDPC Singapore, "PDPA Overview," accessed October 19, 2022.
14. Rei Kurohi, "S'pore tops Asia-Pacific in ranking for start-ups, 7th in the world," Straits Times, June 10, 2022.
15. EDB Singapore, "Headquarters," accessed October 19, 2022.
16. Ian Cheng, "Lucasfilm's ILMxLAB opens first international studio in Singapore," Channel News Asia, February 24, 2022.
17. EDB Singapore, "Tech.Pass," accessed October 19, 2022.
18. IMDA Singapore, "TechSkills Accelerator (TeSA)," accessed October 19, 2022.
19. EDB Singapore, "Meta launches new digital upskilling initiatives to bolster its 2022 programme," press release, June 14, 2022.

Sectors to Watch

Healthcare
Given an ageing population, Singapore has begun to use immersive virtual technologies to enhance medical education and medical services.

Singapore's National University Health System (NUHS) is investing in holographic technology, including using mixed reality to teach medical and nursing students,[20] research on applications in brain surgery, and developing real-time volumetric rendering and positioning of ultrasound scans.[21] Since November 2021, NUHS has also been one of the three worldwide Holomedicine Centres of Excellence.

Beyond teaching and research, the use of holographic technology has extended into medical practice with Singapore conducting the world's first holography-guided heart surgery.[22]

Urban Planning
Government agencies and start-ups in Singapore have found innovative uses for early metaverse technologies in urban planning. Singapore was one of the first countries to articulate a vision of a country-scale digital twin through Virtual Singapore, a dynamic 3D model of the city which planners can use to visualize how the city will develop and evolve in response to population growth, new construction, and other major events.[23] Since then, Singapore Land Authority had embarked on a number of 3D mapping projects over the years. [24]

Some of these efforts have culminated in OneMap 3D, a dynamic visualization platform that presents an immersive experience of Singapore's surroundings. One use case of the platform is that clients of the real estate industry can view listings with real-time location-based services and detailed location information.[25]

Singapore start-ups such as Vizzio Technologies have also innovated new 3D mapping technologies through combining satellite imaging and AI to create photorealistic models of countries in a short time.[26]

Gaming
Early parallels of the metaverse are observed in online games – where gamers have played, socialized, and shopped in virtual worlds for years. Younger gamers, particularly those between 13 and 17, are more interested in metaverse-style games compared to older players.[27] This demographic is expected to spend more time and money in the metaverse in the future.

Singapore is increasingly involved in the gaming space, particularly by building its reputation as an e-sports destination given that it already has much of the existing infrastructure such as high internet speeds, venue options, and a robust events industry.[28] Singapore companies are also accomplished in the gaming industry – Garena, a Singaporean game developer, published Free Fire, the most downloaded game globally in 2019.

To build on its strong foundations in the gaming space, the country is increasing investments in metaverse game worlds. Singapore's state holding company, Temasek Holdings, invested US$100 million in blockchain gaming company Animoca Brands,[29] which has a broad portfolio of web3 games and intellectual property.

20. Microsoft News Centre, "Medical education goes Holographic with mixed reality from Microsoft," press release, January 11, 2022.
21. National University Health Systems (NUHS), "NUHS Embarks on Holomedicine Research in Singapore, Using Mixed Reality Technology to Enhance Diagnosis,Education and Patient Care," PR Newswire, August 12, 2021.
22. Clara Chong, "Holography-guided heart surgery for more precise, speedier incisions," Straits Times, January 9, 2022.
23. National Research Foundation, "Virtual Singapore," accessed October 19, 2022.
24. GIM International, "Singapore's Journey towards a Nationwide Digital Twin," accessed October 19, 2022.
25. Singapore Land Authority, "SLA Launches OneMap3D, and Signs MOUs with Ninja Van, Kabam and Propnex to Further the Use of OneMap," press release, September 15, 2021.
26. Vizzio, "Immersive 3D cities of the world built by Algorithms & A.I.," accessed October 19, 2022.
27. Bain & Company, "Young Gamers and the Metaverse: How the Rules of Success Are Changing", accessed October 3, 2022.
28. Taufiq Zalizan, "The Big Read: The serious business of gaming — Singapore eyes a slice of the billion-dollar e-sports pie", Channel News Asia, June 13, 2022.
29. Animoca Brands, "Animoca Brands raises US$110 million in funding round led by Temasek, Boyu Capital, GGV Capital", press release, September 8, 2022.