

Real-World Opportunities for Virtual-World Project Management

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Virtual worlds such as Linden Lab's Second Life are pervading our everyday world and already impacting organizational practices involving virtual teams and virtual-world project management.

Consider a world in which you can conduct training sessions and bring together experts from around the globe in a single, common environment; hold effective meetings in a shared space where distant resources and people can come together to communicate, laugh, and create artifacts quickly and easily; and coordinate a project with ease and overcome cultural barriers to team effectiveness. Virtual-world technology can help realize these goals.

A *virtual world* (VW) is an instantiation of a metaverse—a fully immersive 3D virtual space in which people interact with one another through avatars and software agents. This virtual space resembles the real world, or “first life,” but without its physical limitations.¹ Until recently, most people thought of VWs as social or gaming en-

vironments. However, VWs are garnering attention because they provide technology capabilities that can transform education, learning, organizational communication, and even virtual project management.

Virtual-world projects are those conducted partially or wholly in a VW through a collaborative team of avatars and people. In VWPs, activities can occur in world, out of world, or a combination of the two. *Virtual-world project management* is the process of managing a project through coordination, communication, and control within the bounds of a VW environment and a traditional environment. VWs can enhance collaboration and VWPM through the unique technology capabilities these worlds provide. Using VW technology capabilities, VWP teams can gain access to richer, more engaging environments to help

overcome collaboration barriers. Our goal is to highlight the unique technology capabilities in these new environments. We provide an example of these capabilities by describing a VW project that we conducted in Linden Lab's Second Life (SL). We also discuss opportunities and challenges for businesses interested in taking advantage of VWs.

Growing Interest in Virtual Worlds

A report from Forrester Research speculates that VWs such as Second Life (www.secondlife.com), There (www.there.com), and other more business-focused VWs are on the brink of becoming valuable work tools.² SL is one of the most popular examples of a VW. In fact, according to a Gartner report, 80 percent of active Internet users (around 2.4 billion people) will have a "second life" by the end of 2011.³

Today, SL has more than 15 million residents, up from just 3 million in early 2007 (<http://secondlife.com/whatis/faq.php>). Residents come to this world from more than 100 different countries, with approximately 60 percent of them being men and 40 percent women. User ages range from 18 to 85 years, with an average age of 33. SL distributes space by partitioning the environment into virtual islands. As of October 2008, there were more than 26,000 islands, with 689 new islands added that month alone.

VWs such as SL are not only for individuals. Organizations such as IBM, STA Travel, Sears, and BP are exploring potential uses of VWs in business contexts through SL.⁴ Such entities can own an entire island or inhabit portions of one; for example, SciLands is a community of islands in SL devoted to science and technology, where more than 20 science and technology organizations have facilities.⁵ These organizations include government agencies, universities, and museums, and occupants of the island include the US National Space Society, the US National Library of Medicine, and the Tech Museum of Space Innovation.⁵ The collaboration between IBM and China's Palace Museum is an example of recent efforts to build a major historical and cultural attraction within a VW. The two worked together to build a virtual version of the famous Forbidden City.⁶ The virtual Forbidden City (www.beyondspaceandtime.org) is a fully immersive, 3D online world intended to recre-

ate the sense of space and time of this Chinese cultural treasure. The project took three years, involved 12 project team members, and cost US \$3 million to build. The final product is available in the form of a download.⁷ Table 1 provides further examples of how companies are using SL in a business context.

These examples show that a growing number of successful organizations and entities are taking VWs seriously. Innovative companies and educational institutions are finding ways to use VW technology to enhance business processes and experiment with novel ideas in new contexts. Yet many companies are still asking why they should spend time and resources exploring these worlds. We examine this question on the basis of

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our own research and provide insight into how companies can use VWs and their inherent technology capabilities for virtual-team interaction and VWPM.

Virtual-World Technology Capabilities

What is so unique about VWs? For one thing, they let you create a world of your choice, complete with buildings and artifacts that perform specific tasks, such as playback of recordings, slide show displays, simulations and models, and access to brainstorming tools. Avatars in VWs can also walk, fly, and even teleport to other areas. They can interact with other avatars or explore the world independently.

The ability to interact with objects and people through another medium is not unique. What is unusual about VWs is the environment's vividness and the technology capabilities that provide opportunities to enhance interaction and collaboration. These environments can support virtual-team collaboration in ways that are not possible with other technologies.⁸

Table 1. Examples of Second Life projects.

Projects	Examples of entities involved
Meet and greet customers, host employee meetings, and conduct global interaction and collaboration.	IBM, BP
Conduct marketing and e-commerce in a virtual showroom.	Sears, BP
Provide product information and updates.	STA Travel
Provide a virtual campus and online collaborative learning.	Harvard Law School
Communicate vision and build relationships with the public and customers.	NASA, IBM
Host a virtual museum for brand recognition and e-commerce.	International Spaceflight Museum
Provide a 3D hospital with free online consultation on resources for medical conditions or issues.	Health Info Island
Conduct market research and test hotel designs.	Starwood Hotels
Interview, recruit, and hire employees.	OgilvyInteractive, TMP Worldwide Advertising & Communications
Provide training simulators and learning programs.	MIT, IBM, Nike, EMC, Discovery Education, BP

Current collaboration technologies such as Web conferencing, video conferencing, and video walls strive to emulate face-to-face communication, but they have not yet done so. For example, video conferencing provides communication through what is referred to negatively as “talking heads.” Video walls such as HP’s Halo provide more life-size images and depth perception, but even these technologies present a physical boundary such as a wall or a computer that separates individuals. VWs are unique because physical boundaries no longer exist. The distinctive features of VW technology include

- 3D life-like conversation and an immersive environment for interaction;
- purposeful nonverbal communication, including the ability to touch; and
- the ability to control avatar appearance, avatar behavior, and the environment.

Because avatars can touch things in the environment, move objects, import objects from real life, and create their own in-world objects, these capabilities provide an opportunity for immediate feedback regarding communication and project deliverables. VWs bring people together in real time to enable collaboration, while their avatars explore simulated worlds.⁹

People can control the appearance of their avatars, including hair color, clothing style, and body type. They can also control their avatar’s behavior through verbal and nonverbal communica-

tion cues. The technology provides purposeful nonverbal communication with deliberate body language, gestures, and nonverbal expressions, including touch. In real-world communication, some nonverbal communication cues occur unconsciously, such as changes in facial expression, which could provide more information than intended. In VWs, the ability to deliberately control cues that are near-automatic reactions in the physical world is a new concept in virtual-team collaboration and interaction. For example, avatars can perform deliberate actions such as smiling, clapping hands, and jumping up and down. These capabilities provide the opportunity for people to express themselves (and their feelings) in a controlled way.

Besides their own appearance and behavior, people can control their environment’s appearance and functions. They can also implement additional tools such as those for voting and brainstorming. These features can enhance the collaboration process or help manage specific tasks on a project.

Finally, individuals can choose their preferred method of communication—whether text in the form of individual or group notes, audio, video, facial expressions, body language and gestures, or Internet lingo (LOL, BRB, PLZ, and so on) in text chat. Thus, a person has the freedom to express and interact with others using one or more technological forms. This ability enhances the communication process and makes the interaction between people more interesting.

Table 2. Virtual-world technology capabilities.

Technology capabilities	Relevance to virtual teams and virtual-world project management
Various communication channels	Enables communication in team meetings, where team members can express themselves freely. Can eliminate geographic and cultural boundaries. Provides ability to communicate using nonverbal expression.
Rendering of people and the real world	Allows team members to express themselves through their appearance and to control their own behavior.
Real-time interaction	Provides an environment for real-time problem solving and discussion. Provides improved coordination and control by facilitating interaction between team members in the VW environment. Fosters mobility and the ability to change locations quickly and easily. Supports real-time immediacy of artifacts through creation and building of figures (3D models or images that can be left behind for others to interact with).
Team process tools and artifacts	Fosters team interaction and leadership. Allows for recording of meetings for subsequent viewing. Provides 3D brainstorming tools, voting tools, or visual problem solving, in which avatars “stand” on their vote (that is, move here for yes, and move there for no). Supports avatar training using software agents.

These and other technology capabilities are available in VWs through advanced scripting and graphics not found in previous forms of collaboration technologies. These capabilities result in features that present a flexible, tailored environment in which meaningful, contextual, and rich communication between parties is possible. Table 2 shows the unique technology capabilities of VWs and their support for virtual-team interaction and VWPM, based on our research.¹⁰

Moving from First Life to Second Life

Project managers have many opportunities for moving into a VW environment such as SL. To illustrate the possibilities, we used VW technology capabilities in a series of experiments conducted in SL with project teams recruited from SL residents. We placed each participant into a VWP team consisting of four or five individuals with varying skills and backgrounds. Team members had no prior history together, so the members had to learn one another’s backgrounds and skill sets. We provided each team the same set of task instructions. The project task was to construct a Rube Goldberg machine that resided on an island within SL. Each team was allowed one hour to complete the task.

We created an island that contained a meeting place for project members. The island had a sandbox area, which allowed project teams to develop their machines. We also developed and made available additional team process tools for brainstorming, voting, and recording of meetings. Fig-

ure 1 shows one of the teams working together.

We recorded the activities of the project teams as they used the technology capabilities available within SL. Our goal was to examine how these teams interacted and collaborated to complete the project task. Interestingly, those teams that used the technology completed the task in the time given. The teams that struggled and did not complete the task were those that also did not take full advantage of the VW’s capabilities to collaborate and interact. Our research suggests various opportunities for members of VWP teams.

Opportunities for VWP Teams

VWs can affect team dynamics in virtual projects by removing interaction boundaries. Virtual teams tend to behave differently than traditional face-to-face teams.¹¹ These behavioral differences are the result of geographic distance, temporal distance, and limited face-to-face interactions. VWs can overcome these obstacles by breaking boundaries in terms of geographic and cultural differences. Geographic distance is no longer an impediment, because avatars come together in a shared space to interact with one another. Cultural differences between individuals can be minimized because participants can create a generic appearance independent of racial or cultural variations. In addition, avatars can use Internet lingo (for example, acronyms and emoticons such as LOL, BRB, and ☺) to express various sentiments.¹²



Figure 1. Team members working together in Second Life. They must build objects to complete a project where the task is to construct a Rube Goldberg machine. Participants are gathered around the machine as they work together to finish their project.

By removing these boundaries, VWP teams can develop trust, which is typically difficult in traditional virtual teams because team members cannot interact directly with one another. VWs can enhance the development of trust through

- the use and control of verbal and nonverbal communication cues,
- simultaneous use of multiple communication channels and the combination of verbal and nonverbal cues, and
- a playful environment that lets users socialize and develop member and group well-being.

In our research, teams in which participants used VW technology capabilities to interact with one another established trust and had successful project outcomes. We also found that appearance was important in the process. Participants could control their avatars' appearance, and some outfitted theirs in professional attire to participate in the project. In fact, participants often commented on the appearance of one another's avatars.

Understanding individual roles and authority on a team is important. Roles often emerge through interaction of team members; leadership roles are easily expressed when team members

can interact and provide immediate feedback on behavior. Leaders typically emerge through verbal and nonverbal cues, which are lost in a typical computer-mediated environment. However, VW technology allows expression of these cues and more. Because people can control their avatars, they can control their placement in meetings—whether they sit or stand, where they sit, and whom they sit next to. They can also control their body language, in addition to their style of dress. VWs provide an environment in which leaders can emerge on the basis of their behavior and actions.

However, many of the challenges related to virtual teams lie in the inability to mimic face-to-face interaction. In our research, project team members carried traditional face-to-face behaviors into the VW, including nonverbal communication, eye contact, and team positioning.

Team members used instant messages and notes with Internet lingo to represent emotions as well as nonverbal cues such as laughing or frowning. In terms of eye contact, project team members would physically turn their avatar toward the avatar or group of avatars they were talking to, so as to make eye contact. Finally, the position of an avatar in relation to the rest of the team indicated the avatar's level of interaction on the project. Although VWs are not intended to replace face-to-face communication, they can incorporate face-to-face behaviors to enhance interaction and the overall experience, thus potentially improving team performance.

Opportunities for VWPM

The unique technology capabilities of VWs lead to increased flexibility regarding how a team behaves, which provides opportunities for VWPM. However, project coordination is a major element of project management, and it presents an enormous challenge in virtual projects. VWs can help minimize coordination challenges by

- enabling immediate feedback during team member communication,

- establishing trust through multiple channels of communication,
- removing geographic boundaries, and
- viewing one another's artifacts as team members work on them—that is, immediacy of artifacts.

In our research, the VW technology capability that had the greatest impact on projects was immediacy of artifacts because of the potential for instant feedback among team members. Immediacy of artifacts is the ability of users to collaborate jointly in the real-time creation and use of artifacts such as text, images, and 3D models. The ability to immediately touch and interact with artifacts can improve team performance. The SL project teams in our research used this capability to facilitate coordination and communication and to increase shared understanding of a task. The teams were immediately able to share their contributions; for example, they created a list of tasks needed to implement their solution, and they divided those tasks among themselves. When a team member completed a task, the outputs of that task were immediately visible to the rest of the team. Team members could interact with the artifact—they could see it, move it, and touch it. This interaction allowed for real-time adjustments or changes on the basis of feedback. Anything within SL can become an artifact—an idea, a preference, or a decision—and it becomes visual through instantiation in 3D space.

VWs also facilitate informal communication that can lead to great discussions about the project at hand. In a traditional environment, these discussions might occur in the hallway, after a meeting, or even around the water cooler. VWs support informal communication, as avatars linger in the VW after a project meeting or before teleporting to another meeting.

Not surprisingly, our experiments showed that traditional project management practices are still important. For example, in addition to having the available resources, employing the right skill set for a project is critical to success. The SL project team members in our research who lacked the necessary skills to execute the project tasks were not able to actively participate in the project. Leadership was also essential. Like traditional virtual teams, VWP teams require a clear definition of roles and an effective team

leader. In our study, VWP teams without a clear project leader struggled with understanding the task and with effectively assigning individual responsibilities. In contrast, VWP teams that had a leader were able to more effectively work on the project. Those teams with leadership discussed and understood the overall goals of the project and were able to distribute tasks to members on the basis of individual skills and experience while synergistically working on the overall project goals.

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Challenges

VW environments are not without their challenges. There is a steep learning curve related to the technology. In our experiments within SL, participants did not use as many VW capabilities as we expected; for example, many people used text chat as the primary method of communication, ignoring other available communication channels such as voice chat and gestures.

Temporal dispersion, or time zone coordination, also remains a challenge that project teams using metaverse technologies cannot easily overcome. VWs support synchronous communication, but project tasks that require individuals to meet at the same time will still find it difficult to schedule team meetings.

Security is a major concern for many organizations interested in VW technology capabilities provided by environments such as SL. Organizations can limit access on their particular island or space, but there is still a risk in sharing proprietary information on a server that the organization itself does not own and maintain. Aside from the security risks, organizations might find it difficult to motivate employees to accept the technology because of its reputation as a gaming environment. (Clearly, though, organizations are moving past this bias by demonstrating the capabilities available in these VWs.) Finally, as more

Table 3. Virtual-world challenges.

Challenges	Description
Client software and hardware	Each user must download client software that requires memory and graphics. VW audio capabilities are not robust, and desktops must be high end.
Learning curve	Learning to operate within the environment to take full advantage of its capabilities can require considerable effort.
Balancing worlds	Project managers must recognize that a VW is not a complete substitute for first life; there could still be a need to meet in traditional surroundings at the same physical location.
Acceptance	Securing buy-in and support from managers and other employees for use of the technology is essential.
Distractions	People's avatars might be tempted to explore and drift away.
Norms of behavior	Some people might show less respect or restraint when using technology to convey their thoughts.
Uncertainty of behavior	The behavior of other people's avatars cannot be controlled.
Representation	Users might have to adjust to the idea of working as their virtual personas.
Security	Second Life is a public space with limited security features.

organizations accept this technology, the risk of unpredictable behavior will grow. As in the real world, there are no constraints in VWs regarding how people behave. In fact, because people are operating in a virtual space, they might show less respect or restraint when using technology to convey their thoughts.

Table 3 lists these and additional challenges to consider when moving from first life to second.

Virtual worlds and their technology capabilities can help virtual teams find new ways to face the challenges of managing a global IT workforce. To appreciate the impact of VW capabilities on organizations of the future, consider a thought experiment: imagine you're part of a highly distributed project with globally dispersed team members who have come together to work within a VW such as SL. Using the VW's technology capabilities, you could immediately contribute to the project by meeting people "face to face" through your avatar in a synchronous shared virtual space. You could customize avatars to engender immediate trust. You could jointly and instantaneously design, build, and review richly textured artifacts—actually show people what you think rather than just state it. You could use 3D brainstorming tools to generate new ideas and rank them, and you could share virtual objects and documents seamlessly between the VW and other software tools. This is all possible using today's VW technology, and the potential for

the future seems endless. There is much to be explored with this engaging and vivid environment for VWP teams. IT

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