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A Phenomenological Inquiry of Virtual Worlds

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ABSTRACT

In synthetic worlds, such as Second Life, World of Warcraft, or SIMS, the dichotomy between reality and virtuality still remains one of the unsolved philosophical inquiries of our time. There remains skepticism regarding the value of virtual experiences versus those of real life. This research presents a starting point for an ethical discourse on the technology of virtual worlds and addresses two questions: What are unique affordances of virtual worlds? And, what are the ethical implications that emerge due to these unique affordances?

Four unique affordances of the technology of virtual worlds – self-expression, co-experience, co-creation, and crowd-sourcing, are identified. Questions from positivist, social-constructivist, and phenomenological perspectives of ethics are recognized and preliminary phenomenological insights of societal pressures contributing to the emergence of virtual worlds are ascertained. This research attempts to analyze virtual worlds from multiple ethical perspectives, starting with a broad phenomenological inquiry within which subsequent impact and discovery studies can be framed. Understanding the societal attitudes and moods that make technologies necessary and valuable help uncover the interests and constraints they embody as well as their potential impacts.

Keywords:

Virtual worlds, phenomenology, ethics, affordances

INTRODUCTION

In synthetic worlds, such as Second Life, World of Warcraft or SIMS, the dichotomy between reality and virtuality still remains one of the unsolved philosophical inquiries of our time. Virtual worlds are computer-based simulated environments inhabited by “avatars,” or 3D representations of users in the virtual environment. Some characteristics of virtual worlds include that they are web-based and hence enjoy the benefits of the Internet such as global reach and 24/7 availability, persistent which means that changes in the environment persist whether or not a user is logged in, allow user-generated content in the form of virtual artifacts, facilitate many-to-many synchronous interactions between users who are logged in at the same time, and allow for informal communication since meeting of users can be through happenstance rather than pre-arranged. Virtual worlds are based on three-dimensional graphics, which differentiates them from the two-dimensional interfaces that currently dominate the Internet.

Virtual worlds have been associated with virtual reality games for a long time. This is because the concept of virtual worlds evolved from Massively Multiuser Online Role Playing Games (MMORPGs), such as World of Warcraft or SIMS. However, the applications of virtual worlds have grown beyond gaming and 3D modeling to other forms of entertainment and information assimilation, such as virtual real estate, brand building, and marketing. Virtual worlds such as Second Life are not game driven, but instead provide open, three-dimensional platforms for user-generated content. Organizations are already sensing the potential of 3D environments in organizational learning and collaboration. IBM, for instance, has set up “islands” in Second Life for, among other purposes, providing a virtual meeting place for its employees to interact. Increasingly, universities use Second Life as a platform for teaching as well as providing information about their programs. Toyota and Reebok use Second Life to collect customer preference information. Such applications could, in time, lead to serious economic and business transformations (Hemp 2006).

Despite such growing popularity, there remains skepticism regarding the value of virtual experiences versus those made in real life. To what extent these synthetic worlds, or computer-based simulated environments, are relevant to real life may be addressable by taking a deeper look at some ethical assumptions that underlie virtual worlds. In this paper we will address the following two questions: What are unique affordances of virtual worlds? And, what are the ethical implications that emerge due to these unique affordances? This article proposes a research agenda that identifies the affordances of virtual worlds and scrutinizes them through multiple ethical perspectives. In particular, questions from positivist, social-constructivist and phenomenological views on ethics are identified. We present preliminary insights from a phenomenological inquiry and conclude with implications of such a research agenda.

THEORETICAL BACKGROUND

Virtual Worlds

A virtual world is a computer-based simulated environment where users have 3D representations called avatars. Before we can engage in a meaningful discussion of virtual worlds, we need to discuss the ontological assumptions of comparing virtual worlds to real life. How are these “computer-based simulated environments” relevant to real life?

Sociologists Berger and Luckmann (1966) would argue that part of the ontological difference between the two is explainable through a human’s perception of “make believe” contexts. They argue that the concepts of “reality” and “knowledge” are socially relative. To make sense of new contexts and reality, individuals translate unfamiliar experiences into everyday life. They use language and meanings from the reality they are familiar with and associate them with objects in the unfamiliar domain. Hence an individual who is familiar with the experience of a tree in real life calls pieces of code, software, and hardware used in the virtual representation of a “tree,” a tree. Dragons and warriors in simulated virtual games are interpreted due to the association of their representations with the words “dragon” and “warrior” and their meanings. Viewing a simulated reality as an unfamiliar context allows us to make the transition between cognitive and social processes that occur in the virtual world to those in the real world. Given this ontological understanding, we cannot dismiss experiences in synthetic environments as meaningless. What individuals

perceive in virtual worlds hence has a very real and meaningful bearing on their real selves. For this very reason, it is important to consider an individual's unique experiences afforded by the technology.

Affordances of Virtual Worlds

Affordance is the perceived or actual properties of an object or environment that allow an individual to perform certain actions (Gibson 1977). Zammuto et al. (2007) drawing on Gibson (1977; 1979) advocate the analytic lens of affordances in studying technology and define an affordance perspective as one that "recognizes how the materiality of an object favors, shapes, or invites, and at the same time constrains, a set of specific uses." From the definition, the affordance perspective is not restricted to the fixed characteristics of a technology, but incorporates the appropriation of those characteristics by users. In the case of virtual worlds, it is not the materiality of one object, but rather that of the simulated environment enabled by virtual worlds, that is appropriated by its users. Virtual worlds, due to their characteristics, have the following affordances:

Self-Expression

In understanding the relationship between an individual's 3D virtual avatar and his real self, the social-psychological phenomenon of self-expression becomes important. The "use of on-line persona can serve a useful purpose for expressing and understanding our 'core' selves unfettered by shyness, social anxiety and physical states" (Joinsen and Deitz-Uhler 2002, p. 291). Social psychologists argue that in real life people feel the need to present a self that is approvable to the society and the social groups they belong to (Olson and Johnson 2001). However, in virtual interactions they do not need to worry about barriers, such as age, status, gender or the stereotypical notions they face in real life (Miller and Arnold 2001). In a series of experiments through computer-mediated interactions, researchers have found that the *true* self of respondents was heightened (Joinsen and Deitz-Uhler 2002). Others have found that participating in online communication gives people the opportunity of "disclosing a long secret part of one's self" (McKenna and Bargh 1998, p. 179). In the same vein, it has been argued that on the Internet "people loosen up, feel less restrained, and express themselves more openly" (Suler 2004, p. 321). This stream of research does not discount the possibility of deceit where individuals pretend to be different from their real life selves. However, social psychologists argue that this deceit reflects what individuals desire to be and would like to be perceived as. Some view presented self in a cyber world as an extension of an individual's real life self.

This can be seen in the following quote from an individual with a virtual persona:

"I also play female characters, despite being male...I don't give my real gender to people very often...I'm exploring aspects of human interactions that are denied to me in real life because I am male" (Reid, 1995 p. 180).

Virtual Worlds present an interesting environment for self-expression because they not only facilitate anonymity; they also provide individuals with more tools for self-expression. Anonymity has been studied extensively in the group decision support literature and has been found to foster creativity (e.g., Jessup et al., 1990). 3D user representation in the form of avatars and the ability of users to influence persistent content enables self-expression in virtual worlds. Individuals can customize their avatars along multiple dimensions, including appearance, clothing, accessories, and possessions. Individuals can also interact with richer representations of products as compared to other internet-based media used for the same purposes (Sawhney et al., 2005) and even customize their avatars and virtual world environments according to their aesthetic preferences. Moreover, for some individuals it is more advantageous to express themselves through non-verbal cues. This group could include individuals with or without specific disabilities, or individuals that are introverted or hold a minority opinion. Therefore, it is possible to learn with individuals who would have not been otherwise included in traditional settings.

Co-Experience

Global reach, synchronicity, 3D user representation, and immersion allow individuals to co-experience by sharing the same virtual space with other avatars. Technical aspects of the virtual environment, such as degrees of freedom of movement and the types of information formats supported, influence the degree of

immersion experienced by an individual in that environment. Prior research has found a positive relationship between the level of immersion offered by the environment and the degree of social presence experienced (Sadowski and Stanney, 2002). Also, virtual environments present an egocentric frame of reference as opposed to an exocentric one. Egocentric frames provide the view of an object, space, or phenomenon from within rather than from outside (viz. exocentric). The difference between an exocentric and egocentric frame of reference is analogous to viewing a dollhouse from the outside as a human versus viewing it from the eyes of a doll living in it (Salzman, 1999). Egocentric frames of reference have also been hypothesized to enhance participants' social presence (Dede 2005). An enhanced level of social presence makes the experience interactive, dynamic, and hence closer to real life than other virtual platforms. Social presence refers to the salience of the interactions of an individual with others in the medium and the degree to which these interactions feel like real-life. Social presence goes beyond perception of the location of others in the medium—it also includes perception of their behaviors and an insight into their actions. Hence through co-experience, an individual is more engaged with others that share the same virtual space.

Co-Creation

Besides being able to co-experience with other individuals, users of virtual worlds have the ability to create and modify persistent content and to work on 3D virtual artifacts simultaneously. This allows individuals to collaborate with one another and to co-create experiences. Literature in perspective sharing identifies the central role of boundary objects in effective situated learning contexts (Star and Griesemer, 1989). Boundary objects are artifacts that enable communication between members within and between different communities of practice (Carlile, 2002). While literature in IS underscores the role played by IT personnel in communities of practice as boundary spanners and gatekeepers (e.g., Levina and Vaast 2002, 2005, 2006; Pawlovski and Robey, 2005; Boland and Tenkasi, 1995), the role of boundary objects conceptualized as IT artifacts that help share meanings has received less attention. Virtual worlds allow avatars to work on these boundary objects, or virtual artifacts, at the same time, providing a powerful and rich representation of the object of interest. For example, when designing a structure together in a virtual world, avatars can see changes and make modifications to the same virtual artifact, thus learning through interacting with each other. The common artifact serves as a boundary object that helps share a common meaning for all individuals who work together using the boundary object. To this extent, we believe that virtual worlds are unique among other web-based communication media.

Crowd-Sourcing

Crowd-sourcing is a term employed for leveraging the collective potential of an undefined group of people, usually connected to the Internet, for pooling resources, such as information, images, or videos (Howe, 2006). For example, Wikipedia relies on crowd-sourcing for its articles; YouTube has user-generated content in the form of videos. Most news-blogs, such as Slashdot and MetaFilter, are also crowd-sourced and, in some cases, are more popular than corporate news websites (Silva et al., 2006). Virtual worlds can be seen as crowd-sourcing platforms in which organizations have the possibility to reach out to the collective pool of avatars for sourcing of ideas and virtual artifacts.

Ethical Considerations

The questions from an ethics perspective on any technology can be framed through a positivist, social-constructivist, or a phenomenological view (Introna, 2005). From a positivist perspective, the view of technology is that of an artifact or a tool, and the ethical questions center around the impact of the technology on rights or moral convictions of individuals. Here, classical ethical theories such as utilitarianism, consequentialism, and deontological ethics provide a useful lens (for e.g. Powers, 2003; Greco and Floridi, 2004).

From a social-constructivist perspective, technology and society co-construct each other such that there is an ongoing interaction between the technology (its design and use) and social practices. From this perspective, the ethical questions focus on uncovering the assumptions, values, interests, and constraints built into the technology for deliberation (for e.g. Bijker et al., 1987; Bijker, 1995; Law 1991; Latour, 1991).

The phenomenological approach views the co-evolution of technology and society such that a technology emerges not as a single artifact, but as a technological attitude or disposition that make the technology meaningful and necessary (e.g. Heidegger 1977; Dreyfus, 1992). Ethical questions from a phenomenological perspective focus on ‘digging’ for the assumptions and attitudes that problematize the ongoing interactions between the society and the technology. Particularly, the phenomenological inquiry appears to be helpful for IS researchers in providing a sense of the attitudes and moods that make the technologies and their characteristic affordances necessary or obvious for society. For example, a phenomenological lens may unearth societal reasons for why 3D virtualization of one’s self is attractive in the first place (Introna, 2005).

RESEARCH AGENDA

This article proposes a research agenda that studies the affordances of virtual worlds through each ethical perspective. Case studies in existing virtual worlds that address each ethical question will be conducted to delve into the ethical implications of virtual worlds. As a starting point, the table below summarizes the questions to be addressed in this research.

Table 1: Ethical questions pertaining to affordances of virtual worlds

	Self-Expression	Co-experience	Co-creation	Crowd-sourcing
Positivist	What are the impacts of customization of avatars and virtual artifacts?	What are the impacts of simultaneously sharing the same virtual space?	What are the impacts of being able to work on the same virtual artifacts?	What are the impacts of being able to reach a global audience for user generated content?
Social-constructivist	What are the assumptions and constraints embedded in customizability of avatars?	What are the assumptions and constraints embedded in simultaneous sharing of virtual space?	What are the assumptions and constraints of working on virtual artifacts synchronously?	What are the assumptions and constraints of reaching a global audience for user generated content?
Phenomenological	What are the societal, economic, or political reasons behind virtual self-expression through customized avatars?	What are the societal, economic, or political reasons behind simultaneously sharing a virtual space?	What are the societal, economic, or political reasons behind working on artifacts synchronously?	What are the societal, economic, or political reasons behind reaching a global audience for user generated content?

Preliminary Insights: A Phenomenological View

While there is immense value in studying ethics from a positivist and social-constructivist lens, a phenomenological inquiry is particularly useful in providing a sense of the attitudes and moods that make the technologies necessary or obvious for society in the first place. Hence the impact analysis and disclosive studies can be framed or situated in a broader phenomenological discourse. Here, we present some preliminary insights from a phenomenological lens that would instigate ethical reflection on virtual worlds. We believe that the following driving forces frame the “mood”, or create a fertile environment for the success of virtual worlds:

Technological advances

Relentless technological advances seem to play a role in fueling the increased interest in virtual worlds. Information technologies continue to increase in power and decrease in cost (Kanellos, 2003; Twist, 2005). The past five years have similarly seen an exponential growth in the processing capacity of mobile devices, such as laptops and handhelds (Soh and Tan, 2008). Correspondingly, forms of information representation are changing from basic text to richer, more intuitive forms that involve sound, motion, and touch. Besides hardware and software improvements, connectivity to web applications has also increased (Krill, 2008). The trend toward ubiquitous access can be seen in the increasing number of hotspots available at public places (Economist, 2008). The Internet is even more pervasive than it was predicted to be, and this pervasiveness is only growing (Lyytinen and Rose, 2003). The growth of virtual worlds would not have been possible without the recent technological advances in hardware, including graphics cards and processors, software, and the pervasiveness of the web. These developments allow for the unique characteristics of virtual worlds: 3D user representations, persistence of user-generated content, support of multiple formats of content, such as text, audio, video, and 3D artifacts, and synchronous interactions.

Demographic forces

The "millennials," the generation born after 1980, have grown up with digital media during their formative years; they are accustomed to visual and auditory channels, including high-definition television, podcasts, e-books, instant messaging, and social applications, such as MySpace and FaceBook. And, they are often observed using them almost simultaneously. This generation will be, and many already are, comfortable using virtual platforms for social networking, education, business transactions, and telework (Dede, 2005). Moreover, the age at which individuals are exposed to these technologies keeps decreasing. Disney's Toontown, Barbie Girls, and Club Penguin are examples of the many virtual worlds that are available for pre-teens. By the time they are in high school, most youngsters in the U.S. are very comfortable with navigating the web using rich interfaces to communicate and conduct transactions. The three technological complementarities that shape how people learn are: an individual's familiarity with the "world-to-the-desktop" notion providing access to people and information around the world via the Internet; an individual's familiarity with multi-user virtual environments (MUVes) due to his/her exposure to gaming and social interaction through these interfaces; and an individual's familiarity with ubiquitous computing such that he/she increasingly uses mobile devices (e.g., PDAs and iPods) that allow infusion of virtual resources into his/her day-to-day real life (Dede, 2005). As the millennial generation gets assimilated into the future workforce, successful uses of technology for learning and communication will reflect their needs (Junglas et al., 2007).

Business landscape

As geographic and temporal barriers become less salient, most organizations are moving to a global business landscape. A company most likely has some global footprint—if not in the form of physical presence, then through its international suppliers, consumers, offshore vendors, or business partners. 24/7 global reach and communication technologies help organizations conduct business anytime, anywhere. There is an increased demand for distance education and virtual courses in educational institutions as well. In such a landscape, it is common to have distributed teams and purely virtual interactions. There is a constant pressure for increasing the richness of this virtual interaction and maximizing the cues and bandwidth of the communication. Virtual worlds allow for that, with the immersiveness and social presence afforded by them.

CONCLUSION

Understanding the societal attitudes and moods that make technologies necessary and valuable help uncover the interests and constraints they embody as well as their potential impacts. This research attempts

to analyze virtual worlds from multiple ethical perspectives, starting with a broad phenomenological inquiry within which subsequent impact and discovery studies can be framed. Four unique affordances of the technology of virtual worlds, self-expression, co-experience, co-creation, and crowd-sourcing, are identified. Questions from positivist, social-constructivist, and phenomenological perspectives of ethics are established. Preliminary phenomenological insights of societal pressures contributing to the emergence of virtual worlds are ascertained. Subsequently, this research is aimed at instigating an ethical reflection on virtual worlds.

REFERENCES

1. Berger, P.L., and Luckmann, T. (1966) *The Social Construction of Reality*, Anchor Books, Garden City, NY.
2. Bijker, W. E. (1995) *Of Bicycles, Bakelites and Bulbs. Toward a Theory of Sociotechnical Change*, MIT Press, Cambridge, MA.
3. Bijker, W., T. Pinch, and T. Hughes. (1987) *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, MIT Press, Cambridge, MA.
4. Boland, J.R.J., and Tenkasi, R.V. (1995) Perspective Making and Perspective Taking in Communities of Knowing, *Organization Science*, 6, 4, 350-371.
5. Carlile, P.R. (2002) A Pragmatic View of Knowledge and Boundaries: Boundary Objects in New Product Development, *Organization Science*, 13, 4, 442-455.
6. Dede, C. (2005) Planning for "Neomilenial Learning styles: Implications for Investments in Technology and Faculty, *EDUCAUSE Quarterly Magazine*, 28, 1, 7-12.
7. Dreyfus, H.L. (1999), Anonymity versus commitment: The dangers of education on the internet, *Ethics and Information*, 15-20.
8. The Economist: Nomads at last, April 10th 2008, available online at http://www.economist.com/surveys/displaystory.cfm?story_id=10950394
9. Gibson, J. J. (1977), *The Theory of Affordances*. In *Perceiving, Acting, and Knowing*, Eds. Robert Shaw and John Bransford.
10. Goel, L. and Mousavidin, E. (2007) vCRM: Virtual Customer Relationship Management, *The DATABASE for Advances in Information Systems*, 38, 4, 56-59.
11. Greco, G. M. and Floridi, L. (2004) The tragedy of the digital commons, *Ethics and Information Technology*, 6, 73-81.
12. Heidegger, M. (1977) *The Question Concerning Technology and Other Essays*, Harper Torchbooks, New York.
13. Hemp, P. (2006) Avatar-Based Marketing, *Harvard Business Review*, 84, 6.
14. Howe, J. (2006) The Rise of Crowdsourcing, *Wired Magazine*.
15. Introna, L. (2005) Phenomenological Approaches to Ethics and Information Technology, *Stanford Encyclopedia of Philosophy*, February, available online at <http://plato.stanford.edu/entries/ethics-it-phenomenology/>.
16. Jessup, L. M., Connolly, T. and Galegher, J. (2009) The Effects of Anonymity on GDSS Group Process with an Idea-Generating Task, *MIS Quarterly*, 14, 3, 313-321.

17. Joinson A. N. & B. Dietz-Uhler (2002) Explanations for the Perpetration of and Reactions to Deception, *Review*, 20, 3, 275-289.
18. Junglas, I.A., Johnson, N.A., Steel, D.J., Abraham, D.C., and Mac Loughlin, P. (2007) Identity Formation, Learning Styles and Trust in Virtual Worlds, *The DATABASE for Advances in Information Systems*, 38, 4, 90-95.
19. Kanellos, M. (2003) Moore's Law to roll on for another decade, *CNet News*, available online at <http://www.news.com/2100-1001-984051.html>
20. Krill, P. (2008) Web 2.0: Offline Access to Web Apps Is Trend, in: *PC World*, available online at http://www.pcworld.com/businesscenter/article/145034/web_20_offline_access_to_web_apps_is_trend.html
21. Latour, B. (1991) Technology is society made durable, in J. Law (ed) *A Sociology of Monsters: Essays on Power, Technology and Domination*. Routledge, London, 103-131.
22. Law, J. (1991) *The Sociology of Monsters: Essays on Power, Technology and Domination*, Routledge, London.
23. Levina, N., and Vaast, E. (2005) The Emergence of Boundary Spanning Competence in Practice: Implications for Implementation and Use of Information Systems, *MIS Quarterly*, 29, 2, 335-363.
24. Levina, N., and Vaast, E. (2006) Turning a Community into a Market: A Practice Perspective on Information Technology Use in Boundary Spanning, *Journal of Management Information Systems*, 22, 4, 13-37.
25. Lyytinen, K. and Gregory, M. R. (2003) Disruptive information system innovation: the case of Internet computing, *Information Systems Journal*, 13, 4, 301-330.
26. McKenna, K. Y. A., and Bargh, J. A. (1998) Coming out in the age of the Internet: Identity 'demarginalization' through virtual group participation, *Journal of Personality and Social Psychology*, 75, 681-694.
27. Miller H. and Arnold, J. (2001) Breaking Away from Grounded Identity? Women Academics on the Web, *CyberPsychology & Behavior*, 4, 1, 95-108.
28. Olson K. R. and Johnson, D. C. (2001) Individual Difference in Self-Presentation Style, *The Journal of Social Psychology*, 131, 4, 494-509.
29. Pawlowski, S.D., and Robey, D. (2004) Bridging User Organizations: Knowledge Brokering and the Work of Information Technology Professionals, *MIS Quarterly*, 28, 4, 645-672.
30. Sadowski, W., and Stanney, K.M. (2002) Presence in virtual environments, In K. M. Stanney (Eds.). *Handbook of virtual environments : Design, implementation and applications*, IEA, Mahwah, 791-806.

31. Powers, T. (2003) Real wrong in virtual communities, *Ethics and Information Technology*, 5, 4, 191-198.
32. Salzman, M.C., Dede, C.J., Loftin, R.B., and Chen, J. (1999) A Model for Understanding How Virtual Reality Aids Complex Conceptual Learning, *Presence*, 8, 3, 293-317.
33. Sawhney, M., Verona, G. and Prandelli, E. (2005) Collaborating to Create: The Internet as a Platform for Customer Engagement in Product Innovation, *Journal of Interactive Marketing*, 19, 4, 4-17.
34. Silva, L., Mousavidin, E., and Goel, L. (2006) Weblogging: Implementing Communities of Practice, In E. Trauth, D. Howcroft, T. Butler, B. Fitzgerald and J. DeGross (Eds.), *Social Inclusion: Societal and Organizational Implications for Information Systems*, Springer, Boston, 295-316.
35. Soh, J., and Tan, B. (2008) Mobile Gaming, *Communications of the ACM*, 51, 3, 35-41.
36. Star, S.L., and Griesemer, J.R. (1989) Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, *Social Studies of Science*, 19, 3, 287-320.
37. Suler, J. (2004) The Online Disinhibition Effect, *CyberPsychology & Behavior*, 7, 3, 321-326.
38. Twist, J. (2005) Law that has driven digital life, *BBC News*, April 18, available online at <http://news.bbc.co.uk/2/hi/science/nature/4449711.stm>
39. Zammuto, R.F., Griffith, T.L., Majchrzak, A., Dougherty, D.J., and Faraj, S. (2007) Information technology and the changing fabric of organization, *Organization Science*, 18, 5, 749-762.