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Crossing the Chasm, One Implementation at a Time

How Advocates and Implementers Are Overcoming Barriers to Adoption of Immersive Technologies in the Workplace

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EXECUTIVE SUMMARY

As Immersive Internet champions in the enterprise attempt to move projects forward, many find their efforts thwarted by a seemingly endless array of barriers. This report sheds light on common barriers and recommends "springboards" that can be used to leap over the hurdles. A thorough understanding of the barriers and springboards is crucial to building an effective business case and earning the trust of potential executive sponsors and other stakeholders. The target audience for this report is Immersive Internet advocates and implementers.

To research this topic, ThinkBalm analysts conducted in-depth interviews with sixteen advocates and implementers who have been involved in immersive technology projects in their organizations. We asked about barriers they faced, whether they overcame those barriers, if so how, and if not why not. Our analysis shows that some barriers become apparent immediately during (or even before) the experiment or pilot. Other barriers rear their heads as the workforce becomes more dependent on immersive technology, and the organization expands its rollout. Still other barriers present themselves further into the future as the immersive technology becomes business-critical or the organization moves toward enterprisewide deployment.

The three major types of barriers to Immersive Internet adoption are technology, people (in particular, time and perception), and money. Currently, technology barriers are the most prevalent. The enterprise immersive technology market is early-stage; many vendors are small, and most available products have gaps in stability, scalability, or functionality. Hardware issues ranging from lack of computer headsets to computer replacement schedules can make it difficult for people to access these media-rich computing environments. Over time, some technology issues will wane. New ones will crop up, such as pressure to avoid redundancy with other collaboration tools, and integration with existing business systems.

Unlike other collaboration and communication tools such as wikis, blogs, instant messaging, and email, immersive technologies have roots in simulations and video games. While this legacy is part of what makes the technology special, first impressions can be difficult to dispel if business decision makers are convinced that 3D avatar-mediated technology is nothing but a game. Issues related to time and perception include getting people interested, devoting the amount of time needed, and teaching people how to use the technology effectively.

The need to build a business case to justify investment is common to any emerging technology effort. Until immersive technology becomes a mainstream means of conducting training, meetings, events, business activity rehearsal, and other work activities, project champions will have to continue demonstrating the value of investments in this technology. Other financial barriers loom on the horizon, like project cost overruns and technology replacement.

This report highlights springboards that can be used to jump over barriers to adoption. Selecting which springboard to use and when to deploy it depends on the Immersive Internet use case(s), severity of the barrier's consequences, and the cost of putting the springboard in place.

BARRIERS: TECHNOLOGY, PEOPLE, AND MONEY

The Immersive Internet holds great promise. Learning, training, meetings, conferences, data visualization, design and prototyping, business activity rehearsal, human resource management, and remote system and facility management can all be done faster, better, and cheaper. Other benefits include the ability for people in disparate locations to work together, increased innovation, competitive differentiation, development of new business capabilities, and increased revenue.[1]

To obtain these benefits in an early-stage technology market, early adopters are putting in lots of sweat equity. Hugo Evans, CIO of AT Kearney Procurement and Analytics Solutions, spoke for many others when he said, "We haven't done a lot with immersive technology yet because we've been saddled by the barriers." Among these barriers are disinterested target users, inadequate hardware, and computer security restrictions (see Figure 1).[2]

Figure 1: Early Immersive Internet adopters face many barriers

Source: ThinkBalm

[1] In a ThinkBalm survey conducted in the spring of 2009, the vast majority of survey respondents (63 of 66) said enabling people in disparate locations to spend time together was at least a "somewhat important" benefit of their immersive technology projects. Most respondents said the same about increased innovation (59 of 66) and cost savings or avoidance (56 of 64). See the May 26, 2009 ThinkBalm report, "*ThinkBalm Immersive Internet Business Value Study, Q2 2009*."

[2] Nearly half of respondents (30 of 65) had trouble getting users interested in the technology, or found that corporate security restrictions got in the way (32 of 65). Sixty percent of survey respondents (39 of 65) dealt with inadequate hardware for their target users. See the May 26, 2009 ThinkBalm report, "*ThinkBalm Immersive Internet Business Value Study, Q2 2009*."

It's not only important for Immersive Internet advocates and implementers to fully understand the barriers that lay ahead before going beyond the experimental phase, but to demonstrate this understanding in their business case documents.[3]

A few tips:

- **Think about barriers in terms of technology, time and perception, and money.** Ultimately all barriers boil down to money, but many barriers don't manifest as straightforward cost items. The boundaries separating these categories are fuzzy and overlapping. Yet parsing the barriers this way can facilitate brainstorming, problem solving, and decision making. It can also help frame audience-centric discussions. Technology decision makers care about technology issues; business decision makers and Immersive Internet advocates and implementers care about people-related challenges; and project stakeholders care about financial barriers.

- **Some barriers will crop up later in the adoption lifecycle.** Some barriers become apparent during the experiment or pilot phase — as soon as the planning process begins. Others rear their heads as the workforce becomes more dependent on immersive technology and the organization starts rolling the technology out broadly. Still other barriers pop up down the road as the organization moves toward an enterprisewide deployment, or the immersive technology becomes business-critical.

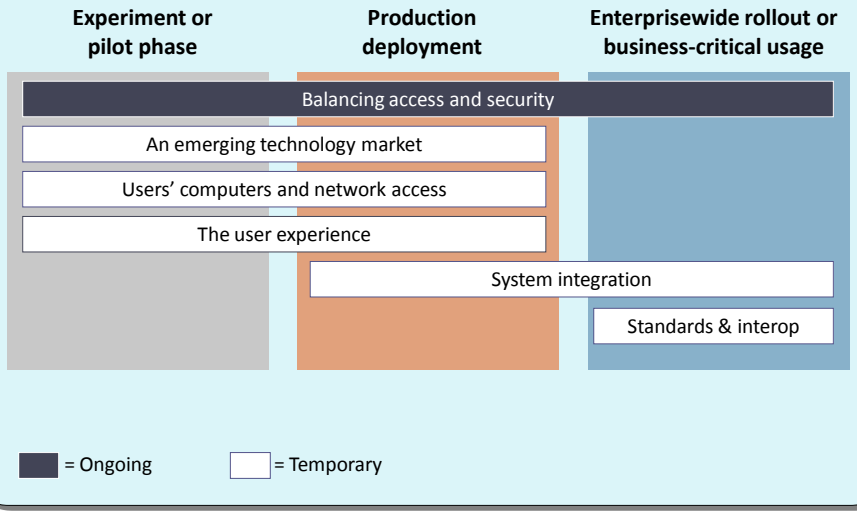
- **For most barriers, springboards are available — it's just a matter of prioritization.** Springboards are flexible approaches that serve as jumping-off places or launch points for getting your organization over a hurdle. A springboard may be a solution to a problem or just a temporary workaround. Selecting springboards, and deciding when to deploy them, depends on your Immersive Internet use case(s), the severity of the barrier's consequences for your strategy and projects, and the costs and benefits of putting the springboard in place.

TECHNOLOGICAL BARRIERS: THE LIST IS EVER-CHANGING

Technological barriers to adoption of immersive technologies relate to software, hardware, and/or networks (see Figure 2). Technological barriers will not go away; they will simply change over time. Due to the rapid-fire pace at which technology changes, just as you solve one problem (such as initial target users having inadequate graphics cards) another will emerge (such as trying to support users with many different kinds of hardware and software). Anthony Adams, owner of groupVision AG, said it well: "New technology developments are always ahead of the mainstream human capacity to use them, and 3D virtual worlds are no exception."

[3] On August 28, 2009, the ThinkBalm Innovation Community brainstormed how to write a business case of immersive technology investments. For the outcome of the brainstorming session see the Sept. 8, 2009 ThinkBalm report, "*How to Write a Business Case for Immersive Technology Investments*."

Figure 2: Technological barriers to adoption of immersive technologies



Source: ThinkBalm

Access vs. Security: A Constant Tension

The tug of war between security (control) and access (freedom) is not unique to immersive technologies. The pioneers who brought instant messaging, blogs and wikis, and email into the workplace have all faced security restrictions, as well. Most people we interviewed for this report cited security restrictions as a barrier to adoption. Many have found workarounds (see Figure 3).

Challenges related to balancing access and security include:

- **Firewalls block access or users' machines are locked down.** "It can be such a choke point to go to IT security for permission to open a single port on the firewall. It's like asking for a pint of blood," according to Sandy Kearney, volunteer president of e426.org and former global director at IBM Research. "It is a mindset about the purpose of the tools. IT organizations are buying people PCs for legacy activities, not for present-day or modern future-type activities." Another common problem is that users don't have administrator privileges on their work computers. They can't download, install, or run the needed software. Sometimes they can't even run a browser-based Java applet.

- **Proxy servers and authentication systems inhibit account creation and login.** Depending on how the enterprise security systems are set up, people may not be able to create user accounts easily, or the authentication process may convolute the login procedure. We interviewed a project manager and team leader at a Fortune 500 company who said, "One of our big challenges is that we over-engineered our login process for security reasons. This presents a usability issue."

- **IT policies reflect perceived security risks as much as actual risk.** Immersive technology is so new that most IT security professionals do not yet know what its real risks are. The impulse is to lock it down to shut out the unknown. But this may not always be warranted. Pam Broviak, city engineer and assistant director of public works in Geneva, Illinois, USA, said, "A lot of the security people we work with in municipal government have opened up the needed ports. They don't actually see many security risks."[4]

- **New forms of collaboration require changes in process — and system access.** Bart Stafford, digital oilfield practice lead for upstream oil and gas at SAIC, said, "Security is a real issue for us because we are dealing with changes in underlying business process. We are creating collaborative workspaces. The people using them require access to multiple sources of data. These people may not have access to the same systems in the past, but now they need it."

Figure 3: Springboards for balancing access and security

Barrier: Balancing access and security	Springboards
• Firewalls block access or users' machines are locked down. • Proxy servers and authentication systems inhibit account creation and login. • IT policies reflect perceived security risks as much as actual risk. • New forms of collaboration require changes in process — and system access.	• Ask high-level executive sponsor to communicate to IT management the importance of immersive technology to the business. • Encourage IT management to adopt an open attitude about non-standard software. They might follow IBM's lead; IBM puts the responsibility in employees' hands, requiring employees to sign acceptable-use guidelines annually. • Request a layman's explanation of security risks and fixes associated with software from immersive technology vendors. • Demonstrate efforts not just to meet, but to exceed, the requirements of legal and IT security departments. • If functional requirements permit, choose a browser-based technology solution so no client install is required. • If functional requirements permit, promote internal, standalone environments, to avoid cross-firewall issues. • Set up a lab or computer room people can use to participate in immersive meetings, training sessions, and events. • Encourage managers to allow people to work from home as needed, if peoples' home computers and network access are adequate. • Encourage users to get in the practice of distributing a backup dial-in phone number for all immersive meetings in case some participants have trouble using built-in voice. • Teach users how to install the client software on a USB memory stick and run the software from there. (This may require some tweaking.)

[4] Leslie Fuentes of the city of Hampton, Virginia assessed Second Life in late 2008 and determined that from a network and client perspective, Second Life and other virtual world software can be utilized safely and effectively. He concluded that risks can be managed through a variety of methods already commonly deployed by localities. See the December, 2008 MuniGov article, "*Second Life — Access Security Options in Second Life for Municipal Applications*."

An Emerging Technology Market Favors Modest Expectations

The field of vendors offering immersive platforms and applications is characterized primarily by small, young companies — or mature companies offering young technologies. This is typical of an early-stage market. Laura Handrick, vice president of innovation at The Maids, said, "One thing that worries me is investing too much in one platform. The market hasn't matured to the point where the platforms have settled down." Sandy Kearney said, "There is no keystone in this market. If you take this to a business ecosystem perspective, what's really missing to drive the market forward is a keystone."

Early adopters are struggling with issues like (see Figure 4):

- **Small vendors can be a risky bet**. Small vendors may eventually go public or be acquired by a larger company. They may be acquired by a company that only uses the software internally or turns it into a platform used only to deliver its own services. Sandy Kearney said, "Because most of the vendors are venture-backed, they're risky; you don't know where they're going to end up." This risk is common to all small vendors, whether they are venture-backed or not. We've already started to see acquisitions occur: Lockheed Martin acquired 3Dsolve and Virtual Heroes was acquired by Applied Research Associates.

- **Implementers are doing a lot of customization.** Most of today's products are platforms, not applications.[5] Project team members — and sometimes end users themselves — are finding it necessary to create 3D spaces and objects, write scripts and code, and do other kinds of customization. Hugo Evans said, "Just give me a URL to go to where I can start doing work. I don't want to buy land or build anything. I want to just start using it now. I want an all-in-one, point-click-and-buy solution."

- **Most of today's offerings lack stability, scalability, or functionality.** Any particular product may be strong in one or two of these areas, but typically not all three. Bart Stafford put it well: "A sad but true case in point: you and I are speaking on the phone right now because I had a problem my getting my voice to work in the virtual world. If you have people who are already struggling with adoption, even if they are happy to deal with these problems on some level, you have expensive people sitting around diddling with checkboxes, which doesn't make sense."

- **IT departments don't yet have the skills to support immersive technologies.** Advocates and implementers, many of whom are not IT pros, are on their own. Suzanne Aurilio, assistant director of people, information and communication technologies at San Diego State University, said, "We don't have IT support for our virtual world projects. This influenced our technology choice. We couldn't go with something that had to run on our own servers and required lots of customization." Terry Neal, owner of Blended Solutions, described the experience of a volunteer who was testing an immersive learning environment. After a full day of troubleshooting she discovered that the problem was a firewall setting on her computer.

[5] Applications are usable by the end user; platforms are designed to be built upon or integrated with, to deliver applications to the end user.

- **Startups tend not to have the customer support resources of larger vendors**. Dick Dillon said, "I would like to have 24x7 help desk service. Every once in a while I run into a glitch and have to wait until morning to get things fixed." Peter Meli, principal with The Coaches Center, said, "One of the main criteria we are using to select a vendor is support. Larger vendors can offer us the support we need, and they have sturdy long-term aspirations."

Figure 4: Springboards for navigating an emerging technology market

Barrier: Emerging technology market	Springboards
• Small vendors can be a risky bet. • Implementers are doing a lot of customization. • Most of today's offerings lack stability, scalability, or functionality. • IT pros don't yet have the skills to support immersive technologies. • Startups tend not to have the customer support resources of larger companies.	• Discuss the vendor's product roadmap with the vendor's chief technology officer. • Ask vendors' executive management teams about their exit strategy. • Work alongside the selected vendor and prepare for project takeover if needed. • Require that the vendor and/or implementation team document all workarounds.

Some Participants Cannot Engage Due to Computer or Network Limitations

An array of software, hardware, and network bandwidth issues is hampering broad-scale adoption of immersive technologies (see Figure 5). Terry Neal told of an institute of technology that, although initially interested in participating in an immersive learning pilot, pulled out because of hardware limitations and security concerns. This is an understandable reaction. Users can experience severe performance degradation due to their computers' limitations or network access problems. Objects and textures may not appear on the screen as expected, or voice or media services may not work properly.

Computer- and network-related barriers include:

- **Inadequate graphics cards, processing power, or disk space degrading the user experience**. Most organizations have a two- to three-year cycle for switching out their desktop and laptop computers. For some it's even longer. Doug McDavid, an independent consultant who retired from IBM after many years, said about IBM, "We had trouble getting people to come into virtual worlds and be fluent because they had inadequate graphics cards." According to Neil Katz, IBM distinguished engineer and CTO of the virtual spaces team in the CIO's office, this is an issue IBM is still wrestling with. Suzanne Aurilio said, "We could do faculty development workshops in a virtual world without too much trouble because faculty had access to high-end computers in our education technology room. But as soon as we started to look at distance learning we hit the barrier of faculty and students who don't have adequate hardware."

- **Hardware and software incompatibilities causing conflicts — even on new machines**. Old hardware is not the only stickler. Both Zain Naboulsi, developer evangelist at Microsoft, and Hugo Evans found that the graphics drivers on new computers, not old ones, brought immersive technologies to a grinding halt, at least temporarily. While both Microsoft and AT Kearney had problems running the virtual world of Second Life on certain Lenovo laptops, hardware and software compatibilities and conflicts are not specific to these particular technologies and are likely to continue occurring as hardware, drivers, and immersive platforms evolve.

- **Project teams having to support a wide range of hardware and software**. The mix of hardware across an organization, along with a variety of operating systems and immersive software versions, can create administration headaches. A project manager and team leader we interviewed said, "We upgraded some Windows machines and now we have two operating systems and multiple builds of our immersive environment to deal with. There are things you can do in Vista that you can't in Windows XP and vice versa. We have replaced one challenge with another." This barrier will become increasingly difficult to deal with as rollouts get larger.

- **Limited network access preventing people from accessing the immersive environment**. Hugo Evans said, "Most of our consultants are at Fortune 500 client sites four days a week. Some clients provide our consultants with full access to the network; others don't. We haven't advanced our initiatives enough yet to fully understand the implications of this." Dick Dillon, senior VP of planning and development at Preferred Family Healthcare, said, "One of our big challenges is we still have to rule out potential clients who could benefit from our services but don't have access to high-speed Internet at their home base."

- **Lack of mobile device support shutting out traveling participants**. Lack of support for mobile devices is not yet a major issue because adoption of immersive technology is at such an early stage. But as more people become dependent on the technology for meetings, training sessions, and events, mobile device support will become necessary. People will need to be able to participate in work activities that take place in immersive environments, even when they can't be in front of their computers. Neil Katz said IBM is already starting to search for ways to support mobile users.

- **Computer headsets not yet being a standard-issue piece of the information worker toolkit**. Many computers have built-in microphones and speakers, but using these for participation in immersive environments can result in echoes and feedback for other participants. USB or analog headsets provide a better experience for all involved. Before long, this barrier will disappear because headsets will become part of the standard toolkit, the way that telephone headsets, desktop or laptop computers, and mobile devices are already.

Figure 5: Springboards for dealing with computer and network bandwidth limitations

Barrier: Users' computers and network access	Springboards
• Inadequate graphics cards, processing power, or disk space degrade the user experience. • Hardware and software incompatibilities cause conflicts — even on new machines. • Project teams have to support a wide range of hardware and software. • Limited network access prevents people from accessing the immersive environment. • Lack of mobile device support shuts out traveling participants. • Computer headsets are not yet a standard-issue piece of the information worker toolkit.	• If functional requirements permit, select technology that does not have graphics-intensive or high-bandwidth requirements (e.g., Web-based). • Via integration with telephony, Web-based text chat, and streaming video to the Web, support users who can't participate fully in the immersive environment. • Identify low-cost computers or computer upgrades that are powerful enough to run the software. If the payoff of your project will be high enough to justify it, include funding for these upgrades in the budget proposal. • Buy headsets for users who don't have them — they're cheap. • Supply a teleconference line so users can switch to telephone for voice communication in case participants have trouble using built-in voice over IP.

People Are Struggling with the User Experience

Most professionals didn't learn to use immersive technology in school, don't play multiplayer video games, and have had little exposure to their computer screens as anything but 2D data delivery devices. So asking them to jump right into navigating an avatar through a 3D environment is tricky at best. Also, most organizations aren't operating at the cutting edge of technology, so the technology foundation for remote work may be several generations behind the times. Enough people having an early bad experience can be fatal to broad adoption.

User experience barriers include (see Figure 6):

- **Non-gamers struggle with the user interface.** The user interface of many immersive platforms and applications available today are not intuitive enough, as evidenced by the amount of time it takes to learn to use them, and the individual, small-group, or hands-on training required (discussed later in this report). Many immersive technologies work differently from the way other Windows- and Mac-based business tools work. For example, rather than opening files and folders, users navigate in 3D space using their mouse or arrow keys. Depending on the particular software used, people may also have to learn new concepts, vocabularies, and etiquette.

- **Common input devices are ill-suited to immersive environments.** Keyboard and mouse are not natural input devices for immersive environments. Users have to select their avatars' gestures and emotional expressions from a point and click menu, or issue typed commands. A 3D mouse like 3DConnexion can help because it mimics the experience of moving an avatar in 3D space — for example, you pull up on the device when you want your avatar to fly, and you push down on

the device to touch down. As inexpensive motion-capture devices become generally available, non-verbal communication in immersive environments will become more natural.

- **It's too hard for non-designers to create, organize, and share content.** In some immersive environments, even sharing presentation slides with others is an unfamiliar, multistep process. Neil Katz said, "It needs to become easier for users not only to access content but to create and share it. We have to enable non-3D designers and programmers to convey ideas and create presentations." Terry Neal said, "Something that has been a challenge is creating the necessary capability so educators can design the education experience in the immersive environment."

Figure 6: Springboards for overcoming user experience barriers

Barrier: User experience	Springboards
• Non-gamers struggle with the user interface. • Common input devices are ill-suited to immersive environments. • It's too hard for non-designers to create, organize, and share content.	• Make ease of use one of your highest-ranked evaluation criteria for enterprise immersive platforms. • Designate "help ambassadors" for all immersive events. • Simplify the experience for new users, teaching them the easiest way (versus all the ways) to move, talk, and upload documents. • Create and distribute simple "how-to" training materials (e.g., videos and "cheat sheets"). • Encourage "gurus" to lead tours through the environment. • Set up a hub outside the environment where people can learn and communicate about the immersive environment (e.g., Web site, blog, or wiki). • Enable voice or text chat participation for people who can't participate in the full immersive experience. • Stream video of immersive events to a Web page for other participants to watch. • Experiment with early haptic and motion-capture devices.

System Integration Will Minimize Redundancy and Maximize Value

Vendors in this early market have to offer full-featured, yet flexible, products to serve the enterprise market on the one hand, and departments and small businesses on the other. The broad array of features they offer will ultimately lead to redundancy with existing communication and collaboration technology already in use within enterprises (e.g., presence awareness, directories, text chat, messaging, voice calling and conferencing, video conferencing, screen sharing, and collaborative document editing). The right answer is software that not only can be run in standalone environments, but also has an integration layer so enterprise IT shops can swap out built-in functionality for their enterprise standard.

System integration-related barriers include (see Figure 7):

- **Functionality redundancy will cause enterprise architecture conflicts.** Pam Broviak noted, "Adoption of this technology hasn't yet reached the point where the IT architects who are focused on enterprise standards are even aware of it." But feature redundancy will become a challenge as deployments expand and enterprise IT architects get involved. A project manager and team leader we interviewed said, "Ultimately, which platform will my organization choose? We are going around the IT barriers to create what we want because we have it in our personal lives. Eventually, IT will create a standard and all the other stuff will go in the garbage." Hugo Evans said, "We do have redundant technology; we just put in Microsoft Office Communications Server, which provides presence awareness, instant messaging, voice, and Web conferencing. The difference is that with immersive environments, you truly do have unified communications."

- **Integration with back-end systems and information worker apps will unleash business value.** Today most immersive platforms and applications are in essence closed environments. Some provide barebones integration with leading office productivity suites. But for the most part, they tend to have limited application programming interfaces (APIs). They do not integrate easily with enterprise collaboration platforms, enterprise content management (ECM) platforms, or other business systems. Neil Katz said, "We need to integrate with what's already part of the enterprise platform. For scheduling meetings and events, I want to use the existing calendaring system. We need instant messaging integration and integration with the voice conferencing system, document systems, and media libraries." Bart Stafford said, "Think about the general architecture of some of these software products. If what you are trying to do involves a lot of business process interaction, putting an architecture together that allows the abstraction of business process from the display is critical."

Figure 7: Springboards for system integration

Barrier: System integration	Springboards
• Functionality redundancy will cause enterprise architecture conflicts. • Integration with back-end and information worker systems will unleash business value.	• Short-list immersive technology vendors that can integrate with your enterprise collaboration and ECM platforms. • Meet with IT pros who own enterprise collaboration, unified communications, and ECM to begin aligning objectives and technology roadmaps. • Work with enterprise architects to ensure that immersive technology choices fit into long-term IT roadmap as much as possible. • Document when to use which collaboration tool (e.g., immersive environment vs. Web conferencing) and incorporate into training program. • Highlight the value of the integration of features into a single interface and experience.

Standards and Interoperability: A Juggernaut for the Foreseeable Future

Widely-adopted standards do not exist for avatars, identity, friends lists, and many other elements of immersive environments (see Figure 8). There are few standards on the back end to enable integration among disparate enterprise immersive platforms. The user experience is not standardized beyond the use of the arrow keys or *A*, *W*, *S*, and *D* keys for navigation. Doug McDavid put it well: "A barrier in the future will be standards and interoperability. If you implement seven different technologies — like Qwaq Forums and IBM Virtual Collaboration for Lotus Sametime, for example — you now have seven systems that don't talk to each other."

One of the implications of a lack of standards is that digital assets become locked in. People can't easily transport their avatars from one immersive environment to another — even when dealing with OpenSim and Second Life, which have the same core technology base.[6] The same holds true for 3D objects, scripts, and animations. Even with multiple instances of the platform (e.g., OpenSim), digital assets can be locked in. This is a problem because, as Neil Katz put it, "People don't want to have to maintain multiple sets of content."

Figure 8: Springboards for operating in a world without standards

Barrier	Springboards
Standards and interoperability	• Choose the best technology to solve the business problem(s) you face, while keeping an eye on long-term implications of your technology choice. • Use the same immersive environment or application for as many use cases as you can to limit unnecessary redundancy and future integration issues, and ease training requirements. • If you are using both OpenSim and Second Life, or multiple instances of OpenSim, put a content management process in place. Document where digital assets will be created and stored and how they will be shared. Content permissions are an important part of this discussion. • Manage expectations regarding digital asset reuse and management. • Require that vendors support standards where they exist and are available.

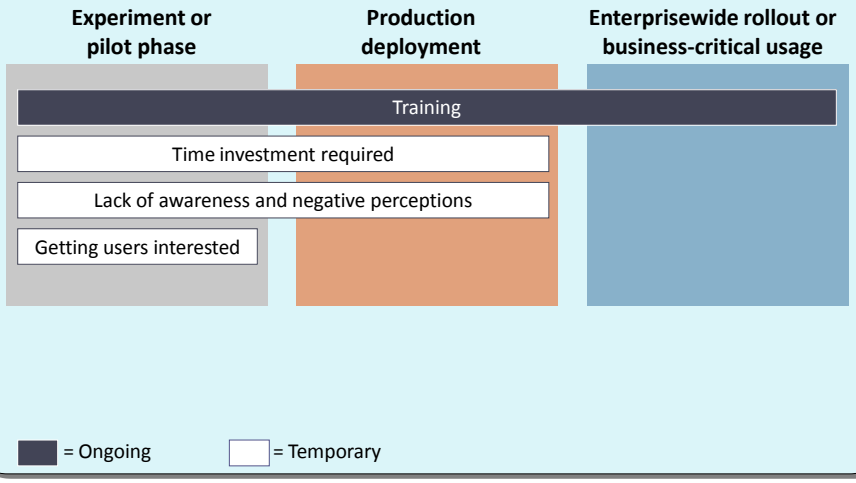
Most Time and Perception Barriers Will Fade

Time and perception barriers are like Olympic hopefuls' pre-game antics: seemingly innocent, but potentially career-ending (see Figure 9). Some issues related to time and perception will fade with each small success, but can kill the project if not addressed early. People who have negative initial experiences may run out of good will and be unwilling to try again. Influential employees may spread dour opinions which can influence many others. Time and perception barriers can result in cost overruns, unmet

[6] Early experiments in integrating virtual worlds are under way. Typically they require that the virtual worlds are built on the same technology. An example of one of these efforts is the v-Business Grid. See the August 27, 2009 blog article, "*The v-Business Grid: A vision of the future Immersive Internet*."

adoption goals, and difficulty obtaining a return on investment. The one barrier in this category that won't go away is training.

Figure 9: Time and perception barriers to adoption of immersive technologies



Source: ThinkBalm

Training Is Here to Stay

Most people we interviewed agreed that bringing people up to speed so they feel comfortable working in an immersive environment takes significant effort (see Figure 10). Neil Katz said, "People have to learn how to look around, change their viewpoint, fly, bring documents in, talk, and text chat. People who are used to playing video games are at least used to the concept of walking around with an avatar." Laura Handrick said, "Training is a big barrier for us. The learning curve for some of the people we want to train using immersive technologies — in our case, it's maids who are cleaning houses — is just too difficult. Likewise, it would be difficult to get our franchise owners to get an avatar and go into a 3D space. The technology is still cutting edge."

Sometimes project teams lack the skills or resources needed to teach people how to use the immersive technology, leaving users to fend for themselves. This leads to user frustration and can hamper adoption. We repeatedly heard during our interviews that the most effective training is hands-on, small-group or one-on-one sessions. Zain Naboulsi said, "Training is the largest barrier to really broad adoption. You can't tell someone to just go in-world and check it out for themselves. The trouble is one-to-one and small-group training just doesn't scale."

Figure 10: Springboards for training

Barrier	Springboards
Training	• Meet with corporate training department to brush up on training tips and skills. • Work with stakeholders to foster an apprenticeship culture. • Treat experienced users as gurus and incent them to help others. • Guide users to external sources where they can acquire skills. • Offer short training videos captured in the immersive environment. • Make the user orientation process easy and fun. • Offer Web-based account creation and avatar selection. • Look for opportunities in each immersive meeting or event or training session to improve the experience for the next batch of people who go through it. • Create opportunities for hands-on experiences. When desired and possible, offer in-person training sessions. • Set up do-it-yourself learning stations and basic technology training inside the environment.

This Emerging Technology Requires Time — Lots of It

Advocates and implementers, as well as end users, are finding that becoming proficient with immersive technology requires time (see Figure 11). Neil Katz said, "One of our pressing challenges is getting deployed and operating quickly. People are crying out for a solution to meeting and collaborating when we can't send them to travel." Terry Neal said, "Once people are motivated, training is not such an issue. But the time commitment required by educators is significant. In one of the pilots I worked on, one institution determined that the amount of time it would take for students to become comfortable in the virtual world was too great a percentage of the time allocated to the course."

Suzanne Aurilio's doctoral thesis work focused on how Second Life residents learn, compared to the way people learn in traditional education institutions.[7] Her research showed that it takes about 30 hours in Second Life before one can become productive. "If you cost in peoples' time," she said, "it is fairly expensive." While not all immersive environments take this long to learn to use, the learning curve is an important cost to consider.

[7] Suzanne Aurilio expects her dissertation, which is on how people learn in Second Life compared to traditional learning, to become available on the Web by the end of 2009. For more information see this Web page: http://pict.sdsu.edu/.

Figure 11: Springboards for reducing the time investment required

Barrier	Springboards
Time investment required	• Question and discuss assumptions. Many people will challenge the value of a new technology when compared to an existing solution. Look for hidden costs of the current ways people are working. • Compare apples to apples. If you hold an hour-long meeting at a coffee shop, with a 10-minute walk at both ends, compare it to an hour-long meeting in an immersive tool plus some training time added. As people become familiar with immersive environment, productivity will rise. But it will always take 10 minutes to walk to the coffee shop. • Focus on benefits, not just costs, of time spent. For example, highlight the benefits of social networking at the start or finish of a scheduled meeting or event.

Good Experiences Cure Negative Perceptions

Negative perceptions of virtual worlds and immersive learning environments abound (see Figure 12). Anthony Adams said, "The real barrier here is negative perceptions within the ranks of upper management, and their unwillingness to look change in the face." John Jainschigg, director of ZDE internet laboratory at Ziff Davis Enterprise, said, "For some people, the hair stands up on the back of their necks. For some, it's almost a moral issue. I wrestle with this on a daily basis." Zain Naboulsi said, "It is hard to convince very technical people to go into a virtual world. They think virtual worlds are just for gaming. It's funny; they will use Internet relay chat or newsgroups but won't go into a virtual world."

In an attempt to change negative perceptions, early adopters are focusing on:

- **Communications and marketing programs.** A project manager and team leader we interviewed highlighted the importance of putting a communications and marketing program in place as a means of creating a positive perception. She said, "We have an entire communications strategy and calendar. We show what's new, what's coming, and hot blogs and content. We are constantly showing that the system is working well."

- **The user orientation process.** Doug McDavid said that the New Media Consortium (NMC), where he has been a consultant, has its own orientation location in Second Life, where they can be approached by NMC's onboarding helpers. Dick Dillon said his organization set up an orientation area in its immersive environment, where clients can learn to move around and communicate. But in Dillon's case, the initial learning takes place in-person. "We are sitting in the same room with our clients when they are first introduced to the concept. Our counselor spends about an hour with them. They get a cheat sheet to take with them."

Figure 12: Springboards for fixing negative perceptions

Barrier	Springboards
Negative perceptions	• Reach out to influential naysayers and offer them personal, one-on-one training and Q&A sessions. • Develop and document a marketing and communications plan and a new user experience and orientation program.[8] • Have executive sponsor set expectations about who will use the technology and why. • Map out who is interested and who isn't, and approach each group differently. • Choose language carefully when educating stakeholders about immersive technology.[9] • Take snapshots and videos in the immersive environment and share abundantly. • Host brown bag lunches, Web conferences, and office hours to give demos, provide training, and answer questions. • Educate people about things that can be done in an immersive environment that can't be done in other ways.

Getting People Interested Is Easy if You Can Demonstrate Business Value

Getting target users interested is a challenge many advocates and implementers face (see Figure 13). According to Jeff Corbin, owner of The Science School, "People are stuck in their ways, doing things the way they always do them." Terry Neal said, "Once you get people engaged, they become key to success of the project." But getting people interested is not a matter of simply giving a good demo. Suzanne Aurilio said, "The initial interest was there. But when it came to actually doing something about it, virtual worlds got deprioritized. It's not just about lack of interest. It's about a value proposition. In a professional development context you've got to ask yourself, 'Why do I want to learn this stuff?'" Anthony Adams said, "The key ingredient to getting people interested is a compelling business case."

Figure 13: Springboards for getting people interested in immersive technology

Barrier	Springboards
Getting people interested	• Secure buy-in from business process owners and functional heads. • Explain and demonstrate how people will benefit *personally* by using the technology (e.g., save time, interact with people they wouldn't otherwise, sharpen their marketable skills). • Demonstrate that the technology solves a business problem.

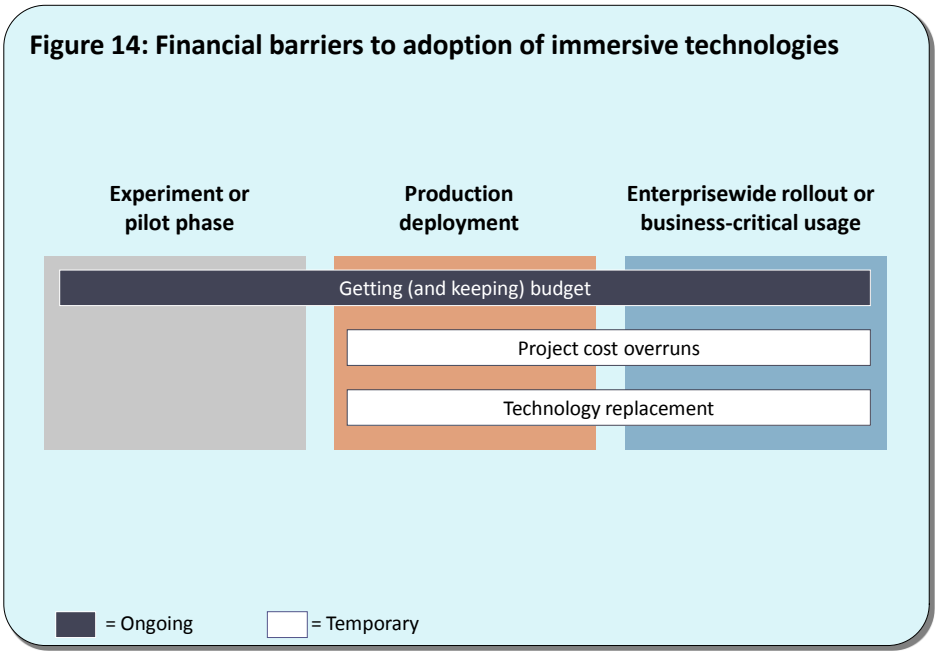
[8] For more insights into how to make sure people have a positive experience early on, see the February 29, 2009 ThinkBalm report, "*How to Give New Users a Good First Experience*."

[9] Technologists and virtual world enthusiasts often speak a different language from that of the colleagues and leadership they need to convince. For more information see the September 8, 2009 report "*How to Write a Business Case for Immersive Technology Investments*."

Financial Barriers: Watch for Clouds on the Horizon

Financial barriers are those related to spending money and deriving monetary value from expenditures. Without a strong business case and a champion among decision makers, the risk of losing an Immersive Internet project is high. If the right people don't believe in the project, or simply don't understand it, the project may be cut. Project teams have to demonstrate that the technology solutions they propose have business value. As deployments expand across the enterprise, or immersive technology becomes business critical, other financial barriers will also rise up, such as cost overruns and technology replacement (see Figure 14).

Figure 14: Financial barriers to adoption of immersive technologies



Source: ThinkBalm

Until Immersive Tech Is Mainstream, You'll Have to Justify the Investment

Decision makers sometimes say they don't see the value of immersive technology, which makes it hard for advocates and implementers to get funding for initiatives (see Figure 15). John Jainschigg said simply, "Getting budget approval is murder." Bart Stafford said, "I have to compete in a budget cycle with other uses of capital like, say, drilling a well. I have to show a business case." These experiences are common and will remain so until immersive technology reaches the early majority phase of adoption.[10] At that time, advocates and implementers will start making business cases for upgrading or replacing the immersive technology they're using, or the infrastructure to support it, rather than for pilots or small production deployments.

[10] ThinkBalm anticipants that work-related use of the Immersive Internet will reach the early majority phase of adoption in the 2013 timeframe. For more information see the May 26, 2009 ThinkBalm report, "*ThinkBalm Immersive Internet Business Value Study, Q2 2009*."

Sandy Kearney said, “Initially, at IBM, we were able to do real work in virtual environments, to demonstrate the value. It helped that we were just seeking a small amount of money. Also, we brought IBM President and CEO Sam Palmisano in world, which helped.” Now that IBM is a little further along, Neil Katz has this take on it: “Ultimately, I think the utility of the solution will drive requirements and the enterprise will need to find a way to manage the costs. It's really about the value of the experience — about whether there is enough demand from users for the application. Enterprise virtual worlds will grow through peoples’ demand for this technology for enhanced means of immersive and real-time collaboration, versus a business case and a ROI to justify the investment. So far, in IBM, we are seeing this demand in spite of the limitations of this emerging technology.”

Figure 15: Springboards for getting and keeping budget

Barrier	Springboards
Getting (and keeping) budget	• Nothing speaks like numbers. Carefully craft and present a high-quality business case. • Ask forgiveness, not permission (but don’t get into intellectual property or policy trouble while doing it). • Offer to fund a small experimental project out of your own pocket (perhaps with guarantee of reimbursement upon milestones). • Create a prototype using free or inexpensive technology. • Put metrics in place in the beginning, and document evidence of business value. • Keep the initial cost of experimentation low.

Avoiding Project Cost Overruns Will Require Vigilance

While to date, most of the people we interviewed for this report, and many others we've spoken to, haven't cited cost overruns, we expect to hear Immersive Internet advocates and implementers talking about it in the future (see Figure 16). Such problems are likely to include too much budget consumption by training and marketing, or never-ending and unprofitable customization to meet business requirements. We’ll hear that it costs more than expected to scale up to support the entire target user population.

Technology Replacement Costs Are Inevitable

Your first investment in immersive technology won’t be the last (see Figure 17). The original technology selected will not be able to meet all future business requirements. In some cases technology replacement will be a planned switch or upgrade, but other times it will not. One person we interviewed for this report, Peter Meli, said, “We endured a huge expense in late 2008 through 2009. We made some wrong choices but we’re moving up the learning curve. Vendors are starting to understand that shared risk is a good way to go, in this early-stage market.” Possible causes of technology replacement are vendor risk or failure, revised business strategy, or consolidation of immersive technology projects under a single banner.

Figure 16: Springboards for minimizing project cost overruns

Barrier	Springboards
Project cost overruns	• Spend appropriately for pilot vs. production deployments. • Seek cost control insights from other successful technology evangelists and project teams within your organization. • Budget extra for user training and a communications program. • Recognize that the apprenticeship culture and volunteer mentality that is prevalent in many early-adopter organizations may not persist. The people who gravitated toward immersive technology and became volunteer evangelists may move on to the next new thing, leaving mainstream adoption challenges — and costs — to others.

Figure 17: Springboards for managing technology replacement costs

Barrier	Springboards
Technology replacement	• Spend extra time qualifying vendors and products before making significant investments. • Speak with reference customers. • Set stakeholders' and sponsors' expectations that early technology investments — but not peoples' time, or the learning obtained — will be throwaways. • If working with eLearning consultants or system integrators, ensure that their technology recommendations meet your requirements. They may have relationships with just a few vendors and be skilled on just a few products, rather than the whole field of options.

RECOMMENDATIONS

A detailed analysis of barriers to adoption can be a sobering endeavor. Immersive Internet projects are early-stage: the market sector is perhaps comparable to a 17th-century naval expedition sailing past the edge of the known world. As such, explorers should expect challenges to adoption. Despite this, a growing number of organizations are adopting immersive technology to solve real business problems, and they are saving (and making) money doing it. The hope is that the organizations that successfully navigate their way through the barriers will reap significant benefits.

To that end, we offer the following recommendations:

- **First things first.** Tackle the immediate, most pressing barriers first. Some barriers can be put off for months or even years. Ongoing barriers will include security, training, and funding. The most immediate will vary from one organization to the next, but in general will include an emerging technology market, network bandwidth limitations, hardware issues, vendors' lack of customer support, lack of awareness and negative perceptions, and getting people interested in using the technology.

- **Get buy-in high up the chain.** John Jainschigg put it well: "It's important to be able to have leaders speak from a position of personal involvement." According to Doug McDavid, "There was little problem with security restrictions at IBM. There was a very high-level push to get involved with this technology so the security people weren't empowered to override us." At IBM this person for a long time was Irving Wladawsky-Berger (chairman emeritus, IBM academy of technology), and later Sam Palmisano (IBM CEO and president). Suzanne Aurilio said, "Our CIO Rich Pickett bought the island we needed in Second Life because he believes we need to stay on top of this stuff."

- **Communicate the business value of the immersive technology to IT management.** Work with the IT manager or CIO's office to help them understand the importance of higher-end graphics cards and headsets to the future of information work. Communicate the business reasons for addressing these requirements when they make new hardware purchases or upgrading existing hardware. Make it clear that you are reaching the point where people can't do their jobs without this technology. Zain Naboulsi describes how this can pay off: "I have been given budget to evangelize internally — to extend our virtual world experience and hold one or more large events in-world. I wouldn't shut up about it."

- **Keep technological barriers in mind when selecting immersive technology.** If appropriate for your situation, choose technology that works with low-bandwidth Internet connection or does not involve intensive 3D graphics. Choose a technology solution that integrates with traditional telephony so people can at least participate via voice if they can't enjoy the full immersive experience. Keep in mind that people who participate only via voice will be second-class citizens to those who are in the immersive environment together — just as people who dial in to conference rooms where others are gathered are second-class citizens.

- **Offer to personally share the risk.** If a lack of headsets is the problem, consider purchasing inexpensive headsets out of your department's budget (or even your own personal budget, if

possible) and giving them to target users. This shows commitment and breeds goodwill. Zain Naboulsi said, "I was a pit bull. I said it was going to happen even if I had to pay for it out of pocket." Or follow the lead of two faculty members at the US Air Force Air University, who literally saved their lunch money for a year to fund a proof of concept for an immersive learning environment.[11]

- **Keep longer-term barriers in mind to avoid big problems down the road.** Keep track of mid-range and longer-term barriers and make decisions now that will help keep future challenges manageable. While some of the immediate problems will go away in time, new barriers will crop up. Mid-term technology barriers will include the user experience, system integration, and mobile device support. After you've been using immersive technology for a while, you may face increased costs due to scaling, customization, and technology replacement. Even farther ahead you'll face feature redundancy and standards and interoperability issues.

- **Anticipate the changing nature of long-term barriers.** Some barriers won't go away; they will simply morph over time. These include balancing security with access, training users, and getting (and keeping) budget. You'll always have new users to train and new functionality people will have to learn to use. Adoption may grow virally, which can create manageability headaches. You may always fight the budget battle; you'll face competition for funding and will have to consistently demonstrate business value.

- **Workaround: work from home.** If users' computers, Internet access limitations, or corporate security restrictions are inhibiting adoption, work with management to get permission for people to install the software on their home computers and work from home as needed. This may not be sustainable on a long-term basis, depending on your organization's culture and the type of work being done. But we repeatedly hear of people using this approach as a workaround until technology and corporate policies and culture catch up. Dick Dillon said, "Because of network performance and security issues, the people who do the majority of the work on our project are happiest when they are somewhere other than the office."

- **Plan now for a change of guard later.** The skills, team, goals, and metrics for Immersive Internet projects will likely change as the technology matures and people become more comfortable using it. It's similar to planning the growth of a startup company. Project leadership in the beginning may require a strong evangelist. But as immersive technology becomes more important to the business and adoption grows, the primary skills needed by project managers may be more technical or organizational.

[11] On September 11, 2009 Cynthia Calongne, a professor in the Institute of Advanced Studies at Colorado Technical University gave a presentation at a ThinkBalm Innovation Community un-lecture. She described the way that Dr. Andrew Stricker and Mike McCrocklin, US Air Force Air University faculty members and the masterminds behind an immersive learning environment, used their lunch money to fund the proof of concept. For more information see this Sept. 16, 2009 ThinkBalm Innovation Community video: "*The Innovation Un-Lecture*."

Research Methodology

ThinkBalm conducted sixteen in-depth interviews (30-60 minutes in length) with Immersive Internet advocates and implementers to gain insight into the barriers they have faced and what they are doing to overcome those barriers. The interviews were conducted during the month of August, 2009. ThinkBalm analysts selected interview candidates from our professional network and the ThinkBalm Innovation Community. We conducted in-depth interviews with people who worked for the following companies and organizations: AT Kearney, Blended Solutions, City of Geneva (Illinois, USA), e426.org, groupVision AG, IBM, Microsoft, Preferred Family Healthcare, SAIC, San Diego State University, The Coaches Center, The Maids, University of Denver, and World2Worlds, along with some that wished not to be named.

Related Research

Reports

- *How to Write a Business Case for Immersive Technology Investments*, September 8, 2009
- *ThinkBalm Immersive Internet Business Value Study, Q2 2009*, May 26, 2009
- *Gathering Insights via 3D Brainstorming*, April 5, 2009
- *How to Give New Users a Good First Experience*, February 24, 2009
- *End Death-by-Lecture: Tours, not Speeches*, January 14, 2009
- *Role-Play Redux: "Convince the Curmudgeon,"* December 17, 2008
- *The Immersive Internet: Make Tactical Moves Today for Strategic Advantage Tomorrow*, November 17, 2008

Videos

- *The Innovation Un-Lecture: A ThinkBalm Innovation Community video*, September 16, 2009
- *The Bridge: A ThinkBalm Innovation Community video*, August 14, 2009
- *Professional Networking Event: A ThinkBalm Innovation Community video*, August 8, 2009
- *A tour of the ThinkBalm Data Garden*, July 7, 2009

Blog Articles

- *What makes a virtual environment immersive?* September 7, 2009
- *The v-Business Grid: A vision of the future of the Immersive Internet*, August 27, 2009
- *Results from spring brainstorm on choosing immersive technology*, August 14, 2009
- *The Coaches Centre pilot: 14X revenue generation, travel costs reduced by $1M CAD*, February 23, 2009

- *Lenovo pilots Nortel web.alive for innovation in customer experience*, January 19, 2009
- *Using the Immersive Internet for employee onboarding*, December 6, 2008
- *Recipe for a great 3D brainstorming session*, November 10, 2008
- *Second Life survey says: "Try it for work – you'll like it,"* October 10, 2008
- *A realism model for Immersive Internet apps: Part II*, July 21, 2008
- *A realism model for Immersive Internet apps: Part I*, July 21, 2008
- *"First life" versus "fake life" – When realism is important in the Immersive Internet*, June 30, 2008

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About ThinkBalm

ThinkBalm offers independent IT industry analysis and strategy consulting services. ThinkBalm was established in June, 2008 and is headquartered in Rhode Island, USA.

- **Research area: work-related use of the Immersive Internet.** This includes virtual worlds and campuses, immersive learning environments, and 3D business applications. ThinkBalm offers research and analysis and custom strategy consulting on these topics to technology marketers and Immersive Internet advocates, implementers, and explorers. ThinkBalm's clients have included Altadyn, BP, Forterra Systems, Linden Lab, Qwaq, and Tandem Learning.

- **ThinkBalm Innovation Community.** The ThinkBalm Innovation Community is a collaborative community with the mission of advancing adoption of work-related use of the Immersive Internet. We focus on use cases like learning and training, meetings, conferences, business activity rehearsal, data visualization, collaborative design and prototyping, remote system and facility management, and HR management.

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