

SEEKING THE ENTANGLEMENT OF IMMERSION AND EMERGENCE: REFLECTIONS FROM AN ANALYSIS OF THE STATE OF IS RESEARCH ON VIRTUAL WORLDS

Completed Research Paper

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Abstract

This paper critically reviews the state of virtual world research within the Information Systems field; revealing areas of interest evident in research studies between 2007-2011, the methods employed to conduct such research, the theories/frameworks used to ground VW research, as well as reoccurring memes/concepts. We argue that virtual worlds are best interpreted as both an immersive and emergent co-creative process, 'performed' by users' actions and interactions both with other users and with artifacts such as virtual goods. Nevertheless, our analysis reveals a near neglect of the substantive nature of digital materiality and of the emergent nature of virtual worlds. We conclude that this 'human-centric' stance has taken focus away from the unique nature of the virtual world artifact itself, and posit a research agenda that focuses on virtual world objects as well as the immersive and emergent activities of 'world-builders' as necessary to advance virtual world research.

Keywords: Virtual Worlds, Literature Review, Secondary analysis, Immersion, Emergence

Introduction

As networked technological systems, online virtual worlds (VWs) are “shared, interactive, immersive environments where participants can communicate, collaborate, innovate and trade” (O’Riordan et al. 2009). As representations of the complex transactions between users and designers, they are further acknowledged as persistent “places of imagination that encompass practices of play, performance, creativity and ritual” (Boellstorff et al. 2012, pp.1). Perhaps most fundamentally however, they are inter-subjective artifacts that support the “creation of shared contexts for social transactions” (Pearce and Artemesia 2009, pp. 133). The study of VW research within the Information Systems (IS) field presented in this paper is particularly interested in ‘social VWs’ (cf. Jung and Kang 2009; Mäntymäki and Riemer 2011) such as Second Life, Active Worlds, OpenSim, Open Wonderland, Blue Mars, etc. as these virtual worlds have emerged as a significant domain of interest within and beyond the IS field. Unlike the underlying ‘progressive’ structure of VWs such as World of Warcraft (e.g. predetermined goals), we acknowledge this genre of VW based on its emergent structure whereby user interactions “co-produce the content and action” that make up much of the environment (Schultze and Rennecker 2007, pp.338).

Calls for VW research have gained considerable momentum within IS, spanning a wide range of conferences and journals, most notably that of the 2011 *MIS Quarterly* special issue on ‘New Ventures in VWs’ (cf. Wasko et al. 2011). The study of VWs continues to be an important area of research for the IS field given the growing integration of browser-based VWs with company websites, the flattening of the steep learning curve in using these systems, the growth of the virtual goods (objects) sector within and beyond VWs (estimated to be \$14 billion in 2012,) as well as the rise of the enterprise ‘virtual leader’ i.e. those who have identified the value of adding VWs to an enterprises growth strategy (Kaye 2012).

Arguably, the uptake of VW research within IS over the last decade grew in parallel with the discipline’s interest in ‘Web 2.0’ collaborative phenomena, as the ‘3D Web’ was seen to be the logical next step for online collaboration and co-creation (Goel and Mousavidin 2007). Although ‘virtual reality’ technologies have been studied for quite some time (Jäkälä and Pekkola 2007), and were outlined as ‘technology in need of IS research’ (e.g. Walsh and Pawlowski 2002), today’s VWs are perceived as a ‘new class’ of IS that focuses on 3D spaces, embodiment, user-created content and raises questions about a priori boundary-crossing between that of ‘actual’ and ‘virtual’ realities (Chaturvedi et al. 2011; Schultze 2010). Nevertheless, since their major exposition in 2007, VWs have failed to meet initial expectations set by advocates, quickly falling into what Gartner’s Research describes as the ‘Trough of Disillusionment’ stage of technological development and adoption by mainstream internet users (Stieglitz and Lattemann 2011; Stieglitz et al. 2010). We posit that researchers now require deeper insight into the state of art, as VWs appear to slowly begin their ascension towards the ‘Slope of Enlightenment’ stage of the technology lifecycle (cf. Gartner 2012). In endeavoring to assist the development of such insight, this study aims to critically review the state of VW research within the IS field vis-à-vis the defining VW characteristics of immersion and emergence.

The paper begins by outlining the design of our study, which consists of an analysis of 389 research artifacts, primarily peer-reviewed, published between 2007 and 2011. The findings reveal the areas of interest evident in VW research, the methods employed to conduct such research, the theories/frameworks used to ground VW research, and the dominant memes/concepts evident in VW research. Having critically assessed the strengths, weaknesses, and biases of VW research in terms of topical, methodological and theoretical coverage, we evaluate the state of VW research vis-à-vis the defining VW characteristics of immersion and emergence. This analysis reveals that emergence, as a core characteristic of VWs, is under-researched due to the dominance of objective studies that frequently focus on avatars using novices (e.g. students) as subjects. Challenging the use of traditional or extended technology acceptance models that conceptualize VWs as products, we argue that VWs are best interpreted as a process rather than a product; specifically as an emergent co-creative process performed by users’ actions and interactions with other users and with artifacts. We posit that in order to better understand such emergence, and by implication advance VW research, there is a need for more focus on virtual artifacts (i.e. the building blocks of the emerging world) and the experienced VW users (specifically ‘world builders’), who are co-creating the emerging world. In seeking this understanding, we conclude that future research needs a socio-material approach to understand both human and non-human agency.

Study Design

The objective of this study is to critically review the state of VW research within the IS field vis-à-vis the defining VW characteristics immersion and emergence. To operationalize this objective, we systematically reviewed relevant IS literature guided by four research questions, namely:

Research Question 1: What areas of interest are evident in VW research?

Research Question 2: What methods do researchers employ to operationalize VW research?

Research Question 3: What theories/frameworks do researchers employ to ground VW research?

Research Question 4: What are the dominant memes/concepts evident in VW research?

Research questions 1-3 allow us to effectively describe the VW research corpus, and to identify strengths, weaknesses, and biases in terms of topical, methodological and theoretical coverage. Research question 4 allows us to identify the subsequent conceptualizations emerging from VW research.

Data Gathering

Candidate research papers were discovered using title, abstract and keyword searches throughout mainstream peer-reviewed IS journals and conferences. In total, 189 papers were discovered from 30 publication sources (see Table 1). From this set of papers, 127 were categorized as empirical research articles, while 15 papers proposed a theoretically grounded framework/model for studying VWs. The remaining papers consisted of editorials, research commentaries and reviews. We identified a significant growth trend within VW IS research beginning in 2007. Hence, our analysis of articles is inclusive of those published between 2007-2011. This time frame has similarly been identified by Wasko et al. (2011) as covering the 'hype' and 'fall' of VW research publications, from being "the next big thing" after the initial media spike in hype in 2006, through to the failure of VWs to meet popular expectations. We believe that this time frame, albeit short, is extensive enough to analyze the literature on a range of research themes, methodological approaches, trends, and patterns, as well as the identified of gaps within the literature.

In addition to mainstream IS research publication outlets, we acknowledged the emerging trend linking IS scholars and IS publications to the open access *Journal of Virtual Worlds Research*. Since its foundation in 2008, the journal's links with mainstream IS research has continued to grow, seeing its support of discussions and research tracks at prominent IS conferences (e.g. Mediterranean Conference on Information Systems, 2012; International Conference on Information Systems, 2011 and 2012), as well as the cross publications by 22 scholars in this domain. We therefore included the journal's library of research artifacts into our analysis. In total, the Journal provided an additional 200 articles throughout 4 volumes of publications from 2008-2011. These consisted of 11 article types based on the journal's own classification system, the largest of which were peer-reviewed research papers.

Data Analysis

In total, 1232 keyword terms were extracted from the library of papers and organized into 48 distinct categories. Papers were filtered by source of publication, year, and article type, before additional analysis based on each paper's areas of interest (RQ1), methodology (RQ2), theoretical grounding (RQ3), and memes/conceptualizations (RQ4). Based on this analysis, we then critically assessed the strengths, weaknesses, and biases of VW research in terms of topical, methodological and theoretical coverage. In particular, we sought to evaluate the state of VW research vis-à-vis the defining VW characteristics of immersion and emergence.

Table 1. Sources of IS Articles Analyzed in Study	
Source	Number of Papers
<i>Americas Conference on Information Systems</i>	40
<i>Australasian Conference on Information Systems</i>	3
<i>Communications of the Association for Information Systems</i>	5
<i>Computer Supported Cooperative Work</i>	4
<i>Decision Support Systems</i>	3
<i>Electronic Commerce Research</i>	5
<i>Electronic Markets</i>	1
<i>European Conference on Information Systems</i>	10
<i>European Journal of Information Systems</i>	1
<i>Human-Computer Interaction</i>	1
<i>Information & Management</i>	5
<i>Information Systems Journal</i>	3
<i>Information Systems Research</i>	1
<i>International Conference on Information Systems</i>	19
<i>International Journal of Human-Computer Studies</i>	6
<i>Internet Research</i>	2
<i>Journal of Database Management</i>	3
<i>Journal of Economic Commerce Research</i>	5
<i>Journal of Information Technology</i>	1
<i>Journal of Management Information Systems</i>	2
<i>Journal of the Association for Information Systems</i>	2
<i>Management Information Systems Quarterly</i>	10
<i>Mardi Gras Conference</i>	17
<i>Mediterranean Conference on Information Systems</i>	3
<i>Midwest Association for Information Systems</i>	3
<i>Pacific Asia Conference on Information Systems</i>	10
<i>Southern Association of Information Systems</i>	3
<i>Special Interest Group on Human-Computer Interaction</i>	1
<i>The DATA BASE for Advances in Information Systems</i>	19
<i>UK Academy For Information Systems</i>	1

Findings

In this section, we present the findings of our study. First, we describe the areas of interest evident in VW research (RQ1). Next, we identify the methods researchers employ to operationalize VW research (RQ2). We then describe the theories/frameworks employed to ground VW research (RQ3). Finally, we discuss the dominant memes/concepts evident in VW research (RQ4).

Areas of Interest in VW Research

Our analysis revealed a strong interest in topics such as online education (e.g. Chen et al. 2009; Chen et al. 2010; Phang and Kankanhalli 2009), business (e.g. Ahonen et al. 2008; Ip et al. 2008), collaboration (e.g. Chandra et al. 2010; Kahai et al. 2007), the purchase of virtual goods (e.g. Guo and Barnes 2007; Guo and Barnes 2009; Guo and Barnes 2011) and their design (e.g. Chaturvedi et al. 2011; Kohler et al. 2011) within VWs. From our analysis the assigned keyword categories with the greatest number of topics included those within the areas of learning and education, theory and method related, psychology and cognitive science, technology, collaboration, identity and self, social constructs, regulations, user group, communication and marketing, economics and commerce, organizational and business, agency, VW artifacts, and medical related. Notably, the above lists exclude the myriad of naming conventions for VWs assigned by scholars (e.g. virtual environment, 3D environment, synthetic world, etc.), as well as the individual names of VWs in an attempt to provide a more meaningful insight into the general focus of VW studies. That said, with regards to naming conventions assigned to VW studies, we found that 41 different designations were assigned to the various genres and conceptualizations of online VWs. Further review of the literature revealed the term ‘social VW’ to emerge as the most prominent term used in description of VWs studied.

One of the most trending categories observed with the literature related to psychological and cognitive related studies, covering a wide range of topics - such as personality, attitudes, behavioral intentions, curiosity, emotion (response and value), enjoyment, escapism, fear, flow, hope, imagination, motivation, psychological development, stress, trust, addiction, anxiety, attractiveness, needs, satisfactions, and attachments. Interestingly, all medical related studies emerged from the *Journal of Virtual World Research*, in particular, its special issue in 2009 on health and healthcare within VWs. While not as prominent, regulations and standards focused studies included an array of topics including that of contracts, copyright laws, intellectual property, governance, policy control and protocols, permission rights (of virtual goods), security, taxation as well as the standardization of VW design (e.g. MPEG-4, MPEG-V, and interoperability between VWs). In addition, a few articles highlighted a number of perceived tensions within VWs, including user challenges and concerns, compatibility issues, conflict and deception, phishing, sexism, spam, as well as virtual crimes.

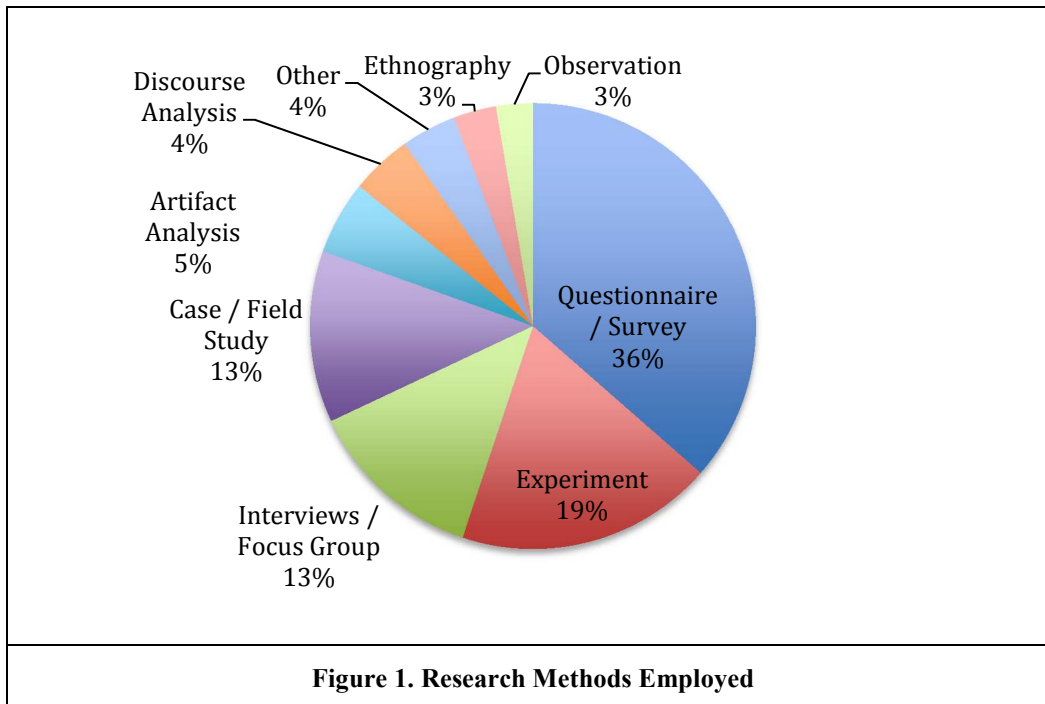
Apart from discussion and studies of entities such as institutions, organizations, communities of practice, guilds, government, and the military, the literature covers a wide variety of user types from: the ‘drivers’ of value, digital natives, entrepreneurs, content creators, ‘griefers’, guild Leaders, IT professionals, gay and lesbian users, children, clients, coaches, new entrants (newbies), players, teenage and ‘tween’ users, veterans, artists, customers, clinicians, patients, characters; as well as researchers. Notably, the *Journal of Virtual Worlds Research* published a special issue on VWs ‘for kids’ in 2010. In addition, while numerous studies focused of individuals (and in doing so covered topics of identity, self, and embodiment), an abundance of studies also illustrated the important multi-user components of these environments, analyzing phenomena such as civic participation, co-creation, collaborative design, collaborative development, collaborative engineering, collaborative gaming, collective memory, competitive and cooperative game play, collaborative learning, team collaboration, producer-consumer collaboration, co-production, peer production, as well as nonmarket collaboration. However, despite a small, yet growing, trend within the research body that makes note of alternative, collaboratively created open-source VW technologies, such as OpenSim (specifically mentioned in 28 articles) most research studies analyzed used Second Life as a basis for discussion/research. Interestingly, of the 28 articles discussing OpenSim, the vast majority came from the *Journal of VW Research*, not from within the mainstream IS community. This is despite the clear interest of IS researchers in open innovation and open source technology, as well as the apparent advantages of such systems such as the “wider array of functionality into backend systems, such as enterprise resource planning, business intelligence, and other database driven applications” (Winkler 2010, pp.6). Other VW studied included a mixture of ‘user-created’, ‘gaming’ and ‘children’s’ VWs, specifically: Bearville, Club Penguin, Cyworld, Entropia Universe, Everquest, Habbo, IMVU, Neopets, Project Wonderland, Quest Atlantis, Star Wars Galaxies, There, and World of Warcraft.

It is evident that within this broad topical coverage of VW research that various gaps exist within the IS field in studying VWs. Evidently, IS scholars are primarily interested in studies that focus on the ‘less successful’ emergent VWs, specifically Second Life. This is despite the large-scale adoption and social movements within ‘gaming’ virtual worlds such as World of Warcraft (McKenna et al. 2010; McKenna et

al. 2011a; McKenna et al. 2011b). Moreover, Lim and Clark (2010) note that, according to the *Consumer Guide to Virtual Worlds*, the largest category of virtual worlds appears to be for youth (i.e. children, tweens, and teens). However these have yet to be included in mainstream IS research studies or calls for papers. While the heavy focus on Second Life has provided detailed insight into various topics, groups, and activities, it has implicitly narrowed the field's interpretation of what it means to study and use VWs in practice.

Methodologies Employed in VW Research

Our findings identify a wide variety of research methods employed. However the mainstream IS research studies were predominantly quantitative, consisting of experiments, surveys, and questionnaires (see Figure 1). We note that VW studies, in line with the IS field in general, has traditionally taken a rather human-centric approach to studying technology mediation; treating humans and technology as separate, presenting an asymmetrical perspective of phenomena, and often presenting notions of separate 'real' and 'virtual' worlds, as well as associated 'boundary crossing' (discussed in more detail later in our analysis). This contrasts with Boellstorff's (2009) call to "broaden the conversation" through developing diverse methodological paradigms, and avoidance of "methodological partisanship" that sides with quantitative methods as the "only scientific or rigorous approaches" in studying VWs (pp. 5).



VW research may be further categorized by the type of users studied. "Immersionist" research refers to research from the residents' perspective, while "augmentationist research explores how real-world enterprises and individuals use VWs to achieve their strategic goals" (Atlas 2008, pp. 2). As mentioned, various studies in recent years have emerged in relation to learning potential through the use of VWs. In our data set, 62 papers were specifically focused on education and learning, the majority of which used students (typically university students) as subjects within research studies. Indeed, the use of students as participants within VWs research is a dominating trend within IS literature, arguably creating a conceptual imbalance favoring the study of augmentationist over immersionist users and experiences.

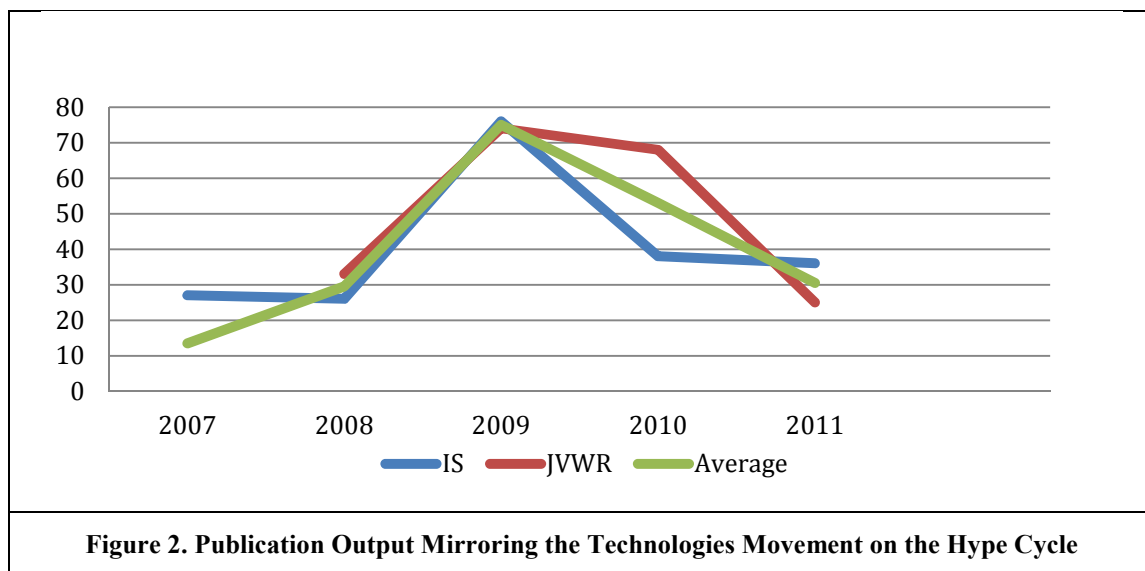
Theories/Frameworks Employed in IS Research

Our findings reveal that specific scholars have been particularly influential in the VW research

community. The work of game researcher Edward Castronova (e.g. Castronova 2005; Castronova 2007) stands out amongst this list, referenced in 80 of the publications analyzed. Other highly cited researchers include virtual reality expert Mel Slater; game researchers Richard Bartle; anthropologists Thomas Malaby and Tom Boellstorff; psychologist Mihaly Csikszentmihalyi; legal scholars Jack Balkin and Beth Simone Noveck; in addition to a range of mainstream IS scholars such as Fiona Fui-Hoon Nah, Stuart Barnes, and Ulrike Schultze.

Notably, the work of the Gartner Research Group has also been highly influential; cited by 49 of the articles analyzed. Gartner's 2007 report (which argued that "80 percent of active Internet users will have a 'Second Life' in the VW by the end of 2011") and their 2008 report (claiming that "90 Per Cent of Corporate VW Projects Fail within 18 Months") have been particularly influential in scholarly discussions of VWs.

Interestingly, the volume of publications analyzed from 2007-2011 mirror (albeit with an expected degree of latency) Gartner's hype cycle stages of VWs technologies, an influential, albeit subjective, model charting the maturity, adoption and social application of the technology. For instance, as shown in Figure 2, we can interpret the technologies rising 'technology trigger' stage during 2008, its "peak of inflated expectations" stage in 2009, falling into its current 'trough of disillusionment' stage, signaling the technologies failure to meet inflated expectations and becoming 'unfashionable'. Critical to this observation however is that while Second Life followed this "rise and fall" pattern, other 'higher profile' VWs such as Blizzard's World of Warcraft clearly have different cycle patterns of maturity, adoption and social applications. VW consultancy group 'KZero' (referenced within 29 articles analyzed) is quickly becoming a more prominent voice within the literature base, has provided a more detailed analysis of the VW and virtual good industries as a whole.



Our findings reveal a wide variety of theoretical lenses and frameworks being used in VW research. Table 2 presents an illustrative list. Various scholars used integrative theoretical approaches (e.g. Kim et al. 2008). For example Goh and Paradice (2008), drawing from theories of social presence, media richness, media synchronicity, social influence, technology acceptance, and channel expansion, compared VWs with other communications media. Evident from the earlier analysis of article keywords, there is a rich body of research focused on understanding aspects related to the pedagogical, social and cognitive nature of VWs. In particular, 42 articles made note of social presence theory (cf. Short et al. 1976) almost half of which discussed it explicitly in relation to their study or theoretical models. Theories related to user behavior and decisions included Chaos Theory (McKenna et al. 2010), Motivation Theory (Mäntymäki and Riemer 2011), Game Theory (Xu et al. 2009), and the theory of planned behaviors (Olapiriyakul and Widmeyer 2009). Next, 13 articles explicitly dealt with the concept of trust, highlighting the proposal of a

trust-theoretic 'VW collaboration model' for collaboration in VWs (Chandra et al. 2010). Several articles dealt with the issue of identity and trust (e.g. Campbell et al. 2007; Junglas et al. 2007), as well as the relationships between perceptions of avatar and trust (e.g. Choi et al. 2009). Next, 10 articles engaged heavily with 'flow', referring to the mental state of flow coined by psychologist Mihaly Csikszentmihalyi (cf. Csikszentmihalyi 1990) focusing on topics such as learning, brands, purchase intentions, loyalty and development processes. Various research models linked the theory of 'flow' to other concepts such as 'co-presence' and 'presence' (e.g. Hendaoui and Limayem 2008); theories of situated cognition and social cognition, (e.g. Goel et al. 2011); and theories of social translucence of technology (Phang and Kankanhalli 2009). In their study, Park et al. (2008) proposed a model for enhancing brand equity in VWs focused on bringing about an enhanced flow state, linking flow to various control (skills and challenges), content (interactivity and vividness) and process (intrinsic and extrinsic motivation) characteristics. While understanding the factors that shape cognition are illuminated by situation cognition and social cognition theory, the theory of flow is said to aid in explaining the effects of immersive technologies (Goel et al. 2011).

Interestingly, 14 research articles employed a technology acceptance approach, many of which used an 'extended' or 'modified' version of the Technology Acceptance Model (TAM), e.g. adapted for a learning context (Rosario et al. 2008), taking into account variables such as perceived enjoyment (e.g. Shen and Eder 2008; Vogel et al. 2008), as well as anxiety and socio-demographic variables (e.g. Fetscherin and Lattemann 2008). Other work used the Unified Theory of Acceptance and Use of Technology (UTAUT) model (e.g. Goh and Yoon 2009a; Guo and Barnes 2007). Zigurs and Zhang (2010) study found that in addition to likability, technology accessibility, and system quality, the factors central to the original TAM model, perceived ease of use and usefulness, influenced student attitudes toward using Second Life in an educational setting. Moreover, 'social presence' and 'telepresence' are understood to have significant effects on perceived learning technology acceptance within VWs (Fuller et al. 2007). Notably, Goh and Yoon (2009b) consider 29 factors involved in the study of user acceptance and VWs. Such extensions are deemed critical, as TAM itself has been acknowledged within the literature analyzed as being insufficient in its ability to explain VW phenomena, in that:

"The number of broader social and collective issues associated with virtual worlds creates a huge space. Under these circumstances, using TAM is akin to shining a fixed beam of light into a dark room. TAM is useful for that on which it shines but cannot be expected to explain all that is going on in the rest of the space, much of which interacts and potentially confounds that under examination using TAM...provides only a limited view into the broad range of behavioral issues associated with virtual world use. To further complicate matters, virtual worlds are in a continual state of change as new applications are envisioned" (Vogel et al. 2008, pp. 10/11).

Thus, the above points not only to TAM's apparent shortcomings in studying VWs but also illustrates, what we argue to be, a significant limitation of extant methodological approaches to provide a better theoretical understanding of 'social' VW phenomena. Specifically, such approaches fail to address the emergent and co-creative architectures, essentially 'black boxing' these systems, in which the functions of the systems themselves are often developed through the on-going introduction and use of user-created, and co-created, content. As Rosendale (2009), founder of Linden Labs, accurately notes in his piece 'VWs, Collaboratively Built', the creation of Second Life is a "truly a collaborative experience, and couldn't have evolved any other way...[and] always involved the Residents of Second Life in a deep and continuing discussion of how the technology and world need to evolve to meet their needs (pp.5)". Such a process perspective moves from an interpretation of the system as a technological product for adoption, to that of an emergent technological process. Interestingly, in their study of the "temporal perspective of the computer game development process" (Stacey and Nandhakumar 2009) note that there is a shortcoming of process-oriented research even within more traditional game development studies, and not simply within these branch of virtual environments.

Table 2. Examples of Theories/Frameworks Used			
Author(s)	Theory/Framework	Author(s)	Theory/Framework
(Animesh et al. 2011)	Stimulus–Organism–Response Model	(Neviarouskaya et al. 2010)	Affect Analysis Model
(Barnes 2009)	Continuance Theory (extended)	(Olapiriyakul and Widmeyer 2009)	Theory of Planned Behavior and the concept of “Affordances”
(Berente et al. 2011)	Toulminian Model	(Saunders et al. 2011)	Theory of virtual space and place
(Cagnina and Poian 2009)	Radar Map Framework	(Schouten et al. 2010)	Media Synchronicity Theory
(Chandra et al. 2010)	Trust-Theoretic ‘VW collaboration model	(Schultze and Leahy 2009)	Boundary Theory
(Chen et al. 2009)	Technology Acceptance Model	(Sutanto et al. 2011)	Self-Regulation Theory
(Choi et al. 2009)	Self-Presentation Theory and Uncertainty Reduction Theory	(Triplet et al. 2009)	Expectancy-value theory and Cognitive evaluation theory
(Clark 2009)	Queer Theory	(Xu et al. 2009)	Game Theory
(Goel et al. 2011)	Theories of Situated Cognition, Social Cognition, and Flow	(Becerra and Stutts 2008)	Extended Theory of Planned Behavior using sociometer theory
(Hooker et al. 2009)	Flow Theory	(Phang and Kankanhalli 2009)	Flow and Social Translucence of Technology Theories
(Jestice and Kahai 2010)	Situated Learning Theory	(Ping et al. 2010)	Transportation Theory
(Kim et al. 2008)	Rich Media Theory and Task Closure Theory	(Verhagen et al. 2011)	Expectancy-Value Theory and Cognitive Evaluation Theory
(Kim et al. 2011)	Customer Value Theory	(van der Land et al. 2011)	Theoretical Model of Effective Team Collaboration in 3D Virtual Environments
(Kong and Kwok 2009)	Dynamic Theory of Organization Creation	(Triplet et al. 2009)	Embodied Social Presence Theory
(Li et al. 2009)	Interpersonal Relationship Orientation model	(Goh and Paradice 2008)	Theories of Social Presence, Media Richness, Media Synchronicity, Social Influence, Technology Acceptance, and Channel Expansion
(McKenna et al. 2010)	Chaos Theory	(Mäntymäki and Riemer 2011)	Motivation Theory
(Merikivi 2009)	Decomposed Theory of Planned Behaviors	(Zhang 2010)	Social Presence Theory

Dominant Memes/Concepts Evident in VW Research

Our findings reveal a variety of memes and concepts that appear to both inform and emerge from VW research. Specifically, we note the wide spread adherence to allegedly ‘naturally-occurring’ dichotomies; in particular social/gaming, real/virtual, and human/object. It is unclear in the literature how these are negotiated, communicated, and managed in practice, leading to long-standing misconceptions and uncertainty in the literature (cf. Schultze 2011).

Divisions of VW Research

Our findings reveal that the terminology used within the literature reflects a bias against the co-creative and emergent constitution of many VWs, in which studies typically express the system as a ‘social VW’, often, imprecisely contrasting it to a ‘gaming’ VW. While often cited within the articles analyzed for his insight into virtual item sales (e.g. Lehdonvirta 2009), Vili Lehdonvirta’s subsequent article (Lehdonvirta 2010) brings into question the generalized conceptualization of VWs into two broad categories’ that of gaming VW or non-gaming, and argues that such categorization should be adequately justified. Indeed, such dichotomies are highly prevalent throughout the literature analyzed. The following extract bases this argument on the social world perspective, whereby other online environments such as massively multiplayer online games (MMOs) may also facilitate comparable computer mediated social worlds.

“[A] social world perspective reminds us that universes of activity and discourse similar to those found around MMOs may also be found around other online arenas that do not necessarily meet the technical definition of a [VW] In some aspects they may be less complex than MMO-worlds, but virtual economies, for instance, can be found in many kinds of services, from social networking sites to instant messaging systems. In fact, for many purposes, the closest comparison to a given MMO-world might not be another MMO-based world at all, but some other computer-mediated social world. For example, in some ways [the VW of Second Life] might be closer to Cyworld or even Flickr than to Entropia Universe or World of Warcraft. Therefore, researchers should not automatically adopt [VWs] as a category to make generalizations to, unless their research somehow justifies it.”(Lehdonvirta 2010, pp. 11).

Consequently, one feasible justification of a dichotomous approach in distinguishing VWs may rest of the ability for user-developers to co-create the environment and its content themselves; be it for utilitarian or hedonic purposes. Here the utilitarian/hedonic dimension of VWs is task independent. Notably, this emergence of the developer within the VW is not typically applicable to ‘gaming worlds’ whereby users do not partake in such large-scale content development within the VW.

Real/Virtual

Of the articles analyzed, 388 papers employed the terms ‘real’ world/lives in contrast to the ‘virtual’ world, while only 11 papers explicitly used the term ‘actual world’ as being the opposite of virtual. Understandably, the term ‘real’ may often act as a synonym for ‘offline’ and not in fact allude to any strict ontological judgment as per Saunders et al. (2011) and discussed by Boellstorff (2008). Some scholars have taken a preference to substituting the word ‘real’ for physical, while others have taken to a dichotomy between the real and the virtual as the ‘magical circle’. This refers to a conceptual ‘membrane’ separating ‘physical’ and ‘virtual’; often in reference to Castronova’s work as well as Huizinga’s (1950) metaphor in relation to play as an activity with a disposition of its own within certain limits of both time and place. The literature makes reference to how this led some to treat the VW as independent from the actual world, arguing against the ‘seeping’ in of the actual world in favor of an ‘in-world’ perspective of VWs as standalone societies.

Alternatively, a social worlds perspective may be employed in the conceptualization of VW (Lehdonvirta 2010); as opposed to a dichotomous notion of the terms ‘real’ vs. virtual. Such a social world perspective understands VWs as being indefinable in that they interact with other social worlds beyond the VW, and therefore its communities of practice are not part of some isolated/independent society. The concept of social worlds (cf. Strauss 1978), drawn from the interactionist school of sociology, defines a group of people who share some level of commitment to collective action(s) while people may simultaneously

belong to multiple social worlds. From this perspective, the following entanglements are acknowledged: the space the VW occupies is not clearly distinguishable; its population is ambiguous; its inhabitants' identities cannot be equated with avatars; social relationships are not bounded by world limits; out-of-world norms and institutions regulate behavior within it; its economy is influenced by shifts in the out-of-world economy; and its law and politics are shaped by outside processes.

The Avatar in the Spotlight

Our findings reveal the overwhelming focus on the avatar over alternative artifacts, such as virtual goods and discursive practices, in studying the various cognitive concepts associated with immersive responses to VWs. In particular, we note that virtual goods, if not exposed as economical or legal products, have typically been downplayed with regard to their impact on VWs themselves. Despite a variety of research within and beyond IS that have illustrated the importance of virtual goods (e.g. Suh and Lee 2005; Daugherty et al. 2008; Jana 2006), a review of article titles alone illustrates the upfront role avatars play in the conception and language used to discuss VW systems within IS, with 31 papers explicitly including the term 'avatar' in their titles. Various IS scholars have used the term avatar in their opening description and formal definitions of VWs with a pre-occupation with the human/avatar phenomenon evident through scholars' engagement in terminology and topics such as 'avatar-based communication' (Goh and Paradise 2008), 'avatar gender' (DeWester et al. 2009), and 'avatar satisfaction' (Kim et al. 2007). The notion of the avatar is typically discussed in relation to concepts such as identity, embodiment, and representation. We note that over 280 of the papers reviewed explicitly discussed the VW, and in particular avatars (in some cases characters), as being 'representations'. These practices lie in contrast to the treatment of other central artifacts such as the virtual good/item. From the articles that focused on virtual goods/items (e.g. Azeharie and Sharma 2010; Ba et al. 2010; Guo and Barnes 2009; Kim et al. 2011; Landay 2010; Lehdonvirta 2009; Martin 2008; Mitham 2010; Salomon and Soudoplatoff 2010; Welch 2010) analysis has typically fallen to matters of economic, consumption or value-based analysis. Although such articles are insightful, the unbalanced treatment and scope of the avatar and virtual good within the focus and analysis of VW studies is problematic if a meaningful engagement of an emergent process perspective is to be adopted.

Analysis and Discussion

As reported above, our study found that while IS scholars have mostly studied emergent VWs, their (developmental) emergence has not been the focus of enquiry. Moreover, through use of traditional adoption theories and the study of novice users, we have been 'black boxing' VW technology, thus ignoring the growth and transformation of these systems and the experienced users that co-create these systems. Furthermore, while studying various psychological aspects of engaging in virtual worlds has raised questions about the boundaries between what is typically referred to as the 'real' versus the virtual, there are inconsistencies in how we interpret such immersion within VWs. Evidently, there has been continual interest in avatars, to the extent of almost ignoring virtual goods. Thus, VW studies tend to focus on human experience and human agency, ignoring non-human agency and the user-created objects that characterize the emergence of virtual worlds. Based on these findings, we now critically discuss the VW research vis-à-vis the defining immersive and emergent characteristics of VWs. We first review the various interrelated concepts discussed within the literature regarding cognitive phenomena linked to the immersive response of VWs, and note the role virtual goods play within such entangled concepts. We then discuss the growing movement within the literature that embraces the emergent nature of co-created VWs. However, we note that studies, for the most part, have only dealt with the emergent structure of VWs on a superficial level. We argue that it is critical to understand the creation, and co-creation, of the shared reality/world (via virtual goods), and not simply the creators (user-avatar) experiences. We therefore see the need for greater investigation into the entangled immersive responses and emergent nature of human and non-human interaction within co-created VWs.

Focus on Immersion

As revealed in the previous section, psychological and cognitive related phenomena are at the core of VW literature. Indeed, beyond the murky terms and perspectives of real/virtual, game/social VWs, and avatars/goods previously discussed in the findings, we now move to focus on one of the most embedded

and entangled entities within the literature – that of immersion. As a core characteristic of VWs, the topic of immersion is deemed important in advancing VW research. Immersion in VWs has been preceded by a long history of the study of immersion in literature, theatre, drama, and games (Jäkälä and Pekkola 2007). Online VWs are characterized by participants' immersion provided, in part, by the environment's persistence, offering stability, 'interchangeable graphics, and evolutionary recordable interactions' (Damart et al. 2010). However, there is inconsistency in the literature regarding the meaning of immersion. For some, it is the notion of focusing "on sensory rather than social cues" (Saunders et al. 2011, pp. 7). For others, it is divisible into components e.g. physical (passive involvement with computer) and mental (transported or "going there") immersion (Beck et al. 2010). It is also perceived as an "experience of an inclusiveness and vividness" (Zhang and Zigurs 2008).

Our analysis revealed that the confusion as to what constitutes immersion within VW studies is a defect inherited from the 'virtual reality' literature. While VWs present a virtual reality, the systems and indeed the domain of VWs research has branched off into its own field of interest, particularly within the IS community. Arguably, the emphasis of VWs has been noted to be less on the technologies used than on the environments themselves (O'Riordan et al. 2009). In bringing clarity with regards to the concept of immersion, renowned virtual reality expert Mel Slater differentiated between 'system immersion' from the concept of immersive responses (cf. Slater 1999); the latter being used to denote Witmer and Singer's (1998) usage of the term immersion. System immersion refers to "the actual system deliver[ing] a surrounding environment, one which shuts out sensations from the real world, which accommodates many sensory modalities, has rich representational capability, and so on" (Slater 1999, pp. 560). In contrast, immersive responses are "a psychological state characterized by perceiving oneself to be enveloped by, included in, and interacting with an environment that provides a continuous stream of stimuli and experiences" (Witmer and Singer 1998, pp. 227).

System immersion is related to the physical configuration of the user interface of a virtual reality system; with classifications (full, semi, non-immersive) depending on the degree in which the user perceives the actual world during engagement with the simulation. From this perspective, (system) immersion is defined via characteristics of the display technology, e.g. inclusiveness, extensiveness, surrounding, and vividness (Slater and Wilbur 1997). In such a classification, desktop-based virtual realities (VWs) are referred to as being 'non-immersive'. Such systems are effective in terms of 'psychologically isolating' users from the actual world, bringing about strong emotional responses in their engagement with the virtual reality (Gutierrez et al. 2008). Indeed, in citing Mills and Noyes (1999), Jestice and Kahai (2010) state that "VWs are a form of non immersive virtual reality" (pp. 2), as users are limited to what is presented via their screens as opposed to full immersive reality facilitated by head mounted displays.

Despite this unraveling of terminology by Slater well over a decade ago, in breaking away from virtual reality studies, VW studies became knotted in confusion and contradictions about defining and studying immersion. Our analysis found that immersion is often indistinguishable in the VW literature from associated concepts such as presence, cognitive absorption, involvement, flow and identity. In the studies reviewed, immersive responses are linked to a lack of awareness of time and a loss of awareness of the real world; thus being cognitive absorption in a specific psychological experience (e.g. Jennett et al. 2008). Cognitive absorption is seen as "a state of deep-level involvement with IS" (Schiele et al. 2011, pp.6) and is associated with VW presence, which includes immersive responses (e.g. Jennett et al. 2008) rooted in Csikszentmihalyi's (1990) notion of flow. Referring to a sense of control and mastering arising from the pursuit of goal-driven activity (Bartle 2003), a flow experience is also seen to be created by telepresence, producing hedonic outcomes such as enjoyment, enabling participants to focus on their actions and feel in control of the environment (see Nah et al. 2011). In the literature studied, flow and immersive responses are seen to 'overlap' by way of enabling a sense of time distortion and providing a challenge that involves a person engaged in a task (Jennett et al. 2008). However some differentiation is found as "flow and [immersive responses]... can play off each other, but neither is dependent on the other" (Bartle 2003, pp. 157). In addition, it is suggested that immersive responses are more emotionally charged than flow, (see Jennett et al. 2008).

In the VW research analyzed, researchers have generally been using immersion in a manner recognizable as what Slater (1999) would see as immersive response. While not viewed as immersion by virtual scholars, VW 'immersion' is thus part of what Slater (1999) regarded as presence. Presence, a multifaceted concept (cf. Witmer and Singer 1998), is believed to be achieved when the user is conscious of 'being in' a

virtual environment (Gutierrez et al. 2008). In the literature reviewed, the terms ‘telepresence’, ‘presence’, ‘spatial presence’ were also used (e.g. Schubert 2009). The idea of ‘immersion as presence’ thus includes a psychological component, with users feeling involved, absorbed, engaged and engrossed; (cf. Lombard and Ditton 1997). Various other concepts are also confounded with presence such as attention, emotion, involvement, engagement, etc. (Slater et al. 2009). Unsurprisingly, the work studied revealed that presence, along with placement, perspective and place are seen as key affordances associated with embodiment within VWs. In particular, presence implies constructs such as identity, agency and performance performed contingently through practices with objects (Schultze et al. 2008). Indeed, immersive responses (which we interpret as part of, and entangled with, presence) “helps deliver: identity” (Bartle 2003 pp. 157). While the avatar, often associated with identity, is now seen by some as a sociomaterial configuration (cf. Schultze 2010; Schultze 2011), we note that part of an avatar’s features are its objects (clothes, weapons, currency); meaning that such objects also share a role in enabling and constraining a sense of presence (Schultze and Leahy 2009). Thus, presence, when viewed as “a psychological state in which virtual objects are experienced as actual objects” (Saunders et al. 2011, pp. 16) has a connection to virtual goods.

Our analysis of the literature revealed that the consideration of interactivity with objects as well as attributions to the media are viewed as significant in creating high levels of presence for participants in a VW (Saunders et al. 2011). For example, within haptic virtual environments, users may feel they are touching and manipulating objects that do not exist in the actual world; resulting in a subjective sense of object-presence (cf. Reiner and Hecht 2009). Thus if the sense of presence is grounded in action, the interaction with objects generates the ‘illusion’ of object-presence, causing participants to adjust their behaviors. We therefore conclude that the materiality of objects is important to our conceptualizations of immersive responses, entangling a web of concepts such as flow, presence, identity, engagement, agency, discursive practices, boundary spanning, as well as the emergence of the VW as it is built from objects. Thus, we argue that objects, like avatars and discourse, require a more explicit and interconnected role in our discussions, theoretical models, and analysis of VWs.

Focus on Emergence

As discussed earlier, VWs are inter-subjective artifacts that support “the creation of shared contexts for social transactions” (Pearce and Artemesia 2009, pp. 133) in which networks of user interaction evolve over time (Putzke et al. 2010). Coupled with this, is the view that immersive response is central to VW design as online VWs combine technology with human imagination (Jäkälä and Pekkola 2007), linking both human and object. Such imagination (Ward and Sonneborn 2009) extends to actions as well as objects designed within VWs (e.g. creating situations in which people take part in sitting, waiting, observing and engaging in conversations with avatars as well as when engaging with other virtual artifacts). The surrendering and indeed transcending of user interaction with artifacts within the VWs “gives rise to the need to better understand how users make sense of VW environments and how they perceive the value associated with VW experiences” (Wasko et al. 2011, pp. 647).

VW research reveals that a combination of symbols and space, inclusive of perceptions of presence and a sense of engagement with objects, aid in defining the context of interactions in the VW (see Saunders et al. 2011). From a design perspective, it has been reported that designers of VWs may promote immersive responses through factors such as control, self-expression, detail (that is non-contradictory and consistent), and freedom of choice (providing open-ended possibilities) (see Bartle 2003). This being the case, ‘co-created VWs’ such as Second Life, rate high in their ability to promote immersive responses. This also illustrates the considerable role of object creation in the sensation of immersive responses within such systems. In agreement with the literature (e.g. Boellstorff 2008), design activities in such environments may rightfully be understood as a craft, a form of ‘techne’ within the system itself, whereby what was originally conditioned within the VW can be extended to accomplish that which at first was impossible. Alternatively, as highlighted earlier in the analysis, the environment and its users emerge through performance. Emergence is defined in the Oxford English Dictionary as “the process of coming forth, issuing from concealment, obscurity, or confinement, [and also] of the result of an evolutionary process”. Central here to this temporal conception of VWs is the term ‘process’ as oppose to, for instance, ‘product’ such as noted earlier within TAM studies.

VWs are a process, performed and in-motion. Constituting VWs via their emergent structure has been

well acknowledged within IS (cf. Schultze et al. 2008; Schultze and Rennecker 2007). Indeed, Schultze and Rennecker's (2007) model incorporating realism vs. fantasy and progression vs. emergence categorization of VW genres has been acknowledged within IS (e.g. Hooker et al. 2009; McKenna et al. 2011a; Wasko et al. 2011) as a key perspective in understanding these systems. Such systems emergence structures are typically devoid of constraining predetermined goals (cf. Schultze and Rennecker 2007; Schultze et al. 2008). Their emergent design enables these systems to “emulate the network-centric, emergent, non-reductionist, and inherently unpredictable dynamics... [having] sufficient resolution to capture the subtle details of the [actual] world, while being abstract enough to allow users to understand the intricate relationships that exist therein (Chaturvedi et al. 2011, pp.2). In particular, we look to Pearce and Artemesia's (2009) study on emergent cultures in multiplayer games and online VWs. The authors note that emergent systems are decentralized and self-organizing; they facilitate a range of collaborative behaviors and collective intelligences that transcend underlying structures such as rule sets, actions, or individual components. Furthermore, they note that certain properties facilitate this emergence within VWs, e.g. their open-ended nature and persistence state, transitions outside of the VW, the synchronicity and synchronicity of a networked and diverse range of users, their long-term engagement, as well as the rapid pace (acceleration) of social phenomena such as friendships within the VW.

We argue that coupled with the emergence of the VW, is the view that immersion (taken as immersive response) is also central to the design and interpretation of VW as “it plays so much a part in conveying the entire virtual experience. Without immersion, there is a fence between player and VW, with immersion, the barriers are lifted” (Bartle 2003, pp. 157). For instance, the bootstrapping capability of developers to re-imagine and create new forms of activity and realities, radically creating new development cultures within the system, presents an outlying category of innovative VW users and virtual goods to study. Hence, this in turn raises the question as to the ability of novice users, such as students (as developers), who, mentioned earlier in the analysis, are often presented as the data source of VW research studies, to readily find value in their (often) culturally isolated (educational) activities compared to experienced and culturally-immersed skilled developers. For instance, let us take the theory of ‘flow’ seen within VW literature as an immersive response. Originally, the concept was developed in the study of creative people such as artists striking a balance between a challenge presented and the person's skill, situated between psychological states of control and arousal. The study of novice users (as a lot of IS research does – see previous section) is in no doubt a contrast to the study of those who freely, intentionally, and creatively extend the natural development process of VWs. ‘Virtual tools’ noted within the literature, such as the Slooodle tool (Hardwick et al. 2009; Schultze et al. 2008; Stieglitz and Lattemann 2011) and Wiki-Tree (Cahalane et al. 2010) are examples of artifacts facilitating the automated rendering and management of other artifacts. These are prime examples of the more skilled user-developer's ability to constitute their activity through such techne, the “creative bootstrapping ability of humans to craft themselves” (Boellstorff 2008, pp.57), and thus, in turn, illustrate the challenging and emergent gap between the VW as it was, and as it presents itself today. We therefore argue that there is a need to explore and study the extent of skilled developers within VWs, who challenge and build upon the systems within which they interact i.e. are responsible for the emergent qualities of VWs.

Conclusions

This paper discussed the state of the art of VW research with an emphasis on research being produced by the IS community. Our findings of publications from 2007 to 2011 revealed that IS scholars have focused on the study of social VWs, particularly Second Life. In addition, we revealed indications of ‘methodological partisanship’ that sides with quantitative methods; foregrounding human experience and agency while frequently use novice users (particularly students) as informants. There is also a tendency to ‘black box’ VW technology in studies of VW technology; ignoring the core VW characteristics of immersion and emergence. Our analysis found that prior research has an on-going preoccupation with dichotomies; separating the virtual from the ‘real’, gaming VWs from ‘Non-gaming’ VWs, as well as studying the avatar to the near neglect of other virtual objects. Our analysis revealed the need for a rethinking of the use and study of immersion and associated sensations within VW research as well as the need to reflect more on the emergence of VWs. Overall, this study has revealed that VW research has under-theorized the core characteristics of VWs, i.e. they are both immersive and emergent systems. Ultimately, our analysis concurs with the observation of Slater et al. (2009) that “too much research in this field [of virtual environments in general] ... is non-productive: recycling and comparison of

questionnaires, philosophical discussion about the true meaning of presence, and so on” (pp. 208).

We believe that our work has several key implications for VW researchers. First, the human-centric stance of VW research, the pre-occupation with the avatar and the under-theorization of virtual goods (objects) have taken focus away from the nature of the VW artifact and ignores the importance of non-human agency in emergent environments. We thus voice the need to examine the ‘mundane’ and suggest that objects, like avatars and discourse, require a more explicit and interconnected role in our discussions, theoretical models, and analysis of VWs. We remind those engaged in researching VW activity that virtual artifacts, inclusive of virtual goods, shape our senses of both ‘community belonging’ and ‘individual distinctiveness’, revealing information relating to sharing norms, status, identity, etc. (cf. Boellstorff et al. 2012). This implies that researchers need methods to study VWs that enable them to ‘overturn each virtual stone’, click on objects, check their meta-data, use scripted sensory data collection methods, and discover how they are performing; in essence, learn what is being performed not just through avatars but through the objects that facilitate and associate involvement, presence, identity, and so on.

Second, and not-with-standing the above, our work cautions researchers to not consequently lose sight of users and Avatars. To the contrary, we argue for a wider engagement with hitherto neglected categories of human agents and call for the move from students in laboratory settings to ‘world builders’, which we class as ‘techne’ creative users, who are experienced in developing virtual goods. This would allow researchers to advance beyond the testing of various *immersive response* concepts (e.g. flow, cognitive absorption, presence, engagement, etc.) to arguably focus on those users that are most immersed and most advanced from a co-creation/emergent perspective (i.e. experienced ‘native’ user-developers). In making this call we are advocating a movement from augmentative-focused research to that of immersionist research, i.e. research within VWs from the residents’ perspective (cf. Atlas 2008).

Third, despite the continual emergence of new VWs, we note that one world ‘Second Life’ has become a type of metonym for emergent co-created VWs due to media publicity and the reliance of researchers on it. Therefore, previous studies, and by implication this study, have provided insights into VWs through the lens of Second Life at the expense of other ‘VWs’. Given that over 350 VWs are listed by *The Consumer Guide to VWs* (cf. Kaye 2012) and the growing interest in virtual artifacts via augmented and virtual reality technologies, there is a need for IS research to both end the dominance of Second Life in studies of VWs and explore other social and progressive VWs.

Overall, we believe that there is now a need to embrace the performative and sociomaterialistic constitution of VWs (cf. Schulze and Orlikowski 2010). “By focusing on situated practice, sociomateriality sees the virtual-real, work-play, avatar-self and presence-absence boundaries as enacted, performed and always in the making” (Schulze 2010, pp. 445). We move that such work may be best suited to ethnographic approaches (cf. Boellstorff et al. 2012) as the ethnographer crafts events as they unfold, paying heed to the mundane and acknowledging human and non-human agency. In line with such a sociomaterialist view of agency, we conclude by positing that it is necessary to move from a social constructionist view of questioning why avatars need/build chairs (cf. Wasko et al. 2011) and daringly also ask ‘why do virtual chairs, or other VW objects, need avatars?’

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