



# **What is the metaverse? An explanation and in-depth guide**

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The metaverse is described as the inevitable evolution of the internet. But what exactly is the metaverse, and what will it become? TechTarget's in-depth guide to the metaverse breaks down where this nascent technology revolution stands today and where it is headed. Topics include the technologies and platforms that support the metaverse, its benefits and challenges, how to invest in it, its history, why the metaverse is important and its impact on the future of work.

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# What is the metaverse? An explanation and in-depth guide

LINDA TUCCI, INDUSTRY EDITOR -- CIO/IT STRATEGY | DAVID NEEDLE

Imagine a virtual world where billions of people live, work, shop, learn and interact with each other -- all from the comfort of their couches in the physical world.

In this world, the computer screens we use today to connect to a worldwide web of information have become portals to a 3D virtual realm that's palpable -- like real life, only bigger and better. Digital facsimiles of ourselves, or avatars, move freely from one experience to another, taking our identities and our money with us.

This is known as the metaverse and, hype notwithstanding, it does not exist today.

What are enterprise leaders to make of a fast-evolving, hyped-up concept that could fundamentally change how humans live? TechTarget's in-depth guide to the metaverse breaks down where this nascent technology revolution stands today and where it is headed. Topics include the technologies and [platforms that support the metaverse](#), its benefits and challenges, how to invest in it, its history, why the metaverse is important and its impact on the future of work.

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Throughout the guide, there are hyperlinks to in-depth explorations of these and other relevant topics, as well as to definitions of important concepts in the metaverse such as interoperability, digital twins, spatial computing and [Web 3.0](#).

## WHAT IS THE METAVERSE? A SHORT HISTORY

The metaverse is a vision of what many in the computer industry believe is the next iteration of the internet: a single, shared, immersive, persistent, [3D](#) virtual space where humans experience life in ways they could not in the physical world.

Some of the technologies that provide access to this virtual world, such as virtual reality (VR) headsets and augmented reality (AR) glasses, are evolving quickly; other critical components of the metaverse, such as adequate bandwidth or [interoperability standards](#), are probably years off or might never materialize.

The concept is not new: The term *metaverse* was coined in 1992 by author Neal Stephenson in his sci-fi novel *Snow Crash*, and work on the technologies that underpin a virtual reality-based internet date back decades (see metaverse history timeline below).



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## WHY IS THE METAVERSE IMPORTANT?

"Metaverse" became a household word when Facebook [rebranded its corporate identity to Meta](#) in October 2021 and announced plans to invest at least \$10 billion in the concept that year. In addition to Meta, tech giants including Google, Microsoft, Nvidia and Qualcomm are also investing billions of dollars in the concept. Management consultancy McKinsey & Company has bullishly predicted that the metaverse economy could reach \$5 trillion by 2030. [E-commerce](#) is expected to be the dominant engine, with gaming, entertainment, education and [marketing in the metaverse](#) also becoming important sectors.

Today, companies use the term to refer to many different types of enhanced online environments. These range from online video games like Fortnite to fledgling virtual workplaces like Microsoft's Mesh or Meta's Horizon Workrooms to virtual dressing rooms and virtual operating rooms. Rather than a single shared virtual space, the current version of the metaverse is [shaping up as a multiverse](#): a multitude of metaverses with limited interoperability as companies jockey for position.

The combination of uncritical enthusiasm for the metaverse and deep uncertainty about how it will pan out has sparked some backlash. Industry watchers have questioned if the metaverse will ultimately be much different from the digital experiences we have today -- or, if it is, whether the masses will be willing to spend hours a day in a headset navigating digital space.

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Other futurists, however, argue that while it is early days for the metaverse and fundamental technical barriers still exist, the metaverse will happen. And, it will arrive with a big bang.

"It is clear that it is one of the most highly anticipated technology evolutions of the coming decade," Dave Wright, chief innovation officer at IT provider ServiceNow, told TechTarget writer George Lawton in "[History of the metaverse explained](#)."

### Attributes of an all-encompassing metaverse

In his best-selling [primer](#), *The Metaverse: And How It Will Revolutionize Everything*, author Matthew Ball defined the metaverse as the following:

"A massively scaled and interoperable network of real-time rendered 3D virtual worlds that can be experienced synchronously and persistently by an effectively unlimited number of users with an individual sense of presence and with continuity of data, such as identity, history, entitlements, objects, communications and payments."

We can expect many variations on the theme of this ambitious vision, explained Lawton in his article on [top predictions about the metaverse](#). Some predict that a handful of platforms will ultimately dominate the space, as Apple iOS and Google Android did with mobile.

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## HOW DOES THE METAVERSE WORK?

Because the metaverse is largely unbuilt, there is little agreement on how it will work.

Broadly speaking, however, the metaverse is a digital ecosystem built on various kinds of 3D technology, real-time collaboration software and blockchain-based decentralized finance tools.

Factors such as the degree of [interoperability among virtual worlds](#), data portability, governance and user interfaces will depend on how the metaverse pans out.

Lauren Lubetsky, senior manager at Bain & Company, speaking in a session on the metaverse at the 2022 MIT Platform Strategy Summit, outlined three possible scenarios:

- The metaverse remains a domain of niche applications, used by consumers for entertainment and gaming but stopping well short of an all-encompassing virtual reality.
- The metaverse is controlled by large competing ecosystems -- for example, Apple and Android meta worlds -- with limited interoperability.
- The metaverse is a dynamic, open and interoperable space, much like the internet but in 3D.



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### Metaverse in popular culture

In Stephenson's dystopian view of the future, *Snow Crash*, people gained status based on the technical skill of their avatars. Another indication of status was the ability to access certain restricted environments -- a precursor to the paywalls and registration requirements some websites use today.

*Ready Player One* by Ernest Cline, later made into a movie by Steven Spielberg, was another novel that helped popularize the idea of the metaverse. The 2011 dystopian sci-fi novel is set in the year 2045, where people escape the problems plaguing Earth in a virtual world called The Oasis. Users access the world using a virtual reality visor and haptic gloves that let them grab and touch objects in the digital environment.

### HOW IS THE METAVERSE ACCESSED?

Two technologies considered important to the development and growth of the metaverse are virtual reality and augmented reality:

- [Virtual reality](#) is a simulated 3D environment that enables users to interact with a virtual surrounding in a way that approximates reality as perceived through our senses. This approximation of reality is now typically accessed through a VR headset

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that takes over a user's field of vision. Haptics, including gloves, vests and even full-body tracking suits, enable more lifelike interaction with the virtual environment.

- [Augmented reality](#) is less immersive than VR. It adds digital overlays on top of the real world via a lens of some type. Users can still interact with their real-world environment. The game Pokémon Go is an early example of AR. Google Glass and heads-up displays in car windshields are well-known consumer AR products.

Whether VR and AR experiences turn out to be the primary interfaces of the metaverse remains to be seen, Gartner senior principal analyst Tuong H. Nguyen told Lawton, adding that what we have now are precursors or pre-metaverse solutions.

At present, many of the metaverse-like experiences offered by gaming platforms such as Roblox, Decentraland and Minecraft can be accessed through browsers or mobile devices and a fast internet connection.

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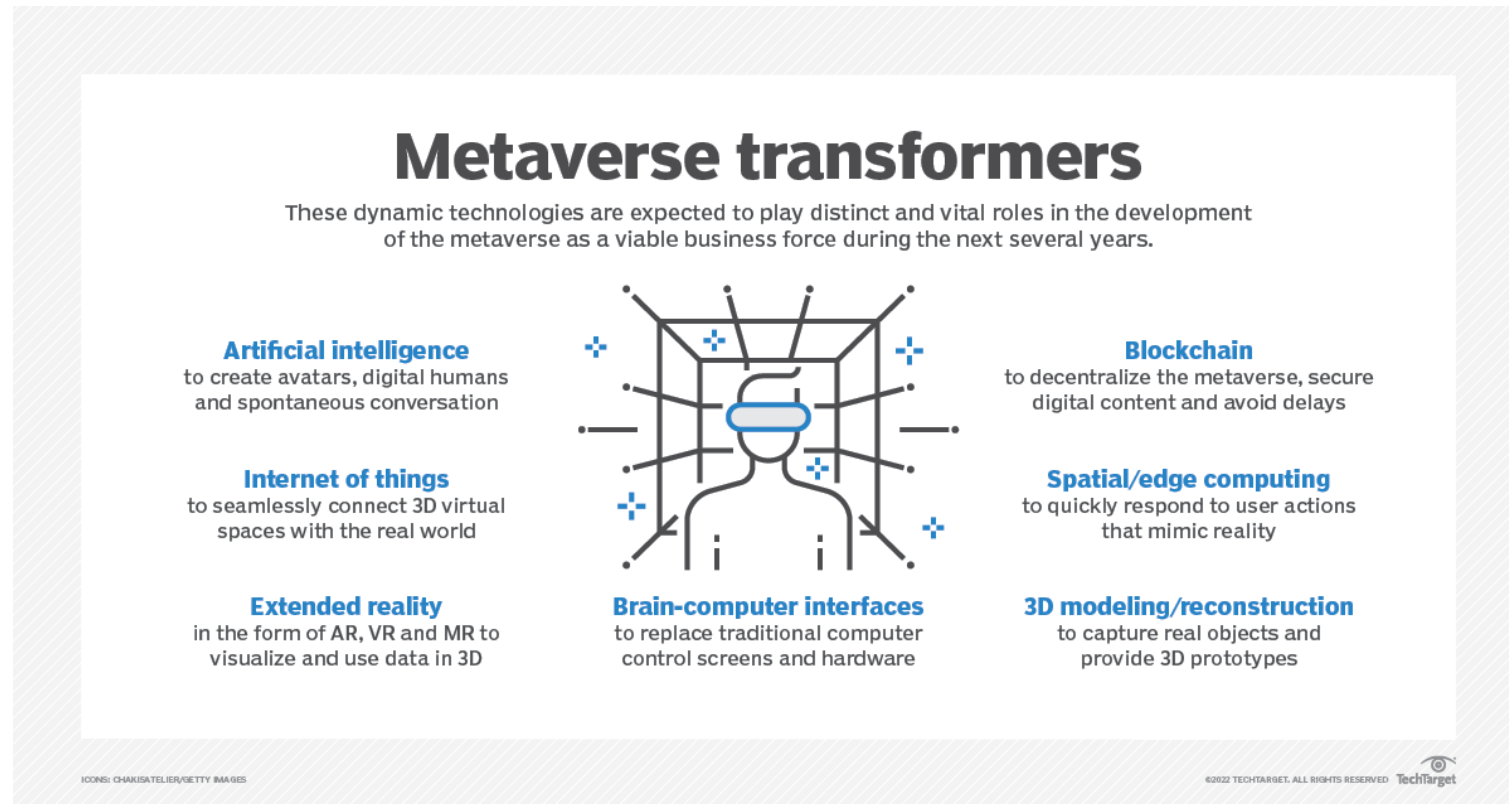
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## METAVERSE TECHNOLOGIES

In her article "[7 top technologies for metaverse development](#)," technology writer Esther Shein explained that industry watchers shy away from codifying the technologies that will

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power the metaverse. This is in part because the metaverse is evolving and partly because many of the tools driving the metaverse are themselves made up of multiple technologies.

Gartner, for example, prefers to describe metaverse technologies in terms of "tech themes." The themes include [spatial computing](#), digital humans, shared experiences, gaming and tokenized assets. Forrester Research characterizes metaverse tools as "enablers of 3D development environments." Professionals skilled in 3D modeling and IoT for [developing digital twins](#) are among the talent companies will need to recruit for.

The consensus among Shein's expert sources was that these seven technologies will have the biggest impact on metaverse development over the next decade:

- artificial intelligence
- internet of things
- extended reality
- brain-computer interfaces
- 3D modeling and reconstruction
- spatial and edge computing
- blockchain

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### What is the difference between the internet and the metaverse?

The internet is a network of billions of computers, millions of servers and other electronic devices. Once online, internet users can communicate with each other, view and interact with websites, and buy and sell goods and services.

The metaverse doesn't compete with the internet -- it builds on it. The internet is something that people "browse," but people can "live" in the metaverse to a degree. The growth of the internet has spawned many services that are leading the way to the creation of the metaverse.

"In gaming, you see Roblox, Minecraft and other immersive video games -- and even Zoom -- foreshadow what the metaverse is designed to offer," said Ben Bajarin, CEO and analyst at Creative Strategies.

*Web 3.0*, or *Web3*, is the term used to denote a new blockchain-based version of the internet. "[Web 3.0 vs. metaverse: How are they different?](#)" unpacks the links and distinctions between the two concepts and explains how a decentralized Web3 aims to give users more control over their browsing experience.

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## WHAT IS THE METAVERSE USED FOR TODAY?

The online gaming industry has decades-long experience in creating immersive virtual worlds. And to the extent a proto-metaverse has a mainstream use, the massive audiences that flock -- albeit not synchronously -- to the likes of Roblox, Epic Games and Decentraland suggest that playing games, building virtual worlds and investing in real estate might be it.

Enterprises are experimenting with metaverse applications in the workplace that build on the virtual applications companies deployed during the pandemic to support remote work. An early application of metaverse technologies involves workplace training. Some hospitals are already using VR and AR to train for common medical procedures, reported TechTarget news writer Esther Ajao. One technology recently approved by the FDA is Medivis, an AR surgical system that lets surgeons quickly sync with a hospital's digital imaging system. Other metaverse-type applications she wrote about in her article, "[Enterprise applications of the metaverse slow but coming](#)," include the following:

- **Digital twin avatars.** These twins will not only exist on computer screens but will be rendered as AI-powered holograms or holographic images that are assigned tasks, Ajao reported. A CEO, for example, could activate an AI-powered hologram of himself to engage with multiple stakeholder groups at once.
- **Metaverse for work collaboration.** Enterprises are starting to use the metaverse to add "an element of realism" to remote work experiences, said Forrester analyst J.P. Gownder. This includes setting up 3D rooms where employees can collaborate.

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# When meta and business worlds merge

Without the benefit of a souped-up DeLorean and flux capacitor, we explore the roads that lie ahead for the metaverse and how this anticipated virtual reality extravaganza will reshape business models.

- The metaverse will be big, but just how big?
- There will be multiple metaverses.
- The metaverse will transform all business processes.
- New security and privacy issues will emerge.
- The metaverse will expand beyond virtual showrooms.
- Digital twins will mirror the entire enterprise.
- Customer service and sales roles will transform and automate.
- Digital-first will evolve into meta-first.
- Enterprises will bake reality into the metaverse.
- Gamification will galvanize calm technologies.
- Robotics innovations will accelerate.



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## HOW DO NFTS FIT INTO THE METAVERSE?

[Non-fungible tokens](#) (NFTs) figure to play a big role in the usefulness and popularity of the metaverse. NFTs are a secure type of digital asset based on the same blockchain technology used by cryptocurrency. Instead of currency, an NFT can represent a piece of art, a song or

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digital real estate. An NFT gives the owner a kind of digital deed or proof of ownership that can be bought or sold in the metaverse.

Metaverse Group bills itself as the world's first virtual real estate company. It acts as an agent to facilitate the purchase or rental of property or land in several metaverse virtual worlds, including Decentraland, Sandbox, Somnium and Upland. Offerings include conference and commercial spaces, art galleries, family homes and "hangout spots."

While the metaverse has created opportunities for new companies such as Metaverse Group to offer digital goods, established brick-and-mortar companies are also jumping in. For example, Nike acquired RTFKT, a startup that makes one-of-a-kind virtual sneakers and digital artifacts using NFTs, blockchain authentication and augmented reality. On its website, RTFKT said it was "born on the metaverse, and this has defined its feel to this day."

Prior to the acquisition, Nike filed seven trademark applications to help create and sell virtual sneakers and apparel. Nike and Roblox also partnered on "Nikeland," a digital world where Nike fans can play games, connect and dress their avatars in virtual apparel.

"NFTs and blockchain lay the groundwork for digital ownership," said Nick Donarski, co-founder of Ore System, an online community of gamers, content creators and game



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developers. "Ownership of one's real-world identity will carry over to the metaverse, and NFTs will be this vehicle."

Read more about [how to start investing in the metaverse](#) here.

## METAVVERSE COMPANIES

These three well-known software vendors have their own metaverse visions.

**Meta.** "From now on, we will be metaverse-first, not [Facebook](#)-first," wrote CEO Mark Zuckerberg in his October 2021 announcement of the branding change. That's an important change because it means users eventually won't need a Facebook account to use other services in the metaverse. Among other non-Facebook products, Meta has already sold millions of its Meta Quest -- formerly Oculus -- VR headset units for navigating the metaverse.

In the Meta announcement, Zuckerberg said the company aims to accelerate the development of the fundamental technologies, including social platforms and creative tools, required to "bring the metaverse to life." After the rebrand news dropped in late 2021, Meta launched Horizon Worlds, a VR space that users can navigate as an avatar, along with tools for developers to create additional virtual worlds. Meta's massive investment in the

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metaverse is considered a gamble by investors as the company experiences revenue declines and layoffs in an uncertain economy.

**Epic Games.** Epic Games, makers of the popular online shooter game Fortnite -- with some 350 million users -- and the Unreal Engine software for game developers, planned to stake a claim in the metaverse following a \$1 billion round of funding in 2021. This included \$200 million from Sony Group Corp.

Epic Games' vision of the metaverse differs from Meta's in that it wants to provide a communal space for users to interact with each other and brands -- without a news feed riddled with ads.

**Microsoft.** The metaverse is coming to Microsoft Teams, the software giant's online meetings competitor to Zoom. The new service lets Teams users in different physical locations join collaborative and shared holographic experiences during virtual meetings. The platform includes a suite of AI-powered tools for avatars, session management, spatial rendering, synchronization across multiple users and "holoportation" -- a 3D capture technology that lets users reconstruct and transmit high-quality 3D models of people in real time. At its [October 2022 Ignite conference](#), the software giant launched in private preview a feature that lets people create and use avatars in place of live video during Teams meetings.

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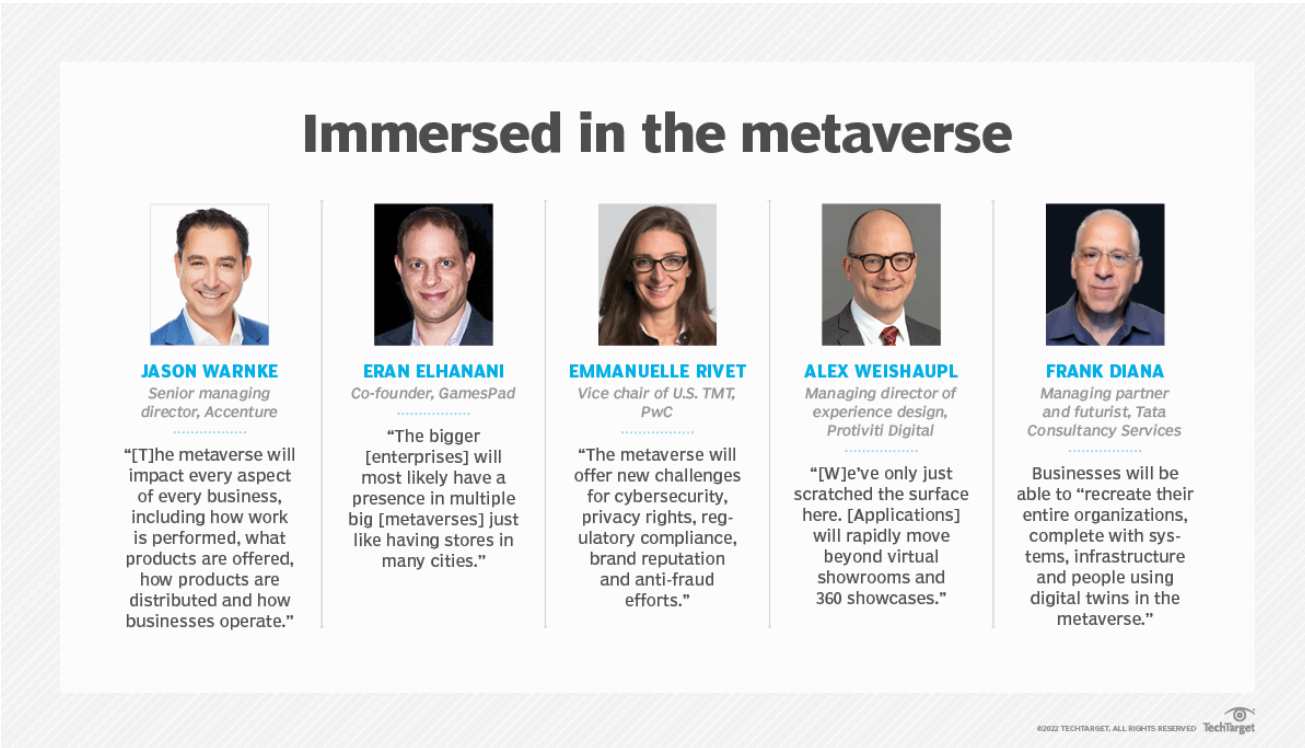
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Microsoft is working with professional services firm Accenture to create Mesh-enabled immersive spaces. Accenture hires more than 100,000 people every year and uses Microsoft Mesh to help onboard new employees. New hires meet on Teams to receive instructions on how to create a digital avatar and access One Accenture Park, a shared virtual space that's part of the onboarding process. The futuristic amusement park-like space includes a central conference room, a virtual boardroom and digital monorails that new hires use to travel to different exhibits.

## Immersed in the metaverse



**JASON WARNKE**  
Senior managing director, Accenture

"[T]he metaverse will impact every aspect of every business, including how work is performed, what products are offered, how products are distributed and how businesses operate."

**ERAN ELHANANI**  
Co-founder, GamesPad

"The bigger [enterprises] will most likely have a presence in multiple big [metaverses] just like having stores in many cities."

**EMMANUELLE RIVET**  
Vice chair of U.S. TMT, PwC

"The metaverse will offer new challenges for cybersecurity, privacy rights, regulatory compliance, brand reputation and anti-fraud efforts."

**ALEX WEISHAUPL**  
Managing director of experience design, Protiviti Digital

"[W]e've only just scratched the surface here. [Applications] will rapidly move beyond virtual showrooms and 360 showcases."

**FRANK DIANA**  
Managing partner and futurist, Tata Consultancy Services

Businesses will be able to "recreate their entire organizations, complete with systems, infrastructure and people using digital twins in the metaverse."

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## **WHEN IS A FULL-FLEDGED METAVERSE COMING?**

While the basic idea of being able to engage in a virtual online world has been around for many years, a true metaverse where lifelike interactions are possible seems years away. In his 2021 [year in review blog post](#), for example, Microsoft co-founder Bill Gates noted that most people don't have the VR goggles and motion capture gloves to accurately represent their expression, body language and quality of their voice.

For business, however, Gates predicted that in the next two to three years most virtual meetings will move from two-dimensional square boxes to the metaverse -- a 3D space with participants appearing as digital avatars (see section below, "How should businesses prepare for the metaverse?").

## **HOW WILL THE METAVERSE AFFECT THE FUTURE?**

It must be underscored that the metaverse is still a set of possibilities, not a reality. There are many unknowns. How exactly the metaverse will become manifest -- who will control it, what it will encompass and how much of an impact it will have on our lives -- is still up for debate. At one end of the spectrum are those who believe the metaverse will enhance our lives, enabling experiences we could not have in the physical world. Metaverse skeptics view it as merely an extension of the digital experiences we have today but not transformative --

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and potentially something worse: a magnifier of the current social media ills, including disinformation campaigns, addictive behavior and tendencies toward violence.

In a 2022 survey performed in conjunction with Elon University's Imagining the Internet Center, Pew Research Center asked 624 technology innovators, business leaders and activists about the impact of the metaverse by 2040. The response was split. According to the [report](#), 54% of these experts said they expect the metaverse will be a fully immersive, well-functioning aspect of daily life for at least a half-billion people globally, and 46% said it will not be.

Similarly, a [recent survey of 4,600 business and technology leaders](#) conducted by Accenture found that 71% of executives believe the metaverse will have a positive impact on their organization, but only 42% believe it will be a breakthrough or transformational development.

### HOW SHOULD BUSINESSES PREPARE FOR THE METAVERSE?

Creating successful metaverse work environments will require far more than grafting existing office spaces and protocols onto virtual spaces, according to employment experts interviewed by technology writer Lawton. Indeed, early research suggests that simply translating existing offices into a 3D virtual equivalent can reduce productivity and even cause nausea and motion sickness.

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Still, like the internet in the 1990s, the metaverse represents an opportunity to "shrink the world," said Andrew Hawken, co-founder and CEO of Mesmerise, a VR technology vendor. Done right, the experts Lawton interviewed said, metaverse technologies could increase teleworker camaraderie, improve collaboration, speed up training, reduce the need for office space and make work a happier place in general. The metaverse will also eliminate jobs, requiring companies to reskill workers, said Frank Diana, managing partner and futurist at Tata Consultancy Services.

### Omniverse for work

The omniverse could refer to the sum of all worlds or -- when capitalized -- a specific industrial metaverse platform from chipmaker Nvidia.

Nvidia's Omniverse platform bills itself as a real-time graphics platform that engineers, artists and developers can use to develop virtual worlds. It integrates industrial digital twins at scale using the Universal Scene Description file format.

"[The metaverse vs. the multiverse vs. the omniverse](#)" explains the differences between these three terms.

Lawton described eight top use cases in detail in "[How will the metaverse affect the future of work?](#)" Here are three:

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**Enhancing teamwork and collaboration.** Instead of the whiteboards, sticky notes and large screen monitors that are the staples of in-person ideation, teams could, for example, "transport themselves to the Louvre Museum for inspiration," Diana said. A digital twin replication of a building could theoretically enable architects to collaborate with clients in real time on layouts and pinpoint problems and opportunities in advance of building out the space.

**Enabling faster learning.** Interactive gameplay and simulations could speed up learning and improve outcomes by, for instance, enabling employees to learn how to operate equipment as if in "real life" or to practice a sales pitch for a big-money client.

**Assessing operations.** The metaverse could make it easier for executives and managers to visit a factory, distribution center or construction site on the other side of the world, shaking hands with employees and doing inspections as if on site.

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# Interoperability in the metaverse—around the corner or a pipe dream?

Standards for an interoperable metaverse are emerging but there are big challenges to overcome.

## Interoperability requires standards for these four components:

- IDENTITY** for connecting individuals to assets and rights
- 3D RENDERING** for displaying the world
- BEHAVIORS** for characterizing objects
- DATA SHARING** for sharing ownership and permissions

## Challenges:

- How do you share behavior?
- How do companies make money while opening opportunity for everyone?
- How will engineers navigate the technical differences between multiple enterprises in the metaverse?



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## METAVERSE PROS AND CONS, CHALLENGES

No matter what form the metaverse takes, cybersecurity and privacy standards loom as major challenges.



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As security expert Ashwin Krishnan explained in his companion articles on metaverse [cybersecurity challenges](#) and [privacy concerns](#), the current lack of privacy regulations for the metaverse presents many risks for businesses and users, including the following:

- misapplication and applicability of current privacy regulations, such as [GDPR](#);
- intrusive and extensive data collection;
- issues concerning data rights and ownership;
- exploitation of minors; and
- user-to-user privacy.

Krishnan advised that businesses should be proactive in creating a viable data privacy policy tailored to their organizations and to work with the major metaverse platform owners and standards organizations to establish security and privacy safeguards. Consumers will need to make an effort to understand the security and data privacy policies of both the businesses they frequent and the metaverse platforms on which those businesses reside.

What will the coming technology revolution mean for average user? For her article on [metaverse pros and cons](#), technology journalist Mary K. Pratt interviewed analysts, consultants, business executives and researchers on the metaverse's potential benefits and drawbacks. On the positive side, an immersive metaverse enables humans to go where they were never able to go before, including outer space. Online social connections become much

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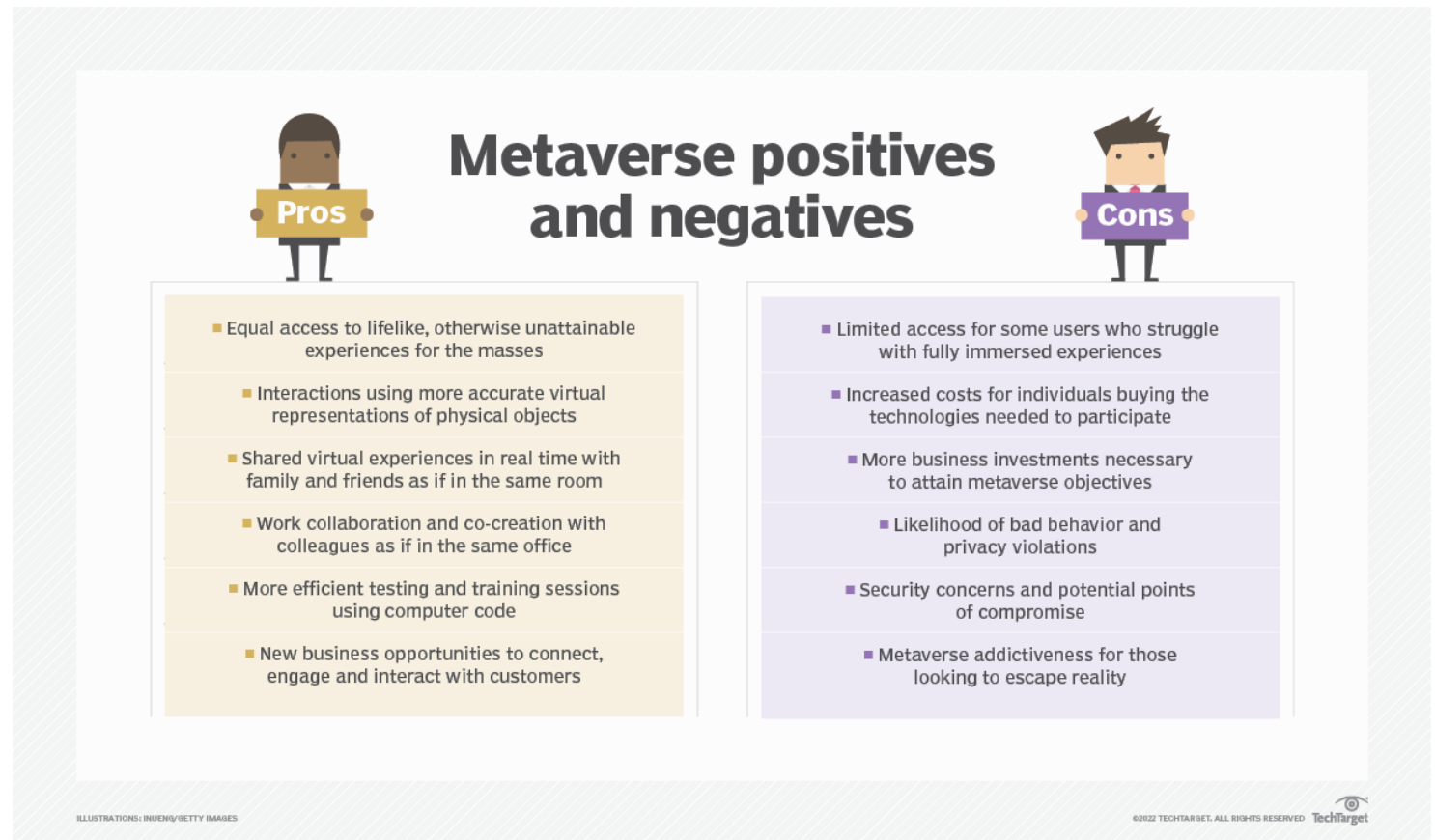
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richer. Of course, the bad behavior witnessed on social platforms has the potential to be magnified in a virtual world. Findings are summed up in the chart below.



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## CONTINUE READING

- [Metaverse interoperability challenges and impact](#)
- [How will the metaverse affect the future of work?](#)
- [Top metaverse cybersecurity challenges: How to address them](#)