



2b AHEAD ThinkTank

THE METAVERSE 2035

Future Study
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#SALMANQADIR



Executive Summary

The Metaverse is a term used to describe the convergence of key digital technologies in order to expand on reality. It creates a new layer of shared, immersive, and interactive digital spaces poised to have a significant impact on every aspect of society by 2035, including social interaction, collaboration, access to information, human experiences, education, commerce and physical reality.

This study divides the Metaverse into its two major components – frontend and backend. This framework helps not only to extrapolate the key drivers and their rapid evolution, but offers a new perspective on unique opportunities, disruptive challenges and strategic implications for business in the coming years.

Through its frontend the Metaverse has the potential to revolutionize the way we leverage technology to experience reality. It explores digital spaces beyond time and space and introduces truly immersive and human centered interfaces. It creates radically new opportunities through digital humans entering into our world and expands the current limitations of our world by automating the creation of content – manifesting in lasting and impactful systemic effects also on the physical reality.

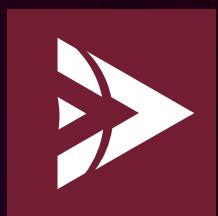
At the same time, the Metaverse is reinventing the digital through the backend. By allowing for digital resilience in the form of a tokenized economy, it facilitates true digital ownership and true digital scarcity. It is the key to reimagining digital identity with privacy, authenticity and scalability at its core, creating both new opportunities as well as limitations for digital marketplaces. This drives societal but especially institutional adoption through the digitalization of trust.

In the next decade, the Metaverse will have a profound direct impact on society and all its industries. However, to truly leverage the rapid advancement to one's benefit – in face of significant long-term unknowns – businesses need to also realize the indirect and secondary impacts of the Metaverse, which is something this study aims to uncover.



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I. PROLOGUE

"Ten years down the road there will be children born for whom the default is that everything in your life is part of the Metaverse."

Richard Skarbez



Dear Reader and Futurist,

Over the past three years, the idea of the Metaverse has undergone a transformation from something utterly unknown to the average reader, to an urgently discussed concept on the forefront of everyone's mind, and finally to a 'meme'-able side note everyone has moved on from. This study, however, looks beyond this very short-term development as it benefits from following this very process from its beginning. It provides insights beyond the hype to really understand what the long-term potential of the Metaverse is, how it intersects with other topics, how it affects business and society and how the convergence of technologies will shape its evolution by 2035.

With Facebook rebranding itself as Meta, the Metaverse was not only jumpstarted into public perception, but it also marked the beginning of a new competition between Big Tech, very much still vying for dominance in this new arena to this very day.

Lined with misconceptions and massive complexities, the Metaverse holds on to the potential for unprecedented acceleration, where the current isolated trends such as NFTs, AI-Art or LLMs like ChatGPT represent only the very tip of the iceberg.

We are living in a time where (im-)possibilities are rapidly unbound from imagination. This makes the Metaverse as the convergence of all those smaller trends the herald of tectonic shifts in the everyday human life of the future – moving the digital reality not just closer to the physical one, but transforming a 2D digitalization into a 3D one. It creates an economy with very few boundaries, powered by humans but even more so by AI, renegotiating what relationships mean, how humans operate, how trust is established and how the social contract must be renewed.



Definition Metaverse

"People often just see the physical universe as the real world, or the real world as having different properties. But it's more like going into different rooms in the same house. If you have an extension, you will always refer to it as the new wing, right? If you, however, are born after the extension was already there, you will just think of it as the house."

If you're born into a world that's a mix of digital and physical, then your actual core representation of reality will be different.

Most of society can't conceptualize that there is a new sphere of reality emerging. Most of them still see Twitter and TikTok, they see Amazon, they see websites, they see games."

Justin Banon

The Metaverse is a non-incremental successor of the internet. It manifests as a complete, persistent digital space, that one can experience similar to the physical space in three dimensions – but beyond the limits of time and space as well as physical constraints.

Contrary to common belief, the Metaverse will, however, not just merely extend the digital spaces but completely redefine them. In the form of ever-expanding realities, often very much counter-intuitive and utterly unpredictable in their development, the Metaverse will be driven by the co-evolution of revolutionary technology intersecting and integrating with each other into a seamless, spatial and immersive user experience enabled by AI, blockchain and VR/XR technologies.

Despite the limitations of being able to predict future developments, especially in the face of rapid acceleration, the underlying trends and drivers are taking shape today – ready to be put together into a comprehensive picture of the future.

By 2035, the Metaverse will undoubtedly and fundamentally disrupt society, economy and reality, transcending human and physical constraints to where only the constraint of original thought is left.

So, without further ado, let us invite you on a journey into a new world, both real and digital.



Dr. Julia Lampert

Director Research | Strategic Foresight



II. BIG PICTURE

"We are at a threshold now between a digital dystopia and a digital utopia, where if we go down the wrong road - that will be all we can have."

Toby Tremayne



Big Picture 2035: Future Narration

She was sitting on her balcony wrapped in a wool blanket. The nights were surprisingly cold for this time of the year. The window right across the patio was lit against the fading light of the day. Inside, she could see her neighbor sitting at the dinner table – with a ghost. Feeling a sudden chill, she pulled the blanket closer.

She had known his wife. They had worked in the same industry. After the diagnosis, everything went really quickly. The funeral was just two months ago.

Trying not to be judgmental, she observed the haunting scene unfolding – not far but seemingly in another world. She saw him pour her a cup of tea. Her, not being his wife, but a person paid for the physical representation of her digital remains. Him, unable to let go and holding on to what had already left.

'Kira! Meeting!' her AI called her through the ambience.

'Shit, sorry ... yeah, I'm coming.' She rushed in to put her headset on and to load in. She saw Chip and Sari already sitting on the bench in front of their virtual office, a cozy cabin in a tropical biome at the edge of a waterfall.

'Moinsen, great you finally show up to the party.' Sari smiled his crooked smile, undoubtedly trying to cover up his failure to update the avatar to the new facial rig she had long suspected to be fully intentional.

She sat down next to them, closing her eyes. Through her mods, she felt the warm blasting sun of Booty Bay on her face. It almost seemed like it was yesterday they all had become ac-

quainted at this very spot 25 years ago. With the advent of spatial computing and the explosion of text-to-world generation, they had re-connected and successfully carved up a niche for themselves by recreating in-game spaces as functioning corporate offices. Today, they were one of the top suppliers for high performance modular spaces in the world, embracing the new culture of on-chain self-employment, benefitting from artists and systems designers co-creating in low friction environments on a very high level. And they became part of the first decentralized worldbuilders guild, solely built on blockchain infrastructure, very early on.

'Do you know how you will vote today?' he asked.

She was watching a boat approach the harbor from the distance, listening to the waterfalls gentle whooshing being forced down the steep cliff into the ocean:

'No. But I have a feeling it might set a really bad precedent. We shouldn't be part of it, and neither should be the guild. He wants to subvert that entire world. How do you think it will develop once he controls all the downtown nodes? Even purely on a systems side?'

Sari grinned again. 'It's not as if the real ancient Rome was a democracy either. Or as if rich people will not always find a way to get what they want. If he can make it work and attract enough people to sustain a base population I just don't see the same issues as you do.'

'But haven't we learned this lesson ten years ago?' Chip interjected. 'If we don't implement basic governance features from the beginning, it descends into a world where the rules are made by a very small subset of actors – no decentralization and no commons either.'

Sari shook his head. 'Look, what you are saying is valid. However, it's still a massive opportunity. It's the biggest city project yet. He is willing and able to spend a fortune on it. Obviously, he has his own agenda – no matter what he tells us about just wanting to become Julius Caesar. But this is a game changer not just for the world-builders guild. We shouldn't vote against it just because we have concerns. Try to look at the bigger picture. None of us thought a project like this was even possible a few years ago. Imagine all the new asset synergies and the bridges, all the metadata that would be freely available for the other economies ... That's not nothing! I think it's worth it, especially if we can put part of the public sector into an on-chain trust.'

'Sure, you do ...' She still had major reservations – maybe because she just didn't like the guy. But she also couldn't help but admit that Sari had a point. 'I am just concerned that in the end he won't meet the community halfway, derailing the way all the new worlds function sooner or later.'

For a moment there was silence. Then, softly but with a certainty she wasn't used to, Chip said: 'We all have concerns. You are right, it most likely will be really hard to stick to our guns at first, but we have already proven that we can turn it around successfully and leverage ourselves and the rest of the guild. The last decade has proven us right – just look at where all the web2 monopolies are today.'





Big Picture 2035: Galvanizing a New Horizon

"The problem is that we are close to having the power of god – but we still are animals. Our brains are not advanced to have that kind of responsibility. [...] We're not going to be proactive but reactive. That also goes hand in hand with AI. AI is going to be generating a lot of stuff in the Metaverse and is going to be actually inhabiting a lot of the beings in the Metaverse. The outcome will be very binary: Either we all become gods or we all kind of die."

Andrew Steinwold

The next ten years are defined by humanity galvanizing a new horizon, balancing on a ridge between great opportunity and great challenge. On one side of the ridge there is a multitude of crises creating an abundance of challenges, but also new responsibilities and possibilities to actively shape the developments for the next generations. On the other side of the ridge is the convergence of cascading technologies increasing complexity of long-term disruption through accelerated innovation beyond our understanding – not just in one sector but throughout all of them.

The challenge for business will be to leverage this accelerating pace in both directions to ensure not mere survival but a transformation of their business model as a key part of this new ecosystem.

Multicrisis

2020 marked a turning point for the global perception of crisis. With the onset of the pandemic, which very quickly morphed also into an economic crisis, ripple effects were manifesting as inflation and a global supply chain crisis. However, the pandemic also unveiled a social crisis and a crisis of institutional trust, information, and democracy, predating it, but only then becoming more visible. Piling onto these crises in 2022, all hopes of returning to a new normal were shattered by the invasion of Ukraine, fol-

lowed by a severe energy crisis, more inflation and unprecedented concerns about food security. After a year of conflict, fears of escalation are still on the rise while the pace of the erosion of globalized trade relations and a new formation of geopolitical blocks are compounding the risk. All of these crises are not only ongoing and unresolved – but also appear to be feeding into each other.

At the same time there is a whole other set of climate and ecological crises escalating alarmingly in parallel. Every year marks a new high of unprecedented global and regional weather patterns; wildfires, flooding, drought, thawing of the ice shield as well as the permafrost. The introduction of the key concept of tipping points and their irreversible nature has not yet settled into the collective mind, while humanity faces an existential challenge, where mass extinction and global warming threaten the basis of our habitat on earth. The time for combating these developments is shrinking rapidly, narrowing the window for effective action in the next ten years foreseeably.

Finally, our societies also face a growing mental health crisis. Fueled by the other existential challenges humanity is facing as well as by an increasingly isolated youth in an environment designed to maximally appeal and subvert their basic instincts, the struggle for meaningful experiences and dialogue defines modern society, limiting societal agency on technological advancement to solely engaging with it full force.

Technology Convergence

In the next ten years, technology will transform the world forever. Especially AI is currently most visibly moving through the veil of obscurity into widespread adoption. It will undoubtedly reshape almost every human task, morphing into a key tool to help us work, move, interact, relate to each other and make sense of the world. Through AI, we will overcome the bottle neck of the human mind to process massive, ever extending amounts of data. It will assist us in boiling down information into granular levels of individual insights. It will help us to reduce the complexity of modern life by placing algorithms into the service of the individual. Meanwhile intelligent autonomous entities and autonomous machines will automate not just more and more physical tasks but especially many of our daily cognitive processes, such as content creation, ideation, design and analysis. This will increase efficiency in a post knowledge economy significantly or even outright replace it.

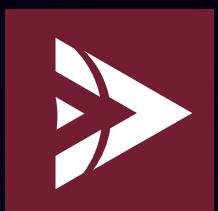
On the other side, blockchain technologies will revolutionize how we organize labor and even economic systems. It functions as a complementary technology to AI and its challenges and advantages by ensuring not only data veracity but also new forms of (autonomous) organizations, effective/real time bureaucracy, smart contracts as well as the digitalization of the core human principle of trust.

Adding to this interconnected feedback loop between AI and blockchain, VR and XR will enable this new digital world and move it beyond the compromise of a screen or mobile device. It will replace this technological limitation with a much richer experience of presence where humans interact naturally with all of our senses and with 25 degrees of freedom (DoF).

Finally, biotechnology and precision therapies intersect with AI, Autonomous Mobility and a next generation of platforms. New energy and battery technology, as well as an immense speedup through AI in innovation, will enable a new Carbon Economy with advances in carbon capture and storage technologies as well as space technology and robotics. All of these emerging systems – and many in between – feed off each other, accelerating each other like a wheel going down a cliff.

By 2035, the degree of disruption and uncertainty of these interconnected systems will be difficult to conceptualize and can seem paralyzing. However, the convergence of technologies also holds immense potential, representing new tools to face the mounting crises. At their helm lies the Metaverse, a persistent space where these developments not just merge together into an unexplored realm for human exploration but also a ubiquitous space for experimentation on how to get it right.





THE
FRONTEND
OF THE
METAVERSE
BY RICHARD SKARBEZ

2035
2025
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1950

III. THE FRONTEND OF THE METAVERSE

2035

"The metaverse is a combination of technologies [that create] a shared model of spatial data that can be accessed by the users. Its defining characteristic is the persistent shared model of all of a world if not perhaps the world. That's an area where I think it gets a little bit murky; does the universe have to cap reality, or is it something that is distinct from or in addition to reality?"

Richard Skarbez

The frontend of the Metaverse is much easier to conceptualize than its backend. It represents all the visible, recognizable and interactable aspects of the Metaverse including its power to transcend time and space for the user with VR, AR and XR Technology, new interfaces, the role of AI Assistants, new digital 3D spaces and direct-distant interaction as well as new customer behaviors, workflows and collaboration.

The profound shift towards natural interfaces and virtual reality, however, will not only al-

low individuals to experience more than their imminent physical reality, but it will allow for truly disruptive business models and revenue streams leveraging AI content and effective human-machine cooperation. In the next ten years, it will represent the next phase of digitalization, in which the gradient and speed of change will be a key challenge for business to navigate.

Digital Spaces: Beyond Time and Space

"In 'The Hacker and the Ants,' there's a scene where the main character goes into a virtual mall, the Metaverse, full of shops and people and things like that. He has a special function on his avatar that makes him tiny, and he finds a hole in the wall. He goes through that hole, and he finds this whole other world. They're all these automated creatures doing things – something that has evolved by itself.

It's that concept that fascinates me and I want to build something or help build something that can create those sorts of systems with emergent properties. That's really what my work is focused on."

Toby Tremayne

The digital spaces of the Metaverse are bound by different rules than traditional physical spaces are. They are not constrained by the laws of physics, despite being able to recreate them in a spatial representation. They exist outside of any point in time and outside of any point in space – ex tempore, ex orbis.

Obviously, direct copies of our world, at a large scale or a small scale, will be among very early use cases of the Metaverse, especially for business in the form of digital twins. However, the Metaverse goes far beyond high-fidelity representation of physical reality.

Digital Twins

Digital twins are a slice of the 3D virtual world, where business can (re-)create assets. It also enables high fidelity simulation in real world conditions, fundamentally reimagining product testing cycles in the future. It also enables a new quality of potential collaboration with customers or between creators. However, especially the collaboration of R&D with AI engineering and design assistants will revolutionize the process, the speed and the output of the economy. Assets like cars, factories, logistic networks, stores and offices will all be first built virtually before being built physically (Riedelsheimer, Lünnemann, Wehking, Dorfhuber 2020).

Physical Twins

"People are kind of familiar with digital twins. But if it's digital, you can also get a physical twin. An NFT, for example, can have a physical twin, where a commitment links a piece of digital reality to a physical artifact."

"With humans we see this kind of twinning already with your Social Media profiles and I think it's inevitable that we will soon also see it in fashion and other sectors."

"It's highly likely that physical objects in the wake of the Internet of Things are going to be tagged and indexed, having a digital presence and a physical shadow, or vice versa."

Justin Banon

The home office version of the Metaverse is another very near-term use case. Meta but also Microsoft are positioning themselves to play a key role in shaping this future. For the individual, it is very easy to imagine virtual board meetings, coffee breaks, ideation sessions or workshops that move from squares on a screen towards spatial representation – especially after the pandemic, where there is a real need to resolve the tug of war happening between employees insisting on their newfound privileges of remote work and the employers desire for effective team building, in-person collaboration and a sense of presence.

However, this is only true for knowledge jobs. Much of our modern but also future economy will consist of work with a physical dimension – mechanics, inspectors, social workers, construction work or farming. Until 2035, also physical work will be highly impacted by the Metaverse. Not only can physical tasks be enhanced by real time assistance through AR, but by remote work concepts similar to how pilots fly drones from far away on the ground. The Metaverse will enable remote physical work by facilitating physical presence through a physical avatar of, for example, a high-performance robot. Humans no longer have to be physically present themselves, but can operate the physical representation from the other side of the world. While most tasks are automated, those who cannot are still executed by a skilled human – just much more efficiently.

Atlas and Spot

Boston Dynamics is revolutionizing robotics through their products. Both Atlas and Spot are designed as mobility platforms pushing the limits of what is possible. Spot is already offering remote industrial inspections and data sourcing through automation including visual and thermal sensors, laser scanning and remote interactions. The self-charging mechanism makes it ideal for teleoperations, enabling a 24/7 ecosystem of autonomous service and maintenance machines until 2035.

Atlas emulates the human form, ideal for legacy systems and collaboration, being equipped not only with advanced control systems but algorithmic reasoning and real time perception guiding its interactions with the environment (Boston Dynamics 2023).

The Metaverse will not only enable humans to transcend physical reality but also time. Despite much of the appeal of the Metaverse being original worlds and unique places of human imagination, it will also enable individuals and especially business to simulate near term futures, alternative presents, and recent historical events. Through a comprehensive process of digitizing assets, cities or entire areas, businesses can test optimal configurations, new production setups, stress test wildcard scenarios or scale very specific aspects of their business up and down predictively.

The Multiplication of Worlds Inside One Reality

With time, however, the Metaverse will evolve from these more tangible use cases towards more comprehensive ones. Many aspects of our current modern and highly digital life will merge together into one interoperable representation with spatial properties. The digital and the physical aspects of reality – especially for Generation A – will fold together into a new reality, into a meta structure of many smaller structures that humans inhabit with their presence both in physical and digital reality.

These structures hold the promise of ultimate multiplication of virtual worlds; digital copies of the ‘real’ world, existing on top of each other and built from a scan of a real physical location with all sorts of fictional layers added on top. All of these layers could be present within versions of the same place – a version control system for reality.

Furthermore, there will also be fictional versions of real locations existing apart from each

other. One version of Berlin might not be the same as another one and neither of those are the same as the actual city at that moment. In the Metaverse, all of these instances reference the same thing, but are also expanding it.

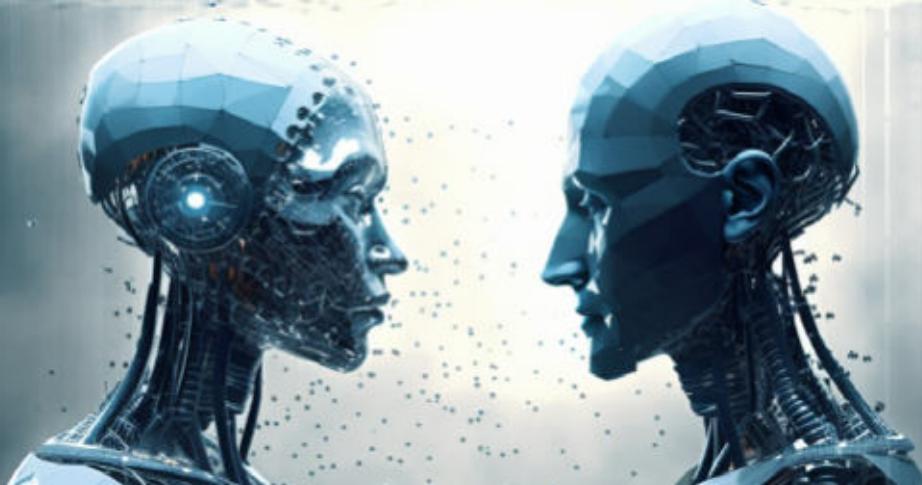
Finally, there are also locations without any anchor to physical reality, where the single reference point might be a piece of art, a piece of fiction or a certain desire. This reference point itself might have infinite potential instances leading to a potential process of atomization and depopulation of this ever-expanding reality. Users and the role of the community become crucial for success, something which we can very much observe as an important trend for business today. De-population is the failure to create popular and populated nexuses as meta-metropolis, the greatest threat to the functioning of a digital ecosystem (see below Meta-Society and AI Content).

This emergence, however, will be highly dependent on a new generation of hardware and interfaces.

“The limitations of the physical world in terms of geography and all of that connectiveness are such that the dominant arena for consciousness is going to be the Metaverse. We’ve seen the impact COVID had. We will look back on it as the trigger, that enhanced our perception of our physical limitations. It gave even more impetus to the digital liberation, where norms started to change. All social interactions or meetings were placed in this digital realm, within this emerging Metaverse – it was the trigger point for the Metaverse.”

Justin Banon





Immersive Interfaces: Natural Language, VR, AR and XR

"The average American born today will spend around 44 years of their life looking at screens. I'm on a computer at my desk right now. That will become very seamless in the future. It will become much more immersive. Throughout time, we had telegram, then the telephone, then we had the internet, written communication, asynchronous communication and now global video calls. There's not a huge leap to some virtual conference room, a virtual coffee shop, where we'll be able to shake hands and feel that handshake."

Andrew Seinwold

Individuals today spend a significant time in the digital world, however detached through a screen and limited by a keyboard. In the next ten years, this way of interfacing will evolve towards much more natural in- and output signals. And while the interfacing with the digital world through natural language and an AI Assistant like Chat GPT prefILTERING the worldwide Web for human consumption might be imminent, VR is another key technology that is offering a more human, 3D, and much more intuitive and immersive experience. Only AR is a technology – beyond niche application – that is set further down the timeline by the experts, being potentially less revolutionizing compared to the other two and morphing most likely into a highly advanced next generation of XR until 2035.

Natural Language Interfaces and AI Gatekeepers

Information technology has evolved over the millennia, from spoken word to ancestral narration, to cave drawings, written symbols, the alphabets, the printing press and finally digital text and video. Information technology transfers information from one human to another without requiring both being physically present in space and time. However, this historically led

to compromises alongside the best available technology. Cave drawings had to compromise aspects such as meaning, scale, global speed and synchronicity. The alphabet enabled concise meaning but still had issues with scale, global speed and synchronicity. The printing press revolutionized speed but still lacked the global scale the internet would introduce – however, it is still dyssynchronous.

Today, with the rise of highly sophisticated Large Language Models, synchronicity is introduced into the next iteration of information technology: Natural Language Interfaces. They recreate the highly sophisticated tool of the spoken language without the requirement of two individuals being physically present, technologically elevating the human communication style of choice: a dialogue.

Speech has come full circle, from its very fleeting nature, its inability of being preserved over time, indexed or searched to a dominant form of interacting with all global information all at once. In the future AI Assistants will crucially enable this highly performing interface of human information processing.

As a new medium this does not reshape who we are as individuals or as a society, but it unlocks a native way of expressing ourselves. It will help

to rebuild heuristics of personal interaction in turn potentially positively impacting fractured social discourse and partisan politics online – which are increasingly threatening to our social fabric (Harris, Weinstein 2021).

THE CONDUCTOR ECONOMY

"AI is inspired by human intelligence like airplanes are inspired by birds."

Sam Altman

The introduction of LLMs and AI Assistants challenges the very core of the concept of the knowledge economy. AI renders all business models of the knowledge economy obsolete as value creation no longer works on information retrieval, hierarchical storage of data and its presentation to the customer. With the evolution of a new software layer in the form of AI, data synthesis is presented to the user in a revolutionizing way which does not look at all like the original data that was used to achieve that synthesis. This changes everything, as the signal of the software itself is more valuable than the noise that created it and the customer resolves the objective at the first layer – fundamentally changing customer behavior. There is no need to consume or interpret data anymore or reward that job to a 3rd party (Friedberg 2023).

Ten years ago, many experts thought with high confidence that AI will impact blue collar jobs first, then low skilled white-collar jobs and later very high skilled jobs – and only then, maybe never, would it be able to challenge the creative mind of a human. Actually, it is moving in the exact opposite direction.

This represents a qualitative shift in the economy, not just a quantitative one, where the cost of up to 90% of the cognitive labor becomes almost zero in time. This intense rate of automatization of knowledge work accelerates productivity and innovation immensely, but also shifts value creation by humans to some degree back towards non-knowledge work, status, exclusivity and the high-quality datasets utilized to train the AI models (Altman 2022).

AI Assistants will not just function as the human gateway to global information but also as their gatekeeper. Organizational and managerial tasks as well as much of day-to-day communication can be automated at the end of the sender and the receiver. Assistance via natural language will become essential for everyone from big to small to medium sized or family-owned enterprises as well as self-employed or private individuals. This task of pre-filtered reality will become increasingly more sophisticated and essential by being trained on top of a base model towards specific environments, use cases or personal preferences and values.

Important for this development, however, is user sovereignty through trusted AI. This could mean a trusted entity behind the AI or the utilization of concepts like edge computing or zero-knowledge proofs, where personal informa-

tion is adequately safeguarded, and the control of the entity lies by the user, not the AI issuer, to safeguard against manipulation.

A Personal Stack

"We will eventually get to the point where you'll hook up to your provider and they will automatically give you a version of your personal stack. You can customize it if you care about that sort of thing, but if you don't, the personal stack takes care of everything for you. You don't have to think about the idea of hosting, of managing payments, of dealing with platforms, of data storage or anything like that – you just take an off-the-shelf package that provides all the backend services that your agent needs, including voice assistance, preference management, etc. And because it's all operating on data that is in your own silo and entirely under your control, it actually makes sense."

Toby Tremayne

By 2035, the ubiquitous utilization of AI Assistants will also lead to some degree of renegotiation of power and industry dynamics in the economy. The access and the dominant role of platforms is challenged by a new generation of platforms without powerful intermediaries. Through technological advancement, the users as the real network asset have the potential to become the platform itself. In practice, this means that AI Assistants will step in as intermediaries for individuals and entities to negotiate directly either with each other or with businesses successfully catering to them. AI Assistants will be able to process transactions and resolve queries autonomously, reliably, fully traceable and immutable, most likely with the help of smart contracts (see below The Backend of the Metaverse).

This gatekeeper or personal assistant could also bridge the gap between physical and digital realities by inhabiting a physical avatar in the form of a pocket AI Assistant in physical space, similar to our mobile device today. In the digital space, they will inhabit a skin of a personal NPC or a fully digital persona (see below Digital Humans: The Meta-Society).

Virtual Reality

"It's easy for us true believers to see where the trendline is headed in the long term. But realistically, we're still pretty close to the beginning of what's going to be one of the greatest technological revolutions of all time."

Michael Abrash

The Quest Effect

Meta is expected to dominate the future of the VR market. In January 2022, the Oculus App hit the top of Apple's App Store, one of the most competitive metrics in the industry. According to estimates, millions of Quest2 headsets were sold over the holiday season alone. This new influx of users also means new content for Quest, sustaining a positive feedback loop to position Meta as largely synonymous with VR and even XR in the future.

This does not just mean that Meta will likely be the go-to hardware provider and/or platform, but that the company will be instrumental in shaping the rules and shared understandings of the medium as a whole. This creates a network effect, that will make it hard to compete even for brands like Apple (Thrillseeker 2021).

In the next five years, VR is going to rapidly grow, in combination with hardware capabilities, ecosystems and applications. The driver for adoption will be utility. A smartphone has, compared to an immersive experience in VR, an extremely low bandwidth channel of interaction. VR, however, has the potential to recreate the entirety of the human experience in the digital realm. It will let individuals do very closely what makes them human in the first place – especially in terms of socially relating to each other.



The prospect of a strong position in the future hardware market leads all major players to vie for dominance. This drives the speed of innovation and lowers prices in the VR market, as well as significantly increases adoption. Meta has positioned itself with Oculus' Quest at the very forefront of this development, however, Apple's Reality Pro is said to revolutionize the sector with many other household names not far behind. There is also competition from China in the form of Qualcomm, but for the long-term perspective, the most advanced headsets of today, like Varjos XR-3, equipped with full face tracking (for facial expressions), pass-through technology and human-eye resolution (photorealistic perception of objects), are offering insights into the future. By 2035, VR headsets will not just be much lighter and more affordable and have a situational toggle between VR and XR, but they will actually also support photorealistic avatars and be part of an interoperable ecosystem with unlimited content, making them a potential everyday item.

Furthermore, this development will be enhanced by an array of complementary technologies offering an intuitive frictionless interface that places human capabilities in the center of the experience:

Phantom Sense

Humans are multimodal creatures. We fuse all sensory input – visual being the dominant sense, shortly followed by audio – into our experience of reality. Especially very high performative headsets, where the visual fidelity is indistinguishable from the experience in the physical world and the auditory experience is perceptively accurate, can create something like a phantom sense, where if a person touches a VR object, it can trick the brain to extrapolate the feeling of touch, similar to how a phantom limb assumes sensory feedback even though it does not exist.

The human sense of reality is really made out of this fusion, where a demo with one actuator on the finger – not hundreds but a single one – can support the sense of reality of a VR headset to trick the brain into feeling texture (Abrash 2022).

"I put on a VR headset and I saw a plate, a brightly colored plate, the kind that comes from, say, Mexico. It's ceramic, but it's not smooth ceramic, it's rough ceramic that feels almost gritty on the surface. I rubbed my finger across that plate [...] and the actuator vibrated, and I heard the sound of it rubbing across and I was rubbing my finger on a plate, there was no question. There was nothing about it that said this isn't real."

Michael Abrash

Haptic Technologies

Haptic technologies are also gaining momentum as an important part of the future hardware of immersive experiences. And despite many state of the art products from companies like bHaptics, especially consumer oriented electro-stimulation has the potential to revolutionize the market in the long-term. It is an approach promising astonishing results, not just through the Teasla Suit but also with astonishing natural conductive fibers such as the Lead Glove from AI Silk or the see-through, wireless haptic glove from WeTac that acts like a second skin. These innovations are merging wearable technology with immersive haptics, allowing actions to constrict muscles as well as uncomfortable or even painful experiences in a digital world, thus enabling the user to really feel something in the Metaverse of 2035 (Yao et al. 2022).

Electromyography (EMG)

Electromyographic sensors, for example on the wrist, can detect the nerve impulses going through the motor neurons to the fingers. They can easily pick up on micro movements, potentially replacing mouse and keyboard in the Metaverse with slight movements of the hands such as taps, clicks, scrolls or even residual, highly accelerated typing. Electromyography is said to be the last missing piece of the puzzle for immersive and interactive digital spaces, as it provides intuitive, nonverbal control over the surrounding. Furthermore, it could elevate the user experience passively by personalizing and contextualizing AI applications and by taking the VR headset data to understand the users state of mind in a specific context, proactively assisting them (Abrash 2022).

"For the first time, it really does become that assistant that is always there, trying to help you do what you want to do. Combine that with EMG because of course it can't read your mind [and] this is a very lightweight way for you to give it feedback."

Michael Abrash

The Challenge with AR

"We're actually talking about a singularity – the point in human evolution beyond which we can't currently understand what it will be like to be human. That's what I see happening."

Toby Tremayne

AR and VR often get conflated. However, they are very different and will occupy a very different role in our life. According to the experts, AR is on a extended timeline and still some time away from universal use cases (approx. 2035 or beyond). Being partially integrated and translated into VR is, however, much closer. This could for example be in form of optional mixed reality, granting the user access to interactions with objects in physical reality – such as a coffee cup or a door.

Especially the rather popular idea of AR being everyday reality, basically getting overwritten by additional information such as neon bright advertisements encroaching on the individual's freedom, is a complete misconception. Advertisements will definitely find new representations in the Metaverse, but the experts point towards more native, less invasive and more effective ways for brands to successfully advertise to customers in the next decade.

Nonetheless, there will be future applications of AR, especially regarding the evolution of a utility layer for interior design, logistics, construction, spatial planning, education or even altered experiences in physical locations. However, this ties AR to a conscious choice and a specific value, most likely remaining a niche until it will come to a full integration as light-weight next generation VR headsets in an XR environment.





Digital Humans: A Meta-Society

"There is this raising of the water for what classical Turing machines can do, including our new AI systems [...]. AI especially in the last decades plus has been a continual story of events and surprising successes knocking over one theory after another of what was thought to be impossible [...]. I would be very hesitant to bet against how far the universal Turing machine [...] can go."

Demis Hassabis

The aspect of digital humans as AI Assistants and gatekeepers in a new form of economy was already discussed above. However, digital humans fulfill many roles and functionalities in the Metaverse. Similar to humans, they have a body and a mind, they interact with actual humans, business and each other, they form lasting relationships and are different from an actual human agent inhabiting a skin or an avatar in the digital world by being a highly realistic copy of a human, with potentially a life story, a character and unique features, but without human consciousness.

3D movement patterns and complex human behaviors.

Metahuman is currently the most advanced option for the creation of digital humans. However, experts predict new AI tools that utilize general datasets to realistically model 3D characters to improve rapidly – enabling deceptively realistic full digital human representation with very limited or no concrete data of a specific situation.

The Body: Metahuman

The shell of digital humans, but also the photorealistic representation of humans as avatars, is not so much an issue for the long-term future, but one that has already fully reached into the present. Many companies and hardware providers are working on it, combining game engines and AI. Digital humans still face the challenge of ‘giving us the creeps’ or being easily told apart from a human as an animated persona, however, extrapolating the most recent advancements in the field of realistic representation of human faces, the issue with this ‘uncanny valley’ seems to be resolvable in the next few years. Until 2035, photorealistic imagery of digital humans can be taken for granted and extend also into

Deepfakes in Warfare

Deepfakes are not just an issue in terms of violating privacy or psychologically impacting an original individual's identity, but they also offer insights into the future of warfare. The authors of the report 'Deepfakes and International Conflict' published by the Brookings Institution, for example, claim that deepfakes will be weaponized by foreign adversaries for disinformation campaigns. They call for 'robust systems for monitoring and authenticating both public and private messages in real time' (Byman, Gao, Meserole, Subrahmanyam 2023), while contemplating their own potential use cases.

Despite the tangible threat of these new technologies, there are formidable downsides to such radical approaches as they inevitably lead towards a highly monitored and a very different digital space than western societies are used to today. This potentially risks making the cure more lethal to democracy than the disease. However, alternative solutions and further downstream challenges of widespread adoptions need to be discussed, including authentication without restriction of privacy, individual freedom or public discourse – especially considering innovations at the backend infrastructure of the Metaverse (Bankless 2023a). (See below Backend of the Metaverse.)

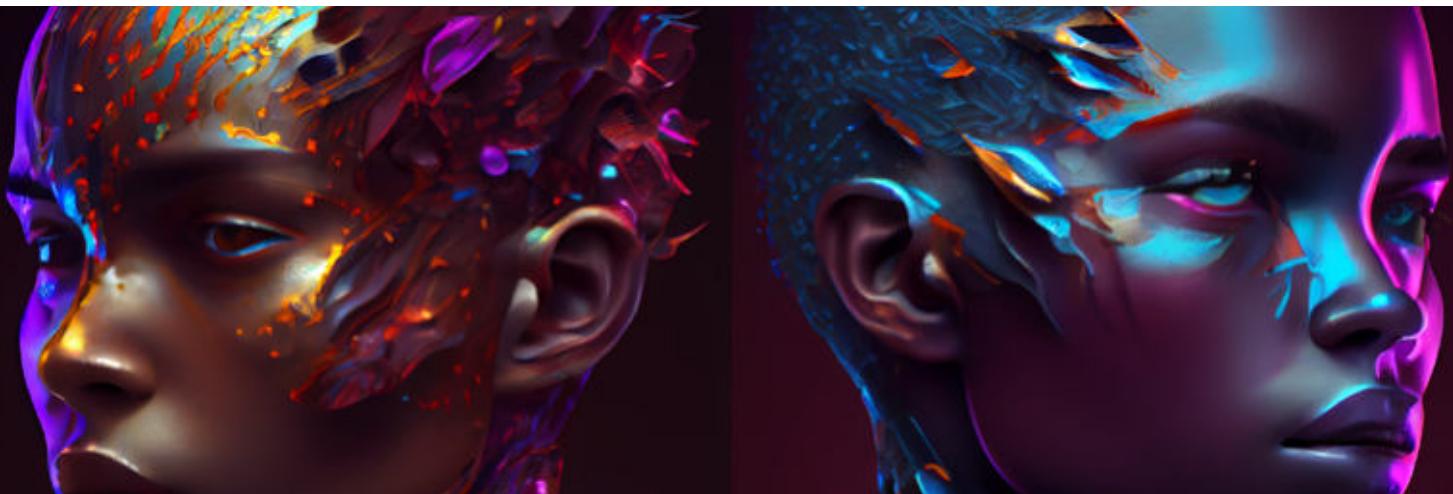
The Mind: ChatGPT

The mind of digital humans can easily be imagined as any business case for ChatGPT. Adding unique characteristics, a living memory, human flaws or quirks to this famous model makes it easy to imagine a real digital personality as the mind of different digital humans working as sales reps, assistants, guides, therapists, doctors, lawyers, consultants, educators, designers, engineers or even life coaches.

The next step of the evolution of such AIs is the feedback loop towards self-improvement. This already exists in rudimentary forms in AI architecture as generator and discriminator but would further evolve into something that is very close to singularity – where human input is not necessary for advancement any more.

In the next ten years, true value creation, however, happens at the middle layer between the capabilities of the base-model and the human job descriptions listed above. These jobs can be partially or sometimes even fully automated through more advanced models trained on specific data sets. However, despite ever more sophisticated models, experts also agree that the main takeaway is an increase in efficiency and their power as a productivity multiplier. Capable professionals or artists will be best at their job when combined with the capabilities of the AI; the model by itself will still somewhat be limited, especially when it comes to truly original thought.





Social Relationships: Virtual Influencers and Mass Entity

Over the past decade, the issue of para-social relationships in the digital realm has slowly but surely increased. Individuals isolated through a highly digital lifestyle and more recently the pandemic are forming relationships online. These relationships fulfill a basic human need and, to some degree, replace actual social relationships. This leads experts to believe that with the next evolution of digitalization through AI and the Metaverse, para-social relationships will also see an evolution in the form of digital humans.

Today, virtual influencers are rather primitive but nonetheless surprisingly popular. Until 2035, these simple virtual characters will be replaced by much more sophisticated and especially much more individualized digital companions that fill not just professional roles but also social ones, for example as a friend, caregiver, a role model or a partner – virtually indistinguishable from a human being.

Furthermore, digital humans will play a key role in populating the vast virtual worlds of the Metaverse. Game NPCs, virtual citizens, digital crowds or service bots: these characters will be what breathes life into the digital realm and award it real depth – as much, if not more so, as their human counterparts. Unreal Engine 5 already has a feature called ‘Mass Entity’ where in-game worlds can be populated by individualized characters with a click of a button, making it a powerful tool which, only a few iterations down the line, could give the user a deceptively authentic experience of a digital society.

Meta-Humanism

Lu do Magalu is currently the most followed virtual influencer with more than 14.6 million followers on Facebook, 6 million followers on Instagram, more than 2.6 million YouTube subscribers and over 1.3 million followers on Twitter and TikTok respectively. Lilmiquela makes an estimate of \$12 million a year with a successful singing acting career, working with top brands like Supreme, Calvin Klein and Samsung, while Barbie has also come alive and turned into a Vlogger. Virtual influencers, however, are not always even digital humans. Under the top 12 virtual influencers in 2023 is also a virtual bee: ‘Bee_nfluencer’ with 250.000 followers. These virtual influencers are not just becoming more successful, but also increasingly more niche, having a real impact on societal structures in the next decade (Molenaar 2022).

Digital humans also raise philosophical questions for society and businesses. Replica, for example, is a startup using GPT3 to try and replicate loved ones from their digital footprint. Having access to these digital representations could be a positive development for some in the process of bereavement, however, the long-term effects on society will be unknown. Being able to converse through time with (digitally reconstructed) personalities such as Einstein, Churchill or Picasso is an age old human dream, which could come with a cost for society that might not be obvious at first.



Automated Creation: Text-to-World

"The thing I'm really excited about: When is the first AI novel going to get published by a major publisher? I think it happens this year. When is the first AI Symphony going to get performed by a major Symphony Orchestra and when is the first AI generated screenplay turned into an AI generated 3D movie that we all watch? And then the more exciting one I think is, when do we all get to make our own AI video game where we instruct the video game platform what world we want to live in? I don't think that's happening for the next three or four years but when it does, everyone's got these new immersive environments that they can live in."

David Friedberg

Prompt Engineering

The text used to direct the model into the intended direction is called prompt. In a business, the person specializing in directing the AI to the desired outcome, interacting with it, tweaking results, navigating versions and being in charge of the final vision is called a 'Prompt Engineer'. They are the 'AI whisperers' of the future, that are – in the example of digital words – the game designers of today. The main difference being that the required skillset is shifting. Some skills will probably still be key to creating a high-quality immersive digital world, others, however, will be fully automated, opening up certain industries for new talent. This effect is not just true for game design, but any industry and any task heavily impacted by these new tools (Clark 2023).

generators has triggered the next evolution of these tools, moving from still images into video and into 3D modeling, enabling a completely new quantity but also quality of content for the Metaverse with text-to-world.

This decreases the time and the cost of not just games but everything from digital offices, to digital twins, digital experiences or even entire universes, driving the adoption of the Metaverse through a massive push in available content.

Furthermore, Game Engines like Unreal Engine 5 already enable the first steps into translating 2D content into 3D content today, bridging the gap until the adequate tools for AI created worlds will be available.

The Metaverse will encompass extensive digital spaces which will mostly be built as a collaborative effort. However, all of the content – the details, the characters, the landscapes, the music and the stories – will also be built with the help of AI tools. The success of text-to-image

The Future of Digital Worlds: Unreal Engine 5

When Epic released its new engine, Unreal Engine 5, it shocked the world of entertainment. It is equipped with vast capabilities of next-generation technology, introducing genuinely game changing tools into the world of game design. It is currently, however, not just revolutionizing how games are built, but also how film and other media is produced, being instrumental in the making of not just Hollywood productions like 'The Mandalorian' but especially also low budget Indie productions as the engine is free to use.

Lumen is the first revolution which enables accurate lighting in real time. It increases immersion significantly by mimicking how light bounces off of objects and surfaces in the real world, making surroundings in digital realities not only deceptively photo-realistic to the point where they are able to successfully trick the human brain. On top of that, Lumen is doing this without a time delay and without the enormous burden of ray tracing in traditional solutions. The vast issue of lighting becomes instantaneous. This is an absolute game changer, as the quality formerly limited to pre-rendered movie style content is now available to everyone.

The second groundbreaking technology is Nanite. Digital spaces are made out of adaptive polygons. Detailed graphics traditionally require a high polygon load, having to strike a balance between the competing forces of performance and realism. Nanite, however, removes this trade-off entirely, allowing extreme detail even in the distance (showcasing scenes with up to seven million assets made up of millions of polygons each). This reduces the enormous time and effort to scale down backgrounds or assets captured in the real world to nothing. With such a vast amount of data being able to be rendered and played all at once and in real time, entirely new possibilities are emerging, where collaborative world building could reach a new quality.

Finally, UE5 introduces the chaos engine, a technology that enables real time destruction or disassembly of every aspect of the world. When an object is destroyed, crashed or interacts in any other way with its surrounding, it is no longer pre-rendered and controlled by the vision of the game designers, but is the result of the actual engine, which makes every action and reaction unique and creates another layer of realism in the experience of virtual worlds (Altraide 2021).



Synopsis: Systemic Effects

"The Metaverse isn't a place, it's more like the void between all the places. It's the idea that there are lots of people in one place, everything is compatible, and anything is possible. It's the idea of freedom, of a lack of borders between systems, of the ability for data to go from and to wherever it needs without people having to program it."

Toby Tremayne

Digital technologies have enabled great shifts in our world and our social fabric over the last decades. The rapid evolution towards the Metaverse will continue to reshape and rearrange social norms, habits, relationships and work. It will offer new solutions and possibilities beyond the physical limitations placed on the economy today. This will have many systemic effects until 2035, for example a shift in physical mobility, digital urbanization and the dematerialization of products and services.

Physical Mobility

"The type of car might also change [...] because if we are not just traveling for commuting, if that is all taken care of by our virtual collaboration, then we really travel for leisure and we travel for fun and we travel for the experience."

Kathrin Pannier

The introduction of the Metaverse will reduce the need to relocate in the physical reality. This will lead to a tremendous decrease in mobility by eliminating most work-related travel and commute. Also, non-essential mobility such as

day-to-day mobility will shift into the digital realm, with the shift towards online retailers and e-commerce.

This makes personal mobility in 2035 something much more intentional, something special. Most physical relocation will be a conscious choice in order to fulfill a social or leisure purpose despite a non-trivial part of leisure activities also shifting into the digital sphere. According to the experts, individuals will, however, not necessarily spend more time in digital spaces overall. Instead of spending their time on a small mobile device on the way to or from somewhere they will rather spend it more intentionally and with social presence in a shared digital space.

The Metaverse eliminates the need to physically relocate by introducing the potential to digitally be everywhere in an instance. This basically introduces teleportation into the economy, where much of the time spent in a car, on a train or in a plane today will be replaced, reevaluating when digital relocation makes more sense than physical relocation.

This indirectly also eliminates the need for occupying central physical locations as an individual, where not just movement and mobility needs change but also the choice of location itself is redefined.

Digital Urbanization

"The Metaverse will bring enormous opportunity to [...] individuals who want to work and own homes far from today's urban centers. [It] is the next best thing to a working teleportation device."

Mark Zuckerberg

The emergence of the Metaverse is dissolving the need for people to remain in urban centers by further untethering work from physical location. This gives rise to a new phenomenon of de-urbanization, where cities will no longer be the sole nexus of commerce and economic productivity. Step by step, they will surrender their role as the center of modern life to the digital, growing in tandem with the expansion of the Metaverse.

There are many drivers for life in big cities. Especially convenience and work play

an important role, and so do cultural and social aspects. Much of these, however, can be recreated, sometimes even in a superior way, in non-urban settings digitally, connected by a global network of satellite mega constellations, eroding the monopoly of the physical city and the exclusivity of its benefits.

Especially in regard to work and convenience, these shifts are already visible today. With the emergence of the Metaverse, they will reach a new level of persistent remote (knowledge and physical) work, online and AI assisted shopping in 3D digital spaces and experiencing human connection as digital social presence.

At the same time, the benefits of a more rural life are increasing. The closeness to nature, its positive effects on mental health, but also the increasing economic pressures, especially on the younger generations, will draw individuals away from urban centers with the promise of a better life-work balance, but also as an economic necessity, with affordable rent, potential home ownership and overall cost of living.

Urbanization has defined the industrial age. Digital urbanization will be defining for the next one, ushering in a new age of urban planning systematically organizing areas of high population density in the Metaverse.

Currently, the Internet does not have a spatial layer – no central digital town square. Until 2035 however, digital urbanization will create new digital mega-cities where real-estate is valued first and foremost by its location and distance to high traffic areas, very much like city centers today.



De-Materialization

"By being able to build a better virtual world, we're actually helping to create a better real world."

Tom Westendorp

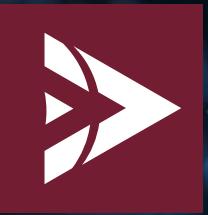
With the rise of the Metaverse, the economy will experience a significant shift towards de-materialization. Physical objects or assets are gradually or disruptively replaced by digital equivalents. This conversion of tangible assets into intangible ones includes the digitization of products as well as services and infrastructure. This might have a significant positive environmental impact by reducing materials, natural resources and energy consumption associated with physical production and current consumption patterns, but also a potential positive social impact by reducing price and introducing scalability.

Until 2035, this will have a profound impact on legacy infrastructure with potentially far-reaching implications for retail, real estate, and manufacturing. As consumers shift towards digital goods for status, expression and virtual experiences, there will be a reduced need for physical inventory. This will disrupt the real es-

tate industry particularly in commercial real estate, however, there will also be less demand for physical office space. The biggest effect of de-materialization will impact the manufacturing industry and its derivative industries, like service industries or waste industries. With more and more consumption becoming exclusively digital, the need for factories and supply chains decreases, reorganizing the way goods are produced and distributed. Additionally, the value of necessary physical goods increases in direct comparison to physical goods for consumption, luxury, or status.

Overall de-materialization will lower the investment barriers in physical infrastructure or inventory, increasing opportunities to successfully participate in the market, but also increasing competition. This will underline the importance of engaged communities for business as well as shared values and intangible meanings attached to products and services – regardless of their priority as digital or physical goods.





THE
BACKEND
OF THE
METAVERSE
IN 2035

IV. THE BACKEND OF THE METAVERSE 2035

"History doesn't repeat, but it rhymes. [In the] future, Facebook could happen to create the dominant platform where users don't actually care about true ownership and rights. However, I think the open-source nature of the ethos of the Open Metaverse will innovate at such a rapid pace, that it becomes like a dream database. The centralized types of a Metaverse ultimately cannot compete – and the Open Metaverse will get more users and more creators on board.

And people will be like, you know what? Facebook wasn't that great in web two. [...] And I'm using Facebook like a punching bag, but it's the same with a lot of web2 companies."

Andrew Steinwold

The backend of the Metaverse is much harder to observe than its Frontend, while being at least as integral to its overall development. The experts expect the backend of the Metaverse of 2035 to develop as an Open Metaverse, radically differentiating itself from the current iteration of the internet by providing a public inter-party settlement layer through blockchain technologies such as Ethereum. This represents a fundamental socio-economic shift, where value can easily, inexpensively, and almost instantaneously be directly transferred.

The current form of global, persistent and permissionless access to information has spread knowledge and ideas faster than ever before in human history. However, it also had huge drawbacks. It concentrated power and wealth in the hands of just a few key intermediaries, putting its development at an impasse. By 2035, the Open Metaverse will challenge this dynamic through the convergence and innovation of new technologies, enabling a next evolution of the internet – not just through interfaces but through the underlying systems.



Mass Adoption

Blockchain has one of the fastest adoption curves of any technology. It is growing 113% a year, which is twice the speed of the internet at its conception (Raoul Pal 2021).

"We're at Day Zero of the growth of the crypto economy. [...] There are billions of people in the world and over the next five to ten years, we're going to get all of those billions of people transacting on chain. That's the future we're headed towards."

Jesse Pollack

Furthermore, the hesitancy over environmental concerns was outright resolved by Ethereum moving from proof of work to proof of stake in late 2022. The merge reduced energy consumption by 99.95% while successfully executing the most challenging software upgrade in history – comparable to changing an engine of a rocket ship midflight (Ethereum 2023).

Finally, and probably most importantly, blockchain technology continues to attract a huge number of extremely passionate developers and young talent. The genuine excitement for this technology not only drives innovation but also new use cases, cementing the industry as one of the most promising fields for disruption until 2035 (Pal 2023)



Digital Resilience: The Tokenization of the Economy

"If you go back to 2006, that was the starting point of public cloud. [...] It took 11 years from the go signal before more than 50 % of all new business applications were deployed into the cloud. My benchmark is these 11 years after the go signal [...] – we'll say it's 2023 – so 11 years after 2023, we should get to more than half of all new major enterprise business relationships transacting on public Ethereum. [...] It will probably be a bit of an exponential curve because it'll start slowly and then, as it gathers pace just like the cloud, it'll start to grow 30% or 40% a year."

Paul Brody

The principle of a different kind of collaboration is what is driving the Open Metaverse. This new quality of collaboration is enabled by blockchain technologies being adopted in the form of enterprise blockchains that will start tokenizing the economy from the bottom up.

Until 2035, enterprise blockchains will find mass adoption by providing both easy to use, neutral infrastructure and true privacy for business use cases – a competitive alternative to the dominant platform monopolies of today's digital reality. These blockchains will not be private blockchains, as the value accrues from neutral infrastructure, but public blockchains offering non-public Layer 2 or 3 applications in form of Zero-Knowledge (ZK) roll-ups for privacy.

This enables business to automate their transactions as well as their business contracts, including terms and conditions in the form of smart contracts. Today, every time a company sends a purchase order to another company there are several steps, such as sending the products, the invoice etc., especially if there are any irregularities, nuances, or special conditions. Companies spend an average of around one hundred US dollars of time and effort every time a payment is approved – the cost of the payment itself is negligible compared to the cost of verifying it. Once enterprises are tech-

nologically able to match the terms of the business agreement with an invoice as a smart contract, settlement becomes instantaneous for a fraction of the cost. If then also business privacy for information and transactions is ensured, the process can evolve from taking 45 days down to five minutes.

Another key feature of enterprise blockchain solutions is their traceability. This applies real control to a system that currently knows very little about what happens two steps up or down in the supply chain. It is perfectly suited to illuminate an entire ecosystem end-to-end, to coordinate all of its pieces and to share business logics and data across enterprise boundaries – without having to create an all-powerful intermediary controlling the ecosystem. This makes the processes of business interactions programmable, alleviating much of the constraints of traditional systems and driving adoption over time. Anything involving multiple enterprises will migrate to the blockchain, thus becoming the standard system of record for all inter-party transactions.

Furthermore, businesses are no longer locked in, they can always freely choose somebody else as their transaction partner, revolutionizing e-commerce away from monopolized platforms towards P2P solutions. The experts in this field even believe that all industries will eventually move towards this new system of digital settlement, producing up to three or even five billion transactions per day just from industrial applications in the form of Layer 2 or Layer 3 activities – leading to an economy in 2035, where everything that is sold and bought will become tokenized.

This true traceability through tokenization will also be key for achieving adjacent long-term goals such as the Circular Economy and ESG Carbon Tracing. Once resources and assets are tokenized, they can reliably be traced and effectively repatriated back into the economy, making a comprehensive circular economy approach not just morally desirable but also practically feasible and actually profitable. Similarly, carbon can be traced on-chain, not just as a best estimate approach with many challenges of interoperability and reliability, but as a transparent real-world value along the entire supply chain – representing one of the fastest growing fields of application in enterprise blockchain technology.

A lot of manufacturing is already digitized and has, for example, a tracking number. Every time a new batch of product is complete the manufacturing system could easily interface with a blockchain application and automatically create a token. Making the only limitation to this tokenization the question of what will be worth being traced. Does an enterprise really want to trace an individual box of strawberries or rather a whole crate?

This level of traceability isn't just the next evolution of digital information, but it is also a precondition for the performance of extensive, complex, reliable and real-time digital twins. It enables the Metaverse to truly merge with the physical world and it allows a shared economy to develop – integrating the newly emerging and rapidly expanding virtual economy with the legacy structures of the physical economy and creating one reliable standard for a functioning and interoperable system.

Base: A Layer 2 Superchain

In early 2023, Coinbase announced Base, an Ethereum Layer 2 and the first of a major exchange. It is built on the Optimism (OP) stack in order to make a freely available open source platform that is scalable, secure and decentralized. In line with Coinbase's ethos to bring crypto solutions to the mainstream, they are focusing primarily on ease of access and usability and the integration of base into their products by default. This will turn the chain centricity of the last cycle into application centricity in the next one – where users start to gain actual value.

The idea of a Superchain is that every chain built on the OP stack shares the same boundaries. If everyone uses a common denominator, a lot of the complexities of being across different chains start to become abstracted away, making a crucial step towards interoperability (Jesse Pollack 2023).

“On chain is the next online. [In the future] crypto is powering every single part of our day-to-day experience – whether it's the money that we spend, the money that we save, the games that we play, the social apps that we use. Those things have been re-platformed from this online platform – which has been incredibly powerful from an information perspective, giving everyone access to information everywhere but it's still been beholden to that same centralization from a money perspective and a value perspective – onto this on chain platform which has the same information characteristics by being globally available [but] for the first time is also globally available from a money and value perspective. It [levels] the playing field [and the] future where our everyday lives are powered by the on-chain crypto economy is going to be incredible.” Jesse Pollack

Paradigm Shifts

"Collaboration, building the Metaverse together open-source is naturally superior to a closed, walled garden approach of monopolization. And the history of the human race proves that."

Toby Tremayne

The Metaverse requires interoperability and interoperability requires some degree of standards. The Open Metaverse is defined by leaving behind the walled gardens of the digital spaces



we know today, opening them up for a different quality of collaboration. It creates a digital ecosystem, which will become much bigger than the sum of its separate parts – especially when it comes to the emergence of a whole new virtual side of the economy.

This can be observed by the dynamic of all major players, such as Microsoft, Meta, Amazon, Google and Apple taking strategic decisions in line with that vision. Almost desperate to ensure their continuing dominance in the digital space of the future, they are fundamentally shifting their products to fit the rapidly emerging new reality. Facebook rebrands into Meta, mustering unprecedented resources for development to shift from 2D into 3D. Google issues a code red regarding ChatGPT naming AI assistance the future of search. Microsoft goes on a shopping spree, not just with OpenAI but also with other historic acquisitions such as Activision-Blizzard for a staggering total sum of \$68.7 billion to “bring the joy and community of gaming to everyone, across every device” (Microsoft 2022). As is tradition, Apple is focusing on competing with revolutionizing hardware and their own VR device in direct rivalry to Meta’s Oculus, while poaching their XR Head of Public Relations, one of the most experienced and competitive personal in the field of VR (Thrillseeker 2022). Amazon meanwhile still shrouds itself in secrecy, only rumored to be planning its own digital asset platform in direct support to its dominant retail platform for physical goods.

Big Tech fighting over dominance in the Metaverse will not taper off until 2035 but intensify – regardless of being explicit. Every major player will invest significant resources to shape the next generation of the internet to their liking, despite publicly committing to the vision of an Open Metaverse. However, their business models are currently all built on walled garden approaches, something that is making compatibility with interoperable systems a real challenge.

If these key players can agree on shared standards and cross-platform protocols, they will speed up developments and take a prominent position in the future Metaverse. If they fail to shift their approach, they will be superseded, opening the space up for possibly entirely new business structures.



Digital Ownerships: NFTs

"People are going to understand that this is absolutely new. It is flipping the current internet paradigm on its head from extracting value from users to adding value and giving users ownership. Over time, people will understand that and love it."

Andrew Steinwold

NFTs

"NFT's are nothing but a vehicle. They're just a way to store something. They are a technical mean to create liquidity, to build something that is truly owned, that is really, truly interoperable. This market craze is nothing but a step, a required step for everyone to learn about NFT's."

Gauthier Zuppinger

Enforceable property rights have always been a key pervasive trait of relationships in any economy. NFTs, non-interchangeable digital assets, that are unique and can be owned through blockchain technology, introduce this concept to the digital realm. Through being both decentralized and universal, they ensure trust and authenticity. They are the keys to digital ownership of unique assets and therefore enable scarcity where there has only been scalability up until now (Kicks, 2021). (See also below Digital Scarcity.)

Alongside the ability to tokenize physical goods comes the ability to tokenize digital goods. The revolution here is not as much traceability, interoperability between digital and physical, speed and cost as discussed above, but the introduction of scarcity, ownership and increased global liquidity creating new economic possibilities.

Digital assets in the form of NFTs have exploded in popularity over the course of 2022; they shocked the world only to subside in hype by 2023. The ability to truly own something in the digital realm, however, has remained as a key revolutionary concept. NFTs are the key to seamless operation in a digital world – not

just an overpriced JPEG. Especially their evolution in the form of identity as soulbound NFTs and their utility as a new form of entry pass to any event, community or concert will make them into a corner stone of the Metaverse in 2035. Everything unique can be represented as an NFT to reliably transfer, store and provide trusted ownership for it.

Soulbound NFTs

To curate an authentic digital identity across platforms while ensuring privacy at the same time, Ethereum founder Vitalik Buterin proposes a specific form of NFT, which is non-transferable. Similar to an ID or a university degree, these digital documents would be irrevocably linked to a person in order to validate digital claims securely but without having to disclose other personal information and without requiring an intermediary acting as a guarantee.

A soulbound NFT authenticating a claim of holding a specific degree would, for example, not have to disclose the issuer of the degree, an NFT authenticating an individual's gender would not have to disclose their age, name or address and an NFT authenticating successful former employment in a specific field would not have to disclose when and where the experience was gained. This could also feed into an on-chain reputation system that ensures social norms and positive digital behavior without encroaching on the value of privacy, anonymity and an open permissionless digital space in the future (Buterin, Weyl, Ohlhaver 2022).

Not just creators and artists are able to claim and therefore gain from their digital creations, also intellectual property (IP) is undergoing new iterations and a development towards different ways to monetize original content and original ideas in a much more open source, decentralized and collaborative environment.

Liquid IP

Liquid IP digitizes the rights to digital content by turning them into blockchain assets, unlocking IP from its legacy structures and potentially unlocking billions of dollars in value. Digitizing IP through the blockchain makes it not just easy to resell, license and rent, but also adds features such as seamless collection of royalties and fees for confer use, the ability to fractionalize the IP or to co-own it while being traded or borrowed against. This requires the original holder to assign intellectual property rights to the NFT as part of the issuance process, which is then enforced by law or smart contract. One of the earliest protocols in this area was OpenLaw, developing smart contracts for legal use cases (Brukhman 2020).

Another quality of NFTs is their resistance against centralized power. In times of increased censorship and centralized power over key social infrastructure, the value of censorship resistant global assets is rising. Even more so, the ability to undoubtedly proof authenticity, with the rise of deepfakes and AI generated content, might quickly become systemically important. NFTs are impossible to alter or manipulate. They cannot just be deleted, updated, or faked without consent, not even by the directive of a court. This is a digital first and the key to a functioning, reliable and permissionless future of an expanding Metaverse.

It makes NFTs the underlying asset class for digital inventory and digital goods, a tool for collectors, traders, gamers, events, communities, business, and normal citizens to participate in and profit from – to truly engage with the economic activities in the Metaverse.

Once reliable ownership is set as a standard for the digital realm, individuals will be even more willing to invest time, money, and their emotions into building digital worlds, economies, and communities. However, as these technologies are still very much at their beginning, their final iteration and impact are impossible to predict.

Persistent Challenges of the Public Space

The debate about the future of the public square remains contentious. With the advent of the Metaverse, the discourse expands towards digital realities and how individuals would experience it with spatial presence.

What rules will be guiding such a shared space? According to which norms will content and digital artefacts be anchored in the digital public? Who is allowed to participate, what voices are elevated and for what reason? How is the public square policed and norms enforced?

The experts approach this issue mainly from the view of personal control. The individual will have the right to freeze out actors and information, remaining in full control over their digital reality. This relegates the right to put out information, but raises the importance of trusted AI assisted filters.

The rise of social media has put society into an unprecedented position today. The value of freedom of speech and open discourse is essential for a functioning democracy. However, recommendation algorithms are designed to maximize engagement, fostering outrage, fracturing social opinion and giving rise to calls for intervention. This is naturally emboldening a majority opinion to police and moderate the public square to their advantage, reaffirming outrage and further fracturing social positions.

On the one hand, the sheer volume of content is overburdening public servants, and criminal behavior in the digital realm is left mostly unaccounted. Amplified by AI generated content, truth and reality will no longer be reliable or even discernible for humans, fundamentally challenging the rise of the Metaverse and the next iteration of social norms (see approaches for solutions below Digital Identity).

However, the Metaverse also introduces hope with its shift towards social presence and spatial interaction. The next iteration of digital spaces will therefore serve the user much better and in accordance with natural behaviors, constituting a unique setting for digital but in person communication to alleviate such symptoms.





Digital Scarcity: Value and Incentive Systems

"Digital scarcity is a complex thing because it's up to the builder to define viscosity. Some assets need to be scarce, some don't. NFTs are definitely a way to ensure viscosity and to prove that this one is the unique one, the first one of something. It is the first history of digital assets – everything can be positively stored as an NFT."

Gauthier Zuppinger

The Next Iteration of Money: Ether as a Triple-Point Asset

There is a saying that time is money. But in truth, money is also time. It is a token of value, a social technology that allows civilizations to scale. With blockchain technology, this social technology has been advanced to have additional, digital features, becoming a highly versatile digital token of value, a non-inflatable, (ultra)sound money with zero marginal cost of production, programmable and not constrained by physical laws.

Experts expect Ethereum to be a central contender for the money system of the future internet, satisfying all the requirements new economies in the Metaverse need at the same time.

Especially its possible classification as a capital asset, a store of value asset as well as a consumable or transformable asset makes it unique in its competitiveness, not just with one other legacy asset class but all of them simultaneously: national currencies, precious metals, income producing real-estate, bonds, equities and commodities. Since the merge in 2022, it has even become deflationary and ecologically sustainable (Hofmann 2019).

Bitcoin has propelled a growing number of individuals and enterprises worldwide to act in its interest, providing massive infrastructure, development time and other tasks to a completely decentralized system. Through the mechanisms of mining – and later on also staking – new incentive systems have been uncovered, altering how digital communities are enabled to organize and to leverage collective action towards a common goal.

"The granularity with which one can use tokens to incentivize and reward certain behaviors is unprecedented."

(Kicks 2021)

Tokens technologically align collective interest with a tangible individual interest, enabling the economization of intangible assets and uncovering innovative solutions for social trust.

Tokens are, however, not just cryptocurrencies (fungible tokens) that individuals and institutions use to speculate or store value. They are an advanced set of tools for collaboration, DeFi, the distribution of digital property, the restriction of access, on-chain governance and much more. Blockchain digitalizes these systems and the mechanisms itself, forcing value to become intrinsic not extrinsic.

Ticketmaster and NFTs

Utility NFTs today offer something unique to artists, industry and fans. With NFTs, it becomes extremely easy to find new ways for unique experiences and individual benefits to become part of a simple ticket. This way, especially loyalty or other intangible values of a community can be extended on with the help of the fan experience. The NFT can be more than a simple, practicable, universal and secure ticket for an event, but it can act as a key to unlock special content or behind the scenes engagement, be integrated into merchandize, give access to reoccurring events, or become an identifier for very select communities and much more. This makes NFT tickets collectibles themselves as well as a tool to really extend experiences and status (Reilly 2023).

Ticketmaster, the biggest industry player in the US, leads the charge with tickets as NFT collectibles. "Since its inception, we've seen significant growth in the use of digital collectibles as an engagement tool with over 14.5M minted NFTs across 4K events." (Ticketmaster 2023)

Blockchain technology also enables collective entities to optimize decision making, where a large group of contributors can be organized in a way to form a hive intelligence in order to address specific challenges from a new perspective. Collectively, such groups, for example in the field of stock analysis, have been able to significantly improve certain outcomes through this collaboration jump.

However, this new technology can also be utilized to distribute value equitably:

"At the same time, community tokens will ensure to incentivize better behavior. One of the biggest challenges that we have in the corporate setting is distribution of value. How do you get a stock certificate for being an Uber driver? You don't. Uber drivers built that community, it's not Uber, Uber's technology is not remarkable. They built a networked effect because they built inertia [...], volume of transactions and [a] user base. But if there were a better option why would I want to stick around at Uber? If I could drive for a community-owned version of that? Like a driver DAO?"

John Paller

Worldcoin

Worldcoin is a project aimed at providing a UBI solution for the future by developing innovative blockchain-based value re-distribution mechanisms. It claims to be building the world's largest public utility network for identity and financial services, relaying its ownership to every individual. This universal access to the global economy will accelerate the transition into a new accountable economic future, while ensuring personal privacy and public collaboration. The first token of Worldcoin is expected to launch in the first half of 2023, globally and freely distributed to individuals for both utility and future governance (Worldcoin 2023).



Digital Identity: Proof of Everything

"We've just unleashed AI. [...] We can basically create any video content we want and we can create deepfakes [...] and there's nothing you can do about it and nobody's going to know whether it's authentic. [...] All you need is to put branding on it, I put it up my Twitter and say 'Hey, look at this article in the New York Times: Biden's agreed to Nuke Russia. Nobody knows what the truth is, going into the election [2024]. This is a huge societal problem [...] Nobody is ready for it and I think the only way of dealing with this is authentication of content and authentication of people, which I think is an NFT use case."

Raoul Pal

In the Metaverse, identity will expand into different roles and personas depending on the context. The primary identity might be the legal person, with a state issued ID, used in formal settings or work, whereas other identities are used in public or private digital spaces.

With self-sovereign identity, as long as the individual does not choose to share their personal information, there is no access granted to this information to others.

However, the inventory of the Metaverse is also a part of this identity in form of a universal digital vault or wallet, where NFTs and other digital assets such as stablecoins, tokens, customized skins, items, data, files or digital real-estate or access cards are stored.

To ensure safe, reliable, and private identity in the Metaverse, the blockchain is a uniquely fitted tool to be utilized as a form of universal proof. With zero-knowledge proofs, an individual can prove outright anything – it can prove its experiences, income, status, affiliations, and values. And it can prove its humanity. Business can prove reserves, inventory, carbon footprint, compliance, working conditions, resource availability, product location and payment history. And it can prove its soundness and dependability as a partner.

All of this is part of identity and can be part of trusted social contracts ensuring the functioning of society and economy in the context of an Open Metaverse.

Proof of Humanity

The concept of proof of humanity refers to a system that utilizes a curated list of credentials, that are considered by a DAO (decentral autonomous organization) to hold authority proving the holder as a genuinely unique biological person – producing something as trustworthy as a digital driver's license without an intermediary.

Especially as a zero-knowledge proof, this ensures both anonymity throughout different identities, personas, and skins and a working system of accountability.

If someone for example provides medical services, they require proof of humanity, proof of their medical license and proof of reputation or client satisfaction.

This creates trusted and safe digital spaces, where people can be anonymous, but also accountable and affected by their long-term reputation (Proof of Humanity 2023).





Digital Marketplace: Future of Work

"The process of commerce should just be completely invisible. If you want to buy something, in whatever context, you could be watching a video game, you could be anywhere in world, in a store with augmented reality or you could walk down the street.

You could see another girl with a nice handbag, right? And it could be for sale, and you could say, I want that. And without talking to anyone, you could do an exchange. Your automated economic agents commit to the terms, and you went from seeing her handbag – she's got a Gucci bag on sale – to the exchange being coordinated, and people getting paid seamlessly.

That's what we're talking about in the Metaverse: Infusing commerce in an automated, non-extraction freeway across everything – as part of an open liquid digital marketplace where everything is searchable, indexable and transactable."

Justin Banon

The experts describe the Metaverse with monetization features already built into its core structures, enabling users to seamlessly trade, tip, gift and share value, content and experiences. How explicitly any of that is achieved is still very much contended, however, as discussed above, the tokenization of physical and digital objects, that then become transactable rather than remaining static records within a centralized database, will be a close first step. State issued CBDCs, stablecoins and natively digital cryptocurrencies will play an integral role in facilitating such frictionless value transfer. However, the Metaverse will extend its profound impact on the digital marketplaces also towards the future of work.

Over the course of the last years, many companies have transformed into being remote first. Despite some backlash to force employees back into the office, employees no longer need to be physically present, awarding truly distributed companies a long-term competitive advantage with the workforce.

Until 2035, this will lead to successful companies investing in remote solutions, executing their contracts over smart contracts and utilizing stablecoins and wallet infrastructure for internal transactions. However, companies will not just increasingly compete with each other for skilled labor but with collective self-employment. Blockchain enables groups of individuals spread all over the world to come together for a common purpose as individual contractors, working for each other and distributing funds based on the work they deliver.



Opolis: On-Chain Self-Employment

"Employment is the key to mass adoption. DAOs are the [...] source of funds. We've got these next generation organizations that have community, they have tokens, they have next generation governance and coordination mechanisms, value distribution mechanisms that allow people to earn from anywhere in the world permissionless. But how do we legitimize it, how do we actually plug it into the old world? That's essentially what Opolis is."

John Paller

DAOs are organizations run by code, where smart contracts allow the systems to run self-sustainable. They reorganize employment and empower the employee in the form of a global public employment utility infrastructure that allows individual contributors to work from everywhere, with whomever and however much they choose. In this system, any currency is accepted in any jurisdiction while crucially safeguarding access to all necessary services and other privileges of modern employment. This enables completely permissionless employment on a global scale that successfully translates a lot of the current crypto complexities into a user friendly experience for the average user (Polygon Alpha 2022).

The obstacles to self-employment often are very basic needs like healthcare, insurance and retirement benefits. Today, employers act as the assurance layer to access those basic needs. Until 2035, this role will be gradually incorporated into usable blockchain applications, decoupling employer and employee and reducing the need for an intermediary in the process of value creation. Those who will still be working for a company will start to expect the same level of control over their time and how to invest it as their peers enjoy.



Synopsis: Systemic Adoption

"Then I had my red pill moment [and] the light went on. It's kind of like waking up out of the Matrix and you're just like – you can't unsee it. It was just a paradigm shift for me. I started understanding that these are [...] economic coordination tools, they are integrity tools, they are benevolence management tools [...] but it just took time to really understand it."

John Paller

Blockchain technologies will enable unprecedented shifts in our world and our economic fabric in the next decades. They will profoundly shape the digital economic space of the Metaverse and in turn create new industries, reimagine enterprise structures, social organization, governance and participation as well as authenticate content. They offer new solutions and possibilities beyond centralized intermediaries and build a bridge between existing economic systems and emerging ones. This bridge will be built in many areas, however, societal and institutional adoption as well as early adopters are the imminent drivers of this technology.

Societal Adoption: Digital Trust

"It's a giant portal for people to walk into this world and over time be like: Hey, maybe I should take some of my payroll in [...] Eth or Bitcoin, you know, whatever they want."

John Paller

The unique value proposition of blockchain technology in the context of the Metaverse is the digitalization of trust. It is the central puzzle piece to social adoption, as it not only safeguards society from potentially existential challenges from rapidly emerging AI adoption, but it also acts to facilitate societal innovation. Trust

is the adhesive of a society and its economy. Much of everyday interaction can be conceptualized as social contracts realized through trust. In the digital realm, this trust has been eroded, a challenge the Metaverse seeks to resolve by introducing digital trust and blockchain technology.

This not only leads to significant efficiency and productivity gains in the digital economy, but successfully erodes the position of monopolies and intermediaries. Not just centralized platforms and banks, but also insurances, other service centered enterprises and institutions more broadly will be challenged or transformed by this diverse technology – as long as the primary value proposition in some way or another is the facilitation of inter-party trust.

Early Adoption: Digital Entertainment

"The idea that surrendering elements of economic control to your userbase can unlock fundamentally new, potentially larger, revenue streams is, admittedly, counterintuitive at first."

Piers Kicks

The gaming industry represent the forefront of the Metaverse. Over the last twenty years, games have not just successfully formed loyal communities but have evolved into real economies. Gamers were the first to ascribe real value to virtual goods, solely based upon utility or status in the game. They allow us to glimpse into the emergent phenomenon of digital worlds driving forth this new frontier not just through the advancement of large-scale infrastructure, immersive technologies but also trough persistent, large scale digital environments with vibrant communities willing to invest in them.

Gaming bleeds into events, entertainment at large, social relations and value creation challenging other industries for economic dominance in the future.

The last iteration of games has been centered heavily around player lock-in, microtransactions and other predatory practices. However, the community has been reluctant towards this approach, opening the industry up for new ideas and possibilities in the Metaverse.

Until 2035, games will be much more multi-player oriented, less restrictive, less pre-scripted and much more responsive. Player led story arcs with real agency, active community development of the world and real economic stakes will transform stagnating innovation into new massively collaborative approaches. Over time actual digital ownership will be introduced to harness the potential of creating real in-game economies and rewards for developing and expanding the shared world, a challenge best suited for blockchain technology.

Finally, experiential digital spaces derived from complex game environments will become a way of large-scale testing for acute real-world challenges.

Institutional Adoption: Digital Frontier

"I'm focusing on the whole idea of blockchain for securities. I look forward to the day when we could tokenize stocks and bonds, that every stock and every bond we could identify immediately [...]. This is why we're working on it [...] and that's where we want to take this and we're leading that effort."

Larry Fink

The backend of the Metaverse, in form of blockchain technologies, has also reached institutional adoption. BlackRock, arguably the most powerful financial entity in the world, has recognized the disruptive potential of this new technology, partnering with Coinbase to provide institutional clients with direct access to crypto through Aladdin. Alongside BlackRock, many institutional actors are positioning themselves to interface in some way or another with this new asset class and almost all governments are trying to utilize the technology for their own digital currencies to stay competitive.

Or to phrase it in the words of the most recent letter to the BlackRock shareholders:

"Several governments [are] looking to play a more active role in digital currencies and [seek to] define the regulatory frameworks under which they operate. The US central bank, for example, recently launched a study to examine the potential implications of a US digital dollar."

A global digital payment system, thoughtfully designed, can enhance the settlement of international transactions while reducing the risk of money laundering and corruption. Digital currencies can also help bring down costs of cross-border payments, for example when expatriate workers send earnings back to their families. As we see increasing interest from our clients, BlackRock is studying digital currencies, stablecoins and the underlying technologies to understand how they can help us serve our clients."

CBDCs

Almost all central banks are involved in developing their own native stablecoins or digital currencies. Despite similar technological backgrounds as a distributed ledger technology or a private blockchain, CBDCs differ fundamentally to public blockchains and cryptocurrencies by offering centralized control over the financial system as well as requiring permission by said centralized entity to use them.

This offers the centralized entity an unprecedented level of control, leading many experts to criticize such a system as dystopian and susceptible to authoritarian tendencies. Monitoring, constricting and excluding actors from the communal payment system would grant the central banks and the governments unrestricted control and information over the individual users, threatening the democratic foundation of our societies (Ripple 2020).





V. CONCLUSION

The Metaverse provides the tools for a next generation of digital systems, allowing people to directly participate in the value they create. It replaces third party intermediaries with trusted technology while offering 3-dimensional digital spaces to imagine and be immersed in with other humans and AIs.

It will become an important platform for commerce, entertainment, and social interaction, leading to the decline of some key areas of physical infrastructure. It will gradually replace the screen as the primary digital interface, placing natural and intuitive human communication at its center.

But also new use cases will be key for business in the future, for example in the field of education, life-long qualification, and AR training, leading to new methods of skill development and the transference of institutional knowledge in a context of accelerated automation and intensifying skilled labor shortages.

The Metaverse will also undoubtedly lead to the creation of entirely new industries and job opportunities centered around virtual worlds and their future service economy. This is especially true regarding blockchain technologies which will ensure and secure private interoperability. However, enterprises will also be forced to adapt by innovating advanced virtual goods and unique digital experiences.

The rise of virtual reality and other technologies will crucially enable remote work and remote socialization leading to an increase in the value of non-urban areas. This will decrease physical mobility needs and create new digital mega cities, impacting the cultural fabric and physical infrastructure in the long-term.

Finally, the Metaverse will be permeated by pervasive Artificial Intelligence and machine learning (unnoticeable through models and algorithms and noticeable through digital humans) to improve user experiences and facilitate automated worldbuilding, especially when it comes to personalized content and individual recommendations as well as enhancing discoverability and enjoyment for the user.

All in all, the Metaverse is much more than just a cartoon version of Zoom or a bulky VR set. It is a complex, interlinked, next evolution of the digital realm coevolving with the convergent force of all the major technologies of our time. It is forming an existential challenge for future oriented business to explore, reimagining value propositions and business strategies as well as untethering humanity from almost all its former constraints.





VI. STRATEGIC RECOMMENDATIONS

Based on the expert interviews, certain recurring themes were identified regarding the Metaverse in 2035. In the following, they will be summarized as strategic recommendations applicable to all industries and enterprises.

Therefore, these recommendations cannot be broken down for specific products, services, business structures or markets. They are meant as a starting point for further exploration of the topic in your specific environment, your unique long-term challenges and the opportunities yet to be realized.

Please feel free to contact us at any time if you are looking for assistance with these concerns.

In order to remain a successful actor in your industry and to leverage the Metaverse with its full potential until 2035, decisionmakers need to marry into the following ideas:

1.

Adapt to the new reality of deglobalization by focusing on resilient sourcing, supply chains and markets.

The Metaverse gives rise to a new quality of globalization until 2035, which will manifest alongside new blocks of power due to global-political long-term developments. Especially traceability and decentralization will be key to new approaches of resilience through new digital opportunities.

2.

Transform the challenge of decarbonization into an opportunity by offering regenerative solutions for your industry.

The Metaverse also offers practical, scalable solutions for core societal issues until 2035, such as an economy driven by carbon and the expansion of economic measurements to include not only price but also overall (environmental) impact.

3.

Adopt decentralization by reorganizing your business structures alongside new values.

In the Metaverse, decentralization will evolve rapidly, moving from a very centralized point in time towards the other end of the scale: more decentralized organizations and systems. This will challenge legacy structures with new approaches such as decentralized production, decentralized platforms, decentralized employment, swarm collaboration and decentralized sourcing.

4.

Leverage deurbanization by reimaging your products and services as well as your employment policies.

Until 2035, the Metaverse will also impact the physical. Urban and rural spaces will be reimaged, while infrastructure and services will adapt towards digital presence, where the exclusivity of physical presence is stripped away.

5.

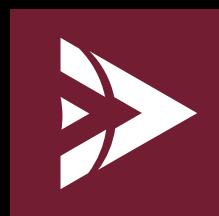
6.

Explore the options dematerialization offers for your business by reevaluating your value proposition in a virtual space with social presence.

Digital goods and services play a central role for the future economy. Until 2035, many of the traditional value propositions will have to be extended into the digital realm. This is an entirely new domain for both business and customers ready to explore first principal approaches.

Utilize the wave of dehumanization and delimitation of the economy through AI by recognizing its potential to exponentially increase the productivity of your business model.

The most important adhesive in the Metaverse until 2035 will be the power of AI. It is not just highly versatile but also yet to be fully realized. Especially the challenge of AI gate keepers, i.e. AI as a filter for much of the decision making and interaction of the future, requires business to develop new ways to cater to the AI in the form of B2AI communication and new marketing strategies.



VII. METHODOLOGY



This study is a qualitative future study, combining an in-depth analysis of existing expert interviews with thought leaders in the field with the prominent Delphi methodology.

At the beginning of the study, an interdisciplinary TrendCycle together with traditional desk research was conducted by an interdisciplinary team of future scientists to establish a 360° perspective on the very complex and rapidly evolving Metaverse in 2035. The aim with this approach is to dissect this multifaceted issue from all sides, giving way to new avenues of thought regarding its long-term development.

To this end, public interviews from prominent experts were analyzed together with other sources, forming a first iteration of how the Metaverse will develop until 2035, what barriers and drivers are expected in the industry as well as how the process of building the Metaverse will look like in practice.

On this basis, further experts with a unique perspective, various backgrounds and special insights into this evolving industry were identified and recruited as interviewees. This iterative process is particularly important in a qualitative study, which is why special care was taken to ensure that each expert – public or selected by 2b AHEAD – was in a position to shape future developments when it comes to the broader question of the Metaverse.

Following the Delphi method, the selected experts were then interviewed in semi-struc-

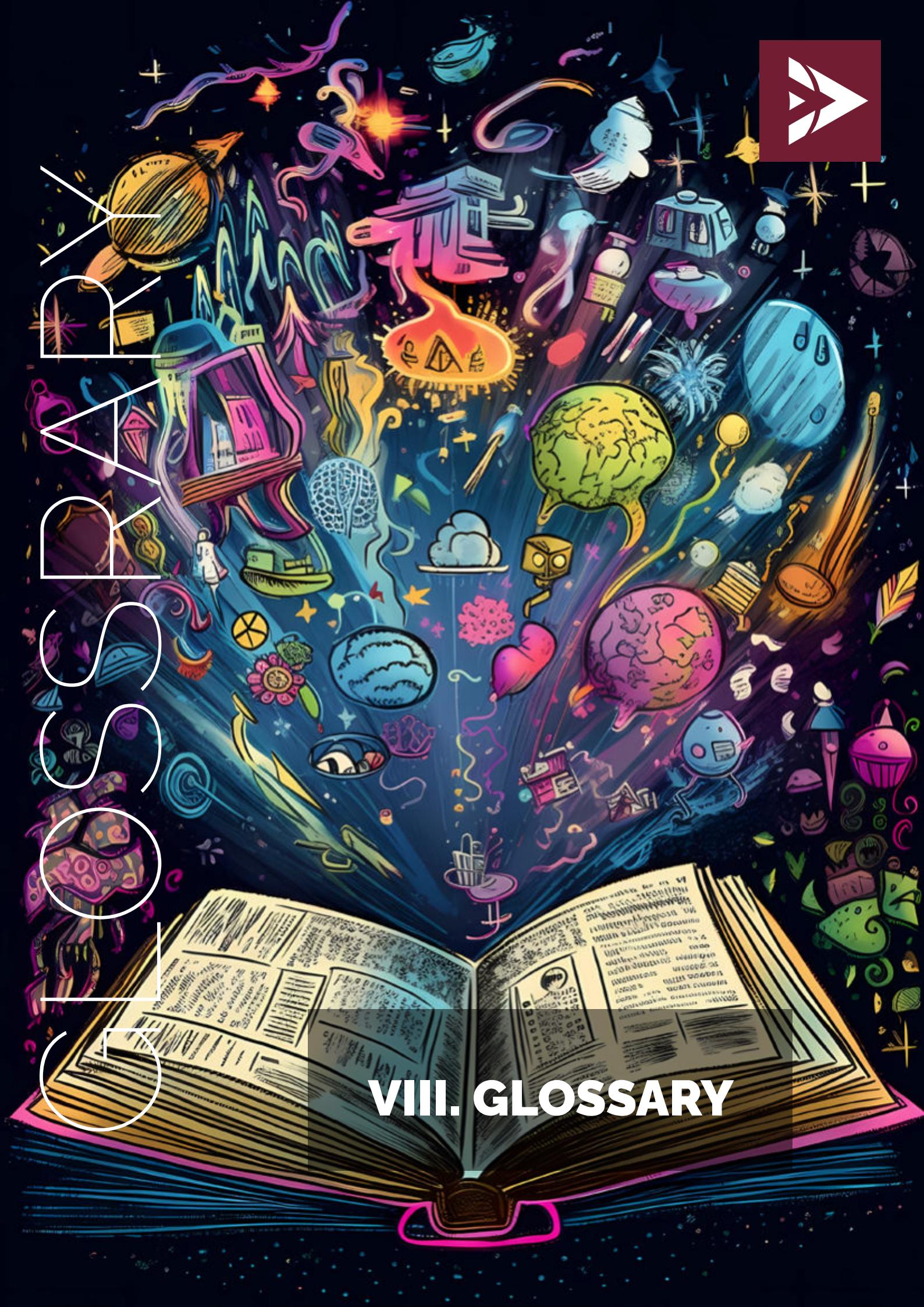
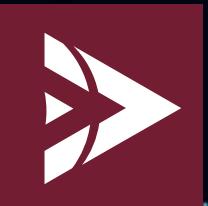
tured in-depth interviews on the most important trends, developments, and challenges for business in the next ten years, to be analyzed together with the publicly available expert interviews.

After this first round, the second round of the Delphi process followed; being expanded on in the form of a Giga-Delphi approach assisted by AI, reflecting on the experts' opinions and hypothesis generated throughout the interview and analysis phase. This aims to evaluate and put the expert opinions into perspectives, enabling an AI assisted reexamination of all aspects presented as crucial in the next ten years, as well as supplement or adjust them in order to develop a consistent and validated perspective on the Metaverse 2035.

Finally, all inputs were gathered and comprised in this final report.

Please find detailed information on the experts that participated or were drawn upon below. We are extremely grateful for them sharing their perspectives, either publicly or in form of prolonged participation in this process to enable this study on the Metaverse 2035 in the first place.

Special thanks to all the unique perspective of the experts and in the literature review, all crucial building blocks of not just how the Metaverse should be, but what it actually could be in 2035.



VIII. GLOSSARY

AI Art

AI Art refers to the use of Artificial Intelligence techniques to create, modify, or enhance visual and audio artwork. AI can be used to generate new images, videos, music, and other types of media by training neural networks on large datasets of existing artwork, and then using these networks to generate new content that has similar characteristics. AI Art can also be used to modify or enhance existing artwork, for example by using image segmentation to remove or replace certain elements, or by using style transfer techniques to apply the style of one artwork to another. AI Art has generated significant interest in the art world and has been featured in several exhibitions and galleries. Some notable examples include the portrait generated by the GAN-based artwork "Edmond de Belamy" and the NFT-based artwork "Everydays: The First 5000 Days" by Beeple.

AI Assistants

AI Assistants are software applications that use AI and natural language processing (NLP) technologies to interact with users and perform tasks on their behalf. Examples of AI Assistants include virtual personal assistants like Siri, Alexa, and Google Assistant, as well as chatbots and other conversational agents. AI Assistants can be used for a variety of tasks, such as scheduling appointments, setting reminders, playing music, answering questions, and controlling smart home devices. They can also learn from users' behavior and preferences to provide personalized recommendations and improve their performance over time. The development of AI Assistants has been driven by advancements in machine learning, NLP, and voice recognition technologies, and they are increasingly becoming a ubiquitous part of our daily lives.

AR

Augmented Reality (AR) is a technology that overlays digital information onto the real-world environment, typically through a smartphone camera or a headset. AR creates an interactive experience by superimposing computer-generated graphics or data onto the user's view of the physical world. This can be used to provide additional information about the environment, such as the names of buildings or businesses, or to create new forms of interactive entertainment or marketing. AR has many applications, including gaming, education, navigation, and advertising, and is being used to create new and innovative ways to interact with digital content. As AR technology becomes more advanced and widespread, it has the potential to transform many aspects of our daily lives.

Bitcoin

Bitcoin is a decentralized digital currency that operates on a peer-to-peer network without the need for intermediaries such as banks or governments. It was created in 2009 by an unknown individual or group using the pseudonym Satoshi Nakamoto. Transactions are recorded on a public ledger called the blockchain, which is maintained by a network of users known as nodes. Bitcoin can be bought and sold on exchanges or used to purchase goods and services from merchants who accept it as payment. The supply of Bitcoin is limited to 21 million coins, and the currency is created through a process called mining, where powerful computers solve complex mathematical equations to verify transactions and add new blocks to the blockchain. Bitcoin is known for its high volatility and has been subject to regulatory scrutiny and controversy, but has also gained widespread adoption and acceptance as a viable alternative to traditional currencies.

Blockchain

Blockchain is a decentralized, distributed ledger technology that allows for secure, transparent, and tamper-proof record-keeping. It is based on a network of computers, known as nodes, that work together to maintain a shared database of transactions. Each transaction is verified and validated by the network, and once approved, it is added to a block of transactions that is linked to the previous block, creating a chain of blocks or a blockchain. The data stored on the blockchain is immutable and can be accessed by anyone on the network, making it ideal for applications such as cryptocurrencies, supply chain management, and digital identity verification. Blockchain technology has the potential to revolutionize many industries by enabling secure and efficient transactions without the need for intermediaries.

CBDC

Central bank digital currencies (CBDCs) are digital versions of fiat currencies that are issued and regulated by central banks. CBDCs are designed to be secure, efficient, and accessible, and to provide a digital alternative to traditional paper-based currency. CBDCs use blockchain or other distributed ledger technologies to enable peer-to-peer transactions, and they can be used for a wide range of payment and settlement services. The development of CBDCs is seen as a response to the increasing popularity of cryptocurrencies, as central banks seek to maintain control over the monetary system and to ensure that they remain relevant in a rapidly evolving financial landscape. CBDCs are being developed by central banks around the world, and are expected to have a significant impact on the way that we transact and store value in the future.

ChatGPT

ChatGPT is a large language model created by OpenAI that uses natural language processing techniques to interact with users and provide responses to a wide range of questions and topics. ChatGPT is trained on vast amounts of text data and can generate human-like responses to text inputs in real-time. The model can understand and respond to a broad range of questions, from general knowledge and trivia to more specific topics such as science, technology, and business. ChatGPT can also provide recommendations, opinions, and advice on a wide range of topics, and has been used in a variety of applications, including chatbots, virtual assistants, and customer service platforms.

Cryptocurrency

Cryptocurrency is a digital or virtual currency that uses cryptography to secure and verify transactions and to control the creation of new units. Cryptocurrencies are decentralized and operate independently of central banks or government institutions, relying instead on a network of computers to validate transactions and maintain the ledger of accounts. The most well-known cryptocurrency is Bitcoin, but there are now thousands of other cryptocurrencies, each with their own unique features and use cases. Cryptocurrencies can be used to buy goods and services, traded on cryptocurrency exchanges, or held as a speculative investment. The technology behind cryptocurrencies, known as blockchain, is also being applied to a wide range of other industries and use cases, from supply chain management to digital identity verification.

Deepfakes

Deepfakes refer to synthetic media that are created using AI and machine learning techniques to manipulate visual or audio content, making it appear as if something has happened that did not. These can range from manipulated videos to doctored audio recordings, all of which are designed to look and sound as authentic as possible. Deepfakes have become increasingly sophisticated in recent years, and they are often used to spread disinformation, defame people or institutions, or for entertainment purposes. This technology poses serious challenges for society, as it can be used to spread fake news, create political unrest, or cause harm to individuals or businesses. As a result, efforts are underway to develop ways to detect and mitigate the impact of deepfakes on society.

DeFi

Decentralized Finance (DeFi) refers to a set of financial applications and services that operate on a decentralized, blockchain-based platform. DeFi applications provide traditional financial services such as lending, borrowing, trading, and investing, but without the need for intermediaries like banks or other financial institutions. Instead, DeFi applications are powered by smart contracts that automatically execute transactions according to predefined rules, with no need for human intervention. This allows for greater transparency, accessibility, and flexibility in financial transactions, as users can interact with DeFi protocols using digital wallets and other decentralized tools. DeFi has the potential to disrupt traditional financial systems and democratize access to financial services for millions of people around the world. Some popular DeFi platforms include Uniswap, Aave, and Compound.

Discriminator

In a Generative Adversarial Network (GAN), the discriminator is a neural network model that is trained to distinguish between real data and synthetic data generated by the generator. The discriminator is trained using a dataset of real data and is then presented with both real and synthetic data created by the generator. The discriminator then determines whether each piece of data is real or fake and provides feedback to the generator about how realistic its synthetic data is. The goal of the discriminator is to correctly identify which data is real and which is synthetic, while the goal of the generator is to create synthetic data that is indistinguishable from the real data to the discriminator. As the two models compete with each other, the discriminator becomes better at identifying the differences between real and synthetic data, while the generator becomes better at creating more realistic data. The discriminator is a key component of a GAN and is responsible for providing feedback to the generator on how to improve its output.

DLT

Distributed ledger technology (DLT) is a decentralized digital system that uses a network of computers to store, record, and share information across a wide range of users in a secure and transparent way. DLT provides a platform for the creation of digital assets, such as cryptocurrencies and other tokens, and facilitates the exchange of these assets in a peer-to-peer network without the need for intermediaries. DLT is based on the concept of a distributed ledger, which is a database that is maintained and updated by a network of computers rather than a central authority. This technology offers numerous benefits, including increased efficiency, transparency, and security, and has the potential to revolutionize industries such as finance, supply chain management, and healthcare. Some popular examples of DLT include blockchain, Hashgraph, and Corda.

DoF

In the context of virtual reality (VR), "degrees of freedom" (DoF) refer to the number of ways in which a user can move within a VR space. Specifically, 25 degrees of freedom would mean that a user has 25 different types of movement or interactions available to them. This could include things like six degrees of freedom for head movement (up/down, left/right, forward/backward, and pitch, yaw, and roll), hand tracking for 10 finger movements, body tracking for 9 movements, and potentially other types of interactions such as voice commands or eye tracking. Essentially, having 25 degrees of freedom means that a user has a more immersive and interactive experience within the VR environment.

Ethereum

Ethereum is a decentralized blockchain platform that allows developers to build decentralized applications (dApps) and smart contracts. Ether, the native cryptocurrency of the Ethereum network, is used to pay for transactions and computational services on the network. Ethereum was designed to be more flexible than Bitcoin, allowing developers to create custom dApps and smart contracts using its programming language, Solidity. Ethereum has become a popular platform for the development of DeFi applications, as well as other blockchain-based applications such as non-fungible tokens (NFTs). The Ethereum network is maintained by a decentralized network of nodes around the world, which work together to validate transactions and maintain the integrity of the blockchain.

GAN

Generative Adversarial Networks (GANs) are a type of AI system that use two neural networks, a generator and a discriminator, to create new data that is similar to a given dataset. The generator network creates synthetic data that mimics the characteristics of the real dataset, while the discriminator network evaluates the synthetic data and provides feedback to the generator on how to improve its output. This feedback loop between the generator and discriminator continues until the synthetic data is indistinguishable from the real data. GANs are commonly used to generate images, videos, and other types of media, and have a wide range of applications in areas such as computer vision, robotics, and natural language processing. Some popular examples of GANs include StyleGAN, CycleGAN, and DCGAN.

Generator

In a Generative Adversarial Network (GAN), the generator is a neural network model that generates synthetic data, such as images or sounds, that closely resemble real data. The generator is trained by being fed random noise as input and learning to transform that noise into a realistic output that is then compared to the real data by a discriminator. The goal of the generator is to generate data that is indistinguishable from the real data to the discriminator, which is itself another neural network model. As the generator and discriminator compete with each other, the generator becomes better at creating more realistic data. The generator is a key component of a GAN and is responsible for creating the synthetic data that is the ultimate output of the model.

Layer 2

Layer 2 refers to a secondary framework or protocol built on top of an existing blockchain network to enhance its capabilities. This layer is designed to process transactions off-chain, reducing congestion and increasing scalability. Layer 2 solutions typically use smart contracts to establish trust and security, enabling instant payments, lower fees, and improved privacy. Some popular Layer 2 solutions include state channels, sidechains, and rollups. These technologies aim to address the challenges faced by blockchain networks such as slow transaction times and high fees, making them more efficient and accessible for users.

Layer 3

There is no commonly accepted definition for Layer 3 blockchain technology, as it is still an emerging concept that is being explored and developed by researchers and developers. However, some proposed concepts for Layer 3 involve the integration of multiple Layer 2 solutions into a cohesive ecosystem, allowing for greater interoperability and scalability between different blockchains. Additionally, Layer 3 may involve the development of new consensus mechanisms and governance models to further enhance the efficiency and security of blockchain networks. Overall, Layer 3 aims to build upon the existing capabilities of blockchain technology to create a more robust and interconnected ecosystem.

LLM

Large Language Models (LLMs) are Artificial Intelligence systems that use deep learning techniques to process and generate human-like language. These models are trained on vast amounts of data and can understand and generate text in a wide variety of contexts, including natural language processing, machine translation, chatbots, and question-answering systems. LLMs have a broad range of applications, from improving language translation and speech recognition to generating content for social media and chatbots. They are also being used in research, education, and healthcare to analyze and extract insights from large amounts of text data. Some popular examples of LLMs include GPT-3, BERT, and Transformer.

The Merge

"The Merge" is a proposed upgrade to the Ethereum blockchain that aims to replace the current Proof of Work (PoW) consensus algorithm with a more energy-efficient Proof of Stake (PoS) algorithm. The upgrade will merge the current Ethereum mainnet with the existing Beacon Chain, which is the PoS chain that was launched in December 2020. This upgrade will result in faster block times, reduced transaction fees, and increased scalability for the Ethereum network. It will also eliminate the need for expensive mining equipment and reduce the environmental impact of the Ethereum network. The Merge is currently in the research and development phase and is expected to be implemented in the coming months.

NFT

NFTs, or non-fungible tokens, are unique digital assets that are verified on a blockchain. Each NFT is unique and cannot be replicated or replaced, making it a valuable digital asset. NFTs can represent a wide range of digital assets, such as artwork, music, video game items, and virtual real estate. They are bought and sold on blockchain-based marketplaces and can fetch high prices, often due to their rarity or perceived value. The blockchain technology ensures that each NFT is authenticated, transparent, and immutable, providing proof of ownership and authenticity. NFTs have gained significant popularity in recent years, with several high-profile sales and auctions, and have been used by artists, musicians, and creators to monetize their digital content.

NPC

NPCs, or non-player characters, are computer-controlled characters in video games or simulations that are designed to interact with players or other NPCs. NPCs can serve a variety of roles in a game, such as providing quests or missions, selling items or equipment, or serving as enemies or allies in combat. They are typically programmed with pre-defined behaviors and responses, but more advanced AI techniques can be used to create more realistic and dynamic NPCs. NPCs have become an essential element in many video games, helping to create a more immersive and engaging experience for players.

Personal Stack

A personal stack is a private blockchain network that is owned and controlled by an individual. It is a decentralized database that is used to store personal information and data in a secure and transparent manner.

One use case for a personal stack is to store personal identification information, such as passport details, birth certificates, and driver's licenses. By storing this information on a personal stack, individuals can have full control over their personal data and who has access to it. They can also use their personal stack to securely and easily verify their identity for various purposes, such as opening a bank account or applying for a job. This can reduce the risk of identity theft and increase privacy, as personal information is stored on the individual's own blockchain network instead of in a centralized database.

Proof of Stake

Proof of Stake (PoS) is a consensus algorithm used in blockchain technology that is an alternative to Proof of Work (PoW). In PoS, instead of miners competing to solve complex mathematical problems to validate transactions and earn rewards, validators are selected based on the amount of cryptocurrency they hold or "stake" in the network. Validators are then randomly chosen to validate transactions and add new blocks to the blockchain. The validator who adds the block is rewarded with newly minted cryptocurrency. The PoS consensus algorithm is designed to be more energy-efficient than PoW, as it doesn't require the intense computational power needed for PoW mining. It also has the potential to be more decentralized, as it doesn't give an advantage to those who can afford expensive mining equipment. However, PoS has its own set of challenges, such as the issue of "nothing at stake," where validators have nothing to lose by validating multiple versions of the blockchain in the event of a fork. To address this issue, PoS protocols often have mechanisms in place to penalize malicious validators.

Proof of Work

Proof of Work (PoW) is a consensus algorithm used in blockchain technology to verify transactions and add new blocks to the blockchain. In PoW, miners compete to solve complex mathematical problems using computational power in order to validate transactions and earn rewards in the form of cryptocurrency. The first miner to solve the problem and validate the block is rewarded with newly minted cryptocurrency. The difficulty of the problem is adjusted based on the overall computing power of the network to ensure a consistent rate of block creation. PoW is seen as a secure way to prevent double-spending and maintain the integrity of the blockchain, but it also requires a significant amount of energy consumption due to the computational power required to solve the problems. As a result, some blockchain projects have been exploring alternative consensus algorithms that are more energy-efficient.

Singularity

Singularity refers to a hypothetical point in the future where Artificial Intelligence will surpass human intelligence in every possible way. This concept is often associated with the idea of technological singularity, where advancements in AI and other technologies will rapidly accelerate, leading to a fundamental transformation of society and the human condition. Some predictions suggest that this point could be reached within the next few decades, leading to a future that is difficult to predict and potentially fraught with both opportunities and risks. The concept of singularity has been the subject of much debate and speculation, with some experts viewing it as an inevitable outcome of continued technological progress, while others argue that it is a flawed or unrealistic concept.

Smart Contract

Smart contracts are self-executing contracts with the terms of the agreement written directly into lines of code. They run on blockchain technology, making them transparent, decentralized, and tamper-proof. Smart contracts can be used to automate the enforcement of contractual obligations, as they automatically execute when certain pre-defined conditions are met. They are typically used in financial applications such as lending, insurance, and asset management, but can also be applied to a range of other use cases, such as supply chain management and voting systems. Smart contracts can reduce the need for intermediaries, streamline the execution of contracts, and increase transparency and security.

Stablecoin

A stablecoin is a type of cryptocurrency that is designed to maintain a stable value relative to another asset, typically a fiat currency such as the US dollar or the euro. Stablecoins achieve price stability by pegging their value to the price of the underlying asset, using a variety of mechanisms such as collateralization, algorithmic trading, or other methods. The goal of stablecoins is to provide the benefits of cryptocurrency, such as decentralization and privacy, while minimizing the volatility that is typically associated with other cryptocurrencies such as Bitcoin or Ethereum. Stablecoins have become increasingly popular as a means of transferring value across borders, as they offer a way to avoid the high fees and slow processing times associated with traditional money transfer services. They are also being used as a means of payment and as a store of value, and are being integrated into a wide range of blockchain-based applications and services.

Token

In the context of blockchain technology, a token is a digital asset that represents a unit of value or utility on a specific blockchain network. Tokens can be used to represent anything from a traditional currency to a unique asset, such as a piece of real estate or a collectible item. Tokens are typically created using smart contracts on the blockchain, which define the rules and conditions for the creation, transfer, and ownership of the token. Tokens can be traded and exchanged on blockchain-based exchanges, and can also be used to access specific products or services within a decentralized network. The use of tokens has become a popular way for blockchain-based projects to raise funds, incentivize participation, and facilitate transactions within their ecosystems.

Transformer

A Transformer is a type of artificial neural network architecture that was introduced in a seminal paper by Vaswani et al. in 2017. Transformers are designed to process sequential data, such as natural language text, and have achieved state-of-the-art results in a range of natural language processing tasks, such as language translation and text summarization. Unlike other neural network architectures, Transformers rely solely on self-attention mechanisms to process sequential data, making them highly parallelizable and more computationally efficient than other models. Transformers consist of an encoder and a decoder, and the training process involves adjusting the weights of the network to minimize the difference between the predicted output and the target output. The popularity of Transformers has led to the development of several pre-trained models, such as BERT and GPT-3, which can be fine-tuned for specific natural language processing tasks.

UBI

Universal Basic Income (UBI) is a social welfare policy proposal in which every citizen or resident of a country is provided with a guaranteed income, regardless of their employment status, age, or other factors. The purpose of UBI is to provide a minimum standard of living to all individuals, and to reduce poverty and income inequality. UBI is typically funded by taxes or other forms of government revenue, and is often seen as a way to provide a safety net for individuals who are unable to find work, or who are in low-paying or insecure jobs. Proponents of UBI argue that it can increase social mobility, reduce stress and anxiety associated with financial insecurity, and foster innovation and entrepreneurship by providing a cushion for risk-taking. Critics argue that UBI is too expensive, that it can discourage work, and that it may have unintended consequences such as inflation.

UE5

Unreal Engine 5 (UE5) is a game engine developed by Epic Games that is designed to provide developers with the tools and capabilities needed to create high-quality, next-generation games. UE5 features a wide range of advanced features and technologies, including Nanite, a new virtualized geometry system that enables the rendering of massive amounts of detail in real-time, and Lumen, a fully dynamic global illumination system that allows for realistic lighting and shadows. UE5 also includes a new audio engine, improved animation tools, and a range of other enhancements designed to make game development faster and more efficient. UE5 is available to developers for free, and is being used by studios and developers around the world to create some of the most advanced and visually stunning games ever made.

VR

Virtual reality (VR) is a technology that simulates a three-dimensional environment that can be interacted with and experienced through a VR headset or other devices. VR creates an immersive experience by presenting a realistic, computer-generated environment that can be explored and interacted with. Users can move around within the virtual environment, manipulate objects, and engage with other users in real-time. VR has many applications, such as gaming, education, healthcare, architecture, and design, and is being used to create new and innovative ways to interact with digital content. VR technology is rapidly advancing, and as it becomes more accessible and affordable, it is expected to become increasingly integrated into our daily lives.

Web2

Web 2.0 refers to the evolution of the internet from a static, one-way communication medium to a more interactive and dynamic platform that enables user-generated content and social interaction. The concept of Web 2.0 emerged in the early 2000s and is characterized by the rise of social media, blogs, wikis, and other online collaborative tools that allow users to share, collaborate, and contribute to content. Web 2.0 also emphasizes the importance of user experience, design, and accessibility, and provides opportunities for businesses to engage with customers and build online communities. The shift towards Web 2.0 has fundamentally transformed the way we interact with the internet and each other online.

Web3

Web 3.0, also known as the Semantic Web, is the next evolution of the internet after Web 2.0. While Web 2.0 was focused on user-generated content and social interaction, Web 3.0 is focused on creating a decentralized web that is powered by blockchain technology and artificial intelligence. This new web aims to provide greater privacy and security for users, as well as greater transparency and accountability for online transactions. Web 3.0 also seeks to address the issue of data silos by enabling seamless data sharing across different platforms and applications. This new web promises to be more intelligent, autonomous, and personalized, and has the potential to transform the way we interact with information and each other online.

XR

Extended reality (XR) is an umbrella term that encompasses virtual reality (VR), augmented reality (AR), and mixed reality (MR). XR refers to any technology that blends the physical and digital worlds to create an immersive experience for the user. XR experiences can range from fully immersive, computer-generated environments to those that superimpose digital information onto the real world. XR is being used in a wide range of applications, from entertainment and gaming to education and healthcare, and is expected to have a significant impact on how we interact with digital content in the future. As XR technology continues to evolve, it has the potential to create new and innovative ways for people to experience and interact with the world around them.

ZK Proofs

Zero-knowledge proofs (ZK proofs) are a cryptographic tool that allow one party to prove to another that they have knowledge of a particular piece of information, without revealing any other information about that knowledge. ZK proofs are used in a wide range of applications, including blockchain and other distributed ledger technologies, to enable secure and private transactions. ZK proofs work by enabling the prover to demonstrate to the verifier that they have knowledge of a particular piece of information, without actually revealing that information. This allows the prover to prove that they possess a certain attribute, such as the ability to access a particular account, without revealing any sensitive information about that account. ZK proofs are a powerful tool for enabling secure, private, and decentralized transactions, and are being integrated into a wide range of blockchain-based applications and services.



IX. EXPERTS

2b AHEAD Expert Interviews

Justin Banon

CEO and Co-Founder of Boson Protocol

Before co-founding Boson Protocol, a project using smart contracts to power real world commerce, Justin spearheaded the Travel Experiences Division of Collinson, where he managed a group of global loyalty rewards platforms. He also serves as a Start-up Mentor at Outlier Ventures, a leading investment firm in blockchain, artificial intelligence, IoT, and robotics.

Boson Protocol fosters decentralized autonomous commerce. It is a decentralized infrastructure for tokenizing and trading things as NFT (non-fundible tokens) vouchers with minimized trust and arbitration.

Richard Skarbez

Virtual Environments Researcher and Lecturer in Interactive Visualisation

Richard is an expert virtual reality technologies. His research interests broadly refer to how humans experience and interact with immersive technologies, and specifically include virtual reality, human factors, user experience design, visualization, and immersive analytics.

He currently is a lecturer of Interactive Visualisation in the Department of Computer Science and Information Technology at La Trobe University in Melbourne, Australia.

Andrew Steinwold

Founder of Zima Red and Managing Partner of Sfermin

Andrew is a crypto investor and analyst focussing on the digital asset ecosystem's rising Metaverse. He founded Zima Red, a newsletter, podcast and blog that explores esoteric digital assets, virtual worlds and all things nfts.

The firm Sfermion can be seen as a new investment manager entity for the Metaverse. It is centered around investing and actively supporting metaverse-native digital asset projects.

Toby Tremayne

Co-Founder and CTO of Crucible

As a Technical Futurist, Hacker, Writer, Troublemaker With over 22 years of experience in enterprise software and game development, Toby helps companies to develop advanced solutions using Web2 & Web3, VR/AR/MR, Blockchain, Sovereign Identity, DAOs and Artificial Intelligence. A serial founder, he has architected and developed entire web3 ecosystems, developing for emergence at scale and quietly trying to turn the entire world, online and off, into an MMORPG.

Toby is passionate about privacy, emergence and ethical development, putting control of technology in the hands of end users and creating metaverse interoperability without walls. He writes about technology, neurodivergence and building for the open metaverse at troublemaker.ink.

Gauthier Zuppinger

Co-Founder of NonFungible.com

Coming from the world of literature and communication, Gauthier co-founded Nonfungible to create a link between different communities of the complex digital ecosystem of non-fungible tokens. He provides service to both project leaders and consumers and fosters innovation by supporting the most advanced players in this field.

NonFungible.com was launched in February 2018, initially to track real-time transactions of Decentraland. Today, it provides consistent and usable experience for digital asset (NFT) markets and is one of the pillars of the non-fungible token ecosystem.

Voices of VR Expert Interviews

Kent Bye (Host)

Journalist and Host of the 'Voice of VR' Podcast

Keny Bye has conducted over 1200 Voices of VR podcast interviews featuring the pioneering artists, storytellers, and technologists driving the resurgence of virtual & augmented reality. He is a philosopher, oral historian, and experiential journalist helping to define the patterns of immersive storytelling, experiential design, and the ultimate potential of XR.

<http://voicesofvr.com/>

Mark Pesce

Writer, Educator, Inventor, Entrepreneur, and Broadcaster

#971: Mark Pesce's Book "Augmented Reality"
Contextualizes AR with History of HCI & Future of Localized Metadata

Mark spearheaded an effort to standardize 3D on the Web and formed the VRML Architecture Group (VAG). The purpose of VRML was to allow for the creation of 3D environments within the World Wide Web, accessible through a web browser. Pesce convinced the industry to accept the new protocol as a standard for desktop virtual reality. This development spring boarded Pesce into a career which has included extensive writings for both the popular and scientific press, teaching and lecturing at universities, conferences, performances, presentations, and film appearances.

<https://voicesofvr.com/971-mark-pesce-book-augmented-reality-contextualizes-ar-with-history-of-hci-future-of-localized-metadata/>.

Fox Buchele

VR Industry Defector Reflects on Google, Owlchemy Labs, Game Dev Culture, Stagnation of Innovation, & Toxic Positivity

Fox is the Co-Founder of Owlchemy Labs, an award-winning VR-Game Development Studio, which was recently acquired by Google. After departing Owlchemy Labs, Fox started his own VR Microexperience fund for small developers.

<https://voicesofvr.com/974-vr-industry-defector-reflects-on-google-owlchemy-labs-game-dev-culture-stagnation-of-innovation-toxic-positivity/>

Public Expert Interviews

Michael Abrash

Chief Scientist at Reality Labs

Michael Abrash is a software engineer and technical writer who is well-known for his contributions to the video game industry. He began his career in the 1980s at Microsoft, where he worked on the development of the first version of Windows. Abrash later joined Id Software, where he worked on the graphics engine for popular video games such as Doom and Quake. He is also known for his work on virtual reality and has written several influential articles on the topic.

Abrash currently serves as Chief Scientist of Reality Labs, Meta's own research and business unit focusing on developing VR/AR soft- and hardware. For more than eight years, he has been leading Meta's VR efforts and has contributed greatly to products such as Oculus Quest / Meta Quest 2 headsets as well as to Horizon Worlds.

https://www.youtube.com/watch?v=rXus-wL_3Qto&list=TLHQMTIwMTIwMjPR1cCIRpNi-Hg&index=5.

Sam Altman

CEO of OpenAI

Sam Altman is an entrepreneur, investor and CEO of OpenAI, a research organization aimed at developing Artificial Intelligence, best known for their LLMs like ChatGPT or DALL-E. Prior to his role at OpenAI, Altman was the president of startup accelerator Y Combinator, where he oversaw the growth of several successful startups including Airbnb, Dropbox, and Reddit.

Altman also co-founded location-based social networking app Loopt, which was acquired by Green Dot Corporation in 2012. He is a board member of several companies, including Airbnb and Reddit, and has invested in numerous successful startups such as Stripe, Asana, and Zenefits.

<https://www.youtube.com/watch?v=DEvbD-q6BOVM>.

<https://www.youtube.com/watch?v=WHoW-GNQRXb0>.

Paul Brody

Global Blockchain Leader at EY

Paul Brody is a global innovation leader and blockchain expert. He is currently the Global Blockchain Leader at EY (Ernst & Young), where he oversees the development of blockchain solutions for EY's clients. Brody has been a vocal advocate for blockchain technology, and has authored several articles on the topic.

Prior to joining EY, Brody was the Vice President and Global Industry Leader for Electronics at IBM, where he was responsible for developing and implementing the company's strategy for the electronics industry. He has also worked as a consultant and advisor for several startups and venture capital firms.

<https://www.youtube.com/watch?v=9FZq-9Oe5Hc>.

Vitalik Buterin

Co-Founder of Ethereum

Vitalik Buterin is a Russian-Canadian programmer and writer who is best known as the co-founder of the Ethereum blockchain platform. Buterin first became interested in blockchain technology after discovering Bitcoin in 2011, and went on to co-found Ethereum in 2014. Ethereum is a decentralized platform that enables the creation of decentralized applications (dapps) and smart contracts.

Buterin's work on Ethereum has earned him widespread recognition in the tech industry, and he has received numerous awards for his contributions to the field of blockchain and cryptocurrency. In addition to his work on Ethereum, Buterin is also a vocal advocate for decentralization and has written several articles and essays on the topic.

<https://anchor.fm/thennetworkstate/episodes/1---Vitalik-Buterin-on-Starting-New-Countries--Upgrading-Ethereum--and-Improving-Yourself-e1ui3a5>

Larry Fink

CEO of BlackRock

Larry Fink is an American businessman and the CEO of BlackRock, the world's largest asset management firm. Fink co-founded BlackRock in 1988 and has since grown the company into a global powerhouse with over \$8 trillion in assets under management.

Prior to founding BlackRock, Fink worked at First Boston Corporation and then at Blackstone Group, where he was a partner and member of the management committee. Fink is widely regarded as one of the most influential figures in finance, and has been named to Time Magazine's list of the world's 100 most influential people multiple times.

<https://www.youtube.com/watch?v=QoZNe-Hjagt4>.

David Friedberg

CEO & Founder of The Climate Corporation

David Friedberg is an American entrepreneur and investor in the technology and agriculture sectors. He is the founder and CEO of The Climate Corporation, a digital agriculture company that provides farmers with data-driven insights to improve their crop yields and mitigate risks associated with climate change. Friedberg also co-founded several other technology companies, including Metacafe, a video sharing website, and The Production Board, a software company that was acquired by Zynga. He is a prominent investor in Silicon Valley and has backed several successful startups, including Airbnb and Stripe.

[https://podcasts.apple.com/us/podcast/e111-microsoft-to-invest-\\$10b-in-openai-generative/id1502871393?i=1000594212341](https://podcasts.apple.com/us/podcast/e111-microsoft-to-invest-$10b-in-openai-generative/id1502871393?i=1000594212341).

Demis Hassabis

CEO & Co-Founder of DeepMind

Demis Hassabis is a British Artificial Intelligence researcher, neuroscientist, and entrepreneur. He is the co-founder and CEO of DeepMind, an Artificial Intelligence research company that was acquired by Google in 2015. Hassabis is widely regarded as one of the leading figures in the field of AI and his research has focused on developing algorithms that can learn from experience and solve complex problems.

Prior to founding DeepMind, Hassabis worked as a video game designer and producer, and co-founded several successful gaming companies, including Elixir Studios and Lionhead Studios. In addition to his work in Artificial Intelligence, Hassabis is also a prominent advocate for ethical considerations in AI development.

<https://lexfridman.com/demis-hassabis/>

Piers Kicks

Venture Partner at Bitkraft Ventures

Piers Kicks is a British entrepreneur and investor with a focus on the gaming and blockchain industries. He is a founding partner at Delphi Ventures and leads the crypto efforts for Bitkraft, the most active gaming investor globally. Kicks is also a board member for the Blockchain Game Alliance, where he helps guide the growth of the nascent sector.

With a background in computer science and philosophy, he has a deep understanding of the undercurrents of the web and is always on the lookout for exceptional opportunities. He is also the host of the podcast series, Metaverse Musings, where he discusses the intersection of crypto, video games, and other interactive media with prominent figures.

<https://metaversed.net/podcast>.

Raoul Pal

Co-Founder & CEO of Real Vision

Raoul Pal is a British investor and the CEO of Real Vision, a financial media company that provides in-depth analysis and interviews with leading investors and financial experts. Pal is a former hedge fund manager and investment banker who has worked for several prominent financial institutions, including Goldman Sachs and GLG Partners. He is also a vocal advocate for cryptocurrencies and blockchain technology, and has invested heavily in Bitcoin and other digital assets.

Pal is known for his macroeconomic analysis and his ability to predict major market trends, and is a sought-after speaker at financial conferences and events.

<https://podcasts.apple.com/us/podcast/raoul-pal-real-vision/id1622756550>.

John Paller

Founder of Opolis

John Paller is an entrepreneur and the founder of Opolis, a platform that provides employment benefits and services to independent workers and freelancers. Paller has been actively involved in the blockchain industry for several years and is known for his advocacy of decentralized technology to create new economic opportunities.

Paller has advised several successful blockchain projects, including Augur and Polymath, and is a frequent speaker at blockchain and cryptocurrency conferences. He has also written and contributed to several articles on the topic.

<https://podcasts.apple.com/gb/podcast/democratizing-work-with-daos-in-web3-opolis-john/id1632705381?i=1000586307579>.

Kathrin Pannier

Managing Director & Partner at BCG

Kathrin Pannier is an expert in the automotive industry with a focus on digital transformation, corporate strategy and sales. She believes that the future of the automotive industry will be fundamentally different from today, electrified, software-driven, customer-centric and sustainable.

Pannier began her career in IBM's software division and joined Boston Consulting Group in 2012. In 2015, she moved to Tokyo as BCG's Global Ambassador and spent the following two years in China. Pannier holds an MBA from the London Business School.

<https://www.youtube.com/watch?v=h8PiQX-jh5uU>.

Jesse Pollak

Protocols at Coinbase

Jesse Pollak is an American entrepreneur and software developer. He is the co-founder of the password management application, Clef, which uses a smartphone as a key to securely access websites and applications. Pollak is also an active contributor to several open-source software projects, including Ember.js, a web application framework, and Electron, a desktop application framework.

Pollak has held various positions for Coinbase over the last six years and currently leads efforts to build, support, and integrate protocols into the products of Coinbase, a digital currency wallet and platform where merchants and consumers can transact with new digital currencies.

<http://podcast.banklesshq.com/coinbase-launches-base-their-own-l2-on-the-op-stack>

Tom Westendorp

Senior Manager at Nvidia

Tom Westendorp is the head of NVIDIA's Automotive Datacenter business in Europe. As Senior Manager Business Development, his focus is on establishing key partnerships for NVIDIA Automotive in Europe. By providing the necessary infrastructure for AI development, simulation and validation, these partnerships can accelerate the production of automated and autonomous vehicles.

Before joining NVIDIA, Tom worked in business development for TomTom in the UK and South Africa, and was responsible for bringing together TomTom's Autonomous Driving strategy across product divisions. He holds an MSc. in Business Administration from the University of Groningen.

<https://www.youtube.com/watch?v=h8PiQX-jh5uU>.

Mark Zuckerberg

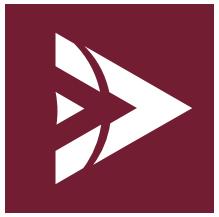
Co-Founder & CEO of Meta Platforms

Mark Zuckerberg is an American entrepreneur and the co-founder and CEO of Meta Platforms, the conglomerate that owns WhatsApp, Instagram and Facebook. Zuckerberg launched Facebook in 2004 while he was a student at Harvard University, and the platform quickly expanded to a global audience.

Zuckerberg is known for his innovative approach to technology and his focus on connecting people around the world. He is also known for his interest in technology and Artificial Intelligence, and has launched several initiatives focused on developing AI and other advanced technologies. Rebranding Facebook as Meta at the end of 2021, Zuckerberg's focus is on building the Metaverse, connecting all of the company's services in one integrated environment.

<https://www.facebook.com/4/videos/1898414763675286/>.

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