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Metaverse

Demystification and the road ahead

February 2024

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SUMMARY

This report on metaverse explores the various issues facing organisations and society as a result of the development of these virtual worlds, as well as their short-term prospects. The metaverse is not a technology in itself, but is made up of a more or less complex assembly of technologies enabling the creation of immersive and interactive digital worlds. These virtual worlds are attracting growing interest from businesses, individuals and society as a whole, but they also raise major challenges.

The first part of this report provides an overview of metaverse, exploring their origins, current developments and forecasts for the future. The announcements by Meta (formerly Facebook) in 2021 and its substantial investments have contributed to the exponential growth of the metaverse market. The underlying technologies are now mature enough to make these virtual universes a reality, and various public and private initiatives have been launched to help create them.

This overview has enabled us to identify potential use cases for metaverse within organisations. In the short term, metaverse could transform various sectors such as real estate, fashion, education and training, by offering immersive and collaborative experiences. However, issues relating to the environmental footprint, data protection and social acceptability may arise. The need to identify the skills required internally or externally to develop these virtual worlds was highlighted, as was the need to define clear objectives and choose the right platform.

Within societies, the perceptions associated with metaverses are as enthusiastic as they are distrustful. Questions are being raised about the relevance and desirability of these virtual worlds, as well as the risks of reproducing the ills of real society. The boundary between the physical and digital worlds and the implications for human relationships are also addressed. While these virtual environments offer exciting new perspectives, it is imperative to consider carefully the ethical, environmental and social issues that accompany them.

Lastly, Cigref, while continuing to monitor developments in metaverse, sees the emergence of generative artificial intelligence as a major new trend which, in the space of a few months since November 2022 and the launch of ChatGPT, has relegated interest in metaverse to second place.

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1 INTRODUCTION

The concept of the metaverse became ubiquitous in the specialist and mainstream media in 2021, following Mark Zuckerberg's announcement that his company, Meta, would be massively redirecting its investments towards immersive technologies, arousing both curiosity and apprehension within businesses. At a time when technological advances are constantly redefining the business landscape, it is essential for organisations to understand the issues surrounding the metaverse in order to prepare for the opportunities that lie ahead. This report is the result of a task force organised by Cigref, whose mission was to analyse the metaverse phenomenon, extract the most relevant ideas and formulate practical recommendations for its integration within member companies.

The metaverse is the subject of much debate and has prompted two types of reaction from companies. On the one hand, some have completely overhauled their service offering by turning to metaverse, often with great fanfare, for fear of missing the decisive turning point it represents. On the other hand, some companies are still hesitating to make a full commitment to this new area of technology because they don't know where to start and face a number of internal obstacles. The aim of this task force report is not to provide an exhaustive vision of the metaverse, but rather to decipher it and identify its potential impact on organisations, society and the general public. To do this, we have explored various key aspects of the metaverse, starting with its definition and its position within the web3 landscape. What do we really mean by 'metaverse'? And what else is metaverse?

The metaverse is constantly evolving, supported by major investments from technology giants. Although it has not yet reached maturity, it is crucial to examine the prospects it opens up, and to share the experiments carried out within it by various companies and public institutions. Our approach has been to identify concrete short- and medium-term use cases, as well as the key success factors and limitations to be considered when integrating metaverse into organisations.

Finally, it is vital not to underestimate the societal aspect of this emerging phenomenon. The initial impact of metaverse, as imagined by the digital industry, will be felt first and foremost by the general public. Questions relating to the acceptability and accessibility of metaverse, as well as the expectations expressed by society with regard to this new virtual universe, merit in-depth analysis. Over and above the technological issues, we need to look at the ethical, cultural and social implications that the metaverse could engender.

In short, this briefing is a first step towards understanding the metaverse and its implications for businesses. It invites you to demystify and explore its conceptual contours, to discover the opportunities it offers and to assess the challenges to be overcome. It also proposes an initial list of concrete recommendations and best practices to guide Cigref member companies in their efforts to integrate metaverse into their operational strategies. While metaverse opens up a new chapter in the digital age, it is up to organisations to decode its guidelines in order to shape a prosperous and innovative future.

2 WHAT IS A METAVERSE?

The rise of the concept of metaverse and its popularisation among the general public have led to a lack of clarity as to its nature and applications. In the early stages of our work, we therefore felt it necessary to clarify the definition of metaverse. The diversity of interpretations led us to ask whether there are one or several metaverses. Following this definitional work, we then set about defining the current metaverse landscape and identifying the current players in this ecosystem. Finally, in the light of these various elements, we have outlined some short- and medium-term prospects for the development of metaverse.

2.1 THE DEFINITION OF METAVERSE(S)

With Mark Zuckerberg's announcement in 2021, the metaverse has entered the spotlight, generating growing excitement in the tech world, among businesses and the general public. However, although the concept has recently become ubiquitous, it is not a new idea. In fact, the term 'metaverse' first appeared in Neal Stephenson's 1992 novel *The Virtual Samurai.* In this context, it referred to a computer-generated virtual world accessed through special glasses, marking the beginnings of a concept that continues to evolve.

Defining metaverse remains a complex task. At present, the metaverse is generally perceived as a "*computer realisation enabling the creation of a virtual universe with which users can interact. This virtual universe can partially reproduce the real world and can be accessed via a variety of interfaces, either conventional (keyboard, mouse, touch screen) or specific (headsets, glasses, gloves, etc.). Multiple individuals can connect simultaneously to this universe, which is constantly evolving in line with developments driven by its users*"[1].

For Mark Zuckerberg, the Meta social network (formerly Facebook) is first and foremost a communication medium, and the metaverse is the evolution of this medium. In the past, we exchanged information via letters, calls, text messages, photos, videos and posts on social networks, but tomorrow these means of communication will be abandoned in favour of the metaverse. This shift in communication will take place because people will have the impression of being in the same room via the metaverse (and no longer behind a screen).

The question then arises: is there a single concept of metaverse or is there more than one? The possible scenarios vary, and only the future will reveal which term to adopt in the light of future developments. Three scenarios are emerging: firstly, the parallel existence of several metaverses with their own specificities and without interconnections, each occupying specific markets; secondly, a scenario in which one main metaverse would largely dominate the others; thirdly, the possibility of the coexistence or combination of various metaverses presenting a level of technical interoperability.

[1] *"Le métavers, quel métavers",* Pascal Guitton, Nicolas Roussel, 2022.

However, despite the exciting potential of the metaverse, uncertainties remain. Who will control the metaverse(s)? Will there be connectivity between metaverses, if there are multiple of them? This conceptual uncertainty has sown doubts among some major digital players, such as Apple and Google. Apple CEO Tim Cook prefers to focus on augmented and virtual reality rather than commit to a hypothetical metaverse[2]. As evidence of this, Apple launched an AR/VR headset in early 2023.

The association of metaverse with web3 technologies also needs to be considered. While some experts link the two, others see them as distinct. However, certain characteristics of web3 are integrated into certain business models of the metaverse. Web3, the future extension of the Internet, is based on blockchain and differs from centralised platforms in that it is decentralised. Combined with the evolution of previous versions of the web, web3 gives users ownership of their creations, encourages co-creation and engagement, while offering brands new creative opportunities.

In sum, with the task force participants, we arrived at a common definition: the metaverse would be established as a 3D space in which users can lead a digital existence, for example via avatars[3]. Based on key technologies such as high-speed Internet, 3D modelling, blockchain and virtual reality, the metaverse offers an immersive experience conducive to interaction and co-creation. At present, this concept lies at the crossroads between social networks and the world of video games. However, it is a constantly evolving concept that needs to be considered over the long term, and the current beginnings raise the question of its value and potential in a rapidly changing digital landscape.

[2] "Apple is not in the metaverse delusion", Nicolas Lellouche, Numerama. Accessed 22 August 2023.

[3] Virtual character chosen by an Internet user to represent them in cyberspace (online games, social networks, metavers, etc.).

The real world, mirror worlds and metaverses

There is confusion between the concept of metaverse and that of mirror world due to the lack of common definitions of these two concepts. We often speak of metaverses in the plural, because today's technical capabilities do not allow us to achieve all the characteristics of a metaverse, in the sense of a global, persistent universe. Metaverse therefore represent virtual universes with different characteristics depending on the choices made by their creator. When we talk about metaverses, several technologies are invoked to offer these different virtual universes. Unlike the metaverse, which consists of a complete virtual environment, the mirror world is based on reality and adds virtual elements to it, in this case augmented reality. It is interesting to study the intersections between these two universes.

What is the mirror world?

The mirror world consists of superimposing a virtual world on the real world, and several methods have been used to achieve this. In this sense, the concept can be associated with that of the digital twin. The first mirror worlds were produced by NASA during the Apollo mission to simulate a rocket in space and offer the best solutions to cosmonauts.

According to Kevin Kelly, "*the mirror world is the fusion of all the digital twins that digitise the physical world. It's an alternative dimension of reality, superimposed on the physical world that recontextualises space. We will interact with it, manipulate it and experience it as we do in the real world. We might search the physical space, just as we might search a text: "find me all the places where a bench in a park faces the sunrise along a river". We'll create hyperlinks between objects in a physical network, just like hyperlinks on the Web*".

These mirror worlds differ from metaverses in that they are directly linked to reality. This virtualisation of reality can be passive or active, thanks to communicating objects that create data that can be integrated directly into the virtual world. Autonomous objects will therefore play an active role in virtualising the real world, by enabling digital copies of cities to be created, for example.

Mirror world experiments are currently on different scales:

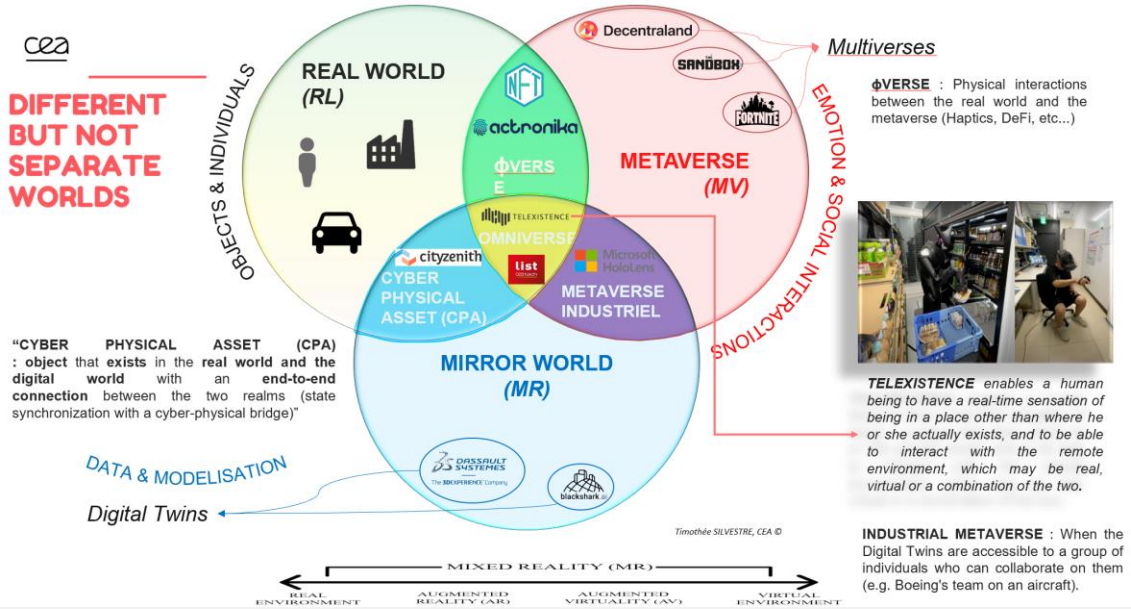
- With the purchase of Scaniverse, Niantic aims to speed up the creation of a 3D map of the world. In the Pokemon Go game, created jointly by The Pokémon Company and Niantic, each user can scan their environment, and all their data is centralised in the game's virtual world.
- At its major annual conference in April 2023, Nvidia presented its latest invention, the Omniverse, a tool that makes it possible to replicate our world virtually and with unparalleled fidelity. This tool is currently being used by BMW.
- The BIM company, using Dassault Systèmes' 3DEXPERIENCity, has enabled the city of Singapore to create a digital model of the cooling zones, to better optimise the installation of solar panels, for example.

- IGN will be scanning the whole of France. With a budget of 60 million euros, the programme will enable France to gradually move from an average point cloud density of 2 points per square metre to an average coverage of 10 points per square metre over the whole country. The IGN has therefore divided France into 236 blocks of 50 km². Data acquisition has already begun, and is proceeding from south to north; 70 blocks have been covered during 2021, and the whole country is due to undergo the same process by 2026.

At present, virtual worlds based on reality are generated by different operators and models, but in the future, they could enrich a mirror world, i.e. a virtual world on a global scale, if standards are shared. The Blackshark.ai company, for example, aims to digitise the whole world and contextualise each space with precise information on the type of neighbourhood, buildings, landscape, etc. Google Maps has done this work, but on a smaller scale; Blackshark's aim would be to digitise the world by other means, using satellite data in particular, and to enable rapid searches to be carried out in this digital world.

The intersections between the real world, mirror worlds and metaverses

These universes are different, but that doesn't mean they are separate. The real world contains physical objects and people. The mirror world contains data from digital twins (a city, a factory, etc.) with the possibility of aggregating them. Finally, the metaverse is more focused on sharing emotions and the ability to communicate between users in these virtual universes. For example, technologies such as Microsoft Hololens make it possible to chat on a medium that resembles the real world.



Intersections between the real world, the mirror world and the metaverse - Source: CEA - Thimothée Silvestre

> The intersection between the three universes is called the "omniverse". The Telexistence company, which offers this type of universe, allows all the actions that a human being carries out in a virtual universe to be reflected in the real world through a robot, because this virtual world is a copy of the real world.
>
> **Timothée SILVESTRE**,
> in charge of technology foresight and trend analysis at CEA

2.2 THE STATE OF THE ART IN METAVERSE: THE VARIOUS EXISTING METAVERSES AND POTENTIAL DEVELOPMENTS

Buoyed by a favourable economic and societal context, metaverses are at the heart of an unprecedented boom. Since Meta's announcements and the investments that have followed, the metaverse market has grown exponentially worldwide. By 2022, it is expected to be worth around $650 billion, with a projection of $783.3 billion by 2024[4]. Paradoxically, the pandemic has encouraged the acceptance and accelerated adoption of digital tools within society, creating fertile ground for the emergence of the metaverse as an extension of this evolution. According to Gartner predictions, between 2025 and 2030, around 25% of Internet users will spend at least one hour in the metaverse.

The European Union itself is showing a growing interest in metaverse. European Commissioner Thierry Breton has announced the creation of an "industrial coalition for virtual and augmented reality", an initiative designed to bring together the players in the metaverse ecosystem, with a view to stimulating investment and development in this field.

The growing maturity of a number of technologies has led to the creation of virtual worlds. Several of these are aimed at the general public, such as *The Sandbox*, *Roblox* and *Epic Games*. These environments attract brands that want to integrate these universes to gain greater visibility and engage their customers. For example, *The Sandbox* offers its users the chance to develop their own metaverse, while others, such as *Fortnite*, call on design agencies to create their virtual worlds. Each metaverse has its own language and identity.

Conversely, more closed initiatives, known as "microverses", enable the creation of private micro-universes within a general public metaverse, offering exclusive spaces within the shared virtual space. See an example of a microverse experimented by BPIfrance on the Decentraland metaverse in the BPIfrance insert below. Finally, there are metaverses that are internal to an organisation, accessible only to its members, via a link, and which are not inserted into any platform.

Currently, the metaverse is mainly rooted in the video games industry, constituting a universe where users interact via avatars. 3D social platforms such as *Decentraland* and *The Sandbox* play a central role in the creation of these virtual worlds. However, future skills needs will emerge to support the

[4] Philippe Richard, IT Social. Accessed 22 August 2023.

growth of the metaverse and professions such as 3D artists and game designers will be essential, alongside new roles such as *metaverse community managers* and *metaverse police*.

The current players in the metaverse fall into several categories:

- **Think tanks**, such as the *Metaverse Standards Forum*, which facilitate discussions between standards bodies and industry players.
- **Emerging 3D social networking platforms**, such as *Decentraland* and *The Sandbox*, offer environments conducive to interaction.
- **3D technology vendors** such as *EPIC* (*Unreal Engine)* and *Unity* are contributing to the technological foundations of metaverses.
- **Digital**, **luxury**, **retail**, **manufacturing**, **defence** and **other sectors** are also exploring the opportunities of the metaverse.

The potential future of the metaverse was explored at the South by Southwest® (SXSW®) trade show in Austin, Texas in 2023. One conference aimed to demystify the metaverse and clarify its definition. According to the presentation, the metaverse represents "*the seamless convergence of the physical and digital worlds, bringing people, worlds and things together in a virtual and augmented world*". The future of the metaverse was analysed using two criteria: the open or proprietary nature of metaverse, and the convergence or division of these virtual universes. Four possible scenarios emerged:

- A unified and open virtual world (the free metaverse), without proprietary technologies,
- A coexistence of separate metaverses responding to specific needs,
- A profusion of metaverses using free technologies (the nedverse),
- A single metaverse for all with proprietary technologies.

The move towards one or other of these scenarios will depend heavily on the investments made by virtualisation players and the adoption of metavers by a growing number of people.

3 METAVERSE IN ORGANISATIONS: WHY METAVERSE?

Now that we have clarified the concept of metaverse and defined the players who make up its ecosystem, it is essential to explore in depth the underlying reasons why organisations are considering integrating it into their information systems. This section will therefore look at the needs that metaverse can address in a company or public administration. By considering the potential benefits and opportunities that metaverse can offer, we will endeavour to sketch out the contours of a strategic reflection on its implementation within organisations.

3.1 POTENTIAL USE CASES FOR METAVERSE: WHAT ARE THE NEEDS ADDRESSED BY METAVERSES WITHIN ORGANISATIONS?

The metaverse could become an increasingly important part of people's daily lives over the next few years, from online shopping to sports activities and the workplace. This incursion could even lead to the transition of certain public services to the metaverse, as shown by the ambition expressed by the mayor of Seoul, who plans to create a digital twin of the city and its services by 2030[5].

Many business sectors have already seized the opportunities offered by metaverse:

1. **Real estate**: Using non-fungible token (NFT) technology[6], it will be possible to acquire virtual real estate, as Wincity already does. At the same time, platforms such as *Seloger* offer virtual tours of houses and flats accompanied by estate agents[7].

2. **Fashion and Luxury**: The rise of NFT technology has seen the fashion, luxury and art sectors invest in the metaverse. The French *Centre National du Cinéma* (CNC) has even set up a fund to support creation in the metaverse, with the intention of accelerating development and distribution within this ecosystem[8]. This initiative is led by Jean-Michel Jarre.

3. **Education**: The metaverse is proving to be an ideal place to train students in complex processes, such as aeronautics or medicine. For example, *Grenoble École de Management* has created a virtual campus in partnership with the digital company Inetum[9].

4. **Events, Shopping, Video Games, Virtual Work Environments**: The possibilities of the metaverse are vast and include the organisation of events, shopping, video games and the creation of virtual offices, among others.

The metaverse, although born of the imagination of science fiction, is now taking shape in reality. Brands are looking to experiment with it even before clear needs emerge. These experiments are made

[5] Seoul wants to deploy its own metaverse, Mathilde Rochefort, Siècle Digital. Accessed on 22 August 2023.

[6] NFT stands for Non-Fungible Token. An NFT is a kind of digital certificate, usually associated with a file (image, sound, video, etc.) that identifies the owner and creator of a work or digital asset. The blockchain makes it possible to allocate purchase certificates in the metaverse via NFTs.

[7] SeLoger tests flat visits in the metaverse, Clémence Tingry, CIO Online. Accessed 22 August 2023.

[8] The CNC creates a €3.6 million a year fund to support creation in the metaverse, Raphaële Karayan, L'Usine Digitale. Accessed 22 August 2023.

[9] Virtual Campus: GEM signs a research and development partnership with the Inetum Group, official Grenoble Ecole de Management press release. Accessed on 22 August 2023.

possible by the growing maturity of certain technological building blocks such as streaming, video and 5G, which are combining to form a decentralised universe. In this context, it is crucial not to treat these technologies in isolation, but to consider them as part of an interconnected ecosystem.

Several use cases are emerging, such as the sale of land for the construction of virtual shopping centres or the use of virtual reality in environments that are difficult to access (such as nuclear power stations). Other scenarios include an economy based on game models similar to *Fortnite*, where access is free but elements that enhance the gaming experience can be purchased, known as B2A for "Business to Avatar", i.e. purchases designed to improve one's avatar in the metaverse. Finally, this virtual world can also be used to exchange information within a company without geographical or linguistic limits (with simultaneous translation of exchanges by an artificial intelligence).

In addition, the metaverse could help to reduce physical travel and therefore the carbon footprint, while providing ultra-realistic environments for training and communication. It can also play a key role in the design and operation of complex systems, as well as in the field of video games, opening up a host of opportunities for businesses and organisations across a variety of sectors.

LVMH experiments in the metaverse

As part of its experimentation with web3 technologies, LVMH has developed several in-house use cases to deploy metaverse to IT user functions. The capsule collection from its Innovation Lab features a real-fake boutique and is an internal initiative designed to raise employee awareness of these innovation issues. The aim of these capsule collections is threefold:

- Acculturate and educate about business concepts and opportunities;
- Sharing use cases and best practice through case studies and PoCs;
- Experiment with innovative solutions, such as testing immersive technologies in the lab.

Every 6/8 months, the collections in the lab are renewed. It's a kind of play. Every year, the lab welcomes several thousand employees so that they can put themselves in the shoes of customers or sales staff represented by *personae*. The *persona*, which is a fictional portrait of a type of customer, helps us to understand their state of mind so that we can better meet their needs and reach them, before, during and after their visit to the shop. This enables staff to project themselves more easily than with the help of slides.

Employees then attend full demonstrations of solutions or product presentations so that they can play around and familiarise themselves with them. Web3, which is still a new subject, is neither simple nor mature, and requires a great deal of teaching to remind people of the key principles of the technologies that make it up. For example, few people or even companies have a crypto-currency wallet. This is why, during these demonstrations, employees are invited to create their own NFT. To open a crypto-currency wallet, they are advised to use the Metamask solution, which is currently the easiest wallet to use.

With regard to metaverse, three specific use cases have been developed:

- 360° representation of a Christian Dior boutique on the Champs Élysées in the metaverse to enable employees to move around in a place that actually exists.
- Givenchy beauty tried an experiment with Roblox: several spaces were created in the 3D environment, with the option of taking photos in your own personalised environment.
- Sephora developed a virtual world in a 3D environment, where live streaming sessions were hosted by guests (influencers, celebrities, etc.).

Olivier LE GARLANTEZEC, Digital Tech Partnerships Director, **LVMH Group**

3.2 BEST PRACTICE FOR OPERATIONALISING THE USE OF METAVERSE

Operationalising the use of metaverse within organisations requires a considered and strategic approach. Here are some essential best practices to guide this complex process:

1. **Defining needs and use cases**: Before exploring metaverse experiences, it is essential to validate the business interest with executive management. This requires a meticulous assessment of the potential benefits, while taking account of the environmental issues and associated risks. Identifying the company's specific needs and the appropriate use cases is a crucial step in ensuring the relevance of metaverse initiatives.

2. **Choice of platform**: Given the lack of standardisation in the metaverse ecosystem, the choice of platform is crucial. Current metaverses are not interoperable, which may mean selecting a specific metaverse or creating a customised microverse. It is also important to consider the size and durability of the players involved, as well as the technological implications and the interoperability of the metaverse with the existing information system.

3. **Identifying the skills needed**: Gaming and real-time 3D technologies are at the heart of the metaverse ecosystem. Acquiring these skills internally or externally is essential to building high-quality immersive experiences. Companies need to identify the skills they need to bridge the gap between gaming and their core business. Partnerships with schools and specialist studios can be envisaged to train and recruit talent in this emerging field.

4. **Collecting the organisation's 3D models and assets**: Companies need to collect and make the most of their existing 3D models and assets, as these resources are crucial to the construction of the metaverse. These elements already carry value and can be used in innovative ways in a metaverse context. 3D technology can be expensive, but it guarantees a certain durability and offers additional monetisation opportunities.

5. Putting **the right organisation in place**: Integrating metaverse into the business requires the right organisation to be put in place. Consideration needs to be given to ergonomics, prolonged use of virtual reality technologies and cryptocurrency payment requirements. The formation of a small multidisciplinary team (legal for intellectual property aspects, HR, marketing, digital, etc.), with measurable short- and medium-term objectives, enables effective progress to be made while ensuring a long-term vision.

6. **Governance and collaboration**: Today, it is generally the communications and marketing departments that drive metaverse projects. The Information Systems Department (ISD) is brought into the loop afterwards to check the technical aspects. As is often the case, when a new technology becomes mainstream it generates shadow IT. However, involving the IT Department from the outset enables security issues to be anticipated and legal and compliance aspects to be taken into account as early as possible.

7. **In-house development**: To avoid the complications associated with crypto-currency payments and external dependencies, in-house development of the metaverse platform may

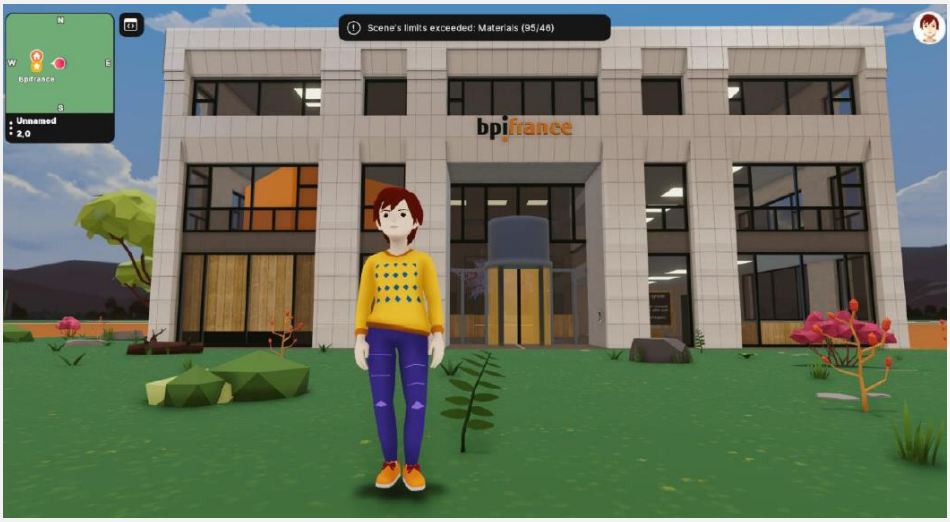
be a preferred option. This gives you greater control over technical aspects and costs, and enables you to meet your company's specific needs.

In short, operationalising the use of metaverse requires an in-depth understanding of business needs, a judicious selection of platforms, the development of key skills and sound governance. By following these best practices, businesses can exploit the potential of metaverse strategically and sustainably, while offering immersive and innovative experiences to their users.

Bpifrance experiments on the *Decentraland* metaverse

Bpifrance began its approach by first determining the objectives of its experiments in the metaverse. Its main objective is to introduce Bpifrance to a young audience, particularly students in the digital sector, with a view to recruiting them. The metaverse was selected through a classic benchmark of platforms based on the technologies available and their deployment. Portability, technologies, deployment and evolution of the platform are the 4 main criteria used for this benchmark. The desire to choose a solution that was accessible to everyone tipped the balance in favour of *Decentraland*. *Decentraland* has a 'web client' that is easy to set up and offers a wide range of technical options for customising it as required. Finally, *Decentraland* hopes to offer its world on smartphones in the near future, as well as a virtual reality client.

To attract and appeal to young graduates, Bpifrance modelled its building in 3D before uploading it to *Decentraland*. Although the graphic style is fairly limited on the platform, everything can be achieved with the right technical skills.



The Bpifrance offices in the Decentraland metaverse

The project has had a 'wow' effect on young employees. What remains to be done, however, is to find the proposals/activities to be addressed in *Decentraland*: setting up stands, mini-games to recruit, etc. The company is only at the beginning. Up to now, its experiments have consisted of testing functionalities at a technical level.

However, in the absence of existing information, one of the major difficulties is accurately assessing the environmental impact and security risk of this metaverse (risk of collecting sensitive data or monitoring user behaviour, risk of cyberattack, no possible moderation of malicious users, etc.).

Bertrand TOUSSAINT, IS Base Manager, **Bpifrance**

Focus on the French metaverse *The Sandbox*

The Sandbox is *a* company offering an online video game that can be played on both mobile phones and computers. *The Sandbox* is a decentralised metaverse based on the Ethereum blockchain. It allows users to create, explore and monetise their gaming experiences. Users can create digital assets, such as avatars, terrains and games, and monetise them by selling or renting them to other users. *The Sandbox* is still in development, but it has already attracted the attention of a number of major brands. This metaverse is owned by the Hong Kong-based *Animoca Brods* group, which specialises in the web3 business.

The Sandbox metaverse is made up of 166,000 terrains of varying sizes. The owners of these terrains can customise them to attract players. The platform has been designed in such a way as to allow people with no knowledge of design or code to have a wide range of customisation options. Each plot of land represents a non-fungible token (NFT) that certifies ownership of the digital object, based on the blockchain.

Gradually, the company has grown and recruited a large number of developers: in two years, it has gone from 5 developers to 420 today, looking after 166,464 different spaces. It has more than 400 business partners around the world.

To acquire land, you need a crypto wallet and cryptocurrency. To make transactions easier, *The Sandbox* has created its own cryptocurrency, called "*The Sand",* which will go on the market on 20 August 2020.

The first plots of land on this metaverse were sold in 2020, following an announcement on discord about the sale: $800,000 worth of land was bought in 10 minutes. Today, 75% of the land on *The Sandbox* has been sold. In 2022, they generated 39,000 unique visitors per day and 201,000 users per month. The most visited site is the *Gucci* site, with a total of 700,000 visits. On average, each terrain experience lasts 30 minutes per user. The overall session on *The Sandbox* lasts 1.5 hours, i.e. 20 to 30 minutes per space, which may seem relatively long. The metaverse is not open all the time, but opens in seasons of a month and a half, with new experiences on offer. Today, users can publish their experience live. The average age of users is currently between 20 and 45, and they tend to be men, but this is changing.

Develop your space on *The Sandbox*

There are two ways for companies to create their own space on The Sandbox:

1. Once you have acquired a plot of land, you can hire a studio to create your own 3D world. A list of studios is made available by *The Standbox* to facilitate the selection process. This arrangement allows the customer to keep 95% of the income generated on the space.
2. It is also possible to work with an in-house team at *The Sandbox*, which is responsible for developing the space. In this case, revenues are shared 50%.

> 99.9% of partners have chosen to have *The Sandbox* develop everything for them. As a fast-growing company, it has everything to gain by helping its partners to grow on the platform.
>
> To develop a successful experience, *Narative Designers* work with the customer to define their needs and propose a coherent project. Following this initial discussion, a development roadmap is proposed. The value for a company comes from the sale of NFT, and you have to be imaginative to find digital assets that appeal to users. For example, *Snoop Dog* organised a concert in his space and 1,000 concert tickets worth $1,000 sold out in just a few minutes.
>
> Today, most computers can access these virtual spaces, and more and more computer configurations will be able to do so because it will no longer be necessary to download a client onto the monitor.
>
> **Bertrand LEVY**, Vice President Global Licensing & Brand Partnerships at **The Sandbox**

3.3 LIMITS TO THE DEPLOYMENT OF METAVERSE

The deployment of metaverse, while full of innovation and promise, is not without its challenges and limitations. Here is an overview of the obstacles and questions raised by the implementation of these virtual worlds:

1. Ecological cost: As metaverse develop, the question of the ecological cost of these virtual universes is becoming increasingly acute. The IPCC continues to warn about global warming, and as the connectivity between virtual worlds increases, so does the environmental cost. This cost is the sum of the carbon impact of the various layers that make up the virtual world: the user's computer and its configuration, the use of in-game voice chat and message exchanges, the user's Internet connection, the consumption of the blockchain, and that of the hosted backend servers, if any.

2. Data protection: Personal data protection concerns are also a major challenge. Privacy and confidentiality regulations must be rigorously respected in the world of metaverse, particularly when sensitive data is collected. Questions of consent, anonymisation and the use of data by metaverse remain without a clear answer.

3. Technical limitations: There are also technical limitations to the deployment of metaverse. The need for skills in 3D, specific programming languages and blockchain technology can be a challenge for companies. In addition, updating content in a metaverse can be complex and resource-intensive. Game loading times depend on the quality of the Internet connection, which can limit accessibility.

4. Security and risks: Security is a crucial issue for metaverse. Malicious users can collect data, monitor interactions and pose risks of harassment or abuse. Metaverse must guarantee user security, data protection and compliance with the RGPD. The risks of cyberattacks and intrusions into virtual worlds are also a challenge.

5. Accounting valuation of virtual assets: Accounting for virtual assets in metaverse can be complex and raises questions about how to report the costs of these intangible assets in companies' financial statements.

In short, the deployment of metaverses faces a complex set of technical, ethical, environmental and security challenges. The transition to these virtual worlds requires a careful and considered approach, taking into account the associated limitations and implications. Companies and players involved in metaverse will need to work proactively to overcome these obstacles and exploit the full benefits of this new technological frontier.

4 METAVERSE AND SOCIETY

The rapid emergence of metaverses has led to an upheaval in our conception of reality and social interaction. While these virtual worlds promise new immersive experiences and commercial opportunities, they also raise complex questions about their acceptability within society. This section will look at the limits and challenges faced by metaverses as they become increasingly integrated into our daily lives. We will explore the legal, psychological and societal concerns that are emerging around metavers, as well as the cultural and relational implications of their increasing adoption.

4.1 THE PERCEPTION OF METAVERSE WITHIN SOCIETY

Perceptions and definitions of virtual worlds are constantly evolving. Whereas access to virtual reality used to require a specific headset, it is now possible to access virtual universes directly from a smartphone. It is also interesting to note that many video game players still prefer the traditional screen. These factors call into question the absolute need for headsets for immersion in these universes. However, aren't these virtual spaces adapted to the current market and accessible on a screen a necessary step towards the future of metaverse, with the democratisation of virtual reality headsets that better meet users' expectations?

A crucial question then arises: what steps will lead to the widespread adoption of metaverses? This question highlights the need to identify the key factors that will facilitate the widespread acceptance and use of these virtual worlds.

Another perspective emerges: what need do metaverse really meet? Metaverses are made up of various technological elements such as virtual reality, real-time 3D modelling and the web3. Each of these elements can be approached independently or combined together to form very different metaverses. This is why it is difficult to reach a consensus on what needs metaverse meet. Indeed, the participants in the Cigref Task Force were unable to reach a consensus. Some see the benefits of metaverse in the creation of a digital twin of cities, factories with dangerous locations and, more generally, ecosystems; others see the possibility of acculturation or training through role-playing; still others see the metaverse as a new space for creating experiences, or business, offering leisure activities, etc. Others see the metaverse as a way of creating a new environment, a place where people can live and work together.

What's more, the very existence of metaverses raises profound societal and ethical questions. The risk of reproducing the ills of real society, such as addiction and addictive behaviour, is a cause for concern. The very way in which these worlds are created raises questions, as they could reproduce the prejudices of their creators and make these spaces less inclusive. It is thus possible that the metaverse could become a space of disciplinary utopia, where interactions are limited to consumption and restricted actions. In other words, the perception of freedom in the metaverse is hampered by the rules of the utopian world in which the participant evolves. They are constantly self-evaluating, locked into feedback loops and adjusting their behaviour to raise or lower the statistic that has become their

life. This potential pitfall highlights the need to maintain a balance between the real physical world and the digital world in order to preserve the mental health and well-being of users.

Ultimately, the perception of metaverse within society is constantly evolving, raising fundamental questions about their usefulness, impact and integration into our daily lives. In-depth reflection on these issues is essential if we are to shape a future in which metaverse play a positive and balanced role in our modern society.

4.2 THE LIMITS OF THE ACCEPTABILITY OF METAVERSE

Philip Rosedale, creator of Second Life, one of the first metaverses created in 2002, had this to say about his game: "*I think what we've learned - and somewhat sadly, given the work I've done - is that it's not for everyone, and maybe it never will be for everyone*". This statement underlines the fact that metaverses are not universally suitable for everyone, and that they can give rise to reservations, addictive behaviour and abuse. Behavioural problems in metaverse mirror problems in real life, such as violence and harassment. This raises the question of moderation and the application of rights in these virtual spaces.

The legal status of avatars raises complex issues. In the event of a dispute, which law applies: that of the country where the company creating the universe is based, that of the country where the server is hosted or that of the user? This highlights the challenges linked to digital identity, in the case of identity theft in the metaverse via an avatar, and cross-border jurisdiction. This legal vagueness is bound to lead to abuses in the early stages of use of these virtual universes.

The environmental impact is also a barrier to the acceptability and adoption of metaverse, because metaverses involve the use of powerful microprocessors, the latest infrastructure and equipment, the use of a telephone network with very high bandwidth and low latency, data storage centres and energy consumption directly linked to the number of users. In addition, the training of artificial intelligence models is very present in the Metaverse. As the amount of data captured increases, the processing required will increase exponentially in order to maximise the value extracted from these immense data sets. The risks of addiction that these virtual universes can represent could drastically alter social relationships. China, for example, has introduced stringent measures to combat addiction to online video games, imposing a limit of three hours' gaming a week for under-18s. This approach therefore raises questions about the potential addiction and psychological impact of metaverse, especially as Anses[10] has highlighted the harmful effects of virtual reality on users' mental health, linked to the sensory incongruities it generates. The notion of trust is therefore crucial in metaverse. Current suppliers of metaverse need to be assessed in terms of trust to guarantee the safety and integrity of users.

In short, metaverse can have a profound impact on human relationships and culture. They challenge traditional interactions and personal identity, raising concerns about the evolution of society and culture as these technologies emerge.

[10] The French National Food Safety Agency.

5 CONCLUSION

The emergence of metaverses represents a digital revolution that is arousing both fascination and apprehension in society. While these virtual worlds open up new opportunities for business, collaboration and entertainment, they also raise complex concerns about privacy, ethics, the environment and the impact on our human relationships. Metaverses have immense potential to transform the way we interact with technology and each other, but it is crucial to weigh up their benefits and challenges carefully.

Europe and France launched consultations at the beginning of the summer to better anticipate the development and deployment of these virtual worlds. Cigref supports the need to invest in European players for the development of interoperable, environmentally-friendly and ethical metaverse. It is important to tackle this issue now to avoid a small number of major players becoming the future gatekeepers to virtual worlds, leaving European companies in the role of mere consumers of technologies dominated by third countries.

This is why Cigref will continue to keep a close watch on developments in metaverse. We will remain committed to analysing significant developments in this field, highlighting the impact on businesses and organisations. However, it is important to note that with the emergence of generative artificial intelligence, as demonstrated by the advent of Chat GPT and other similar technologies since late 2022, discussions around metaverse have been partly overshadowed.

This rapid evolution in generative artificial intelligence has even led major players, including Meta, to redirect their investments and efforts towards these new opportunities. This trend underlines the dynamic and constantly evolving nature of the technology sector, where priorities can change rapidly in response to technological advances and emerging needs.

So, while metaverse continue to attract a great deal of interest, it is essential to recognise that the technological landscape can evolve rapidly, and that trends can change over time. Cigref will continue to support its members in their understanding of the ever-changing digital challenges and will remain open to exploring the new opportunities that generative artificial intelligence and other technological advances bring to our societies and organisations.

ABOUT CIGREF

Cigref is a network of major French companies and public administrations whose mission is to develop its members' capacity to integrate and master digital technologies. Through the quality of its thinking and the representativeness of its members, it is a unifying force in the digital society. Cigref was founded in 1970 as a not-for-profit association under the law of 1901.

To achieve its mission, Cigref relies on three areas of expertise that make it unique.

Membership
Cigref embodies the collective voice of France's major companies and public authorities on digital issues. Its members share their experiences of using technologies within working groups to bring out the best practices.

Intelligence
Cigref participates in collective discussions on the economic and societal challenges of information technologies. Founded nearly 50 years ago, Cigref is one of the oldest digital associations in France, and draws its legitimacy from both its history and its mastery of technical issues, the foundation of skills and know-how that underpin digital technology.

Influence
Cigref promotes and respects the legitimate interests of its member companies. As an independent forum for exchange and production between practitioners and stakeholders, it is a benchmark recognised by its entire ecosystem.

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