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Sébastien Damart
CNAM (Chaire EGSS) M-Lab (DRM - UMR CNRS 7088), sebastien.damart@dauphine.fr

Christine Defuans
Orange Labs Services aux Entreprises, christine.defuans@orange-ftgroup.com

Doudja Saïdi Kabèche
AgroParisTech M-Lab (DRM - UMR CNRS 7088), doudja.kabeche@agroparistech.fr

Mathias Szpirglas
Université du Littoral M-Lab (DRM - UMR CNRS 7088), mathias.szpirglas@dauphine.fr

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Mathias Szpirglas
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ABSTRACT

Managing modern organizations requires innovative measures to facilitate interaction. In this paper, we focus on interaction mechanisms, such as business meetings. We attempt to highlight the possible contributions of virtual worlds in terms of such organizational mechanisms. This original work presents a review of the literature about business meetings and their structural properties. It also presents the specific properties of virtual worlds that serve as a mechanism for facilitating the interaction of multiple participants. Our research demonstrates that immersion is a property common to both meetings and virtual worlds. This immersion is expressed in a wide range of forms that are described in this paper.

Keywords

Virtual worlds, business meetings, immersion, organizations

INTRODUCTION

At their inception, 3D virtual worlds (VW) were simple Internet gaming environments. However, as their audience grew and their function changed, economists and sociologists, and later management science specialists, began to be interested in these environments (Castronova, 2001). Over the last decade, the stakes involving VW have become increasingly apparent to companies. The development of VW (such as Second Life, Alpha World become Active Worlds) on the Internet also made new markets and new strategies appear (Pepper and Rylander, 2005, Lui et al., 2007), and these new markets were a potential source of considerable profit. The development of VW also led to new collaborative tools for organizations, mobilizing new technologies that helped give more meaning to the information than the current information systems (IS) could supply (Kobrin, 2001). In fact, progressively, it became clear that VW were going to offer new interactive environments to organizations. This paper focuses on these new interactive environments.

Modern organizational management requires innovative measures to facilitate interaction and communication. Traditionally, business meetings aimed to facilitate the interaction of the various participants. Fulk and Collins-Jarvis (2000) defined "meeting" as "the act of gathering together for a limited period of time for the purpose of communication". These authors suggest that a meeting must necessarily be considered as synchronous (i.e., the participants gather in the same place at the same time) to clearly isolate the beginning and end of this episode of communication. As a space for interaction, meetings are set up to serve a wide range of organizational objectives: creativity, innovation, design, crisis management and/or coordination, to name but a few. As Fransisco (2007) has suggested, meetings are needed to deliver or obtain information, strike agreements, find solutions to problems and/or motivate/stimulate teams. Varying the structural properties of meetings gives them an appropriate form to accomplish a given objective.

In addition, for the last several years (maybe even decades), meeting organizers have taken advantage of information and communication technologies (ICT) that allow the geographic dispersion of the participants. VW also offer this possibility. However, this paper shows that their contribution to meetings is more complex. VW are persistent spatialized representations of a universe that is separate from the real world. In this universe, the codes linked to identity, interaction or communication are unique.

In this paper, we first describe the **meeting's properties** by which it is possible to create interaction spaces and immersion mechanism for participants during a meeting. In a second section, we present some **virtual worlds' properties** which were selected for being closely related to the meetings' properties. We then focus on immersion, one of the characteristics of VW that seems to echo the fundamental issue of meetings, in terms of solicitation of participants' attention and power of mental concentration. As Davis et al. (2009) reminds us, immersion in VW concerns the "degree to which people perceive that they are interacting with their virtual environment rather than with their physical surroundings (Guadagno et al., 2007) ", this environment being fully a part of the meeting's mechanism. Our work is intended to show the potential range of VW uses that can not only increase but also renew the immersion experience of meeting participants, thanks to an enriched and different solicitation of their cognitive capacities.

THE MEETING'S STRUTURAL PROPERTIES AND CONTEXTUAL DYNAMICS

The structural properties of meetings

In meeting organization, the form of a meeting must be adapted to its objectives. Choosing the appropriate structural properties can do this. One of these properties is the *structure of the participation*. According to Fransisco (2007), company's members' competences and contribution to meeting's objectives determine the relevance of their involvment in meetings. In the particular context of ill-structured problems or problem-solving, Stumpf et al. (1979) and Wanous and Youtz (1986) have shown that the performance of a working group is influenced by the group's composition and diversity. Diversity is characterized by race, skills, social class or values for Jehn et al. (1999), by knowledge for Rulke and Galaskiewicz (2000) and by cognitive schemas for Kilduff et al. (2000). The cognitive dimension appears more clearly in the research about the processes of sharing mental models. Carley (1986) has shown the importance of communication in aligning the mental representations of group members. Damart (2008) has shown the importance of structuring the participation and the role that meeting participants play in the cognitive alignment of participants. Studying the structure of participation is all the more interesting since the "virtualization" of the meeting allows the display level of participants' roles and identities to be customized.

Organizing a meeting also requires defining its *spatial framework*. Since "virtual" working groups are widespread in extended companies, we use the term "spatial framework" not for the meeting place itself but for the support of the participants' interactions. In addition to face-to-face meetings, various studies about meetings have looked at teleconferences (i.e., conference calls and video conferences), computer conferences, Group Support Systems (GSS) or Electronic Meeting Systems (EMS), virtual meeting rooms (VMR), as well as email and chats (Fulk and Collins-Jarvis, 2000; Shachaf, 2008). At first, electronic meeting tools were a response to time constraints and traveling costs. Then, as shown by Grohowski et al. (1990) and Kalika et al. (2008), using them appeared to increase the efficiency of the meeting. Hoxmeier and Kozar (2000) identified three meeting facilitators: the traceability of the exchanges; the anonymous nature of the exchanges, which makes it easier for the participants to express their ideas; and the parallelism of the discussions around a central idea, which positively influences the participants' attention level. Volkema and Niederman (1996) and Francisco (2007) have underlined that the availability of documents for the participants prior to the meeting improves their contributions and their respect for the meeting agenda. Electronic tools facilitate this document availability, even during the meeting. These tools help meeting participants to cognitively align on the same task, although they may cause information overload, which can be counter-productive (Hoxmeier and Kozar, 2000; Kalika et al., 2008). Some studies have shown that, with conference calls and video conferences, the lack of a unified spatial framework affects the level of immersion in the meetings and thus the level of participant involvement. The alternative of virtual meeting rooms seems to improve team cohesion and the feeling of belonging (Shachaf, 2008; Bailenson, 2008).

Through these interaction tools, the *communication modes* in meetings have evolved considerably. Numerous studies have compared these communication modes and the richness of the information exchanged. The criteria that Daft et al. (1987) proposed for this comparison are the ability to transmit information rapidly and receive a rapid response, to send several types of signals, to establish a personal contact and to use rich and varied language. These authors demonstrated that face-to-face communication is the richest mode of communication. Lantz (2001) compared face-to-face communication, chats and communication in a collaborative virtual environment. He concluded that, for a well-identified task, chats and communication in a collaborative virtual environment were superior. He also showed that, to encourage participation, it was necessary to establish codes for language and speaking, more in instantaneous electronic communication than in communication in a virtual collaborative environment, where the participant's avatar is present. Similar studies have shown that the comparison of the effectiveness of the interactions taking place with different communication modes depends greatly on whether or not the interactions concerned well-identified task (e.g., Gorse and Ammitt, 2007; Huisman, 2001).

In addition, it seems to be accepted that the quality of a meeting is positively influenced by the *level of formalization* of all or part of the meeting's characteristics. For Bostrom (1989), the meeting announcement or invitation, the agenda, the meeting support documents, the meeting minutes, all are used to describe these characteristics. Although other studies (e.g., Anson et al., 1995) have underlined that a too formalized facilitation process may be harmful for group cohesion, the idea of the positive influence of formalization corroborates the conclusions of many studies on the contributions of formal group-decision-support systems (De Sanctis and Poole, 1994).

Nonetheless, this formalization may not be enough to describe a meeting completely. In reality, the meeting objectives, forms and participation may vary, as well as the context in which the meeting occurs. In addition, as Volkema and Niederman (1996) highlighted, the access to information related to the preparatory step, the meeting itself or the meeting output is often difficult. Furthermore, in our opinion, certain specific situations, such as the meetings around the coffee machine, can be considered as non-formalized meetings; as such, they are occasions for communication, whose objectives and structural properties are not defined in advance.

Meeting dynamics and context

In their study of organizational routines and the link between strategic and operational processes, Jarzabkowski and Seidl (2008) and Hendry and Seidl (2003) describe meetings as episodes in the organization's life that play a crucial role in expressing and creating a common strategic vision. In our opinion, meetings also play a *role in these processes* as a tool for anticipating and adapting the company context. For example, the meetings of a project steering committee, which has relatively stable participative structure and spatial framework over time, will be the backdrop for completely different kinds of interactions from the start of the project to its completion. Thus, we distinguish, according to their occurrence frequency, routine meetings and exceptional meetings. *Routine meetings* are the regular meetings that occur more or less frequently (e.g., daily, weekly, monthly). Managers judge this kind of meeting too frequent, too long, and too inefficient, thus decreasing the participants' attention. Benbunan-Fich and Truman (2009) have shown that meeting participants use their laptops to multitask more in informational meetings than in problem-solving meetings. *Exceptional meetings* arise from exceptional situations (e.g., crisis, conflict resolution, need to lighten a meeting agenda) that must be dealt with through a coordinated effort. Usually, these meetings have variable parameters—participants, length, frequency—that cannot be predicted beforehand.

The *integrative dynamic* that occurs in a meeting allows the process of convergence of the interactions taking place during the meeting to be described. We use the concept of integration with the same meaning as given by Follett (1924) and by Walton and McKersie (1965). For these authors, integration is a type of conflict resolution that is supported by the joint development of new alternatives. "Integration" is different from "compromise" in that neither party renounces his/her requirements. Thus, the "integrative dynamic" of a meeting refers to the processes which lead the participants to produce a common output (e.g., design prototype) or any kind of common decision or representation. This integrative dynamic is influenced by many factors; among them is the recourse to tools for structuring collective interactions (e.g., GSS or EMS). Murthy and Kerr (2002) have shown that, when the need for convergence is strong (e.g., problem-solving meetings), face-to-face meetings are the most efficient. On the other hand, in meetings that require creativity, an electronic support allows the meeting to be more productive.

The performance of the integrative process also depends on the structure of the participation, as defined above, especially the group size (Damart, 2008; White, 2002). The convergence towards a common shared output is not always the goal. For example, in routine informational meetings, the output is controlled *a priori*, and the interaction of the participants is not desired. Similarly, in creative meetings, the interactions are intended to facilitate the appearance of a maximum number of new ideas. In innovative design, Hatchuel and Weil (2003) refer to this process as expansive rationality, which they compare to the procedural rationality in which it is a question of trying to compare, select, filter and highlight the best alternatives, as is done in problem-solving meetings.

In this section we showed that many parameters are involved in the meeting progress. According to the targeted goals of the meeting, participants' attention and immersion are differently required. They are linked to the expected output, the spatial framework and/or the distributed roles. The actors' level of attention or participation to the meeting is deeply related to the level of immersion. In fact, the way actors are involved into the meeting is determined by their ability to be immerged into the situation. The length of meetings can also affect actor's involvement, as attention can be focused during a limited period of time only. VW present features that could probably renew these issues.

THE PROPERTIES OF VIRTUAL WORLDS

Virtual worlds are worlds "in which people interact as avatars with each other and with software agents, using the metaphor of the real world but without its physical limitations" (Davis et al., 2009). Through their numerous properties, virtual worlds fulfill new functions, by letting users, via an avatar, extend their perceptions of the real world as well as increasing their experience (e.g., identity, sensory and immersive) in the virtual world.

Transformation of the spatio-temporal environment and identities

Virtual worlds act jointly on two parameters linked to the users' concentration and attention on their virtual activities. VW thus allow the creation of an environment capable of holding the users' attention, which will help them to separate from their real environment, or even break with it and plunge into an imaginary world, sometimes preventing them from extracting themselves from this imaginary world. As with electronic collaborative tools, the intermediation of a virtual world allows the participants to eliminate the geographical distances that separate them in the real world. They find themselves plunged into an environment that is elastic and immediate on the temporal level, making it possible to interact in a meeting place that is persistent and free of geographic constraints. In a virtual world, it is also possible to divert objects from their primary function, thus allowing an imaginary use of these virtual objects. In addition, virtual objects (and now real objects too) become data transmitters and receivers. It is possible to imagine VW that are directly connected to real objects, thus allowing the recomposition or augmentation of the use of these objects.

Compared to traditional communication tools, VW allow the participant's physical presence to be greatly modified. Avatars are the codified expression of this physical presence. Communication through avatars is a streamlined form of expression in which a limited number of messages are communicated (e.g., facial expressions or gestures). Body language is codified and reduced to a normalized palette that is made available by the developers and ergonomists. Thus, traditional types of communication are renewed and new languages are invented. Although the avatars offer everyone the possibility of multiplying their interactions within a collective meeting place, they are for the moment limited to vision, hearing or touch as interfaces for acting in the VW.

Furthermore, avatars express an individual's identity. As such, they are perpetually under construction. Each avatar constructs its own identity and reputation in the virtual world (Angel, 2008). The physical appearance of the avatar is highly personalizable and interchangeable. Consequently, an individual can give his/her avatar its own personality, which allows him/her to be assimilated into one or more communities. This permits the individual to live "another life" anonymously and explore new facets of his/her identity: the virtual environment liberates individuals from certain societal constraints (Junglas et al., 2007). We leave the question of the confusion between the avatar's identity and the real identity of its creator open to debate (Junglas et al., 2007).

The users can also promulgate several identities of their own, whether they are fantasy or real. They can thus multiply their possibilities for action in the virtual world. The question of whether or not the avatars controlled by a single user constitute replications of this user is interesting because, in this case, the multiple avatars' identities would allow this user to be somewhat ubiquitous, with avatars acting in several places at the same time.

Towards the ubiquity of presence and availability

Ubiquity is defined, first of all, in a temporal space. This notion, as we mean it, is not a static situation, but rather a situation that can be expressed differently depending on the temporal scale considered. Long-term ubiquity would consist of having an alternative virtual representation as opposed to the one in the real world. The replicated presence of a company in "Second Life", in the long run, could be considered as a form of ubiquity, in the sense that the company exists both in the real world and in the 3D virtual world. That would be a relatively static form of ubiquity. However, in our opinion, the notion of ubiquity has a real meaning in the instantaneity and interactivity of an individual situation in relation to the environment: "being" in several places at the same moment. Due to networks and 3D virtual worlds, it is now possible to be represented in two distinct places, either through a simple declaration of presence or availability or through the manipulation of an avatar.

More precisely, ubiquity is the ability of the users to multiply their presence to act in different environments at the same time. They are thus virtually present in two different places (e.g., two meetings in two different places). However, this doesn't necessarily mean that they are more available. This raises the question of the "actual" availability to act in one environment or the other and introduces the distinction between two key notions: presence and availability.

In a virtual world, *presence* is important because the visibility of the avatar attracts the attention of the other protagonists to its actions. Thus, an avatar can be present (i.e., "visible") in a given place other than the one in which its user is acting, but it

is not necessarily "active" and "available" to interact with the other avatars. If the user is unavailable, the avatar isn't able to respond to requests made by the other avatars. In this case, the avatar simply represents the user's presence.

It is possible to grant the avatars certain observation functions. For example, using the recording tools of the virtual world, the avatar can record the conversation and keep a copy of the discussion that takes place around it, but it cannot take part in the discussion. In this case, the avatar serves as an audio-visual device that allows the discussion to be monitored from a remote location. Although the avatar is active, it cannot interact with the other avatars. Its actions are automatic and do not require any attention, mental availability or action on the part of the user that it represents.

On the other hand, if the user declares his/her *availability*, the other participants know that his/her avatar is likely to be reactive and respond to their propositions. As a result, the situation is "steerable" because it is known to be actionable by the protagonists available to make it evolve together.

Finally, there is one more possible form of ubiquity that is much more prospective in nature, in which avatars, as intelligent robotized clones of the individual, act as they have been programmed; they are autonomous and they are not controlled by the user in real time. This is a more complex form of personal representation, with a misleading sense of availability that makes the other participants think that a user directly controls a given avatar.

Interactive ubiquity can thus be expressed in many different ways since, as we have shown above, the ubiquitous presence of the avatars is fairly relative. Nevertheless, by multiplying the occasions for interaction, the ubiquitous situations in VW can be seen as means of enhancing meetings. The question of ubiquity remains nonetheless complex when seen from the perspective of a declared presence in several places. Ubiquity demands much in terms of cognitive capacities and attention of the users, who are not limited by the possibilities of the VW but rather by their own cognitive capacities (e.g., being ambidextrous and capable of simultaneous cognitive and motor multitasking).

VIRTUAL WORLDS AS IMMERSION SUPPORTS

If we consider meetings as interaction spaces and immersion mechanism, this would mean that, *a priori*, virtual worlds can be an appropriate support for meetings since these worlds are themselves interaction immersion supports. In the following sections, we will attempt to establish a parallel between these two types of mechanisms in an effort to better evaluate the possible contributions of VW to meetings. All the properties presented above demonstrate that VW offer renewed widespread immersion conditions, which, applied to business meetings, could provoke an in-depth modification of the meeting's structural properties.

An enhanced immersion experience using the VW's spatio-temporal features

First of all, VW should be considered as ICT that provide diverse communication tools (e.g., for navigation, communication, personalization). The level of immersion in VW is largely conditioned by the "quality of use" ("quality of use" is used to mean the relationship between the tool's global ergonomic quality and the skill with which the tool is used). In fact, to encourage immersion, the use of the tool must be sufficiently intuitive or using the tool regularly must be enough to confer mastery. In other words, VW must be sufficiently familiar for the search for meaning to be concentrated on the immersion and not on learning how to use these tools.

Three-dimensional VW create the environmental conditions in which the participants are immersed. By reconstituting the material infrastructures in a virtual form, it is possible to reproduce an environment that encourages immersion in the interaction space that is the meeting. Three-dimensional VW are an opportunity for enhancing this interaction space, not only in terms of tools to support the interaction, but also in terms of graphic and spatial conditions that mobilize and stimulate the senses as well as the attention. One success factor of the immersion in a virtual world resides in the almost infinite possibilities in the way that "real" can be represented. With their creative potential, VW allow a variable flexible representation space to be formed. The sounds and visuals in the VW can be completely reshaped and can take the most diverse and most unexpected forms. The range of possibilities is extended considerably to allow both the individual and collective imaginations to be expressed more comprehensively. Even more, VW make it possible to propagate new experiential frameworks (Goffman, 1974), which lead to new supports and unknown/known virtual situations.

Furthermore, this extended spatialization of a digital interaction support offers a certain persistence, which makes it possible to envision extensive possibilities for a sustainable immersion experience. This comes back to another concept. We consider that VW have persistent sustainable features that can make them available at any time. These features provide an immersion framework that has a stable structure, interchangeable graphics and evolutionary recordable interactions. For example, this framework can provide meeting follow-up. In the real world, conference room is usually liberated after the meeting has ended so that other company members can use the room; however, in the virtual world, this room can be dedicated to this

meeting, and thus become a permanent fixture without any logistic constraints. Consequently, objects in this space may become interactive instruments and/or stable relationship tools. These "memory trunks" both insure the traceability of the virtual discussions and allow the control of "double-loop collaborative learning" by authorizing a reflexive perspective (Argyris and Schön, 1996). The virtual conference room becomes reconfigurable and thus in constant evolution.

An adjustable immersion

The frameworks and representations that VW provide to business meetings can be imposed in a static form or can offer fairly broad possibilities for personalization. Immersion can thus be considered as a continuum going from one extreme, individual frameworks (i.e., personalized environment), to the other extreme, collective frameworks (i.e., the collective definition of a unique spatio-temporal environment).

On one end of the continuum, the virtual world is a mechanism for immersing individuals into their own virtual environment. It becomes a highly customized interface that is not shared with a group. However, this interface includes a set of tools for interacting collectively, and even tools for sharing information in real time (e.g., text, images). The virtual world is thus constructed around the individual, with each individual recreating his/her own space. Within this frame of reference, two options are available to individuals. The first option is to use the virtual world as a personal interface, with which individuals enter into communication with individuals (or avatars) situated outside their own world. This kind of virtual world is thus only visible to the individual that "possesses" it. The second option is to choose to make the individual's own virtual space accessible to others, thus allowing other individuals to immerse themselves in a universe of personal representations. In the case of a meeting in these VW, several individual VW could be used to interact with the others, according to interoperability rules. The meeting would thus become the space where the individual virtual worlds meet, instead of where the individuals themselves meet. Each individual will "possess" his/her own virtual world that will be more, or less, open to the worlds of the others.

On the other end of the continuum, the virtual world is a shared, standardized immersion support. The virtual environment, both the visuals and the sounds, is common. The avatars see the same things, and they manipulate the same objects. The individual spatio-temporal frameworks are removed in favor of a single reference framework, a single virtual world, shared by all the participants. Personalization is practically non-existent because any modification would have an impact on the representation of the others. In this collective world, the participants can group together to modify the common objects or even the environment itself (e.g., walls, landscapes). The appropriation of the space is collective and the use of avatars appears essential for materializing the presence of the participants, encouraging exchanges and making the immersion in the world effective.

Between these two extremes, it is obviously possible to imagine different degrees of immersion. Doing so would make the position of the virtual world move on the immersion continuum since the variable element is the level of personalization and appropriation possible of the virtual world's interface or, in other words, the interface's level of porosity to the shared universe of representations. At an intermediary level, a common foundation could be proposed, and based on the individual parameters of this common foundation, each participant could appropriate the environment in a personalized manner. The virtual world would, in this case, be partially shared.

An attempt to position the virtual world in relation to other technical tools intended to support meeting interactions would require adding the degree of distantiation (i.e., the degree of reproduction of reality) to the previous notions. In fact, several tools are based on reconstituting reality, for example, by reproducing a common space or a traditional room with all the traditional supports (e.g., white boards, files, telephones). Often, due to interface constraints (e.g., overloaded interfaces and the risk of cognitive overload), this space is streamlined to allow the user's attention to be focused on the tools and the contents. However, when considering 3D VW and the interface richness that they offer (e.g., spatial mobility, moving landscapes, depth), the constraints related to cognitive overload on a "flat" screen could be lifted; the possibilities for multiplying the tools, supports and/or positions become almost infinite. The difference will be in the richness of the person's experience, both from the perspective of the use procedures employed and the visual, auditory and emotional experience.

CONCLUSION

Meetings gather participants together and propose an interaction space to accomplish their objectives. The participants are immersed in this space in the sense that, during the meeting, they focus all their mental resources on one fundamental issue, one type of information or one problem. ICT make it possible to gather participants that are geographically scattered, which makes controlling the participants' immersion in the meetings complex.

Virtual worlds are characterized by participants' immersion. This immersion is mostly related to the potential to faithfully reconstitute images from the real world in 3D but also to the possibility of accessing a universe in which the codes of

language, communication and information are different from those of the real world. Organizations can use VW to reinforce the meeting's potential for immersion. We propose that the participant's immersion in a meeting can be reinforced on an immersion continuum. At one end of the continuum, each meeting participant designs a virtual space for interacting with the other meeting participants; this universe can easily be appropriated because it is completely personalized, thus facilitating the immersion in the meeting. At the other end of the continuum, the organization designs an identical interaction space for all the participants; the common character of this space allows the same representations to be shared, resulting in a more efficient coordination. Based on this conceptual frame, we will do an empirical work essentially consisting in experiments, with the aim to compare the immersion level of individuals in business meetings within different kinds of environments. As a preliminary step, the research will focus on the way to build indexes measuring the immersion level in meetings. A second step is the evaluation of variables that could describe structural properties of meeting environments in which participants will be placed during the experiments.

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