

Paying Attention in Meetings: Multitasking in Virtual Worlds

Kelly Lyons, University of Toronto

Henry Kim, York University

Saggi Nevo, SUNY Albany

ABSTRACT

In this paper, we present the results of interviews with 23 corporate virtual world users which show how the use of virtual worlds for distributed meetings may help to overcome some of the problems associated with other kinds of technologies used to support meetings over distance. In particular, the results of our study suggest that the extent of multitasking enacted during virtual worlds meetings is in between face-to-face meetings and teleconferencing. When participants multitask, they simultaneously engage in other activities (e.g., e-mailing and texting) while attending the meeting, thereby paying less attention to the meeting's agenda. It has been argued that multitasking can be beneficial in some cases yet detrimental in other cases. Technologies that support distributed meetings should, therefore, afford an opportunity to engage in some degree of multitasking but not so much as to distract them from the meeting goals. Based on a series of interviews with 23 users of corporate virtual worlds, our study suggests that virtual worlds are capable of providing this desired balance.

KEYWORDS: Virtual Worlds, meetings, collaboration, multitasking.

INDEX TERMS: H.4.3 [Information Systems and Applications]: Communications Applications -- Computer conferencing, teleconferencing, and videoconferencing

1 INTRODUCTION

With the increase in globalization, an increasing number of companies conduct business across distance. More companies than ever are distributed across geographic boundaries and time zones, and many employees are working from home or, otherwise, telecommute. Faced with adverse economic conditions, companies are attempting to save money by reducing the number of meetings involving travel and overnight stays and are further motivated by a desire to reduce their carbon footprints.

This means that meetings are increasingly taking place over distance, supported by some combination of technologies including teleconferences, video conferences, electronic meeting software and, more recently, virtual worlds (e.g., Kahai, Carroll, & Jestic, 2007; Lucia, Francese, Passero, & Tortora, 2008).

In this paper, we look at the organizational use of virtual worlds for meetings and focus on the extent of multitasking exhibited by the individuals attending the meeting. Multitasking has been associated in the past with meetings over distance supported by technology. Mark, Grudin, and Poltrock (1999) report on the use of desktop conferencing with application sharing to support meetings over distance by four teams at a major corporation. Among their findings, they describe that many people reported multitasking during the meetings and most of the people in their study found multitasking to be advantageous in that they could accomplish other work and attend more meetings. However, some people in their study reported that multitasking was a "distraction and detriment" (Mark, Grudin, & Poltrock, 1999). Tang (2005) discusses how to design technology to reduce social awkwardness

associated with multitasking computer interactions with other activities such as participating in meetings.

We characterize multitasking in meetings as not paying full attention to the meeting's proceedings. It can mean attending to email or instant messages during meetings, reading unrelated or even related material during a meeting, or engaging in any other activity that is not part of the discussion or current agenda of the meeting. People multitask for a number of reasons such as productivity (Mark, Grudin, & Poltrock, 1999) or not wanting to miss anything (Stone, 2006). Researchers have noted that multitasking has become so common that it virtually a social norm (e.g., Tang, 2005).

Our study shows that multitasking in meetings takes place more often in teleconferences than in face-to-face situations. This may be because people feel a level of social awkwardness when multitasking in a face-to-face meeting (Tang, 2005) or may be due to social concepts of awareness and accountability (Erickson & Kellogg, 2000). An interesting question is whether multitasking has a positive or negative impact on various aspects of meetings (for example, outcomes, effectiveness, efficiency, or personal relationships of participants). On the one hand, multitasking can increase effectiveness by allowing participants to pull in needed information or engage with someone not currently in the meeting in order to move an agenda forward or to fill in gaps in knowledge. On the other hand, multitasking can cause people to be distracted and not give sufficient attention to the meeting and the issues at hand. There is also a social component associated with multitasking that might cause others in the meeting to feel that their colleagues are not giving sufficient attention to the issues on the agenda.

To further understand the advantages and disadvantages of multitasking in distributed meetings and to understand the impact of the enabling technologies, we conducted semi-structured interviews with virtual worlds' users at a large multinational enterprise (LME). Several themes emerged from our analysis of the interviews. In particular, the use of virtual worlds for meetings emerged as a prominent theme. The identification of this type of usage of virtual worlds promoted a second round of interviews in which we asked interviewees specific questions about business meetings in general, meetings in virtual worlds in particular, and multitasking in meetings.

The results of our interviews further substantiate prior research (Mark, Grudin, & Poltrock, 1999; Stone, 2006; Tang, 2005) which found multitasking to be: (1) a common occurrence in technology-supported meetings over distance and (2) considered both a positive and a negative activity. Our study of meetings in virtual worlds shows that virtual worlds provide an environment in which individuals' levels of multitasking, while not quite the same as that in face-to-face meetings, are greater than in teleconferencing.

The rest of the paper is organized as follows. We present a review of literature of virtual worlds, technology-supported distributed meetings, and multitasking. We then present our research methodology followed by our findings about meetings in virtual worlds and multitasking in meetings. This is followed by a brief discussion of the key findings. We then conclude with suggestions for future research.

2 LITERATURE REVIEW

The research on virtual worlds has been undertaken by different disciplines with a focus on a variety of issues. Early research focusing on building and improving virtual 3D environments came out of computing science, engineering, and other applied technological sciences (eg, Mackinlay, Card, & Robertson, 1990). More recently, researchers have begun to examine the use of these 3D virtual environments in a variety of different contexts. Researchers in sociology and psychology are primarily interested in understanding how social behavior norms in virtual worlds differ from the real world (Yee, Bailenson, Urbanek, Chang, & Merget, 2007). There is an interest in political and legal issues such as liability, regulation, intellectual property, and economic and monetary systems in virtual worlds (Balkin & Noveck, 2006; Mayer-Schonberger & Crowley, 2006; Sipress, 2006; Soraker, 2008). Researchers have studied virtual worlds from the perspective of market research (Hemp, 2006), advertising (Barnes, 2007), eCommerce (Holzwarth, Janiszewski, & Neumann, 2006), organizational issues (Nebolsky, Yee, Petrushin, & Gershman, 2003), industrial engineering (Edwards, 2006), and management information systems and services (Goel & Mousavidin, 2007; Kadavasal, Dhara, Wu, & Krishnaswamy, 2007). There is also increasing interest in the use of virtual worlds for education (Boulos, Lee, & Wheeler, 2007; Bronack, Riedl, Tashner, & Greene, 2006). A detailed literature review (including applications of virtual worlds in business, education, law, and the social sciences) can be found in (Messinger, Stroulia, Lyons, Bone, Niu, Smirnov, & Perelgut, 2009).

Recently, the topic of meetings in virtual worlds has been identified as an important area for future study (Bessière, Ellis & Kellogg, 2009; Hendaoui, Limayem & Thompson, 2008; (Kahai, Carroll & Jestice, 2007). While there are relatively few studies about the use of virtual worlds for meetings over distance, there are numerous studies into other kinds of technology support for meetings over distance. Some work looks at meetings in general and the effect of distance on various aspects of meetings and collaboration (Olson & Olson, 2000; Bos, Shami, Olson, Cheshin, & Nan, 2004; Siina 2007). There has also been a large amount of research introducing novel tools and technology to support meetings over distance (Erickson & Kellogg, 2000; Lucia, Francese, Passero, & Tortora, 2008). Other work has focused on the use and effectiveness of existing technology for supporting meetings over distance (Cameron & Webster, 2005; Isaacs & Tang, 1994; Mark, Grudin, & Poltrock, 1999).

Multitasking has been studied in a variety of ways such as in general work environments (González & Mark, 2005), as a result of ubiquitous computing (Tang, 2005), and in meetings (Mark, Grudin, & Poltrock, 1999). To the best of our knowledge, no study, to date, has investigated multitasking in meetings conducted in virtual worlds. In this paper, we look at the use of virtual worlds to support meetings over distance and, in particular, the effect of virtual worlds on the phenomenon of multitasking in meetings.

3 RESEARCH METHODOLOGY

The data collection was carried out in two phases: we first conducted open, semi-structured interviews with 23 corporate users of virtual worlds and analyzed the results of those interviews; we then asked follow-up questions specifically addressing the notion of meetings in virtual worlds and analyzed the answers to those questions.

3.1 Data Collection and Analysis -- Phase I

The semi-structured, face-to-face, and phone interviews with key informants were used to develop a better understanding of the

emerging phenomenon of virtual worlds, seeking to gain insights on how these technologies are used to carry out organizational tasks.

To maximize the breadth and potential to generalize the results from this first phase of our study, we interviewed key informants who use virtual worlds for different reasons and who have varying degrees of experience with virtual worlds. Overall, 23 individuals from a large multinational enterprise (LME) were interviewed. Just under half (48%) have been working at LME for ten years or more and 22% have been with LME less than five years (the rest had between five and ten years experience at LME). Our sample was 52% male with 43% in a managerial position. The participants came from across the LME organization, representing a variety of roles and positions (e.g., consultants, directors, project managers, and designers).

Typically, the interview location was a conference room at LME, and when interviewees were teleworkers or lived in a different country, interviews were conducted by phone. The average interview lasted 45 minutes and interviewees were asked (and granted permission) to record the interview. The first five interviews were conducted by all the authors and the rest were divided between two of the authors who then conducted one-on-one interviews. This approach was taken to allow for faster data collection while reducing the risk of bias and ensuring the consistency of the interview.

After conducting 20 interviews we felt that a sufficient level of saturation in the data was reached (Strauss & Corbin, 1994). As a measure of percussion, we conducted three additional interviews and decided to stop the data collection process when it became apparent that no new issues were raised by the interviewees and sufficient convergence was obtained.

The interviews were transcribed by a professional transcriber and then analyzed and coded by the authors: the data were read, parsed, and categorized into categories. In most cases, multiple confirming comments from different key informants were used to determine the coding value. To establish a common data analysis approach, the authors agreed on a set of guidelines and then continued to code independently. Findings were then used to populate a single database.

We identified important variability among the interviewees: some of our informants were experts who not only use virtual worlds for internal business purposes but use them in work with clients as well, whereas others identified themselves as novices and noted that they use virtual worlds intermittently; however, each informant has participated in at least one corporate project on virtual worlds.

3.2 Data Collection and Analysis -- Phase II

During phase I, the use of virtual worlds for meetings was identified as a major theme. Accordingly, we returned to the participants from Phase I one year later to ask them some specific questions about meetings and technology used to support meetings. We contacted them by email reminding them of the previous interview, letting them know that the theme of meetings in virtual worlds had come up in our interviews, and asking them to answer several follow-up questions. The follow-up questions were presented on-line and automatically collected in a database. Some of the people we originally interviewed had left LME by the time phase II was conducted. To make up for the loss of informants we invited additional employees of LME to answer our questions. Overall, 19 people responded to the follow-up questions. Since the original group and the secondary group do not completely overlap in terms of the participants, it was deemed best to decouple the interview results of the two phases.

4 MEETINGS OVER DISTANCE USING VIRTUAL WORLDS

More often than not, knowledge workers within organizations are geographically distributed yet the need for them to meet, make decisions, get to know one another, and collaborate remains at least as important, if not more, than it did in the past (Johnson, Manyika, & Yee, 2005). At the same time, organizations are cutting travel for face-to-face meetings in order to save costs and reduce their carbon footprint. A recent Linden Lab case study about Second Life reports that IBM estimates savings of over \$250,000 in travel and venue costs and additional savings of \$150,000 in productivity gains (since the virtual meeting participants did not have to leave their computers to participate and return to work quickly) (Linden Lab, 2009).

Our interviewees confirmed that travel has been reduced at LME with seven informants describing fewer opportunities to travel face-to-face to meet with colleagues. One informant said, "You know, obviously this is probably an industry wide phenomenon but [people who work at LME] don't tend to travel a lot just to have face-to-face business meetings. We're really encouraged to use other means, whether it's telecons or videoconferencing," with another saying "And also because we're now a global business, we work ... virtually. We're keeping down on travel costs." Two informants mentioned the importance of not only cutting costs but also reducing carbon emissions, one saying, "And that's important because you know, carbon footprints are important. Cost reduction is important for the enterprise," the other saying, "the calculation was that for a given event ... that cost \$180,000 ... that meeting was 56 metric tonnes per event of CO2."

When we asked our 19 informants how often they participate in meetings face-to-face versus over distance, 17 out of 19 are often or always in meetings supported by teleconferences and nine informants rarely or never meet in person. None of the people we asked meet in person exclusively, and of the eight who said they meet in person often, all but one also meets by teleconference or with eMeeting technology often. The people in our study are often meeting with colleagues over distance using a mix of mediating technologies.

Not only are people meeting colleagues over distance but there is often a significant difference in time zones of the meeting participants. We found that 13 out of our 19 informants sometimes or often participate in meetings where the time zone difference is 4-6 hours. Six informants said they sometimes participate in meetings where the time zone difference is 7-9 hours and five people said that sometimes the time zone difference is greater than nine hours. Two people indicated that they often participate in meetings with a 7-9 hour time zone difference and one person said the time zone difference in their meetings is often greater than nine hours. Our group of informants frequently participates in meetings with participants from across the world.

There is a need to figure out how to support these meetings better. A suggested way to do so is by using virtual worlds (Kahai, Carroll, & Jestice, 2008; Bessière, Ellis, & Kellogg, 2009). Informants in our study indicated to us that meetings are promising business use of virtual worlds. Of the original 23 people we interviewed, 16 people brought up or introduced the idea of conducting meetings in virtual worlds. In all of these cases, the informants did so without any suggestion of meetings in virtual worlds by the interviewer. It was most often brought up by informants in response to the questions:

"What benefits do you think virtual worlds bring (or can bring) to organizations?";

"How do you think virtual worlds can be used for work?"; or

"How do you use virtual worlds?"

In one case, an informant discussed setting up communities of practice in a virtual world as an example of their own use of virtual worlds and went on to describe meetings of this community held inside the virtual world. One informant talked about participating in meetings in virtual worlds when asked how they first got involved in virtual worlds and another described meetings in virtual worlds when asked to provide a narrative of how they spend their typical day. Another informant talked about how they started getting involved personally in virtual worlds a year prior to the company getting involved. When asked if the informant was still involved for personal use, the response was, "... I find that I have less time to do anything in there on a social or after work time period because I already am in there for meetings and other events that I do." One individual described setting up business meetings in virtual worlds for clients when asked to describe their role in the company.

While more and more teams and work groups are geographically distributed with fewer opportunities to meet face-to-face, there remain several problems with the use of technology to support meetings. Informants in our study identified many issues with the use of teleconferences and video conferences to support meetings over distance and suggested reasons why conducting meetings in virtual worlds would alleviate some of these problems. The potential benefits of using virtual worlds for meetings identified in our interviews include:

Social Engagement: An important research question asks how to bring the social and emotional needs met by face-to-face meetings into meetings over distance (Kahai, Carroll, & Jestice, 2008; Olson & Olson, 2000; Siina, 2007). We learned that our informants feel that virtual worlds provide an opportunity for social engagement, trust, and team building in meetings.

Informal Time Before / After Meetings: One of the ways in which meeting participants build social relationships in meetings is through the ability of meeting participants to socialize and engage in informal discussions before and after the formal meeting time (Olson & Olson, 2000). Our informants indicated that meeting participants in virtual worlds often partake in small group discussions before and after meetings.

In-group / Out-group Effects: Sometimes in meetings over distance, there is one group that meets face-to-face and others who participate remotely. When this happens and the collocated group is larger than the remote groups, there is the potential for the larger collocated group to form a group identity that can be detrimental to the outcomes of the entire meeting group (Bos, Shami, Olson, Cheshin, & Nan, 2004). Our informants indicated that virtual worlds can help overcome the in-group/out-group effects in distributed meetings.

Time Zones and Meeting Times: People we interviewed felt that virtual worlds bring an experience that is closer to video conferencing than teleconferences without forcing people to be on camera in the middle of their night.

Cultural Issues: One of the interesting points that came out in our interviews involves the notion of virtual worlds overcoming cultural issues such that the game-like environment of virtual worlds seems to help people overcome issues of hierarchy prevalent in different cultures.

Getting Attention to Speak or Interrupt: An important barrier to teleconferences is the ability for people to signal their intention to speak or interrupt the current discussion (Isaacs & Tang, 1994). Some of our informants felt that virtual worlds provide an advantage over teleconferences for enabling participants to signal their intention to speak or interrupt the current discussion.

Ability to Re-Experience the Meeting: One of the advantages of technology-supported meetings over meetings in person is the ability to more easily record (and later re-examine) meetings

supported by technology (Lucia, Francese, Passero, & Tortora, 2008). Some virtual worlds provide the opportunity to record and later play back the interactions, exchanges, chats, and discussion during sessions and our informants identified this as an advantage over face-to-face meetings.

Multitasking: While the interviewees raised several interesting issues regarding meetings in virtual worlds, the notion of multitasking was the most prominent, mentioned by nearly everyone, often with conflicting opinions. We present our findings about multitasking in virtual worlds meetings next.

5 MULTITASKING IN MEETINGS AND VIRTUAL WORLDS

Multitasking is becoming increasingly common in work environments, partially enabled by technology and ubiquitous computing (González & Mark, 2005; Tang, 2005). In this study, we investigate multitasking in meetings which we characterize as not paying full attention to the meeting agenda. In (Stone, 2006), the concept of continuous partial attention is defined as different from multitasking because multitasking is motivated by productivity and continuous partial attention is motivated by not wanting to miss anything. We do not differentiate among the motivations behind the multitasking. It could take place because one is interested in being more productive (eg., responding to an email while someone makes a point one has heard before) or it could be motivated by not wanting to miss anything (eg., checking for new email or browsing a news source).

Our study finds that this kind of multitasking takes place in meetings most of the time. Almost two-thirds of the people we asked admitted to sometimes, often, or always engaging in multitasking during face-to-face meetings. That increased to 100% in meetings conducted over teleconferences.

It has been argued that multitasking is becoming part of the social norm but, even so, there is a social awkwardness associated with its practice (Tang, 2005). This social awkwardness might be partially explained by awareness and accountability characteristics of socially translucent systems. Erickson and Kellogg (2000) define socially translucent systems as those which support three characteristics of social processes: visibility, awareness, and accountability. Visibility means social information is visible to participants. Awareness means that we are made aware of information that affects our actions hence we bring social rules into play. Accountability means that we know that others are aware that we are there and so we will be held accountable for our actions. If a person is talking with you using a video conference and that person answers their cell phone, you will be aware they are transitioning their attention from you. Since they know you can see them, they will also feel accountable for their actions, possibly causing a level of social awkwardness. If, however, a person is talking with you on a teleconference and their phone is on mute, you may not be aware if they answer their cell phone. More importantly, since they know you cannot see them, they may not feel accountable for the action of answering the cell phone or checking email.

An important question to ask is whether and when this kind of divided attention is useful or detrimental in general work environments and specifically in meeting situations. People have referred to both “Multitasking Attention Deficit” (Curtis, 2000) and, by way of a counter argument, “Multitasking Attention Dexterity” (Torrence, 2001). Tang (2005) suggests that multitasking behavior brings benefit to the individual at the expense of the social good (the experience of the team or outcome of the meeting). He reports that some view multitasking during a meeting as an unwelcome and disruptive activity and others are

pleased with the fact that it allows busy executives an opportunity to participate (Tang, 2005).

González and Mark (2005) present a study of 36 information workers in two companies where they found that people continually switch their focus throughout the day, on average spending 10.5 minutes on activities connected to the same work theme before switching to another work theme. Rather than declaring this activity as negative and building systems that make it difficult to multitask, they argue that this kind of multitasking should be supported by collaboration technology and systems so that information workers can do it more effectively.

Specifically to multitasking in meetings, Mark, Grudin, and Poltrock (1999) observed several team meetings conducted using NetMeeting software and found that there were two ways in which people viewed multitasking in meetings. Many people reported that they engaged in other activities during the meeting and most saw this as an advantage of using NetMeeting over face-to-face while others described it as a distraction and a detriment (Mark, Grudin, & Poltrock, 1999).

We asked people at LME to indicate the impact of multitasking on meeting efficiency, effectiveness, outcome, their ability to participate in the meeting, and on the relationships of participants. Results are summarized in Table 1. Just under 74% of the people we asked feel that multitasking has a negative impact on efficiency with almost 16% feeling it has a positive effect on meeting efficiency. Just over 84% feel it has a negative impact on their ability to participate in the meeting. However, only 58% feel it negatively impacts effectiveness with just over 10% stating that multitasking has a positive impact on meeting effectiveness (the rest feel there is no impact on meeting effectiveness). Only 58% of people we asked feel multitasking negatively impacts meeting outcome with just over 5% indicating a positive impact on meeting outcome. Perhaps most surprisingly, just 53% feel that multitasking has a negative impact on participant relationships with the rest indicating no impact on participant relationships.

Table 1. Percentage of people who feel multitasking has a negative impact, no impact, or positive impact on different meeting characteristics.

Meeting Characteristic	Multitasking has a Negative Impact	Multitasking has No Impact	Multitasking has a Positive Impact
Meeting efficiency	73.7%	10.5%	15.8%
Meeting effectiveness	57.9%	31.6%	10.5%
Meeting outcome(s)	57.9%	36.8%	5.3%
Ability to participate	84.2%	15.8%	0%
Participant Relationships	52.6%	47.4%	0%

Our results reinforce the findings of other researchers that multitasking in meetings, while detrimental to some aspects of meetings, is not always negative and can even positively impact meeting effectiveness and efficiency. This seems to indicate that we need technology that allows some level of multitasking to enable its productivity features but not so much as to negatively impact participants’ ability to participate in the meeting. People designing technology to support meetings and collaboration continue to strive to emulate the features of face-to-face meetings with technology (Olson & Olson, 2000). Ideally, we desire a

technology that enables a similar amount of multitasking that is afforded in face-to-face environments. In the next section, we argue that virtual worlds provide an environment that is much closer to face-to-face than teleconferencing with respect to multitasking in meetings.

5.1 Multitasking in Virtual Worlds, Face-to-Face, and Teleconferences

Some of our informants described virtual worlds as an ideal environment for meetings when it comes to multitasking but not all agree on the reasons. One felt that it is easier to multitask during meetings in virtual worlds than during videoconference meetings (seeing this as an advantage of virtual worlds), saying, “The other problem is that while you’re working in video over IP it’s good, but then you’re not really multitasking. Whereas when you’re on a meeting that’s happening in a virtual world, you might be running multiple tasks at the same time. Like running a chat tool in the same environment, listening and watching, talking, moving, you know, through the environment as well as maybe picking up some other things at the same time. This is very hard to do when you’re working in a video over IP mode because then people can see that you’re not attending the task. And you lose your attention. So those are some of the value points that we’re finding these virtual places actually come up over video over IP today.”

Another informant felt that multitasking in virtual worlds was difficult, indicating this to be an advantage of virtual worlds for meetings, saying, “I like the productivity [of] meetings because ... it’s not a disembodied one off task as you’re multitasking ... It’s very difficult to multitask when you’re ... in virtual worlds ... especially when it’s a meeting. So if you don’t pay attention your head droops and people know you’re not paying attention.”

Yet another informant described multitasking during meetings in the following way: “When you’re at a meeting you need to be able to sit down and look around the room and pay attention and not stare at your laptop ... on the phone, it’s totally opposite and so I’m usually ... wandering around the house and doing the laundry and playing on my computer the whole time. Now the virtual world is sort of *this in between space* and you can be sort of just be doing what you do on the phone, but yet ... you have a lot of multimodal input coming towards you and so you need to not only see what’s going on, you need to hear what’s going on and you need to follow suit if people are moving around to show that you’re sort of paying attention and involved with the conversation or interaction.” (Italics added).

We found the idea that virtual worlds were a kind of in between space intriguing and proceeded to examine this notion further by presenting follow-up questions to our informants. We asked them to indicate how often they have multitasked while participating in a meeting in person, using a teleconference, and in a virtual world. We also asked them to indicate how often others were multitasking during a meeting in person, using a teleconference, and in a virtual world. Table 2 summarizes the results.

Table 2. Reporting on how often multitasking takes place in different types of meetings.

Type of Meeting	Rarely / Never Multitask		Sometimes Multitask		Often / Always Multitask	
	Self	Others	Self	Others	Self	Others
Face-to-face	36.8%	10.5%	52.6%	57.9%	10.6%	31.6%
Virtual world	58.3%	36.4%	25%	36.4%	16.7%	27.2%
Teleconference	0%	0%	26.3%	21.1%	73.7%	78.9%

We suggest that a key feature of virtual worlds which may cause this apparent difference is the level of attention required to participate. One informant described it in the following way, “there is a sense that it demands more of your full attention. Because you... have a physical dimension going on. You have to manipulate things to get that there... coordinating, there’s often ... the multi channel... dialogues going on, chat, instant message, the phone or the voice... it becomes a slightly more immersive ... experience ... one of the questions is does that bring more accountability.”

We further investigated this notion of virtual worlds and engagement by asking people to rate how well face-to-face, virtual worlds, and teleconference meetings enable people to pay attention during the meeting and to what extent they allow people to participate in the meeting. Table 3 shows the percentage of people who said each type supports the two meeting characteristics well or very well. It appears that our informants believe that virtual worlds are better able to support paying attention than teleconferences are but not to the same extent as face-to-face meetings. Our informants also report that virtual worlds provide better opportunity to participate than teleconferences but, again, not as well as face-to-face meetings.

In the next section we discuss our findings and their implications for meetings over distance.

Table 3. Percentage of people who feel different meeting media support the ability to pay attention and opportunity to participate well or very well.

Meeting Characteristic	Face-to-Face	Virtual Worlds	Teleconference
Ability to Pay Attention	94.4%	41.7%	11.1%
Opportunity to participate	77.8%	54.5%	11.1%

6 DISCUSSION

Our study finds that virtual worlds are capable of bringing the distributed meeting experience closer to that of face-to-face meetings when it comes to multitasking. A significant amount of multitasking takes place in meetings, even face-to-face meetings. At the same time, multitasking is seen as both positive and negative. Multitasking can bring benefits such as efficiency and effectiveness but it can also negatively impact the ability of people to participate and pay attention in meetings.

Our study suggests that virtual worlds may be considered as a viable new technological alternative for distributed meetings since they are capable of enhancing the positive aspects of multitasking while at the same time dampening the negative aspects of multitasking. The key features of virtual worlds that enable this balance appear to be the notion of togetherness and presence of individuals through their avatars, which makes people feel they cannot multitask as much as they do in teleconferences, and the level of cognitive attention required to participate in a virtual world (which keeps people engaged in the virtual world meeting) together with the fact that participants are able to switch between the virtual world environment and other technologies. While our informants felt accountable (they do not want their avatar to fall asleep in the meeting), they also felt they can switch between tasks as needed. This notion of accountability may be the key factor that keeps multitasking at bay, preventing it from rising to the levels often seen in teleconferences.

Our study suggests that virtual worlds are a viable tool for distributed meetings. Suggestions for ways to further study this phenomenon are suggested in the following section.

7 CONCLUSION AND FUTURE WORK

The use of virtual worlds in organizations is new and has not yet been studied extensively. In particular, there is little work to date on meetings in virtual worlds. In this paper, we presented results from a study of 23 virtual world users in a large, multinational enterprise. Our study indicates that virtual worlds are a viable IT-enabled environment for meetings over distance and provide an opportunity for multitasking that matches that in face-to-face meetings.

There are several limitations to our study which we discuss here. The number of informants is relatively small and not all of them are experts in virtual worlds nor do all of them use virtual worlds regularly; however, all of our informants worked on at least one virtual world project and some of our informants are experts who not only use virtual worlds for internal business purposes but work with clients as well. The people we interviewed bring a breadth and variability of experience with virtual worlds. Nevertheless, large scale studies or experiments should be conducted to assess the generalization of the findings presented in this study.

Our study indicates that people multitask even in face-to-face meetings. All the informants had participated in meetings where others have multitasked. It is important to understand the impact of this seemingly acceptable behavior on meeting outcomes, relationships among participants, and efficiency. Previous studies and our own results indicate that some people feel the ability to multitask during meetings is beneficial but others find that it negatively impacts several aspects of meetings. This conflicting view of multitasking is an interesting avenue for future research.

It would be interesting to explore multitasking in different technology-enabled meetings and examine its effects on various outcomes (e.g., problem solving and decision making). Another promising direction is to study participants' satisfaction with the meeting outcomes and relate it to their own level of multitasking, and that of other participants. These studies could help us learn if there are unique ways in which meetings should be facilitated when it comes to different technologies and multitasking.

REFERENCES

- [1] Balkin, J.M. & Noveck, B.S. (2006). Eds., *The State of Play: Law, Games, and Virtual Worlds*, New York University Press, New York, 2006.
- [2] Barnes, S. (2007). *Virtual Worlds as a Medium for Advertising*. Database for Advances in Information Systems 38(4) 45-55.
- [3] Bessière, K., Ellis, J. B., & Kellogg, W. A. (2009). "Acquiring a Professional 'Second Life:' Problems and Prospects for the Use of Virtual Worlds in Business", CHI 2009, April 4-9, 2009, Boston, Massachusetts, USA, ACM 978-1-60558-247-4/09/04, 2883-2898.
- [4] Bos, N., Shami, N. S., Olson, J. S., Cheshin, A., & Nan, N. (2004). In-group/Out-group Effects in Distributed Teams: An Experimental Simulation, *Computer Supported Collaborative Work*, 2004, 429-436.
- [5] Boulos, K.M.N., Lee, H., & Wheeler, S. (2007). *Second Life: An Overview of the Potential of 3-D Virtual Worlds in Medical and Health Education*. *Health Information and Libraries Journal* 24 233-245.
- [6] Bronack, S., Riedl, R., Tashner, J., & Greene, M. (2006). Learning in the Zone: A social constructivist framework for distance education in a 3D virtual world. *Proceedings of Society for Information Technology and Teacher Education International Conference*, 2006, 268-275.
- [7] Cameron, A. F. & Webster, J. (2005). "Unintended consequences of emerging communication technologies: Instant messaging in the workplace," *Comput. Human Behavior*, vol. 21, no. 1, pp. 85-103, 2005.
- [8] Curtis, H. (2000). *Flash Web Design: the art of motion graphics*, New Riders Publishing, 2000.
- [9] Edwards, C. (2006). Another world. *Engineering and Technology Dec.* 2006 28-32.
- [10] Erickson, T. & Kellogg, W. A. (2000). Social translucence: An approach to designing systems that support social processes. *ACM Transactions on Computer-Human Interactions*, 7, 1 (Mar. 2000), 59-83.
- [11] Goel L. & Mousavidin, E. (2007). vCRM: Virtual Customer Relationship Management. *Database for Advances in Information Systems* 38(4) 56-60.
- [12] González, V. M. & Mark, G. (2005). Managing currents of work: Multi-tasking among multiple collaborations, In *Proceedings of the 8th European Conference of Computer-supported Cooperative Work (ECSCW'05)*, September 18-22, 2005, Paris, France.
- [13] Hemp, P. (2006). Avatar-Based Marketing, *Harvard Business Review* 84(6) 48-56.
- [14] Hendaoui, A., Limayem, M., & Thompson, C. W. (2008). 3D Social Virtual Worlds: Research Issues and Challenges. *IEEE Internet Computing* 12, 1 (2008), 88-92.
- [15] Holzwarth, M., Janiszewski, C., & Neumann, M. M. (2006). The Influence of Avatars on Online Consumer Shopping Behavior, *Journal of Marketing* 70 (4) pages 19-36, 2006.
- [16] Isaacs, E. A., & Tang, J. C. (1994). What video can and cannot do for collaboration: A case study. *Multimedia Systems*, 2, 63-73.
- [17] Kadavasal, M.D., Dhara, K.K., Wu, X. and Krishnaswamy, V. (2007). Mixed reality for enhancing business communications using virtual worlds, *Proceedings of the 2007 ACM symposium on Virtual reality software and technology* 233-234.
- [18] Johnson, B.C., Manyika, J.M., & Yee L.A. (2005). "The next revolution in interactions", *The McKinsey Quarterly*, 2005.
- [19] Kahai, S. S., Carroll, E., & Jestice, R. (2007). Team collaboration in virtual worlds. *ACM SIGMIS Database*, 38(4), 61-68.
- [20] Linden Lab. (2009). Case Study: How Meeting in Second Life Transformed IBM's Technology Elite into Virtual World Believers, Accessed August 29, 2009, available at http://secondlifegrid.net.s3.amazonaws.com/docs/Second_Life_Case_IBM_EN.pdf
- [21] Lucia, A. D., Francese, R., Passero, I., & Tortora, G. (2008). SLMeeting: supporting collaborative work in Second Life. In *Proc. AVI 2008, ACM Press* (2008), 301-304
- [22] Mackinlay, J. D., Card, S. K., & Robertson, G. G. (1990). Rapid controlled movement through a virtual 3D workspace. *SIGGRAPH Computer Graphics*, 24, 4, 1990, 171-176.
- [23] Mark, G., Grudin, J., & Poltrock, S. E. (1999). "Meeting at the Desktop: An Empirical Study of Virtually Collocated Teams", In *Proceedings of ECSCW'99, The 6th European Conference on Computer Supported Cooperative Work*, 12-16 September 1999, Copenhagen, Denmark, pp. 159-178.
- [24] Mayer-Schoenberger, V. & Crowley, J. (2006). Napster's Second Life? The regulatory Challengers of Virtual Worlds,

Northwestern University Law Review 100(4) (2006) 1775—1826.

- [25] Messinger, P. R., Stroulia, E., Lyons, K., Bone, M., Niu, A., Smirnov, K., & Perelgut, S. (2009). "New Directions for Social Computing in Virtual Worlds: Applications for Business and Social Sciences," *Decision Support Systems*, Vol. 47, Issue 3, 204—228.
- [26] Nebolsky, C., Yee, N. K., Petrushin, V. A., & Gershman, A. V. (2003). Using virtual worlds for corporate training, *Proceedings of the 3rd IEEE International Conference on Advanced Learning Technologies (ICALT'03)*
- [27] Olson, G. M. & Olson, J. S. (2000). Distance Matters, *Human-Computer Interaction*, 2000, Volume 15, pp. 139—178
- [28] Siina, R. M. (2007). Emotional Engagement on Geographically Distributed Teams: Exploring Interaction Challenges in Mediated Versus Face-to-Face Meetings, PhD Dissertation, Stanford University, June 2007, 174 pages.
- [29] Sipress, A. (2006). Where Real Money Meets Virtual Reality, *The Jury Is Still Out*, *Washington Post* (Dec. 2006) Retrieved August 12, 2009, from <http://www.washingtonpost.com/wp-dyn/content/article/2006/12/25/AR2006122500635.html>
- [30] Soraker, J. H. (2008). Global Freedom of Expression Within Nontextual Frameworks, *Information Society* 24(1) (2008) 40—46.
- [31] Stone, L. (2008). Continuous Partial Attention -- Not the Same as Multitasking, *Business Week*, July 2008, Accessed July 3, 2009, available at http://www.businessweek.com/business_at_work/time_management/archives/2008/07/continuous_part.html
- [32] Strauss, A. & Corbin, J. (1994). Grounded Theory Methodology: An Overview. In N. K. Denzin, & Y. S. Lincoln (Eds), *Handbook of Qualitative Research*. Thousand Oaks, CA, US: Sage Publications, Inc. 273-285.
- [33] Tang, J. C. 2005. "Ubiquitous computing: Individual productivity at the expense of social good?", *First International Workshop on Social Implications of Ubiquitous Computing*, held at CHI 2005, April 2005, Accessed July 3, 2009, available at <http://www.vs.inf.ethz.ch/events/ubisoc2005/UbiSoc%202005%20submissions/04-Tang-John-NEW.pdf>
- [34] Torrence, P. (2001). "Fast Cars, Fast Food, Fast Access", *Digital Web Magazine*, September 9, 2001, Accessed September 1, 2009, available at http://www.digital-web.com/articles/fast_cars_fast_food_fast_access/
- [35] Yee, N., Bailenson, J., Urbanek, M., Chang F., & Merget, D. (2007). The Unbearable Likeness of Being Digital: The Persistence of Nonverbal Social Norms in Online Virtual Environments, *CyberPsychology & Behavior* 10(1) (2007) 115—121.