GLG

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PERSPECTIVES ON THE METAVERSE

Exploring Our Digital Future

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INTRODUCTION

On September 27, 2021, Meta, then known as Facebook, announced a $50M investment in global research and program partners to help build the Metaverse collaboratively.

Over the subsequent month, the incidence of the search term "Metaverse" became 25 times as prevalent, according to Google Trends, reaching a peak toward the end of October.

Meta's rebranding from "Facebook" certainly helped keep the buzz afloat, with search term prevalence sustaining for about six months, as the global community gradually decided to try to figure out what the fuss was all about.

The Metaverse is not a new idea. Author Neal Stephenson coined the term in 1992 in his book *Snow Crash*.

The term "Metaverse" was coined by author Neal Stephenson in his 1992 book *Snow Crash* to describe a wireless, online, virtual reality experience. The technology is also not entirely new, nor is its usage in a business context, with the likes of IBM, DARPA, and Google evangelizing, experimenting, and investing in it as early as the early aughties. The hype has certainly never been as high as now, and we at GLG have certainly seen a major uptick in client research over the past year or so.

Everyone we talk to wants to know: What is it? Is it real? When will we start seeing it? Can I make money supporting it? How? What will my role be? Many of our clients are connecting with GLG experts such as the authors of the five articles included in this eBook to ask them these types of questions and more.

While nothing replaces a conversation with a human (yes, I'm aware of the irony), we've put together these articles that will help you get up to speed quickly on the questions above.

I specifically found value in Avi Bar-Zeev's overview of what the next few years of the Metaverse are likely to look like in his article titled **Metaverse Evolution: A Five-Year Timeline**, and in the value chain and technology overview in Steve Chen's **Metaverse Outlook and the Current Trends**.

Tang Yi's piece, **Hyper-Realistic MetaHuman: The "Bridge" to the Metaverse in Web 3.0,** was a helpful overview of where the Metaverse is *now*. John Keh's article, **NFTs, the Metaverse, and How They Fit Corporate Strategy**, finally enabled me to get my head around the connection between these much-discussed topics.

As the GLG Account Manager for our semiconductors clients, I found special interest in Alexander Ermolaev's analysis claiming that **NVIDIA Is the Key to the Metaverse**. Who the winners and losers will be remains to be seen, but there's little doubt that performant hardware and devices will be key. This will also be the case as it relates to networks requiring higher bandwidth and lower latency, compelling software and games, NFTs, and other blockchain-based technology to enable uniqueness and, of course, interoperability, as well as cybersecurity and effective data privacy to drive user trust and safety.

If that last paragraph caused your brain to hurt a little, don't worry. Read the articles in this eBook and I'm sure you'll get the gist in no time.

The Metaverse is still in flux. But a technology in flux presents opportunities if you have the insight to see where they lie. Hopefully this eBook shares a little of the insight that GLG's Network Members can provide. If you'd like to talk to any of GLG's experts about the Metaverse, please contact us. Enjoy!

ELAD GOLDMAN, VP, ACCOUNT MANAGEMENT, GLG

METAVERSE EVOLUTION: A FIVE-YEAR TIMELINE

AVI BAR-ZEEV, GLG NETWORK MEMBER AND FORMER EXPERIENCE AR/VR/MR PROTOTYPING LEAD AT APPLE, FORMER UX LEAD (PRIME AIR & ECHO FRAMES) AT AMAZON, AND FORMER PRINCIPAL ARCHITECT (HOLOLENS) AT MICROSOFT

The Metaverse, purported to be an immersive technology that will change the way humans interact, has attracted significant attention just in the past year. Goldman Sachs analysts predict that the Metaverse could be an $8 trillion opportunity, driven by a new wave of technological innovation across augmented reality (AR) and virtual reality (VR), in addition to the expected growth in global, digital, and virtual economies.

Despite ambitious forecasts like this, uncertainty remains over the Metaverse's revenue potential, as well as the impact that technology, privacy concerns, and shifting consumer preferences will have on the outlook for this burgeoning market.

A common understanding of the Metaverse will evolve over time. When people refer to the Metaverse, they might actually be talking about components of it, such as AR cloud, virtual worlds, Web 3, non-fungible tokens (NFTs), or bitcoin.

Looking at the Metaverse

It's best to look at the Metaverse phenomenon in different stages.

It's probably best to look at the Metaverse phenomenon in different stages. You could call our current stage the **adverse**, which is the ad-funded internet. In a virtual world, everything we do costs us time, money, or privacy.

As we scratch the surface of the Metaverse, you could also call this the **dejaverse** phase, witnessing things we've seen before, such as Second Life. Roblox has also been around for years. Meta (Facebook) is rebranded, but not new.

The stage we're just beginning to enter is the **transverse**, where companies get together to build standards. There's a movement afoot to make our identity standardized and more private.

These first three phases lead up to what people have traditionally called the Metaverse. But perhaps it's more accurately described as the **meterverse**, a world in which we are charged for just about everything we do.

If we move the target further, we get to the **exoverse**. Companies like Niantic and Google are already building that. Google Maps is an example. It's about mapping the outside world. Niantic is also talking about a real-world Metaverse. REI, a U.S. outdoor sporting goods company, is getting into AR. It wants to marry a low-tech environment — camping with maybe a stove and a tent — with AR for an immersive experience that goes beyond that.

Finally, a little more esoteric, is the **esoverse**: from eso, meaning within. It's using technology to explore our inner selves. You're beginning to see some of that with meditation apps. I think that we can expect a whole world of being able to actually delve into what it means to be human.

All of this leads to the **holiverse**; it's about being complete or whole, as in holistic. It is the integration of all these things.

It's difficult to pin down timing and when transitions occur, but a commonly defined Metaverse might happen in the next five years. The exoverse is happening now, but it won't be mature until everybody has a common device, so that's more like six or seven years. Esoverse is hard to predict, but in 10 years it will start to crystallize.

The Metaphysics of the Metaverse

As it evolves, the Metaverse is getting metaphysical. As creators in a digital world, we empower ourselves with the kind of superpowers that exist in fiction. Those superpowers are "God-like," in terms of being able to control the world around us and being able to be present in multiple locations at the same time.

If you had to come up with a succinct way of defining the Metaverse, it's a future internet we inhabit with digital avatars or holograms. The most important aspect of that inhabiting — Mark Zuckerberg calls it the embodied internet — is it becomes fully interactive.

As it evolves, the Metaverse is getting metaphysical.

Think about Facebook today. You don't really see people directly; you're seeing pictures and posts about people, but you're not seeing the people first-hand. That Metaverse doesn't exist yet. Metaverse development also requires solving hard problems, including fundamental physics issues. What comes out between now and five years from now will be preliminary.

The Technology of the Metaverse

As it evolves, we're also seeing a push toward decentralization as a reaction to how pervasive government and corporations are in our lives. We want democratization, and no one has solved that problem.

Facebook invested $10 billion in Metaverse development. That's an expensive sandbox. Is it still possible for the Metaverse to become democratized rather than dominated by well-capitalized businesses? Big companies want a return on their investment, so we're probably in for an immediate future of walled gardens and centralization in the way the early internet was with CompuServe and AOL.

Once everybody has practical devices — affordable AR, VR headsets — you might see advancement. As soon as every corporation has devices and they're interoperable, you'll likely see the open web technologies proliferate just as they did with the internet in the '90s.

Privacy in the Metaverse

Metaverse technologies require deep knowledge of individuals. If that same technology is used to exploit us, we have to shut it down. My hope is we can get rid of these invasive business models by the time the technology proliferates.

The technology with the most promise of Web 3 technologies is self-sovereign identity. It inverts the problem of privacy so each of us keeps our own data instead of giving it to corporations.

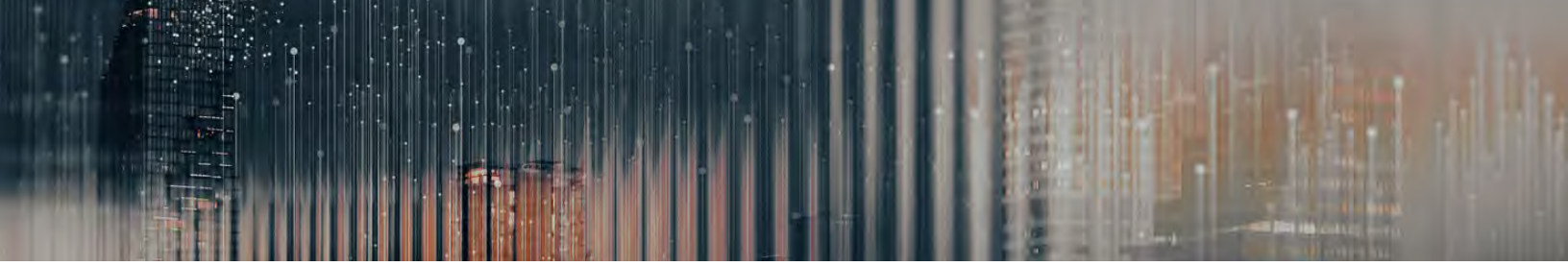
One interesting development is zero-knowledge proof. It allows a website or merchant to validate you, based on factors such as age or creditworthiness. You can pursue a transaction without giving away personal information. You maintain your own data and through a zero-knowledge proof, they learn nothing about you except the narrow information they need for validation.

Safety and Regulation in the Metaverse

Even putting ads and privacy invasion aside, regulators need to grapple with the long-standing issue of safety in virtual worlds. When you enter a virtual world such as a multiplayer game, it's not necessarily safe. Some people do things that are criminal or at least highly antisocial in the physical world. You're relying on private companies to police themselves, and they can't always prevent fraud, harassment, or worse. Relying on AI is not sufficient. It's an urgent government regulation issue, and what we can regulate now is the business model itself.

I may sound like a pessimist — and I have a lot of concerns — but long term I'm optimistic. All technologies should be about empowering people: empowering us to have better lives and to improve the world around us. That's the reason I'm excited about AR, even more than VR. AR is about understanding the world and our role in the world. That can help us have better interactions and improve business and personal relationships. That's an example of what I'm hoping to unlock.

This industry article was adapted from the GLG Roundtable "Metaverse Opportunities Amid a New Era of Digital Disruption."



METAVERSE OUTLOOK AND THE CURRENT TRENDS

STEVE CHEN, GLG NETWORK MEMBER AND FORMER DIRECTOR OF STRATEGY AT TENCENT
This article was translated from Mandarin

In 1992, science fiction writer Neal Stephenson coined the term "Metaverse" in the novel *Snow Crash*. In the novel, humans employ programmable avatars to interact with each other in a three-dimensional virtual space that is a metaphor for the real world. Stephenson saw the Metaverse as the next incarnation of the internet. Since then, the concept has been carried into movies like The Matrix and Ready Player One.

Now, especially after Facebook's announcement of its new name — Meta — the venture capital community is talking about the Metaverse. This is still undiscovered country, but investors foresee great opportunity in this virtual space. According to recent Bloomberg estimates, the value of the current global market of Metaverse is about USD $800 billion. When exactly can this concept really take hold? In which scenarios is there more room for imagination?

On November 30, 2021, Steve Chen, GLG Network Member and former Director of Strategy at Tencent — and who was involved in the early days of Roblox — shared an in-depth discussion about Metaverse trends. Here are some highlights from that discussion.

What are the characteristics of the Metaverse?

As far as we can see, there are three main features of the Metaverse.

As far as we can see, there are three main features of the Metaverse. First, it is a highly immersive experience. This is consistent with previous experiences created by extended reality (XR) devices such as AR and VR. Second, it seems to be a sustainable world in itself: the Metaverse is a virtual world that is parallel to reality based on the new computing platform, and it will be associated with people's daily necessities of life and beyond. Third, there is a clear way to exchange value within it. The interconnection of blockchain technology gives rise to new value creation and value exchange in the Metaverse.

According to the current messaging from major players in the sector, the Metaverse is based on human-centered experiences, including personal digital identities, social interactions, and daily immersive experiences. It is not a game, but a virtual space of online and offline value exchange. The Metaverse is a sustainable system with economy and civilization.

What are the groups of players in the Metaverse sector?

Currently, main players in the Metaverse sector can be divided into four camps:

1. **Virtual Reality (VF)/Augmented Reality (AR) and Mixed Reality (MR) Providers:** For this group of players, the Metaverse is a new computing platform and traffic portal based on new ways of interaction after the mobile internet. Trends in the information and communication technology (ICT) industry have come in approximately five waves: microchip, computing platform, operating system, content aggregation and distribution, and application. The whole extended reality (XR) sector is naturally connected to the Metaverse through immersive experience.

2. **Gaming and Internet Giants:** The Metaverse itself is regarded as a game-like experience by default, and games we know of are also close to the Metaverse experience. Also, internet giants have enabled their own user account systems that are in line with the continuity of the metauniverse. Internet giants in China have a chain of business, including online services like livestreaming and gaming, as well as offline services like convenience stores, logistics, etc. This makes it possible to bring some of the offline value to the online Metaverse system.
3. **Digital Currency Community/Blockchain Community:** In these sectors, the value creation process and benefit distribution are dominated by several giants. As blockchain technology goes to the public, this group of players will likely move toward decentralized blockchain-based value exchange.
4. **Infrastructure/Interaction Technology Providers:** This group includes existing game engines and companies that provide rendering, tools, and new interactive technologies. They are leading participants with direct experience.

The Metaverse involves six major technical components.

What are the main supporting technologies of the Metaverse?
In terms of underlying support technologies, the Metaverse involves six major technical components.

1. **Internet of Things:** These technologies can provide the Metaverse with reliable data and make connections between virtual and real worlds.
2. **Networking and Cloud Computing:** Advancements in communication network technology are the foundation of the Metaverse, and the communication network and cloud games provide the Metaverse with network-level technology
3. **Artificial Intelligence:** AI provides audio and visual technical support for a large number of Metaverse applications.

However, the preceding three technologies are both well established and dominated by large players that control most of the market share, leaving few investment opportunities for newcomers. The next three sectors — interactive technology, gaming, and blockchain — are more suitable for players to enter and invest.

4. **Interactive Technology:** Interactive technology continues to upgrade iteratively, providing an immersive virtual reality experience and deepening perceptual interaction. It includes hardware equipment and engine providers based on AR, MR, and projection, as well as companies engaging across industrial spheres. It is more relevant for companies based on sensor technologies, especially somatosensory (such as motion capture, brain-computer interaction, voice interaction, etc.).
5. **Gaming:** Like the Metaverse, games feature flexible interaction and rich information, providing a platform for creation, interactive content, and social scenarios. The Metaverse includes a game engine, VR system construction, 3D modeling, and rendering technology (among other features). However, the gaming and virtual worlds are inherently limited, and only some games can create a strong connection to the Metaverse.
6. **Blockchain:** Among different technologies, the one that is highly associated with the Metaverse is mainly developed around Ethereum, including NFT, decentralized finance (DeFi), public chain speed, smart contracts, decentralized autonomous organization (DAO), social system, decentralized exchanges, distributed storage, and other blockchain technologies.

This technology industry article is adapted from the GLG Webcast "Giants Competing in the 'Metaverse.'" Era of Digital Disruption."

HYPER-REALISTIC METAHUMAN: THE "BRIDGE" TO THE METAVERSE IN WEB 3.0

TANG YI, GLG NETWORK MEMBER AND FOUNDER AND CO-PRESIDENT OF SHANGHAI RANMAI TECHNOLOGY

This article was translated from Mandarin

The digital human, MetaHuman, has emerged and is now one of the most mature commercial applications in the Metaverse. Because it was born in the Metaverse, the MetaHuman already excelled in various applications, including virtual models and brand spokespeople. So how did digital humans evolve? What is the industry structure? What kind of investment value do they offer?

To answer these questions, GLG invited Tang Yi, founder and Co-President of Shanghai Ranmai Technology, to explore the future of digital humans. The following is the interview summary.

Hyper-realistic avatars narrow the distance between digital and real people to create realistic emotional interactions.

How did digital humans develop?

Digital humans use computer graphics (CG) technology to create a digital image that is designed to look like a real human being with a humanlike personality. These hyper-realistic avatars narrow the psychological distance between the digital image and real people to create a realistic emotional interaction for humans. There are four main stages in the evolution of digital humans.

1. **Embryonic stage** (1980s): Digital humans, mainly drawn by hand, were introduced to the real world for the first time.
2. **Exploration stage** (early 2000s): Conventional manual drawings were gradually replaced by computer technologies such as CG and motion capture.
3. **Primary stage** (recent five years): Breakthroughs in deep learning simplified the production process, and AI has become an inseparable tool. Representative images include Microsoft's Xiaoice and Samsung's digital human, NEON.
4. **Growth stage** (present): Groundbreaking improvement in aesthetics with profound advances in technology that impart higher intelligence, greater fidelity, and more diversity. Typical technologies include AYAYI and Hua Zhibing.

What is the structure of the digital human industry?

The industry structure can be divided into the following layers.

- **Infrastructure companies** — They provide underlying tools for digital human production, such as modeling, rendering, motion capture, and collaborative management of assets, and these include companies like MAYA, Unity, and ARNOLD.
- **Asset producers** — They employ basic tools required to complete the entire digital human service. Digital Domain and Faceunity Technology are examples of such producers.
- **Planning and operation companies** — They manage the intellectual property (IP) of digital assets and create opportunities for digital asset derivatives. Such companies include Brud, China Literature Group, and Mihoyo.

- **Platform companies and industry clients** — Platform companies refer to internet service providers (such as Baidu, Volcengine, and Tencent), while industry clients include brands, entertainment agencies, mass media, and interactive entertainment, among others (such as CCTV, SM Entertainment, Florasis, Bilibili). These companies use digital humans for a variety of purposes in different environments and business sectors.

What kind of long-term investment value do digital humans offer?
Innovative marketing using digital humans can generate a lot of buzz for brands. Virtual personalities operating within real-world parameters offer brands and users alike a space where real and virtual humans can interact. Digital humans can also help companies achieve digital transformation and efficiency.

For brands, the investment value of digital humans lies in the following two aspects.

- **Compared with a celebrity brand ambassador, a digital human is more manageable and versatile** — The character design is stable and controllable. It has a long lifecycle and can serve the brand for a long time without the negative incidents that real-life celebrities may get involved in. With the help of technology, they can deliver content steadily. Digital humans can be designed to be user-centric to maintain interactivity and user engagement.
- **Compared with traditional brand equity, digital humans are more effective and comprehensive** — They create a unique brand perception and provide users with conceptualized branded assets in a digital world, rather than a decentralized membership or points system. They add a personal touch. The interactions of the digital human and a brand's customers can strengthen emotional ties to the brand. Digital humans also have an emphasis on user inputs and co-creation.

Before going online, it is necessary to clarify the purpose of your digital human.

Brands can choose to use existing digital humans or develop their own. Brands that choose to employ a predeveloped digital human often want an image that fits with the tone of the brand to do quick and direct marketing. Following prevailing trends can generate attention and traffic for the brand, or help brands test the market and identify ways to stand out. It can also help explore the possibility of brand reorientation but with more fragmented results.

Building your own digital human has a higher cost and the investment cycle is longer. If you choose to develop your own digital human, the cost is about RMB 8 to 10 million (USD $100,000 to $125,000), including technology, materials, and manpower resources. The return on investment comes from an extension of the IP itself, as well as NFTs and business endorsements in brand collaborations.

Before going online, it is necessary to clarify the purpose of your digital human. This helps create the character and build the storylines and images. For example, when we create a digital human, we need to do a focus group and write a character biography. After the launch, you still need to continuously generate content for the character and push the business-driven transformation between B2B and B2C. Long-term operations often involve tasks like content planning, creative styling, visual postproduction, and business development.

This technology industry article was adapted from the GLG teleconference "Hyper-Realistic MetaHuman — Unlock the Imagination in Digital Assets Operations."

NFTs, THE METAVERSE, AND HOW THEY FIT CORPORATE STRATEGY

JOHN KEH, GLG NETWORK MEMBER AND FOUNDER OF RUN THE CHAIN AND FORMER CHIEF MARKETING OFFICER OF GENESIS BLOCK AND GBV CAPITAL

From NFTs (nonfungible tokens) to virtual real estate, blockchain-based assets have exploded in the past year. The phenomenon is driven partly by tech and international brands that anticipate people living a part of their lives in the future in the virtual world. This naturally draws corporations to take a closer look at ways to get involved, find their niche within the blockchain, and capitalize on it.

What Are NFTs?

An NFT represents ownership of a unique item, such as digital artwork, that exists on a blockchain. Think of it as a certificate of ownership that cannot be modified. Or compare it to a concert ticket, where you have a ticket on a specific date in a specific seat, that's nonfungible, because no one else can sit in that seat on that particular date. Today, sales volume of NFTs is currently in billions of dollars.

Identify the problem for your company, and then apply an NFT solution that makes sense.

Collectibles and artwork are a popular niche for NFTs. There have been a couple of oft-reported examples of NFTs commanding huge payouts in the past year, catapulting NFTs into the limelight. Perhaps you've heard about how Christie's auction house sold an NFT last year for $69.3 million, created by Beeple, a digital artist. Recently [December 2021], digital artist Pak broke Beeple's record, selling "The Merge" for $91.8 million to 28,983 collectors.

Digital content is another NFT application, such as a piece of music or a movie. For example, a musician might have a sample pack, and other musicians can use elements to integrate with their music.

Many companies are dabbling in NFTs. Ethereum, the most established blockchain platform, offers domain names through Ethereum Name Service. It uses NFTs to provide customers access to Ethereum addresses with easy-to-remember names. Coachella just announced Coachella NFT lifetime tickets that are also tradable. That use case fits very well with how the tech can be used.

There are projects where companies are collateralizing invoices, debt, and insurance in NFT form. Using NFTs occurs in the context of securities and derivatives too, especially when you look at using them as potential custody for tokens, assets, or insurance. There are many ways you can use this technology in the context of ownership.

The best thing corporates can do is to get creative. Identify the problem for your company, and then apply an NFT solution that makes sense. It should be something that solves a real problem.

What is the Metaverse?

The concept of the Metaverse is also trending at the moment. The Metaverse is a virtual world that merges social media with the real world to deliver an interactive experience. The vision is to enter the platform and encounter a wide variety of things to do. You could play an interactive game, or

you could go to a cryptocurrency stock market and trade cryptos. It's loosely defined, and it won't have value until we see one Metaverse, or until there's agnostic interoperability among existing platforms. However, these platforms have advanced in the past year. Wilder World is one that is still developing, but the resolution and quality is a big leap from earlier Metaverses.

One of the biggest challenges of Metaverses is interoperability. If you're building on an esoteric chain, you can't get any liquidity on that chain, and any sort of financial movements you're making on that blockchain might be all for naught, even if you have the best technical world. Can assets be moved? Is there a function to at least exchange them for cash and move that on and off? These are things to look at when considering a Metaverse.

NFT and Metaverse Trends

Nike's acquisition of RTFKT was clever because they're investing in infrastructure. If you own the "processing house" for NFTs, then you become the point of gravity. Out of the big players, like Adidas and Bose, Nike stands out. They took a committed approach by acquiring RTFKT. Adidas created a collaboration, which may earn short-term gains, but may not be sustainable because it leans on a third party. If you're a major brand with deep resources, it might make more sense to do it in-house.

Currently the Ethereum chain is congested. Many people are seeking alternatives, like Solana, Cardano, and Polkadot, places that are developing NFTs and Layer 2 technology solutions like IMX. Ethereum's somewhat bulletproof with tried-and-true code. Solana is gaining significant institutional investment. Choosing a platform is about figuring out what's important and finding the chain that provides it, risk- and investment-wise.

What's Coming Next?

What we may see next are projects in which people work on Ethereum (ETH) and BowsCoin (BSC) from day one, or Solana and ETH from day one. Agnostic platforms or ones with multichain capability are going to be more common, if not necessary.

The Metaverse needs to make sense for your business and not be cumbersome for users.

When you look at the Metaverse, Decentraland was one of the first iterations, but graphics were lacking. I think Wilder World has a lot of potential. As far as leaders, I can see Sandbox or Animoca taking the lead. I don't think Facebook, renamed Meta, can do it. They have capital to buy the right companies or buy the right talent to become the leader. It makes business sense, but I think because of who they've become, people may not want to support them.

Exploring the Metaverse will be about finding meaningful ways to engage. It needs to make sense for your business and not be cumbersome for users. If you integrate all this great blockchain, cryptocurrency, NFT into your business and you don't educate the consumer and it's not easy, it's all for naught.

If you want to do it yourself, you need to find the right talent. It may make sense to tap talent in-house who are passionate about crypto. Do a census, find the people who are passionate, and put together a team that already understands your business. Even so, mistakes are inevitable. Perhaps most important is to make sure you know what the problem is that you're trying to solve.

Ask yourself why this needs to be tokenized. Why do you need to do an NFT? How does this help your business? If you can't answer, go back to the drawing board. If you can answer those questions and find the right people, proceed, but be flexible. Technology can change rapidly to a point where your thesis is no longer valid. Flexibility helps you pivot the thesis to match the market. As always, of course, do your own due diligence and research.

This financial industry article was adapted from the GLG Webinar "Beyond Bored Apes: How to Integrate NFTs and the Metaverse into Corporate Strategy."

NVIDIA IS THE KEY TO THE METAVERSE

ALEXANDER ERMOLAEV, GLG NETWORK MEMBER AND FORMER HEAD OF AI AND DEVELOPER RELATIONS AT NVIDIA

NVIDIA might be the best-positioned company to help grow the Metaverse alongside giants like Meta, Google, and Amazon. NVIDIA's core competency, producing powerful graphics hardware with chips capable of running huge calculations in parallel, is the same stuff that allows massive Metaverse projects to run.

More technological advancements and more massive scale is coming to the Metaverse very soon and much of the necessary innovation is likely to touch NVIDIA, but not just its hardware. NVIDIA has its own Metaverse project called Omniverse that acts as a sort of toolkit to bring together all the components that make things work.

What Is the Metaverse?

To give more context, the Metaverse is a bit of a catchall term for collaborative, online, open-design environments. These types of environments aren't exactly new; people have been meeting, interacting, and creating content in these spaces for decades.

Blocky graphics and stilted motions defined early projects like Second Life, a Metaverse game that came out in 2003, but those pixelated graphics have now graduated to high-definition, Hollywood-style, 3D computer animations with AI-guided, humanlike movements.

Metaverse designers can create different artifacts, like a chair or a flower, or a virtual house with custom-made backgrounds, or an amusement park.

To join a Metaverse you need an avatar, or digital representation of yourself. It's a lot like a video game where users choose from among a static selection of characters to play as. In the Metaverse, things can be taken a step further, users are able to create their avatar without restriction, often on design software like Adobe Illustrator.

Metaverse designers can also create different artifacts, like a chair or a flower, or a virtual house with custom-made backgrounds, or an amusement park. A person in the Metaverse uses the avatar they created to go and meet people online and interact with them in a way that they've defined. They can use artifacts for trade.

Today's Metaverse

Creating for today's Metaverse requires talent and big computing power. Unlike the blocky floating characters of 20 years ago, designers have the capability to make avatars that move like humans that are modeled in 3D with the quality of a Pixar movie (the Pixar technology is what NVIDIA uses in its Omniverse project). So even if an avatar is a blocky LEGO character, that LEGO character moves around like a human. If it's a horse, it moves like a horse. It can have facial expressions. It can speak in any language. The designer determines how their avatar is perceived by others.

Applications of the Metaverse

The applications are nearly limitless and go beyond social and entertainment. The same tools can be used in engineering and fabrication scenarios. A car company, for instance, can move away

from designing automobile modules in a piecemeal fashion and have all their teams collaborate in the Metaverse. Companies can dynamically and collaboratively design a car, or a factory, or train robots to be more efficient in the real world. People from around the world can be in the same office, the same boardroom in the Metaverse.

The computing advancements that underpin this better-looking, better-performing world — like ray tracing, posture estimation, Universal Scene Description — are complex and expensive. But all of them come down to two issues: rendering 3D graphics and training and implementing AI.

For a long time, NVIDIA has been an innovator in graphical processing units (GPUs). Their chips are designed to perform massive calculations for a computer's central processing unit (CPU). NVIDIA chips contain several thousand cores and can perform 5,000 or 6,000 calculations in parallel. That's about 100 times more calculations at the same time than some chip-making competitors like Intel, and it means exponentially better graphics and more fuel for calculation-heavy AI.

In the Metaverse, companies can collaboratively design a car, or a factory, or train robots to be more efficient in the real world.

When NVIDIA made Omniverse and combined the hardware with a full stack of developer software, it unlocked potential for the Metaverse to grow in new ways. The NVIDIA Omniverse offers AI in the stack and the hardware capability to run AI. More important, because Omniverse is software agnostic in a lot of ways, huge players like Amazon, Meta, and Google, which have much bigger AI units but maybe not the same level of graphics, will be able to use it to push huge structural improvements in their own Metaverse projects.

But the tool is not reserved for big companies. Omniverse is open, very flexible, and accommodates multiple design capabilities. Collaboration means that different people must be able to incorporate their own creations into that environment and use it how they want.

For example, because the Omniverse can be viewed as one of the biggest supercomputers available, it's attractive to the scientific community. Researchers could use NVIDIA's Omniverse to run climate modeling scenarios or quantum physics, which require large-scale calculations and open collaboration.

But perhaps the most important constituency is developers, who will use Omniverse more like a software stack to literally design the look and feel of the Metaverse at large. They'll get access to libraries or design environments along with a preloaded AI or graphic stack that they can use natively.

NVIDIA expects that a majority of designers will use whichever tools they already have and just bring artwork and artifacts into Omniverse using connectors or import-export. NVIDIA will give designers some tools while fostering an environment where they can design things without being restricted by whatever NVIDIA is offering. NVIDIA doesn't expect people to just sit on the Omniverse.

NVIDIA and the Metaverse

NVIDIA will probably maintain a free version of Omniverse that makes sense mostly for individual designers and developers. A lot of the NVIDIA software-hardware stack is not always cheap, so a lot of individual designers might hesitate to use it. A free version allows those doing gigs, or working from home, to operate on NVIDIA's software and hardware stack.

All these elements — the connectivity of Omniverse tools, the ability to work with large companies and individual designers, the power of the NVIDIA hardware — means that NVIDIA is poised to have keystone position as the Metaverse grows.

This technology industry article was adapted from the GLG Roundtable "Nvidia's Omniverse & the Metaverse: The Importance of AI and the Focus on Developers."

ABOUT OUR EXPERTS

AVI BAR-ZEEV

Avi Bar-Zeev has been a pioneer, architect, and advisor in AR/VR/MR for nearly 30 years, behind the scenes in the world's largest tech companies and at large. Most notably, he helped found and invent HoloLens at Microsoft, assembling the very first AR prototypes, demos, and UX concepts. He also built the first prototypes for what is today called the AR cloud.

At Amazon, he helped launch PrimeAir, as well as design UX for what is now called Echo Frames (no-display, wearable glasses). From 2016 to 2019, he helped Apple advance its own undisclosed projects by prototyping experiences and hardware while exploring new use cases to validate hypotheses.

In 1999, he co-founded the company behind Google Earth and subsequently helped define Second Life's core technology. Back in the mid-'90s, he worked on groundbreaking VR experiences for Disney, including Aladdin's Magic Carpet VR Ride, the Virtual Jungle Cruise, and Cyberspace Mountain, serving as technical lead for many.

STEVE CHEN

Steve Chen since 2020 has been the COO of AI4FIT, a company dedicated to empowering home gyms with artificial intelligence computer vision technology. From 2015 to 2019, he was Director of Strategy for Tencent's Mobile Internet Business Group, where he worked on projects for IEG (Interactive Entertainment Group), exploring next-generation hardware and entertainment forms beyond mobile apps, such as consoles, XR, and "Metaverse." Some of the projects he worked on led to partnerships between Tencent and companies such as Nintendo and Roblox. In early engagement with Roblox, his job involved analyzing the competitive landscape and key players in the Metaverse.

TANG YI

Tang Yi is the founder and Co-President of Shanghai Ranmai Technology, which is a leading pan-entertainment MCN organization. He is familiar with short video marketing and operation, Metaverse, virtual human IP operation, NFTs, and digital collection, among other topics. Ranmai Technology has developed and launched several hyper-realistic digital humans. Among them, AYAYI has been online since May 20, 2021, and currently has more than 600,000 followers on Weibo and Red. Its partnership brands and organizations include Tiffany, BOSE, Porsche, BURBERRY, MAC, L'Oreal, and Tmall, as well as fashion publications such as WSJ Magazine China and Harper's Bazaar.

JOHN KEH

John Keh specializes in marketing blockchain, cryptos, and decentralized finance (DeFi). He was the chief marketing officer at Genesis Block and GBV Capital between 2020 and 2021. He is also the founder of Run the Chain, a crypto marketing agency that specializes in launching and marketing early-stage blockchain startups. Alongside his role at the above, John is also the co-founder of Ministry of Solana, a Solana-focused accelerator, and an advisor at Radian, a blockchain-based dating ecosystem. Last October, he founded Trinity Capital Ventures, a crypto-native investment firm focusing on early-stage assets.

ALEX ERMOLAEV

Alex Ermolaev is currently an Advisor at VasoGnosis. Before this, he was Managing Director at TeamCamp. Prior to this role, he was employed at Change Healthcare Inc., holding the title of Director of AI. He has also held roles at Nvidia Corporation, Alanta, Ergo Growth Partners, and Microsoft. He has 20 years of experience building bleeding-edge software businesses.

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