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Evolution of the Metaverse¹

Technological advances are enabling more immersive experiences in virtual worlds and digitally augmented experiences in the physical world. These experiences are increasingly associated with the metaverse, a term rooted in science fiction originally referring to a dystopian digital reality.² The recent pandemic highlighted how technology can transform work and help us overcome great obstacles, prompting organizations to consider how virtual and augmented reality can enable next-generation workplace and customer experiences. Our research explores the potential promise and peril of emergent metaverses to business and society. We also take a position on how they should be governed.

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Introductory Comments

Two decades ago, universities suddenly became interested in virtual worlds. Schools and research centers leased islands on Second Life, wrote cases, ran classes, set up virtual labs to run experiments and pondered future business applications. Very little came of these initiatives but that all changed in October 2021 when Mark Zuckerberg announced that Facebook would hire 10,000 people to build the Metaverse and then, only weeks later, rebranded Facebook as Meta. Virtual worlds were back with a new shiny “metaverse” label. Back, too, were the questions about what virtual worlds are and how they would impact business and society. To address these questions, *MIS Quarterly Executive* senior editor Blake Ives interviewed the University of Arkansas’s metaverse research team of Mary Lacity, Jeff Mullins and Le (Carol) Kuai. Among the questions Mary and her team were asked to address were: What is the metaverse and how does it differ from the virtual worlds of nearly 20 years ago? Why are you studying it? What will the projected business value be and what are its use cases? How might, and should, it be governed? What are the potential pitfalls? What can we expect from follow-up technologies? Is there a dystopian urban landscape lurking at the end of the metaverse rainbow?



¹ This MISQE Insights article is the edited transcript of an interview conducted by *MIS Quarterly Executive* senior editor Blake Ives with the authors. The purpose of MISQE Insights is to distill the findings from academic research into actions that can be taken by IT practitioners.

² Stephenson, N. *Snow Crash*, Bantam Books, 1992.

Insights for IT Leaders

Blake Ives: Let's start off with an easy question. What is the metaverse and how does it differ from virtual worlds that caught our attention well over a decade ago? Are we talking about one grand metaverse, rather like when we think about the internet but with a lot more shared functionality, or will there be many metaverses?

Mary Lacity: Actually, that's not easy to answer because there is no universally accepted definition of metaverse. We don't even have agreement on whether the term is singular or plural. When defined in the plural form, some sources define the minimal requirement of a metaverse as a virtual world one visits with an avatar. With that definition, metaverses are a rebranding of the virtual worlds that have been around since the launch two decades ago of Second Life and World of Warcraft.

With the singular definition, the metaverse is a futuristic, three-dimensional and immersive digital universe that seamlessly connects users to any virtual world. Many people include augmented reality (AR) as a key feature.³ The requirements for a single metaverse have not yet been achieved, such as portability of avatars and digital assets, and scaled, real-time rendering of three-dimensional images. Gartner estimates that a single metaverse is more than ten years away.⁴

Blake Ives: Mary, you and your colleagues, through the years, have been out in front on so many transformations—outsourcing, offshoring, net sourcing, robotic process automation and blockchain come immediately to mind. You never jumped on the first virtual-worlds-in-business bandwagon, so what makes you think the time is now right for the metaverse, the latest

incarnation of virtual worlds? What is it that has caught the eye of you and your team? Why are you now studying metaverses?

Mary Lacity: Each of us has different beliefs and reasons for researching metaverses. I became terrified when Facebook's CEO, Mark Zuckerberg, announced in October 2021 that Facebook was changing its name to Meta. Meta is investing billions to build what Zuckerberg calls the next chapter for the internet. All I could think about was "surveillance capitalism" on steroids, the term Shoshana Zuboff uses to describe how companies exploit personal data to increase their profits.⁵ They use our data to nudge our behaviors to influence what we buy, think and do, and even the way we vote. I don't want one or a few tech giants devising the next version of the internet. It's not just our mouse clicks that will be monitored in a metaverse but everything we say and do. The potential negative consequences of addiction, cyberbullying, surveillance and cybersecurity breaches could massively escalate in an immersive and persistent metaverse. Amplifying this concern, some consultants project the economic value of metaverses to be in the trillions of dollars over the next eight years⁶—so I really think we must get out in front of this now. Jeff and Carol, however, have more optimistic views.

Jeff Mullins: I see immense potential for the metaverse to improve existing experiences and create new ones that are more accessible and meaningful than those available online today. In the 1990s, the internet revolutionized how we access information. In the 2000s it transformed commerce, and in the last decade—for better or worse—it has changed the way we present ourselves and see each other through social media. The metaverse is the next chapter: an internet of experiences. I study how work

³ Wikipedia, for example, includes augmented reality in its metaverse definition (<https://en.wikipedia.org/wiki/Metaverse>): "In futurism and science fiction, the metaverse is a hypothetical iteration of the internet as a single, universal and immersive virtual world that is facilitated by the use of virtual reality (VR) and augmented reality (AR)." Citigroup also includes AR as a key metaverse feature: "We believe the Metaverse is the next generation of the internet—combining the physical and digital world in a persistent and immersive manner—and not purely a Virtual Reality world." See *Metaverse and Money: Decrypting the Future*, Citi Global Perspectives & Solutions, March 30, 2022, available at https://icg.citi.com/icghome/what-we-think/citigps/insights/metaverse-and-money_20220330.

⁴ *Hype Cycle for Emerging Tech*, 2022, Gartner, Inc., available at <https://emtemp.gcom.cloud/ngw/globalassets/en/articles/images/hype-cycle-for-emerging-tech-2022.png>.

⁵ Zuboff, S. "Big Other: Surveillance Capitalism and the Prospects of an Information Civilization," *Journal of Information Technology* (30:1), March 1, 2015, pp. 75-89.

⁶ Precedence Research estimates that the global metaverse market will be worth around \$1.6 trillion by 2030. See *Metaverse Market Size to Worth Around USD 1,607.12 Bn by 2030*, Precedence Research, June 8, 2022, available at <https://www.globenewswire.com/en/news-release/2022/06/08/2458533/0/en/Metaverse-Market-Size-to-Worth-Around-USD-1-607-12-Bn-by-2030.html>. Citigroup predicts that the metaverse market will be worth between \$8 trillion and \$13 trillion by 2030 and that it may have five billion users. See *Metaverse and Money*, Citigroup, Inc., March 30, 2022, available at https://icg.citi.com/icghome/what-we-think/citigps/insights/metaverse-and-money_20220330.

and play are converging through information technology,⁷ and I see the metaverse as bringing the immersive and augmented experiences that we associate with games into the mainstream—i.e., into business, education, healthcare, government and other institutions.

Carol Kuai: There is a huge chasm between the risks Mary describes and the benefits Jeff sees the metaverse bringing. There is an only slightly smaller one between the current technological capabilities and the exaggerated views of the metaverse portrayed in popular media. In Ernest Cline’s novel *Ready Player One*, for example, many people chose to spend most of their time in the metaverse because it was preferable to the physical world.⁸ I am interested in helping developers and businesses bridge those gaps.

Blake Ives: Well, you’ve at least convinced me why we need to study the metaverse—Mary’s motivation is driven by fear, Jeff’s by the promise of the metaverse and Carol’s by the need for reconciliation. Let’s turn our attention to the potential business value. We have an automobile manufacturing facility here in South Carolina, whose headquarters are in Germany. During the pandemic, this firm scanned its entire factory with video and lidar (light detection and ranging) sensors so the engineers back in Germany could “visit” the factory without getting on a plane. The saved travel costs easily justified the investment, but the real savings will come when it is time to do the annual model changeover. This automobile manufacturer is using the visual model of the factory, essentially a virtual—albeit static—digital twin, to virtually prepare for the switchover. The measures in the virtual model are so accurate that engineers can see if a new piece of equipment will fit. The firm believes its consequent ability to enhance preplanning will significantly reduce the number of days that the assembly lines will have to be stopped to make a model changeover. Does that sort of scenario fit into your vision of the metaverse?

Mary Lacity: Yes, if engineers can “visit” the factory with an avatar, then this is a good example of a metaverse. A similar example from our research is “metaversities”—digital twin

environments of college campuses. Imagine never having to cancel classes for inclement weather or pandemics; remote students in a metaversity feel like they are in their own classrooms. The three of us visited a metaversity platform developed by VictoryXR and Carol and I went through their certification training for metaverse education.⁹

Jeff Mullins: Metaversity experiences (with virtual reality headsets) and the factory twin you referred to have advantages in addition to saving on travel and convening meetings more easily. Metaverses can be interactive laboratories for training, education, design and experimentation. Unlike physical objects, digital objects can scale to any size, allowing avatars to do things like shrink or expand objects. The ability to manipulate and interact with digital objects transcends physical limitations.

Mary Lacity: During our metaversity training, one of our favorite experiences was dissecting a pig the size of a room by climbing inside of it. My avatar got stuck inside the pig’s intestines—Jeff’s avatar had to come and rescue me. Users like me can recover from mistakes in a virtual world safely, so it’s easy to extrapolate the use case to companies for onboarding, training and upskilling employees. For example, Accenture recently onboarded 150,000 new employees in a virtual world.¹⁰ It’s like a less expensive version of the flight simulators used to train pilots. The implications for occupational safety and emergency response training alone are tremendous.

Jeff Mullins: Metaverses provide immersive experiences, so people are more present. Unlike a Zoom meeting, it is difficult to multitask while in a metaverse. However, this could be a short-lived advantage because major virtual reality (VR) platforms are letting users have multiple screens in the virtual environment and receive notifications like we do on our phones and smart watches today. Even so, I believe the sense of presence will still be greater in a metaverse.

Blake Ives: The automobile factory I mentioned, still has a long way to go before the virtual twin can fully simulate the progression of

7 Mullins, J. K. *Getting Serious about Games: A Study of Work and Play through Information Systems*, doctoral dissertation, University of Arkansas, 2019, available at <https://scholarworks.uark.edu/etd/3494/>.

8 Cline, E. *Ready Player One*, Ballantine Books, 2011.

9 For more information, see *Learning in the Metaverse*, 2023, VictoryXR, Inc., available at <https://www.victoryxr.com/metaversity/>.

10 *Accenture Onboarded 150,000 New Staff in the Metaverse during the Pandemic*, Ledger Insights, September 9, 2022, available at <https://www.ledgerinsights.com/accenture-onboarded-150000-new-staff-in-the-metaverse-during-the-pandemic>.

cars along the assembly line. As Mary indicated above, an earlier successful example of business benefits from a virtual world was providing safety and operations training for factory workers.

Finding business value is essential and, I believe, is the reason that virtual worlds struggled to take hold the first time around. What added value do you see metaverses providing for businesses?

Mary Lacity: We can sum up the potential value of metaverses for businesses as providing richer and safer experiences for customers and employees, reducing costs and helping to meet organizational goals.¹¹ For customers, examples of richer and safer experiences include allowing them to try on virtual clothes or visit a destination before purchase to reduce the risks of buying an outfit or booking a trip they will not like. For employees, onboarding, training and collaborating in a metaverse can improve teamwork and collaboration by providing a greater sense of presence than videoconferencing. This is particularly useful for dangerous activities, such as hazardous materials handling and bridge inspections.¹² A scaled metaverse platform can reduce the costs of travel or prototyping and deliver on sustainability goals, such as less carbon pollution from commuting.¹³

Jeff Mullins: We will see progressively greater interaction between physical and virtual worlds. Business value will emerge as these worlds begin to converge. For example, at a recent CES (Consumer Electronics Show), a major display maker debuted a pair of AR glasses with dual color projection lenses that are almost small enough to not look silly (they look like somewhat exaggerated horn-rimmed glasses from the 1950s). Early use cases for these glasses include automatic spoken language detection with subtitles for translation and augmented navigation to highlight important landmarks

and points of interest. These are things we can already do with our phones, but this immersive technology can do them better while increasing our sense of real-world presence.

Carol Kuai: The convergence of physical and digital worlds will also bring new business opportunities and even new business models that are difficult to predict. Huge markets like cloud computing and search engine optimization are good examples of prior business models that have emerged from new technological capabilities. And today we wait with high expectations to see what breakthroughs in commerce will emerge from ChatGPT and its peers that will soon follow.

Blake Ives: Can you take me on a shallow dive into the technological choices that underpin these emerging technologies and explain why you believe one path might be better than another for a business, such as my friends in the automotive industry who are just dipping their toes into the metaverse opportunity?

Mary Lacity: The conversation needs to be bigger than the value for companies. If we are potentially talking about the next version of the internet, everyone—consumers, content creators, businesses, governments and NGOs—should have a voice in shaping that future.

The choices are less about technology and more about governance. The two choices are generally referred to as “Web 2” or “Web 3” versions of the metaverse. Web 2 versions apply the same business models as e-commerce, content and social media companies do today—a centralized platform provider harvests and monetizes users’ data in exchange for free or low-cost services. Meta is the leading example of a Web 2 metaverse; Meta’s latest Quest headsets collect a massive amount of user data on hand movements, eye movements, facial expressions, audio data, payments and places visited, and store user-generated content such as photos and videos. We encourage IT leaders to read Meta’s “privacy” policy.¹⁴

Web 2 metaverse companies are likely to keep a large percentage of the revenues from metaverse app developers. Today, Meta keeps 47.5% of developer revenues for Horizon Worlds, one of its first metaverse applications. Two other

11 Dincelli, E. and Yayla, A. “Immersive Virtual Reality in the Age of the Metaverse: A Hybrid-Narrative Review Based on the Technology Affordance Perspective,” *Journal of Strategic Information Systems* (31:2), June 2022, 101717, available at <https://doi.org/10.1016/j.jsis.2022.101717>.

12 Demchak, G. *A Perfect Storm: Bridge Inspections Re-imagined with Drones, AI/ML, Photogrammetry, and Mixed Reality*, 2021, video available at <https://resources.nvidia.com/en-us-general-aec/gtcs21-ss31918?lx=NIVLvC>.

13 *Value Creation in the Metaverse*, McKinsey & Company, June 2022, available at <https://www.mckinsey.com/capabilities/growth-marketing-and-sales/our-insights/value-creation-in-the-metaverse>.

14 *Supplemental Meta Platforms Technologies Privacy Policy*, Meta, January 1, 2023, available at <https://www.meta.com/legal/quest/privacy-policy/>.

Web 2 companies—Steam and Google Play—keep 30% of the revenues from apps developed by others; Roblox keeps nearly 75%!¹⁵

Jeff Mullins: Several Web 3 metaverse virtual worlds have been created and are being maintained by communities on decentralized platforms, including Decentraland, The Sandbox, Somnium and Cryptovoxels.¹⁶ These metaverses use decentralized architectures (i.e., blockchains) and some—like Decentraland—have completely decentralized governance through a decentralized autonomous organization (DAO).¹⁷ The main advantage of the Web 3 approach is putting more control and autonomy into the hands of the users—in terms of their identity, behavioral data and digital assets.

Carol Kuai: In theory, Web 2 companies can also use these technologies but the governance will be different. For example, nonfungible tokens (NFTs) can be used in Web 2 metaverses to represent unique digital assets, such as virtual plots of land, goods and services like event access passes. A Web 2 version merely means that a company has custody of the users' digital wallets—whoever holds the private keys stored in the digital wallets is ultimately in control of the assets. A Web 3 version means that users possess and control their own digital wallets.

Blake Ives: Mary, given your concerns about surveillance capitalists exploiting us from the metaverse, I assume you favor the Web 3 version.

Mary Lacity: Yes, from the perspective of individuals, I do. However, I agree with Jeff and Carol that there are legitimate business use cases like your factory example that warrant a centrally governed application. In that example, the application is used within the boundaries of the firm to deliver value to the company, its employees and, presumably through lower costs, its customers. It's not putting the company in a position to take advantage of consumers. Gartner

refers to these applications as “intraverses.”¹⁸ A centrally governed platform for business-to-business ecosystems that does not collect or exploit user data is also justifiable.

Blake Ives: What are the pitfalls of Web 3?

Jeff Mullins: A significant challenge with the Web 3 approach is that current capabilities are quite limited and will probably evolve more slowly than Web 2 environments due to the inability of Web 3 companies to match the huge capital investments being made by the dominant Web 2 companies. For example, as of the beginning of 2023, Decentraland and The Sandbox, two Web 3 entrants, lack a VR client application, so they are mainly accessed via traditional web browsers. Down the road, accessing a Web 3 metaverse using the Meta (a Web 2 company) headset will bring a whole new set of challenges.

Blake Ives: You've mentioned headsets a couple of times and Meta seems to be the current leader in this space. Any thoughts about where Apple's headset might fit, with all the rumors swirling around ahead of its anticipated release? What about other wearables?

Jeff Mullins: I see a mixed bag with the Apple headset. On the one hand, Apple excels at user experience, and metaverses are all about enhanced and new experiences. Once the technology is ready, Apple will want to make glasses as ubiquitous as its phones and watches but that may take a while. Based on the likely price point for current “state of the art” wearable technology, it's quite possible that Apple's initial entry into the space will be in the high-end niche market.¹⁹ Compared to other Web 2 giants, Apple is also more protective of users and their data. On the other hand, Apple's competitive advantage stems from its closed platform ecosystem. In addition to collecting a percentage of developer revenues, as Mary mentioned earlier, Apple exerts full control over what apps can enter its ecosystem—a practice that can stifle innovation and that has resulted in several lawsuits alleging unfair competitive practices.

15 Ramel, D. *The Metaverse Developer Pay Problem*, 1105 Media Inc., June 29, 2022, available at <https://virtualizationreview.com/articles/2022/06/29/metaverse-developers.aspx>.

16 *Top 10 Metaverse Crypto Projects to Watch in 2023*, Sensorium, November 29, 2022, available at <https://sensoriumxr.com/articles/top-metaverse-crypto-projects>.

17 Christodoulou, K., Katelaris, L., Themistocleous, M., Christodoulou, P. and Iosif, E. “NFTs and the Metaverse Revolution: Research Perspectives and Open Challenges,” in *Blockchain and the Token Economy* (eds. Treiblmaier, H. and Lacity, M.), Palgrave MacMillan, 2022, pp. 139-178.

18 Resnik, M. and Khilare, A. *The Gartner Top Strategic Technology Trends for 2023: Metaverse*, Gartner Webinar, 2023, available at <https://webinar.gartner.com/452064/agenda/session/1065306>.

19 *An Interview with Matthew Ball About Disney, Streaming, and the Metaverse*, Stratechery, February 16, 2023, available at <https://stratechery.com/2023/an-interview-with-matthew-ball-about-disney-streaming-and-the-metaverse/>.

Carol Kuai: In addition to VR headsets, wearable devices that engage our other senses are being developed. Haptic hardware provides a sense of touch by applying vibrations or forces. Our mobile phones already alert us to messages by vibrating, but metaverse haptics are expanding to include fingertips, gloves, vests and full-body suits, as seen in popular movies such as *Ready Player One* (based on the book of the same title). Olfactory headset attachments omitting bursts of scent are just coming to market. Gustatory devices simulate taste by spraying chemicals on a user’s tongue. At present, however, these devices are rather clunky.

Mary Lacity: These devices might seem clunky to wear today, but the history of laptops and phones suggests that mobile technologies will become more portable even as they become more powerful. Eventually, humans might access the metaverse through microchip body implants—something Elon Musk is already investing in. Neural, cochlear, heart and dermal implants are used for medical treatments. But again, I am terrified of what such devices will mean for our humanity.

Blake Ives: About 16 years ago, our research center leased a private “island” on Second Life. My avatar, Blake Stringfellow, was young, handsome and, unlike me, also of near-normal height. One day, while visiting a public island in Second Life, I met a couple—an architect and an interior designer in real life—who were building some really cool stuff. We chatted briefly and their avatars, Louis Beauchamp and Serena Vale, agreed to build me a campus of virtual buildings in exchange for having a nice place for them to play, where their buildings would, unlike on a public island, remain standing after they went offline. In the language of the metaverse, the builds were “persistent.” A dozen clicks and a minute later, the avatars were on our barren island with rights conferred for them to visit and build. A few days later my new architectural firm had designed the campus, my construction crew had erected the buildings, my interior designer had outfitted them and my landscapers had sculpted the grounds surrounding our first classroom. It was beautiful and the economics were advantageous.

At the time, many other professors were out there on their own universities’ islands,

some teaching, some attending seminars, some conducting research projects. Most of us, for a time at least, were busy imagining and, just as Jeff is now, predicting a glorious commercial future that surely lay just around the corner. But we were a tad premature. Today the technology is both faster and cheaper, big-name companies like Meta are supportive and consultants are rubbing their hands together in expectation.

Last time ‘round, you [Mary] stayed out and I jumped in. This time, Jeff and Carol are in, while I, with wings still singed from that long-ago fire, wait for evidence that the renewed interest in virtual worlds isn’t, to quote Yogi Berra, *déjà vu* all over again. Have you got any solid evidence this isn’t just higher-quality, better-financed hype? Is it time to go all in?

Mary Lacity: Let me first answer a slightly different question: Which companies are going all-in? In our recent white paper, we identified which U.S. businesses are already exploring metaverses by analyzing Securities and Exchange Commission (SEC) 10-K reports,²⁰ corporate press releases and U.S. patents. Overall, we found surprisingly little activity despite the hype and market projections for a multi-trillion dollar industry within the next decade.²¹ But there are of course exceptions because some companies are all-in already. This is what worries me and why I am warning about the risks of a handful of tech firms dominating this space, like we have now with social media.

To answer the “should” question, the metaverse future is not deterministic—it will emerge from the choices we make today. Deep thinkers who understand behavioral economics will need to develop good economic business models to incentivize innovation and adoption of the metaverse. Given this, we can achieve the vision of individuals owning and monetizing their identities, credentials and digital assets; of freely coming and going across virtual worlds; of securely executing transactions peer-to-peer with low transaction fees; of having a voice

²⁰ The annual report to the SEC on Form 10-K provides a comprehensive overview of a company’s business and financial condition and includes audited financial statements.

²¹ Lacity, M., Mullins, J. and Kuai, L. *What Type of Metaverse Will We Create?* Blockchain Center of Excellence white paper, University of Arkansas, October 2022, available at https://bpb-us-e1.wpmucdn.com/wordpressua.ark.edu/dist/5/444/files/2022/10/2022_02_BC0E-WhitePaperMetaverse5493.pdf.

in the governance of the applications; and of promoting the inclusion and dignity of all. We also need widespread participation in creating open standards. At a minimum, many companies should assign representatives to participate in standards-making bodies such as the IEEE Metaverse Congress,²² the Metaverse Standards Forum²³ and the Trust over IP Foundation's AI & Metaverse Technology Task Force.²⁴

Jeff Mullins: The financial and technological momentum suggests augmented and virtual experiences are key aspects of the road ahead, irrespective of whether it's called "metaverse" or some other label the hype machine churns out.

Carol Kuai: The innovations are coming and my hope is that we—the IS community—can help to promote a balance between the free-market forces that drive investment and create innovation and the societal benefits arising from interoperable standards that enable a level playing field and consumer empowerment. This balance has, for example, been achieved with open source software that allows anyone to add value on top of public codebases.

Blake Ives: So, the hard data Mary referred to does not seem, to me at least, to support the hype, suggesting that Jeff's road ahead may be a long and uncertain one. But I believe your evidence, perhaps with the exception of the U.S. patent data, is biased toward the demand side. On the supply side, a small number of players like Meta are making big bets that they can stoke demand. This supply push is very different from what we witnessed 20 years ago. Moreover, the recent COVID-19 pandemic and the consequent need and subsequent desire to work from home have added considerable fuel to the metaverse innovation engine.

I share Mary's pessimism but for a different reason. Whether the future lies in Web 2 or Web 3 models (or even Web 5), I worry about what that future will be and where—home, office or beach chair in Maui? If, over the next 20 (or even 50) years, most knowledge work (and entertainment

and education) transitions to the metaverse with knowledge workers in their homes, what happens to all those big office buildings, hotels and campuses in downtown Manhattan, Manchester and Melbourne? What happens to those cities if they lose the tax revenues from office buildings? What about the impact of home-based workers on airlines and on the building-services, restaurant and construction industries that currently serve those cities?

Carol mentions societal benefits, but should we not also forecast and prepare for societal disruptions and costs? As a cautionary tale, consider the huge societal disruption caused 70 years ago by a far simpler technological innovation—the intermodal shipping container. Though container shipping lowered costs and increased profits, it has resulted in much of Western manufacturing moving to Asia, thus creating massive domestic blue-collar job losses and political discontent.

Carol Kuai: As many say, technology is a double-edged sword. Technological innovation may bring both societal benefits and costs. Globalization has caused many manufacturing industries to move to developing countries but has also created new innovations and job opportunities. As a global community of researchers, we should closely monitor those trends, understand the mechanisms, explore the risks and opportunities, and work with practitioners to leverage the benefits while averting risks. No matter which roles the IS community plays, we share the hope of using technology to make a better world.

Jeff Mullins: Let's take the automobile as a historical example of a disruptive technology. Initially, automobiles were luxury items with little practical value, but as the technology improved, costs decreased and infrastructure developed, they became a fixture—a necessity—for many. The mass-market adoption of automobiles was an important factor in the move from cities to suburbs. But it also promoted a sense of individualism and autonomy that had some critics predicting a withdrawal from society.²⁵ It's not hard to envision a similar trajectory for metaverse technologies and we see similar criticisms today. Because the metaverse is at

²² Information about the IEEE Metaverse Congress is available at <https://engagestandards.ieee.org/IEEE-Metaverse-Congress-Series.html>.

²³ Information about the Metaverse Standards Forum is available at <https://metaverse-standards.org/members/>.

²⁴ Information about the AI & Metaverse Technology Task Force is available at <https://wiki.trustoverip.org/pages/viewpage.action?pageId=19657312>.

²⁵ Pawley, M. *The Private Future: Causes and Consequences of Community Collapse in the West*, Random House, 1974.

such an early stage, we have an opportunity to influence its trajectory toward solutions that maximize value and minimize risks.

Blake Ives: I'll close by asking each of you a controversial question: What, if any, is our responsibility as researchers, educators and practitioners to predict and help shape the future world that may be largely defined by the metaverse? What concrete steps should we be taking now?

Jeff Mullins: As scholars, we need to reconsider many of our assumptions about how people perceive and interact with the world as their experiences take on new digital dimensions. These assumptions range from basic psychological processes (e.g., motivation, cognition and emotion) to more advanced human-computer interaction design (e.g., navigating a 3D space where the laws of physics only apply to some objects in our field of vision). Going back to the automobile example, phenomena like road rage and distracted driving are unique challenges tied to basic psychological processes, and human-car interaction design has advanced significantly in the last few decades to incorporate new digital capabilities.

Mary Lacity: But we need to do more than just observe the world—we should help build it in a way that mitigates the risks of addiction, cyberbullying, surveillance and cybersecurity breaches. We need to translate our research about human behavior in metaverse environments into actionable guidance for the practitioners who are creating these new experiences.

Practitioners need to explore the potential for business value from enhancing customer, employee and partner experiences based on the unique capabilities of virtual and augmented reality. These explorations need to focus on more than just profitability and also consider the risks we've talked about to human well-being and society at large—businesses will need mitigation strategies to address these risks. As mentioned earlier, practitioners should also participate in metaverse standards initiatives; having a seat at this table will prepare organizations to navigate the complex road ahead. One final piece of advice I can offer, based on my own experience of working with Jeff and Carol: Instead of hiring high-priced consulting firms, practitioners should

consider tapping into the hidden talents of their employees—many of whom will likely be gamers.

Carol Kuai: As educators, we need to start experimenting. To that end, Mary and I are co-teaching a special topics class this fall called "Metaverse Uses, Risks, and Ethics." We and the students will explore different metaverse platforms, develop and deliver one educational experience in a metaverse, and write recommendations for students, faculty and administrators pertaining to the opportunities, risks and ethical guidelines.

Mary Lacity: Carol and I are teaching this course because one of Blake's and my mutual friends, Professor Michael Parks from the University of Houston, influenced me long ago when he said, "It's easy to criticize, it's hard to build stuff."

Blake Ives: Thanks for your insights. We are fortunate to have the three of you to help look after society and the metaverse developers as the metaverse unfolds or, just maybe, unravels.

About the Authors

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