

The future of life, the Metaverse, and everything – Using patent data to capture the greatest innovators at the next digital frontier

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1. Introduction

The Metaverse is expected to grow into a trillion-dollar investment opportunity within the present decade. A study by Bloomberg Intelligence puts the associated revenues at almost USD 500 billion in 2020, potentially rising to USD 800 billion by 2024,¹ while McKinsey estimates that the Metaverse has the potential to create USD 5 trillion in value by 2030.² The STOXX® Global Metaverse Index (the “STOXX Global Metaverse”) provides a systematic and transparent way for investors to track the performance of companies that are exposed to these technologies, using patent data to identify market leaders and innovators.

The Metaverse is still at an early stage of its evolution and there is no single, comprehensive definition as yet. However, most descriptions seem to agree on its immersive nature, its integration of physical and digital worlds through augmented reality and virtual reality (AR/VR) and its use of three-dimensional simulation. Initially, its development was led and dominated by online game makers, but social networking companies are catching up fast by investing heavily in AV and VR equipment. The COVID-19 lockdowns in 2020 and 2021 gave a further boost to online gaming and entertainment providers, but also created a need for remote working, shopping, education and medical services. Admittedly, these last areas have so far been mostly two-dimensional, but advances in 3D imaging and modelling capabilities and improved haptic equipment will soon turn them into more immersive experiences, which will, in turn, benefit manufacturers of graphic processing units and VR/AR devices.

As the “Meta-” in “Metaverse” implies, there is unlikely to be a single virtual world, but rather a conglomeration of decentralized, interlinked digital environments. This will require a connecting infrastructure (network and hardware) and common standards to ensure interoperability. Eventually, users will also want to transfer their online personae and digital property across different virtual worlds, which will necessitate secure, tamper-proof ways of proving their identity and ownership rights, such as non-fungible tokens (NFTs) or blockchain. Cryptocurrencies are also likely to grow in importance, although traditional payment methods such as credit cards will continue to play a critical role, too.

The dynamic and evolving nature of the Metaverse means that many of the technologies associated with it are also in relatively early stages of their development cycle at present, with only limited attributable revenues. Patents are, therefore, a better indicator of which companies are the biggest innovators and specialists in the field, and are most likely to benefit from the underlying “Future Technology” megatrend as a result.

In this paper, we explore the rationale and methodology behind the construction of the STOXX Global Metaverse. We start by explaining the concept of megatrends and how they can be captured through thematic indexing, using a multifaceted approach based on revenue and patent analysis. We then focus on the Metaverse as a theme and determine the associated subthemes and technologies. We show how the methodology applied by our data provider, EconSight,³ to identify high-quality patents can be used to select and weight the most innovative companies in the relevant industries. We look at the performance of the STOXX Global Metaverse relative to the STOXX® Global Total Market Index (“STOXX Global TMI”) and the STOXX® Global 3000 Technology Index (“STOXX Global 3000 Technology”), before concluding with an outlook on the major use cases and opportunities for the Metaverse in the years to come.

¹ <https://www.bloomberg.com/professional/blog/metaverse-may-be-800-billion-market-next-tech-platform/>

² <https://www.mckinsey.com/capabilities/growth-marketing-and-sales/our-insights/value-creation-in-the-metaverse>

³ EconSight is an independent and neutral consulting company. Its aim is making technological progress measurable in order to develop a better understanding of the impact and significance of one of the most important trends of our time.

2. Thematic investing: Capitalizing on megatrends

Thematic investing is often considered to be synonymous with capitalizing on long-term, structural changes in all areas of society known as “megatrends.” This term was coined in the early 1980s by US political scientist John Naisbitt and refers to powerful, transformative macroeconomic forces that have a major impact on countries, businesses and societies around the world, disrupting the way products and services are produced, delivered and consumed. Megatrends are persistent, ubiquitous and global, which means that they unfold over at least several decades and can, sooner or later, be observed in all areas of life and all over the world. They are complex, multilayered and multidimensional, and generate their dynamic and evolutionary pressure through their interactions.

For example, urbanization has been slowing down in most developed countries over past decades – even reversing slightly when people began looking for bigger houses in the countryside during the COVID-19 lockdowns – but is still going strong in emerging markets. With this comes a need for smart city infrastructure that focuses on connectivity (telecommunications and mobility), resource efficiency (energy, water and waste management) and citizen wellbeing (the environment, city management and property).

Many of these developments have been accelerated by recent geopolitical events, namely the coronavirus pandemic and the Russian invasion of Ukraine. While people had already started to appreciate the benefits of cleaner air during the first months of the lockdown, the effective shutdown in gas and oil supplies from Russia has underscored the necessity and urgency of a transition to cleaner and more sustainable energy sources.

The COVID-19 pandemic has also irrevocably changed the way we work, shop, and educate and entertain ourselves and our children. With this digitalization of all areas of life came an increased need for digital security, which was further aggravated by the heightened threat of cyberattacks from Russian hackers in response to Western sanctions. Meanwhile, the fact that many workers decided not to return to their old jobs after lockdown measures were lifted, and the resulting labor shortages, put pressure on manufacturers to streamline their production processes, boosting demand for automation and robotics.⁴

3. Capturing megatrends: Revenues versus patents

Spotting and capturing megatrends is inherently forward-looking. While many sociodemographic developments have been underway for multiple decades, other potential paths – especially around new technologies – are only just emerging. This means that finding investment opportunities linked to the corresponding themes requires a multifaceted approach.

In the case of ongoing trends, there are established industries already catering to the needs of specific demographic groups such as millennials or the silver economy. Vehicle electrification and workplace digitalization and automation are also proceeding at full speed, while online shopping, entertainment and education are an integral part of our daily lives. The existence of related products and services permits straightforward identification of companies deriving a substantial portion of their revenues from sources linked to the themes in question.⁵

⁴ For a more detailed analysis of how COVID-19 and the Russian invasion of Ukraine have accelerated existing megatrends, see our recent white paper entitled [Thematic investing in the current climate](#).

⁵ For revenue-based thematic indices, Qontigo uses FactSet’s Revere Business Industry Classification System (RBICS) data to select companies that derive a substantial proportion (>50%) of their revenues from sources associated with the theme in question.

In the case of evolving concepts such as artificial intelligence or the Metaverse, a large proportion of the anticipated revenues, profits and share price gains may lie in the distant future. Also, many of the disruptive innovations that will transform the way we live, work and interact have yet to be discovered and developed. Therefore, much will depend on the innovativeness of the players involved.

Patents have been found to be a reliable, forward-looking indicator for innovation activities. However, with millions of them filed worldwide, screening out the most relevant and significant ones can be a big task. Qontigo therefore partners with EconSight to find the most innovative companies for the relevant technologies. EconSight is a specialist patent analytics provider with a sophisticated classification system for identifying companies with an advantage in cutting-edge technologies. EconSight's detailed taxonomy, alongside its patent quality and specialization scores, is used to identify companies that are market leaders and innovators in the identified technologies.

We will now take a closer look at the Metaverse theme. We will start by attempting to define what the Metaverse is and then explain how the STOXX Global Metaverse captures the performance of companies associated with this theme.

4. What is the Metaverse?

The term “Metaverse” – a portmanteau word made up of “meta” (the Greek for “transcending”) and “universe” – was first introduced in the 1992 science fiction novel *Snow Crash* by American author Neal Stephenson. The book depicts a virtual environment populated by avatars that humans control using haptic devices and virtual reality goggles. This idea of an immersive, three-dimensional, digital world was further popularized by other novels, movies and TV series, such as *Ready Player One*, *The Matrix* and *Upload*, and the emergence of multiplayer online games.

However, the Metaverse is also likely to have more practical applications in the near future such as work meetings, medical examinations and procedures, trying on clothes, or visualizing new wallpaper or furniture in one's home. What all of these use cases have in common is the immersive experience within an imagined environment, or a simulated or augmented version of the real world.

We have therefore defined the Metaverse as follows:

The Metaverse is an emerging concept that simulates the real world or imagines a world beyond it, integrating digital and physical interactions to produce an immersive experience.

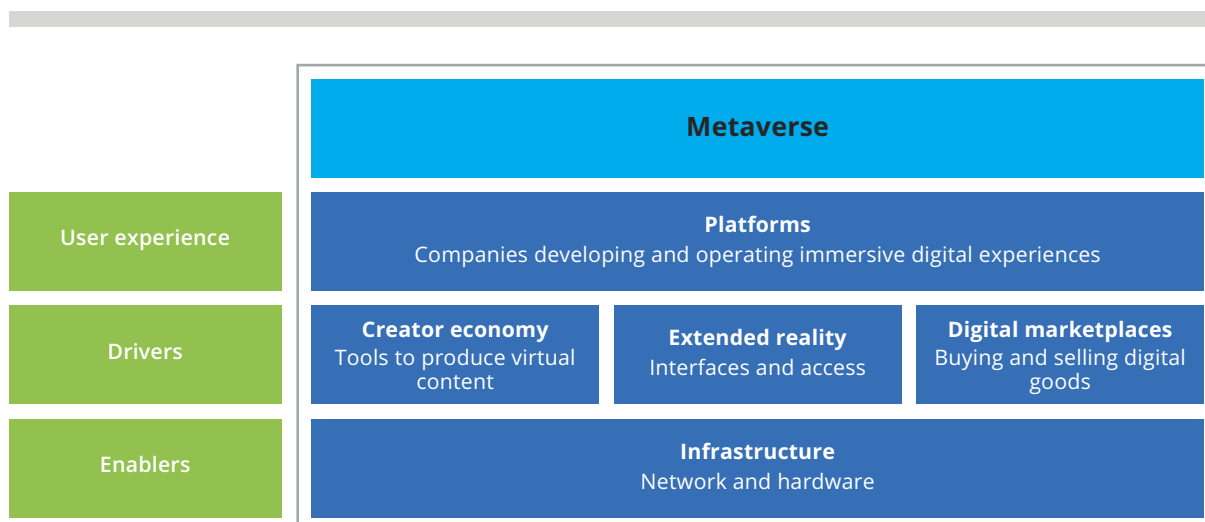
This integration of digital and physical interactions will require a wide range of technologies, which will span basic infrastructure (hardware and networks), platforms, interfaces and devices, plus content and (virtual) goods and services.

5. Indexing the Metaverse

The STOXX® thematic indices provide a rules-based, transparent, systematic approach to capturing megatrends. The STOXX Global Metaverse selects companies exposed to a defined set of technologies associated with the ongoing adoption of the Metaverse, ranging from firms developing interactive virtual platforms, wearables and immersive technologies to those providing computer processing capabilities and infrastructure.

The process of defining the index starts with establishing the key themes associated with the Metaverse. Its foundation is the physical infrastructure – the hardware and networks – connecting the multitude of digital worlds and enabling users to interact with the system and other users. In turn, users require interfaces that link the real world to a virtual or an augmented reality. These devices can range from computers, gaming consoles, mobile phones and tablets to smart glasses, VR goggles and haptic suits. Figure 1 shows the key themes associated with the Metaverse.

Figure 1: Metaverse key themes.



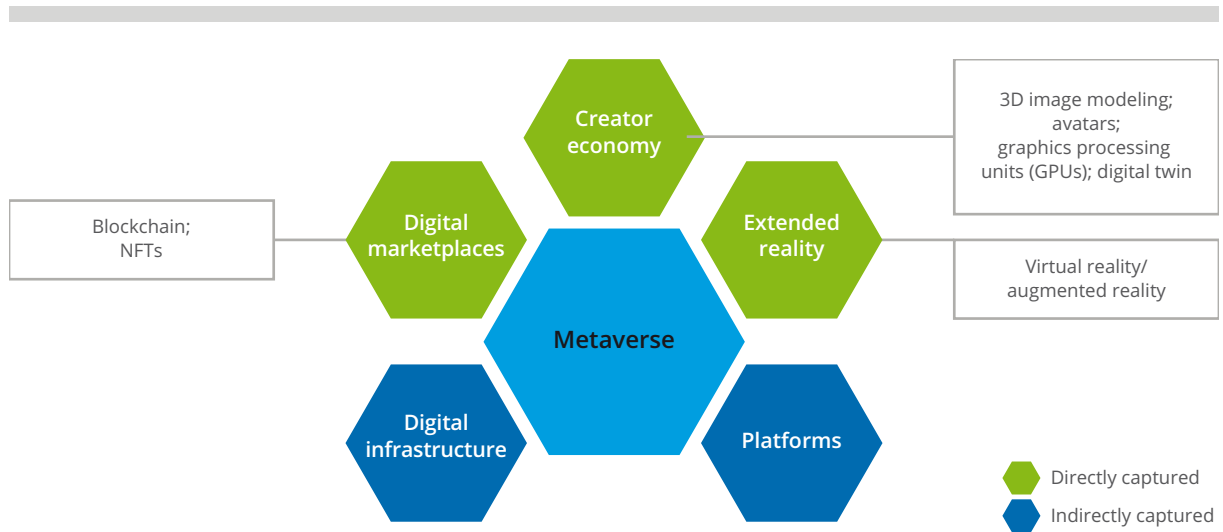
Source: Qontigo.

Most users are likely to access the Metaverse via platforms. In their earliest forms, these mostly comprised online, multiplayer role-playing games, but they will soon extend to virtual worlds in which participants can acquire real estate, build and decorate houses, and shop for clothes and accessories for their avatars. This opens up endless opportunities for creators and sellers of digital content. However, conducting business in such a virtual environment will require secure marketplaces and tamper-proof ways of proving one's identity and ownership rights. The latter will likely be achieved using decentralized technologies such as blockchain and NFTs. This will become particularly important once users start looking to transfer their online personae and property across different virtual worlds.

Other use cases for the Metaverse will include virtual conferences, work meetings, entertainment (e.g., for music or sports events) and sightseeing. The creation of an immersive, three-dimensional experience will require ever more powerful graphics processing, 3D image modeling, and rendering software and hardware. So-called "digital twins" – virtual representations of physical objects or processes – can be used to model entire factories, product lifecycles and supply chains, thus enabling companies to explore new ideas and designs or to test new equipment in a risk-free environment.

Figure 2 links the technologies that have been identified as essential for the functioning and adoption of the Metaverse to the associated themes.





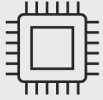


Figure 2: Metaverse subthemes and associated technologies.



Source: Qontigo.

The technology definitions shown in Figure 3 are taken from EconSight’s classification framework of more than 400 cutting-edge technologies.

Figure 3: Key technologies driving the adoption of the Metaverse.

<p>3D Image Modelling</p>  <p>3D image rendering, 3D image modelling for computer graphics, texture mapping, perspective computing and other technologies.</p>	<p>Blockchain</p>  <p>Blockchain is a shared database technology where consumers and suppliers of a transaction are directly linked and details of the transaction are always recorded, viewable, verifiable and unchangeable by all.</p>
<p>Avatar</p>  <p>Digital copy of the user to increase immersiveness, user-friendliness and human-machine interaction.</p>	<p>Virtual & Augmented Reality</p>  <p>Refers to the perception of reality in a computer-generated and interactive environment. Augmented reality superimposes information on the real world.</p>
<p>Graphic Processing Unit (GPU)</p>  <p>GPUs are different to CPUs in that they can process large blocks of data much faster, which is needed to work with large and complex images.</p>	<p>Non-fungible Tokens (NFTs)</p>  <p>NFTs or non-fungible token is a synonym for encryption techniques to identify and protect the identity and uniqueness of digital assets to be used in the digital or virtual realm.</p>
<p>Digital Twin</p>  <p>Describes the digital mapping and modelling of real or unreal objects for manufacturing purposes. The aim is to test the functionality or simulation of processes.</p>	

Source: Qontigo, EconSight.

6. Company selection: Picking today’s market leaders and tomorrow’s winners

The companies to be included in the STOXX Global Metaverse are chosen from the STOXX Global Total Market universe.⁶ After initial liquidity, market capitalization and ESG filters are applied, stocks are selected on the basis of two criteria:

- (1) The number of **high-quality patents (HQPs)** in the relevant technologies and
- (2) The company’s **patent specialization**.

This dual selection process ensures a good balance of established players and emerging innovators.

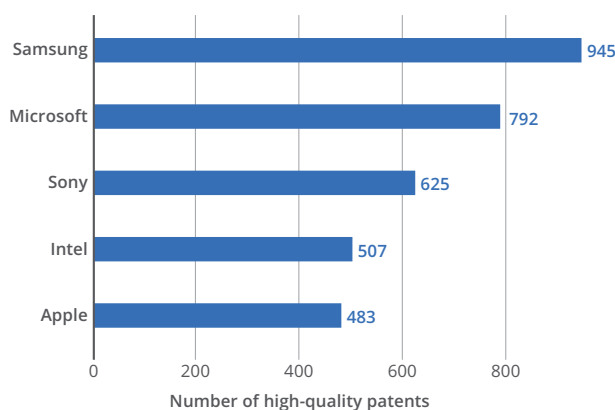
High-quality patents: EconSight calculates patent quality as the product of the frequency with which a patent is cited and the number of countries in which IP protection is applied for, with an emphasis on newer citations and larger countries. Only the top 10% of patents ranked by this score are considered “world class”. Eligible securities are sorted in descending order of their number of HQPs linked to the associated Metaverse technologies, and the top decile is chosen for index inclusion. If two or more companies have the same number of HQPs around the 10% threshold, preference is given to the firm with the highest specialization within the theme.

Patent specialization: This is defined as the number of active patents associated with the technologies divided by the company’s entire active patent portfolio. A firm is considered to be an innovator in the field, and is included in the index, if more than 30% of its active patents are linked to the Metaverse. This threshold is lowered to 25% for stocks that are already in the index.

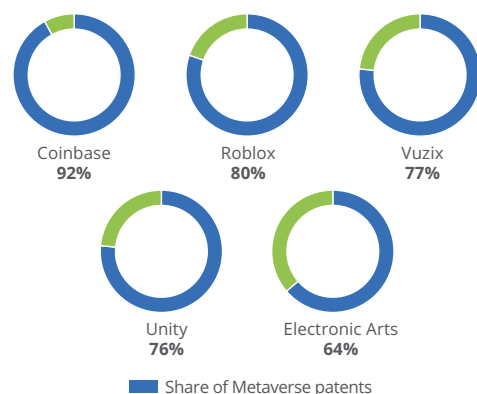
However, companies with less than ten active patents in the defined Metaverse technologies are not eligible for inclusion under the two criteria. Figure 4 shows established players captured in terms of their HQPs (on the left) and innovators identified by their degree of specialization on the right.

Figure 4: Capturing companies operating in the Metaverse.

Top 5 companies captured through high-quality patents



Top 5 companies captured through specialization score



Source: Qontigo, EconSight.

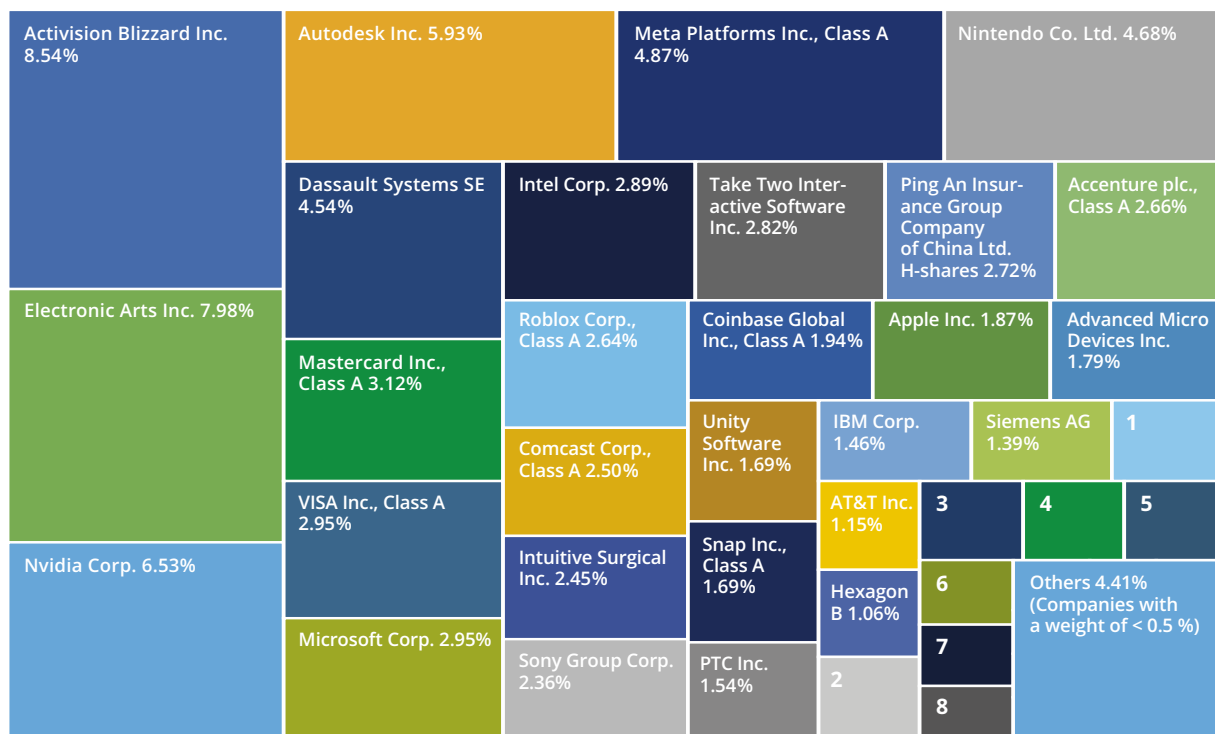
⁶ For a more detailed description of the selection process, see the [STOXX® Index Methodology Guide](#).

Once the final universe has been determined, the index weights are calculated in a multistep process. Initially, all stocks are equally weighted, with a slight downward adjustment being made to smaller securities to ensure sufficient liquidity for replication in an investment fund. The adjusted equal weights are then multiplied by the relevant specialization scores and renormalized across all holdings. In a final step, individual positions are capped using the 4.5/8/35 rule.⁷

7. Index composition

The STOXX Global Metaverse contained 65 names as of December 30, 2022. The combination of the adjusted equal weighting and the modifications introduced by the patent specialization scores ensures that the index overweights companies that are focused on the field, rather than the biggest stocks in terms of market capitalization. For example, Apple, Microsoft, Alphabet, Meta and Nvidia make up nearly half of the market value of the STOXX Global 3000 Technology and represent around 9% of the STOXX Global TMI. However, their combined weight in the STOXX Global Metaverse is just under 18%, as can be seen in the tree map chart in Figure 5.

Figure 5: STOXX Global Metaverse constituents and weights.



1 Bentley Systems Inc., Class B 1.17% 2 Amazon.com Inc. 1.03% 3 Qualcomm Inc. 0.84% 4 Alphabet Inc., Class C 0.81%
 5 Samsung Electronics Co. Ltd. 0.80% 6 Alphabet Inc., Class A 0.79% 7 Nike Inc. Class B 0.78% 8 Stryker Corp. 0.66%

Source: Qontigo.

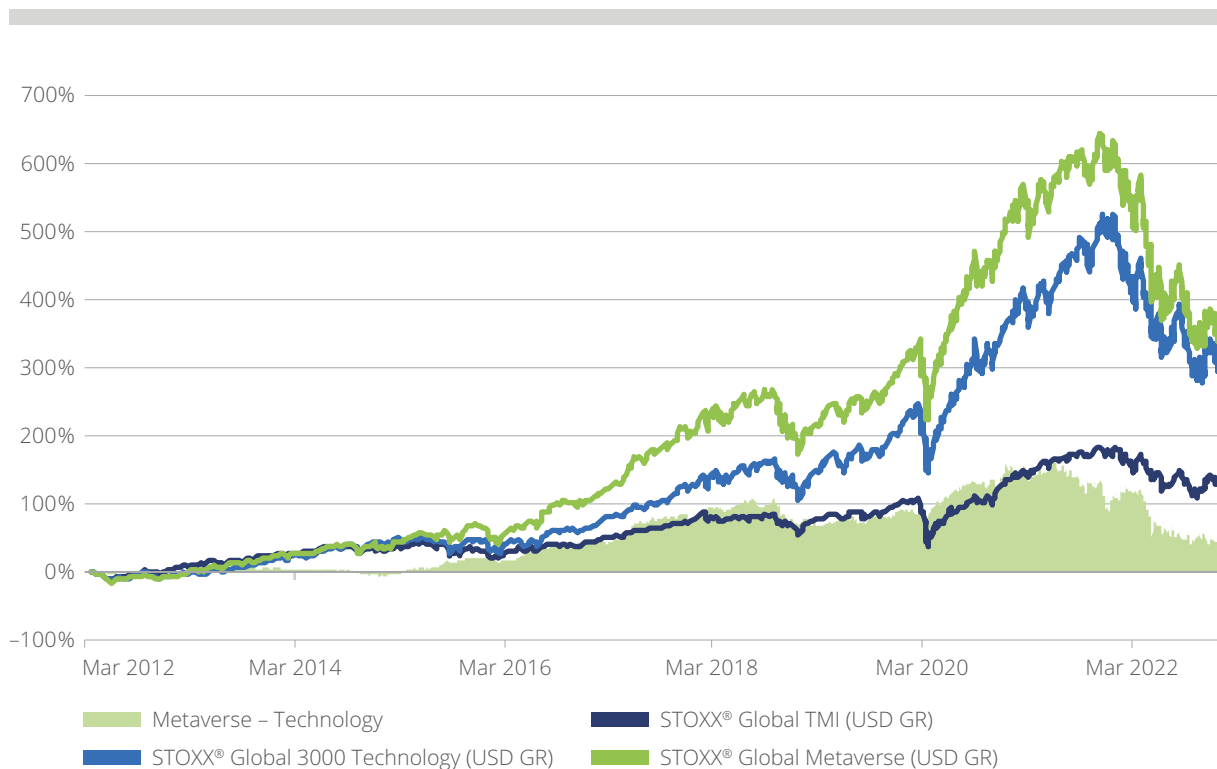
⁷ The 4.5/8/35 rule ensures that, at rebalancing, no single security can have a weight greater than 8% while, in the aggregate, assets with individual weights of more than 4.5% cannot make up more than 35% of the total market capitalization of the index.

By contrast, three of the biggest names in the STOXX Global Metaverse – Activision Blizzard, Electronic Arts and Autodesk – account for 23% of this index’s market capitalization but less than 0.2% of the STOXX Global TMI. However, with specialization scores of 45%, 63% and 45% respectively, these niche players have been given a much bigger weight than generalists such as Apple, Amazon or Alphabet, whose Metaverse patents make up less than 10% of their total IP portfolio. The same large weighting also applies to highly specialized companies such as Coinbase (specialization score of 92%), Roblox (80%), Vuzix (77%) and Unity (76%).

8. Index performance

Between March 2012 and December 2022, the STOXX Global Metaverse⁸, which is denominated in US dollars, generated a gross return of 350%, compared with 131% for the STOXX Global TMI. It also outperformed the STOXX Global 3000 Technology benchmark, which yielded 302% over the same period. Figure 6 shows the cumulative USD gross returns for the three indices, with the light green area representing the relative performance of the STOXX Global Metaverse versus the STOXX Global 3000 Technology.

Figure 6: Cumulative USD gross returns (“GR”) since March 19, 2012.



Source: Qontigo.

⁸ The index was launched on August 12, 2022, history is available from March 19, 2012.

The widening return differential between the STOXX Global Metaverse and the STOXX Global 3000 Technology indicates a steadily growing outperformance from 2015 to mid-2021. In particular, the global lockdown measures introduced at the onset of the coronavirus pandemic in March 2020 turbocharged STOXX Global Metaverse gains – something that is not surprising given its strong exposure to online and video game manufacturers.

9. Conclusion and outlook

The Metaverse is an evolving and dynamic space that will continue to see ongoing innovation and exponential growth. This makes it hard to predict which companies will thrive in that environment, but it also offers great potential for those market players – entrepreneurs and investors alike – who get it right. Spotting the most innovative companies early in the process will be a crucial part of successful investment strategies, and access to high-quality patent data will be an essential ingredient.

The COVID-19 pandemic has accelerated the digitalization of almost every aspect of our lives, and the Metaverse will be at the center of this ongoing development. Some parts of what can be considered the origins of the Metaverse, such as online gaming worlds, are already well-established, while live entertainment offerings are likely to follow suit. Remote work and education applications are also bound to become more immersive, as the underlying technologies become more powerful and cost-effective. Digital security will be imperative, as users require a secure environment in which to conduct business and process payments, plus tamper-proof ways of proving and protecting their (virtual) identities and property.

The following sections are some of the conceivable use cases and opportunities for the Metaverse.

Gaming

Gaming companies have traditionally been at the forefront of developing and shaping the Metaverse, and their long-standing experience in building virtual worlds plus their large proportion of high-quality patents will continue to play a central role in future advances. The emergence of immersive, multiplayer online games has been a key driver behind the development of equipment such as VR goggles and haptic devices. Bloomberg Intelligence (BI) estimates that online game makers and gaming hardware producers will account for half of the projected USD 800 billion in revenues that will be generated in the Metaverse in 2024, as video gamers continue to shift more and more titles to 3D online worlds.

Entertainment

The second-largest revenue opportunity will be online entertainment, with BI estimating that earnings from livestreaming films, music concerts and sports events may exceed USD 200 billion in 2024. The Motion Picture Association reported that the global home/mobile entertainment market reached USD 78.5 billion in 2021, with the number of online video subscriptions growing from 1 billion in 2020 to 1.3 billion in 2021.⁹ Subscriber numbers are likely to have declined slightly in 2022, as the surge in living costs prompted many households to review their discretionary spending. But tech research and consultancy firm Omdia

⁹ <https://www.motionpictures.org/wp-content/uploads/2022/03/MPA-2021-THEME-Report-FINAL.pdf>

still expects the number of online video subscriptions to surpass 2 billion in 2027, as more and more streaming service providers adapt their business models to include cheaper or free ad-funded alternatives to their premium, ad-free options.¹⁰

Buying and trying goods

According to venture capitalist, author and Metaverse visionary Matthew Ball, roughly USD 54 billion was spent on virtual goods and custom graphical appearances ('skins') in 2020.¹¹ A growing number of real-world consumer companies have started producing branded merchandise for, and setting up shops in, virtual worlds, too. However, the online marketplace will not just be about the latest designer clothes and accessories, or beautifully decorated homes for avatars. Customers will also be able to examine physical goods in 3D before ordering them online, or to assess how a new piece of furniture could fit into their home. Additionally, manufacturers could run simulations, using digital-twin technology, to see how new equipment would interact with the rest of the factory before buying it.

Finance

A secure payment infrastructure will have to be at the heart of such a digital commercial environment. Cryptocurrencies will gain importance alongside more traditional payment methods such as credit cards. Counterparties will have to be able to prove their (digital) identity through verifiable, tamper-proof credentials. NFTs and blockchain will be used to establish and ascertain ownership rights in virtual assets (e.g., digital art). Such assets may even be used one day as collateral for digital loans and mortgages.

Social media

Social media platforms will play an important part as promoters of, and access points into, the Metaverse. Their established infrastructure, user base and investments in VR equipment will give them a crucial head start, although game makers could try to close the gap by adding social features and user-generated content to their existing products and services.

Work

However, the Metaverse will not only be used for social interaction and entertainment or online shopping. It will also have a wide variety of applications in the workplace. Today's two-dimensional Zoom or Microsoft Teams meetings could be replaced with virtual, three-dimensional meeting rooms, in which avatars take their seats around a conference table. Hiring managers could take candidates on a virtual tour through the workplace after interviewing them in 3D. Employees' actual physical locations could become almost irrelevant.

¹⁰ <https://omdia.tech.informa.com/pr/2022-may/new-omdia-research-shows-subscription-video-growth-in-the-uk-despite-onset-of-cost-of-living-crisis>

¹¹ <https://www.matthewball.vc/all/metaversepayments>

Education

The COVID-19 pandemic forced many schools, universities and training providers to move a large part of their lessons and educational content online. Although many of these institutions have since gone back to using physical classrooms, students learned to appreciate the flexibility of online courses, which they can take at their own pace and regardless of their real-world location. At the same time, gamification has made learning experiences more engaging, enjoyable and rewarding.¹²

Medical care

Another traditional in-person interaction that was increasingly handled remotely during the pandemic was visiting the doctor, at least for minor illnesses. Going forward, patients could point out ailments in 3D during a virtual appointment, instead of trying to describe their symptoms over the phone. In turn, it would be easier for therapists to demonstrate exercises to patients.

Experienced doctors will be able to better train, advise and supervise colleagues in remote and crisis-torn regions. Enhanced haptic devices will enable medical students and junior doctors to repeatedly practice surgical procedures and hone their skills before operating on real patients. Telesurgery, in which a doctor remotely controls a surgical robot, will one day enable patients to access the best available expert health-care without having to travel.

Infrastructure and hardware

Amid all these exciting virtual use cases, it is easy to forget the underlying infrastructure and interfaces. The creation of a truly immersive experience will not only require VR goggles and haptic equipment, but also powerful graphic processing units (GPUs) and software that can model and render three-dimensional, photorealistic images in real time. Hardware and software providers will have to agree on common standards to enable the different, decentralized virtual worlds to interconnect and interoperate in a single, transcending Metaverse.

¹² See our recent white paper entitled "[The future of school and play: STOXX Global Digital Entertainment and Education Index](#)" for a comprehensive analysis of the digital education and entertainment landscape.

10. Contacts and further information

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