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## Looking to the Future: Higher Education in the Metaverse

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The concept of virtual reality—of humans interacting in computerized, digital environments—has been in existence for over twenty-five years now. The cult-classic movie *Tron*, perhaps the first movie to explore the concept, was released in 1982, and by the early 1990s, “virtual reality” was the buzzword *du jour*. Films like *Lawnmower Man* (1992) provided visions of people entering digital environments through the assistance of external devices worn on their bodies—goggles for seeing, special gloves for touching, and so on. The idea was that at some point in the future, these devices could be miniaturized and worn naturally, allowing people to interact simultaneously with an augmented physical reality as it exists and an immersive virtual reality in whatever form or shape we imagined it.

Although computer scientists, engineers, and researchers have been working toward this goal ever since, other areas of development in virtual environments have progressed more rapidly. The explosion of the Internet and “social media” services that connect an ever-growing population through online communities; the worldwide spread of mobile communication devices, pocket-sized phones, and the broad range of services and access to information they provide; global satellite mapping and positioning systems; radio-frequency identification (RFID) tags embedded into products, environments, and even living beings; cheap and ready access to hardware and software to better create and share digital content; and the technology used to create and populate enclosed three-dimensional (3D) virtual environments already in use by millions of people—all of these developments arrived before the gloves and goggles and full-body sensory immersion imagined in those early days.

Indeed, we now have thousands of examples of digital, 3D virtual environments, accessed by the familiar computer interface. From “mirror worlds” like Google Earth, a virtual representation of our planet that can be overlaid with both historical and real-time data, to “virtual worlds” that can resemble reality or not, virtual reality has come to pass in a form different from what many had expected. In the last decade, these environments were often used for Massively Multiplayer Online (MMO) games or specialized simulations created by professional developers, but as with many Internet technologies, this paradigm is shifting—and shifting rapidly. The same technology trends that are disrupting traditional publishing and broadcast models are having a similar effect on the uses and affordances of virtual environments. With the advances in computational power, Internet access and speed, and graphical 3D reproductions possible on an *ordinary* home computer, and with the development of new software products that place the ability to create new digital content in the hands of *ordinary* people, we are beginning to see in virtual worlds emergent behaviors that rival the explosion of creativity, innovation, and engagement seen in other web-based media.

Yet despite all of these changes, “virtual reality” still evokes images reminiscent of *Lawnmower Man* for many people, who, in the absence of personal experiences with these environments, often dismiss virtual worlds as a technology that isn’t yet ready for prime time or as a young gamers’ fad that holds little relevance to professionals or serious academics. The articles in this issue of *EDUCAUSE Review* demonstrate that legitimate educational uses of virtual worlds are already being discovered and documented and that the academic inquiry into virtual worlds is of a very serious nature indeed. But beyond the capabilities that virtual worlds offer us at the moment, it is the possibilities that we can imagine for the future that may be the most compelling.

In this emerging ecosystem of digital tools, spaces, and networks that exist “online,” virtual worlds represent a convergence of several technology trends that, if realized, would place us on the cusp of an even deeper change that could profoundly influence our daily interactions in and perceptions of both worlds—physical and virtual. The beginnings of this change, already in evidence, have very real implications for higher education, not because of the changing needs of learners, as is often discussed in the context of the “net generation,” but rather because of “(1) the changed ways in which we can access, interact with, and create information, and (2) the changed ways in which we can access, interact with, and connect with each other.”<sup>1</sup>

### Emergence of the Metaverse

The term *metaverse* was coined by Neal Stephenson, in his 1992 science fiction novel *Snow Crash*, to describe a persistent, immersive 3D virtual environment in which everything from business to entertainment could be engaged in by any user, anywhere in the world, with access to a terminal. In Stephenson’s novel, the creation of the metaverse allowed much of our day-to-day human interaction to move into the virtual world, and this in turn profoundly

changed human societies and culture in the real world. Though the current state of the emerging metaverse is far from the seamlessly integrated world that Stephenson imagined, his novel not only shaped the way the technology has developed but also influenced the imaginations of its users.

In its current context, the metaverse is a complex concept. For the purposes of this article, the definition in the *Metaverse Roadmap* will suffice: "In recent years, the term has grown beyond Stephenson's 1992 vision of an immersive 3D virtual world, to include aspects of the physical world objects, actors, interfaces, and networks that construct and interact with virtual environments. . . . The Metaverse is the convergence of 1) virtually-enhanced physical reality and 2) physically persistent virtual space. It is a fusion of both, while allowing users to experience it as either."<sup>2</sup> In short, we can imagine multiple and myriad digital mirrors of the real world existing alongside multiple and myriad digital worlds that do *not* represent the real world, all used for a variety of purposes, tied into a variety of communication methods, and populated by any user with Internet access, as well as a steady stream of data originating from objects and devices in the real world.

If we accept as a given that, over time, the barriers to adoption and the technical impediments will be addressed and that, at some point, broad adoption of virtual worlds will become commonplace, then a number of possibilities open up, not only for education but for other sectors as well.

## Virtual Workplace of the Future

The most obvious and early incentive for businesses to become involved in virtual worlds was the opportunity to market their services to a highly sought-after demographic, but the opportunities didn't end with virtual replicas of brick-and-mortar stores. The market research firm Screen Digest predicts that virtual worlds, including the buying and selling of virtual goods and services, will be a \$1.5 billion industry by 2011,<sup>3</sup> while another firm, Strategy Analytics, predicts nearly one billion users of virtual worlds and an \$8 billion services market by 2018.<sup>4</sup> Millions of real U.S. dollars are already changing hands every day in worlds like Second Life as users with an entrepreneurial spirit satisfy a thirst for virtual goods that seems to rival our real-world material wants.<sup>5</sup> At the Virtual Goods Summit held at Stanford University last year, Dan Kelly, CEO of Sparter, said, "It's easily a billion dollar [secondary] market. Consumers have told us these things have value, the industry now is trying to reconcile that with their business model."<sup>6</sup>

Beyond marketing efforts and the buying and selling of virtual goods, other business uses of virtual worlds are also emerging. Both IBM and Intel have developed private collaboration spaces in Second Life because they see tremendous potential for connecting a distributed workforce. IBM has even gone so far as to establish a virtual worlds conduct policy for its employees.<sup>7</sup> Sandra Kearney, IBM's Global Director for 3D Internet & Virtual Business, recently discussed early opportunities for businesses in virtual worlds to see real ROI, including employee orientations, process and change management training, and even the serendipitous "water cooler effect" of employees networking and forming better working relationships through chance encounters in digital environments. "We are closing the gap between static and real time information, interaction and experience in a cost effective manner," she said.<sup>8</sup>

Her words are echoed by Christian Renaud, formerly Cisco's Chief Architect of Networked Virtual Environments: "We have been gradually migrating from a traditional industrial-age workplace metaphor of individual work tasks performed in a shared setting (think of a cubicle-farm of either call-center representatives or engineers occupying three floors of a building) to a Knowledge-age metaphor of more collaborative, integrated tasks that are performed by virtual, geographically dispersed teams. So, instead of doing autonomous work in a collaborative setting, we are doing collaborative work in more and more autonomous (or at least geographically distinct) settings. This is the *Shift*."<sup>9</sup>

These companies are already preparing for a future when a typical physical workspace will be fully augmented by a digital counterpart. And as energy consumption and global climate change become more pervasive problems, many industry analysts are considering the potential of virtual worlds to reduce travel for everything from day-to-day business activities to large-scale conferences and meetings. At the World Economic Forum in Davos, Switzerland, earlier this year, Mitch Kapur, the founder of Lotus Development Corporation and designer of Lotus 1-2-3 and a member of the Board of Directors for Linden Lab, spoke of the work being done to increase the "sense of presence" through better gestures, avatar animations, and interfaces in virtual worlds. "If you do the math, the cost savings to do meetings virtually at a distance instead of putting people on planes is enormous. Carbon offsets are one of these intermediate solutions, if they are done well they do make a difference . . . but it's like trying to fill a bathtub with the stopper open. I see this causal change from 3D cameras, body language, more realistic interaction, to make virtual worlds more useful not just for people who want to explore a different identity . . . but [for] ending the tyranny of geography [through virtual meetings]."<sup>10</sup>

Industries are also exploring how virtual worlds might enable better collaboration with their customer base, facilitate rapid prototyping of products, and even be used to display real-time data and to control real-world facilities in new ways. The technology industry giant Siemens, in partnership with University of Cincinnati researchers, is exploring how to convert models created with its industrial design software into 3D models that can be imported into virtual worlds to allow real-time feedback from clients, who would be able not only to see the model on the screen but also to walk around it, get inside it, and interact with it.<sup>11</sup> How this ready access to development and design tools in a collaborative environment might also change manufacturing processes remains to be seen, but certainly many in the industry expect that it will soon drive a shift in products that are created through "user-centered design" processes. Rather than facing a limited palette of choices on a web form, for example, users might enter a virtual showroom and help construct the very products they want to purchase.

Other sectors are exploring altogether different uses, such as importing real-time data feeds into 3D maps and displays that allow the user to experience the information in ways that can't be duplicated by "flat" models. Government agencies are already using virtual worlds technology to explore simulations of weather phenomena, natural disasters, and training scenarios, and these simulations will become only more rich and meaningful as more real-world data can be integrated into the models. Prototypes are also being developed to tie real-world hardware to

facilities and controls in virtual worlds. In one example, Implenia, a Swiss construction and building services provider, developed a link between a real-world dollhouse and its counterpart in a virtual world so that doors, lights, and temperature controls for the physical model could be controlled by switches in the virtual model.<sup>12</sup> This could be extended to any number of facility-control and virtual-modeling systems for management by a more distributed workforce or even extended to homes and appliances for virtual monitoring and control.

In each of these scenarios, higher education has a significant role to play. Business and industry will be looking for an educated workforce ready to meet the challenges these new environments present, from new modes of marketing, design, and manufacturing to new kinds of management and organizational leadership models that leverage virtual environments as one option in a suite of online tools serving the needs of companies and their customers. As virtual economic activity and the delivery of virtual goods and services increase, so too will the need for new areas of research and scholarship. The social sciences can help us better understand how human behavior in these environments is similar to or different from behavior in the real world, while computer scientists and engineers will be needed to increase capacity, usability, safety, and crossover to real-world facilities and objects. Businesses are already seeking interns with experience in virtual worlds and are partnering with researchers to develop innovative uses for existing platforms. This trend is likely to increase as virtual worlds gain broader adoption and more widespread use in the commercial sector.

In addition, higher education institutions can benefit from many of the same cost-saving techniques as businesses by leveraging the collaborative capabilities of virtual worlds for conducting the “business” of education. From enabling internal collaboration and planning meetings to providing student services on a virtual campus, virtual worlds hold enormous promise for providing a platform for faculty, staff, and students to interact in an environment that can be entirely flexible to accommodate different needs. What would a classroom look like if we weren’t constrained by physical proximity, existing facilities, and the simple human need to sit? How would teaching change if instead of the occasional field trip to a real-world facility or location, students had ready access to professionals and experts in their native “digital” environment with the simple click of a mouse button?

If all of this sounds a little too fantastic, or a little too futuristic, consider that many of these activities are already taking place for isolated projects, in prototypes and rough experiments. Just as in the early 1990s no one could predict how fully the Internet would become integrated into our day-to-day lives, it is difficult for many people today to imagine how quickly the real world and virtual worlds may become entwined. But the rapid spread of web-based technologies should serve as an example of how quickly these changes can take place.

## Explosion of Worlds, Confusing Choices

Virtual worlds technologies are not without their obstacles. Currently, each virtual world exists unto itself; “travel” between them as a single user, avatar, or identity is largely not possible, and each world implements a different combination of toolsets, communication gateways, and affordances. Unlike the Internet, which is based on standardized protocols that work across many platforms, virtual worlds technology today is still largely based on closed, proprietary systems. These “walled gardens” are internally consistent, but in most cases the content created within that environment cannot be exported and imported into other worlds. This closed-world paradigm makes sense in the video game industry, where each company competes for subscribers by offering premium game content, but as the uses for virtual worlds have expanded to include the kinds of non-game activities that Stephenson imagined, this paradigm presents very real barriers to the sorts of activities that business, governments, and higher education institutions are looking to conduct.

In the last few years, rumblings from the open source and user communities about this lack of interoperability seem to have reached critical mass. Early development has begun on open source platforms like Sun’s Project Wonderland and the OpenSimulator Project, while semi-open platforms like Multiverse and worlds like Second Life, Kaneva, There, and China’s HiPiHi have added increased abilities for user-generated content. Many believe that Linden Lab’s Second Life saw such rapid success and media attention because this was perhaps the first virtual world to entirely open content creation to its user base, but apart from competition in the open source community, Second Life remains one of the few virtual worlds to do so. Linden Lab has also responded to pressure from open source competitors to solve the “travel between worlds” problem. In July 2008, it announced that a partnership with researchers at IBM had resulted in the first inter-virtual-world teleport, in which an avatar from a Second Life test-world was transported to a virtual world operated by IBM.<sup>13</sup> Although this breakthrough provides a valuable proof-of-concept that such travel is possible, many technical hurdles remain, including how to address security and authentication issues, how to enable the portability of inventory and assets, and how to extend this process to the wide variety of virtual worlds in existence.

We can expect to see the development of open standards and protocols for virtual worlds to continue, but in the meantime, higher education institutions will be faced with choosing which virtual worlds platform to invest in, presenting a conundrum. Selecting one platform necessarily limits use of the others, and each world caters to different user populations and demographics. For example, institutions seeking new methods for student recruitment may want to invest in platforms different from those that would be chosen by institutions focused on exploring the simulation or modeling capabilities of a virtual environment. Due to limited budgets and portability of assets across platforms, it is unlikely that institutions will have a presence in many different worlds.

To further complicate matters, the most open platforms from a content-creation perspective also often require the most expensive hardware, limiting accessibility, for the moment, to those with broadband Internet access and higher-end computers. Many institutions would have to prioritize hardware upgrades for existing infrastructure to take advantage of these platforms. In terms of greater distance-learning outreach, it is a sad irony that the populations who might benefit the most from this technology may also be the least likely to have access to it. In fact, broader adoption of virtual worlds is likely to exacerbate accessibility and digital divide issues in the coming years, and as we have seen, these are significant challenges to overcome. Still, traditional and nontraditional students alike

seem to be interested in online course options that accommodate flexible scheduling, and many educators hope that virtual worlds technologies will enable higher education institutions to provide top-notch service and instruction to students no matter where they live, whether by helping “distance” students feel more connected to others in the course through the sense of co-presence in virtual worlds or by providing another avenue for students to connect to the institution in a more visually rich and appealing way than allowed by the flat web.

Another consideration from an institutional perspective is how virtual worlds technologies will integrate with existing student information systems and learning management platforms. One would think that course/learning management systems like Blackboard would be quick to explore this market, but we’ve seen few examples of this to date. Until we see greater adoption by higher education institutions and more demand from faculty and students, demand that will trickle up to those making the purchasing decisions, service providers are unlikely to begin to interface with virtual worlds platforms. Because most virtual worlds platforms are proprietary and the underlying technical standards that help different systems talk to each other have not yet been developed, existing learning management systems would have to start from scratch in a new market. We may see more service providers move toward integration with virtual worlds when these platforms begin to adhere to common protocols that can interface with existing student information and learning management systems.

Finally, higher education institutions facing a plethora of choices offered by virtual worlds will need to carefully consider a number of strategic and legal issues. In recent years, the trend toward “software as a service” has been growing: instead of purchasing a software product that is installed and hosted on the institution’s own servers and managed by internal employees, the institution pays an outside company to host the software application and provide service to customers via the Internet. Virtual worlds platforms largely seem to be following this model, which places higher education institutions in the position of relying on the service provider for everything from data security, uptime, and reliability to governance of the legal relationships between the institution and its faculty, staff, and students under the provider’s terms of service. Although some worlds like Second Life grant intellectual property rights to content creators, others do not, and existing platforms may not satisfy the legal requirements that higher education institutions are bound by, such as accessibility, accreditation-reporting, and student privacy requirements. Until enterprise-level virtual worlds are developed for internal hosting, or until the various independent virtual worlds coalesce into something resembling an open 3D Internet, colleges and universities will be forced to weigh these issues carefully and understand the implications of their choices.

## Pioneers Forging Ahead

It’s almost unfortunate that we talk and think about virtual worlds as a kind of “technology” application rather than as an exciting new laboratory, or as a giant sandbox to test new theories, or as a way to step into our collective and individual imaginations in a manner that we have never been able to do before. Given all of the uncertainty in an emerging market and the public hysteria about the dangers of the Internet to children, it is understandable that educational institutions would approach something as fantastical as virtual worlds very warily indeed. And yet, it is the Second Life educational community that has plunged headlong into exploring this virtual world.<sup>14</sup>

Granted, many of the pioneers in virtual worlds for education have previous experience with teaching online, and there’s a higher “tech savvy” quotient among them overall. But these instructors have faced every conceivable obstacle—from lack of funding and suitable infrastructure to skepticism and sometimes outright hostility from administrators, to worries about leading students down a primrose path toward online addiction, to fears about inappropriate content and intellectual property rights and a general confusion about the legalities of digital content—and they continue to show a staunch determination to not let these challenges stop their exploration of a technology that appears to have so much potential. In many ways, teachers involved in virtual worlds today resemble the instructors who pioneered web-based distance-learning programs and fought similar battles a decade ago, as they focus on continually seeking ways to improve learning outcomes regardless of the platform.

In a time when our modern educational system is under fire for being disconnected from the real world, from authentic experiences that will lead students to real academic achievement, many educators see virtual worlds as a tool that might help instructors connect students to the real world through the technology of the virtual world. Part of this enchantment comes from the unique affordances of the platform: it gives students the ability to play, to practice, to pretend, to be creative and imaginative, and to do things that they don’t or can’t or can’t yet do in real life. But virtual worlds move beyond authentic learning. If we see virtual worlds as sitting within an emerging ecosystem of web and social media technologies that enable many different learning styles, with many opportunities for “just in time” information, for direct contact with real-world practitioners, and for self-directed learning, perhaps we can learn to leverage this technology in ways that will enable the kind of personal autonomy that deepens a student’s sense of investment in the outcome, a key to helping students become lifelong learners.

Virtual worlds technology, like the Internet in general, is changing the way we access and experience information and the way we can access and connect with each other. Few college/university presidents or CIOs are currently prioritizing the exploration of virtual worlds, but it seems safe to predict that within the next three to five years, a higher education institution without a virtual worlds presence will be like an institution without a web presence today. The affordances are too appealing and the market forces too powerful to ignore the technology altogether. In addition, government and industry will be looking to researchers for information, policy guidance, and innovative applications as the technology matures. Higher education has a key role to play in this development, and we can look to the work of the early adopters and pioneers, many of them highlighted in this issue of *EDUCAUSE Review*, for hints of what this future may hold.

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