

Virtual worlds – past, present, and future: New directions in social computing[☆]

Paul R. Messinger^{a,*}, Eleni Stroulia^b, Kelly Lyons^c, Michael Bone^a, Run H. Niu^d,
Kristen Smirnov^a, Stephen Perelgut^e

^a University of Alberta, School of Business, Canada

^b University of Alberta, Department of Computing Science, Canada

^c University of Toronto, Faculty of Information, Canada

^d Webster University, Business Department, United States

^e IBM Toronto Labs, Canada

ARTICLE INFO

Available online 11 March 2009

Keywords:

Virtual worlds
Social computing
Gaming
Avatars

ABSTRACT

Virtual worlds, where thousands of people can interact simultaneously within the same three-dimensional environment, represent a frontier in social computing with critical implications for business, education, social sciences, and our society at large. In this paper, we first trace the history of virtual worlds back to its antecedents in electronic gaming and on-line social networking. We then provide an overview of extant virtual worlds, including education-focused, theme-based, community-specific, children-focused, and self-determined worlds – and we analyze the relationship among these worlds according to an initial taxonomy for the area. Recognizing the apparent leadership of Second Life among today's self-determined virtual worlds, we present a detailed case study of this environment, including surveys of 138 residents regarding how they perceive and utilize the environment. Lastly, we provide a literature review of existing virtual world research, with a focus on business research, and a condensed summary of research issues in education, social sciences, and humanities.

© 2009 Elsevier B.V. All rights reserved.

1. Introduction

Virtual worlds, where thousands of people can interact simultaneously within the same simulated three-dimensional space, represent a frontier in social computing with critical implications for business, education, social sciences, technological sciences, and our society at large. Members participate in virtual worlds through their avatars which are graphical representations of themselves. In Sanskrit, “avatara” means “incarnation.” The use of the term was made popular by Neal Stephenson in his novel *Snow Crash* [100]. Avatars, in the novel, interact in a virtual-reality Internet that he refers to as a “metaverse,” which is equivalent to the more common current term, *virtual world*. Members of a virtual world (through their avatars) can engage in rich interactions with each other: they can exchange

messages, objects, and money; they can communicate through voice over a headset and microphone; they can navigate through the world by walking, running, driving vehicles, flying, and teleporting; and they can “experience” the world through a rich variety of interactions with it, including dressing, changing their avatars' shapes, touching things, building and owning things, engaging in quests, doing sports, dancing, hugging, and kissing. Indeed, according to one source, “Virtual worlds are becoming increasingly sophisticated, enabling organizations and individuals to ‘step into the internet.’” [52].

Viewed solely as entertainment, virtual worlds lie at the frontier of the burgeoning video-game market, which, with \$12.5 billion in U.S. revenues in 2007, surpassed motion-picture revenues and also cut into the television market share. Canadian sales of \$1.5 billion were also more than four times what Canadian movie theatres took in at the box office [85]. Global sales in the computer and video game industry were \$18.85 billion in 2007, \$9.5B in game sales, and \$9.35B in console sales [46]. This form of social computing, however, is moving far beyond its gaming origins, with unanticipated implications for how we work, learn, interact, use the Internet, shop, and, yes, play.

Virtual worlds are also emerging as a novel form of social computing – an evolution of the Internet that may have been largely unanticipated by early analysts who touted this phenomenon as an “information superhighway.” We think that a much better metaphor for virtual worlds is a *globally shared playground and workspace*. We expect that virtual worlds will grow in societal importance in at least two ways. First, virtual worlds offer a window into the future of the

[☆] The authors are indebted to Victor Zhang and David Chodos, for writing the Second Life scripts which navigate respondents to our Internet survey and pay subject fees (see Fig. 4.2), and to Andrew Hay and Shoshana Messinger, for assistance with descriptions of virtual worlds for teens and children. Research funding for this work comes from IBM, the National Sciences and Engineering Research Council, the Alberta Ministry of Advanced Education and Technology, the Social Sciences and Humanities Research Council of Canada Initiative in the New Economy Research Alliance Program (SSHRC grant 538-02-1013), and the University of Alberta School of Retailing.

* Corresponding author.

E-mail addresses: paul.messinger@ualberta.ca (P.R. Messinger), stroulia@cs.ualberta.ca (E. Stroulia), kelly.lyons@utoronto.ca (K. Lyons), mbone@ualberta.ca (M. Bone), runniu68@webster.edu (R.H. Niu), ksmirnov@ualberta.ca (K. Smirnov), perelgut@ca.ibm.com (S. Perelgut).

Internet (or at least part of it). Second, these environments provide a rich real-time form of social and economic interaction with numerous applications and subsequent implications.

We explore virtual worlds and their impact in several areas in this paper. In Section 2, the history of the development of virtual worlds is traced to its roots in gaming and social computing. Section 3 reviews the different kinds of existing virtual worlds. Section 4 provides an in-depth description of Second Life (from now on, SL), together with results of a survey we have conducted of SL residents. Section 5 summarizes current research and identifies further research questions about virtual worlds in business, the social sciences, and other areas. Section 6 closes with some observations for the future.

2. Precursors to 3D virtual worlds: games and social networks

In this section, we review the history of two parallel socio-technical phenomena, namely on-line gaming and social-networking that, we believe, have led to the advent of today's virtual worlds.

2.1. Milestones in electronic gaming

From *Pong* to *PlayStation*, we have seen vast advances in the technologies supporting electronic gaming in the past four decades. Countless arcade systems, game consoles, and handheld systems have brought the industry to where it is today: an extensive network of gaming companies together pulling in \$18.85 billion dollars in global sales in 2007 (\$9.5B in game sales and \$9.35B in console sales [46]), with the potential to more than double by 2010 [59]. This growth can, in part, be attributed to the improvement of console technologies over time as well as the changing parameters of how people play games, where they play them, and with whom they can play them. For a detailed description that traces the linkages of early games in history to the more important electronic games and virtual worlds as of 2002, see [17, Fig. 1]. For all games, traditional or electronic, there are three dimensions of content allure: (a) strategic and tactical objective-oriented problem solving, (b) thematic and fantasy role-playing, and (c) testing one's reflexes in an immersive environment using special-purpose interfaces. We limit ourselves below to a description of several interesting relatively recent milestones (see Table 2.1).

Electronic game platforms historically progressed from bulky coin-operated arcade systems, to much smaller console systems for the home, to single-person applications on mainframe and personal computers, to local area networks, and finally to the Internet. Nutting Associates released the first video arcade game in 1971 under the manufacturing direction of Nolan Bushnell, who later went on to found Atari and release the first arcade version of the now infamous *Pong* [45]. With the development of much smaller, affordable console systems, people started playing video games in their homes, alone or

with friends. LAN (Local Area Network) games provided another venue to play with groups of people and to experience large-scale social interaction through gaming. By 2004 large LAN parties were attended by 1200 people [28]. As the Personal Computer (PC) and Internet technology grew at a rapid pace, so too did the video game consoles' capabilities. Releases of the PlayStation 2 in 2000 and Microsoft Xbox in 2001 offered gamers the ability to connect to the Internet and to play against (and interact with) other gamers across the world.

Meanwhile, the games themselves also grew to include progressively less structured environments, greater player freedom to pursue self-defined objectives, and the ability to create their own content. Early games such as *Pong* and *Super Mario Brothers* involve players making choices or moving their avatars along preset paths to achieve predetermined objectives. Subsequent gaming developments allowed for more freedom, realism, and creativity. "Sandbox", "open", or "unstructured" games, such as the enormously popular *Grand Theft Auto* series, offer realistic worlds that are large (although still geographically bounded), easy to explore, and traversable based on the player's own whims rather than a preset path [11]. These expansive settings and freedom of movement coupled with injections of realism into the surroundings – such as progression of daily time in a 1 s to 1 min ratio – create an immersive environment unlike structured gaming [79]. Player freedom and control is also prominent in "god games," which offer players near omnipotence within the game world; Peter Molyneux's *Populous* introduced this genre in 1989 [4].

The massively successful *The Sims*, and its sequels *The Sims Online* and *The Sims 2*, provide players a certain amount of control of their environment and the nearly unlimited ability to generate their own content [54], including "skins" for the avatars, new types of decor for the homes, and new pieces of furniture. Indeed, Electronic Arts (the producer of Sims games) claims that over 80% of the game's content is made by users [84]. Shared content itself is not new: in 1996, *Quake* became the first multiplayer, freeform game to provide open standards which allowed for user contributions [47]. Because of user-generated content, the games cannot be separated from the players, nor the players from the games; neither the games nor the players is fully understood without studying the other. Just as in real social systems, we observe the symbiotic emergence of culture and content. We will see (in Section 4) that this is also true for open-objective virtual worlds.

An important segment of online distributed games, massively multi-player online role-playing games (MMORPGs), has users striving to attain increasingly challenging levels. There are many such worlds currently in operation, including *Everquest*, *Lord of the Rings Online*, *City of Heroes/Villains*, *Age of Conan*, and *World of Warcraft*. In these worlds, avatars can wander where they wish, but mobility is initially limited by the dangers of advanced zones [62]. By earning experience points, avatars can gain skills and strengths that

Table 2.1
Milestones in electronic gaming.

Exemplar game	Year released	Platform	Key developments
<i>Pong</i>	1972	Arcade	First highly successful coin-operated arcade video game. Followed by Tank, Indy 500, Space Invaders, and Pac-Man [45,108].
<i>Super Mario Brothers</i>	1986	Video Game Console	Release of Nintendo Entertainment System in U.S. (previously Famicom in Japan), which would feature popular characters like Mario, Donkey Kong, Zelda, and Popeye [45].
<i>Populous</i>	1989	PC and Console	First "god game" that put the players in a nearly omnipotent role regarding the game world [4].
<i>Doom</i>	1993	Local Area Network	LAN games permit interconnected gameplay where players can cooperate or fight [51]. Emerged from earlier single-player Unix games such as Rogue.
<i>Quake</i>	1996	Internet	First game to utilize Internet connectivity to allow players to exchange their own creations in a first-person shooter context [47].
<i>Grand Theft Auto</i>	1997	PC and Console	First entry in a series that would become the most popular "sandbox games." These unstructured games allow players to explore the world environment in a nonlinear fashion [11].
<i>The Sims</i>	2000	PC and Internet	Best-selling game series of all time, later expanded into shared online environments. Much game content is made by users [84].
<i>World of Warcraft</i>	2004	Internet	Most popular online gaming environment, with over 11 million active accounts sharing an online world [10].

aid in coping with these dangers. These MMORPGs also offer small “quests,” or designer-provided objectives that serve as games within the larger game [97]. In this way, MMORPGs reflect the designer-intended and guided gaming tradition that appeared in all early electronic games. However, the purpose-driven worlds of MMORPGs inevitably reveal unexpected social challenges and benefits as their millions of players interact through their chosen avatars [20]. Culture, thus, asserts itself in purpose-driven worlds, as it did in games with user-generated content.

We hasten to reemphasize our main point that the development of the electronic gaming industry led to a progression of socio-technical innovations that set the stage for (and became incorporated within) virtual worlds. These innovations include the development of user-controlled avatars, multi-user interaction, 3D animation, open-objective environments, MMORPGs, and user-generated content.

2.2. Brief history of online social networking

We now argue that social networking – a much more recent phenomenon than gaming – was also a precursor to virtual worlds. Social networking applications started in 1997 when SixDegrees.com was launched [13]. Social networking platforms (SN sites, or SNs, for short) have since proliferated, their features have expended in interesting ways, and overall membership has grown dramatically. The essential features of social-networking web sites are that they provide a platform in which members can (a) easily create “profiles” with information about themselves, and (b) define their “trusted” circle of friends. The environments support the differentiation of public vs. private information on members’ profiles, and authorize access to the private aspects of the members’ profiles only to their circle of friends. In all SN sites, the profiles can contain textual and pictorial information and an increasing number also support audio and video content. Other common features include communication media such as blogging, instant messaging and chat, notifications when the profiles of one’s friends have been updated, introductions to friends of friends, reviewing of content and tagging with general comments, and content recommendations based on the members’ comments and reviews. These environments bring together most elements that have come to be considered under the heading of “web 2.0” technologies in simple, highly usable ways for people who have little to no technical expertise. In these environments, the technology becomes transparent and the members are free to pursue their objectives of socializing and content sharing.

For a thoughtful survey of the various SN sites, together with a historical overview, see [13]. In this section, we selectively acknowledge interesting trends and events in the history of the social networking.

- Some SN sites have been aimed at membership within a geographical location, making initial assumptions about the language and etiquette of their potential members. For example, Cyworld was initially launched in South Korea in 1999. Today, Cyworld also serves the United States, China, Japan, Taiwan, Vietnam, and Germany.
- Some SN sites were launched for a specific demographic profile. For example, there are many web sites for children, such as Neopets (neopets.com), and teens, such as Nexopia (nexopia.com). Even more interestingly, Facebook was initially conceived as a forum for Harvard students. Many of the SN sites in this category expanded their offering to wider segments of the population. Today, in addition to individuals from all over the world, many corporations, educational organizations and community and activist groups can be found on Facebook.
- Some SN sites were designed and promoted as environments to support a particular activity or theme (as opposed to general networking). For example, YouTube was designed for video sharing; the more recent Dogster and Catster enable information exchange

among pet owners; and hisholyspace.com and muslimspace.com are faith-based. Some special-purpose web sites were conceived for the explicit purpose of delivering a traditional service online (such as LinkedIn’s professional introductions) and others were developed after it was realized that the needs of niche groups, with particular interests and beliefs, were not being met with the open, general-purpose sites.

We close this section by noting that, like gaming, the emergence of social networking introduced innovations and practices that have come to be adopted within virtual worlds. These innovations and social practices include easily created profiles (including textual and pictorial information and support for audio and video content); a trusted circle of friends and capabilities for both public and private message dissemination; new media elements (e.g., blogging, instant messaging, chat, notifications, introductions, content reviewing), and a structure of various classes of social networks (geography-based, demographic-based, theme-based, etc.). Overall, the combined innovations in electronic gaming and social networking made virtual worlds possible.

3. Taxonomy and overview of virtual worlds

A long list of virtual worlds has emerged since the early 1990s, roughly in parallel with the development of 2D social-networking sites. Participation has grown exponentially since 2000, due to improvements in virtual-reality technology (adapted from electronic gaming), continued drops in personal computer prices, increases in computing capacity, and greater broadband network access. Organizations and businesses are rushing to establish a presence in these worlds, and academics are stepping up efforts to understand the implications of virtual worlds and predict the longevity of the phenomenon. The purpose of this section is to provide an overview of the current state of the virtual world sector.

To help understand the structure of extant virtual worlds, we adopt and refine the proposed typology of virtual communities presented by Porter in [86]. This typology can also help organizations and individuals better identify which worlds are appropriate for which activities and why. The five elements of the typology (purpose, place, platform, population, profit model) focus on critical questions that journalists, marketers, and service providers are taught to ask: (1) For what purpose? (2) Where? (3) How? (4) Who? and (5) How much? Although we retain these same five elements as proposed by Porter [86], we make some modifications for the virtual worlds context as follows.

1. Purpose (Content of Interaction): Porter focuses on the interests shared by the community members that shape and focus the discourse in the community. Applying this idea to gaming, social networking, and virtual worlds, we emphasize whether a game has a strategic, tactical, or thematic appeal; whether a social network is themed (i.e., has a specific purpose) or open; and whether a virtual world has an age focus, a content focus, or is open. An additional characteristic of the “purpose” element, we believe, is the degree of *augmentation* vs. *immersion* of the activities of the world members. Some worlds, especially fantasy worlds, offer virtual environments, quite separate from the real world, in which people can *immerse* and explore behaviors and activities untypical of their real self. Other worlds, for example those focusing on education and training, offer virtual opportunities and social networks for people to *augment* their real-world activities and social networks.
2. Place (Location of Interaction): Porter discusses the “place” attribute in contrast to the geographically bounded nature of real communities, and focuses on the types of location and presence cues offered by the virtual world to enable its members to formulate a psycho-sociological sense of place. We also consider the realism of the world’s rendering of the environment (whether it is 2D, 2.5D or 3D), the place-changing behaviors supported by the

world (i.e., walking or flying or teleporting), and whether world members are geographically collocated or dispersed in reality.

3. Platform (Design of Interaction): Porter focuses on the degree of “interactivity” supported by the virtual community, in terms of whether it enables synchronous or asynchronous communication or both. In discussing this attribute, we also include the type of client that the members use to interact with the virtual community, and the types of interaction technologies supported by it. For example, whether the client is available on a browser or requires a special “download-and-install” process defines, to some extent, how frequently and in how many contexts the members can be in world. Furthermore, different worlds support a different degree of freedom in communication; some dictate a limited set of expressions from which their members can choose; others enable their users to select between public vs. private communication channels; yet others support communication through audio and video.
4. Population (Pattern of Interaction): We follow Porter by focusing on the size of the group and the types of social ties among the group members. We also consider distinguishing characteristics of the target user market, in terms of its age, gender and geography demographics.
5. Profit Model (Return on Interaction): Porter focuses on revenue or non-revenue generating environments. We elaborate on Porter's taxonomy by examining whether the world supports (1) a single purchase price or registration fee (i.e., fixed fee); (2) fee per use (i.e., variable fee); (3) subscription based (and on what basis subscriptions are made); (4) advertising-based; (5) pay-as-you-go extras (virtual assets including clothing, land, and software); and (6) sale of ancillary products, such as real stuffed animals and accessories, which are accompanied by passwords for accounts in virtual worlds where virtual versions of the products enable combined real and virtual play.

We apply this typology to a few select prominent virtual worlds in Table 3.1, representative of the main classes of virtual worlds. (We created this table after examining as many worlds as we could find in Virtual Worlds Management <http://www.virtualworldsmanagement.com>, [24], Wikipedia, and various web pages). In order to put the worlds in context, both conceptually and sequentially, Table 3.1 also includes a few select prominent Internet games and Online Social Networks. (Note that online games, online social networks, and virtual worlds all constitute virtual communities, so the typology applies to all three). We provide more detailed descriptions of the most prominent referenced worlds in the Appendix, but we comment below on several overarching themes.

Five prominent classes of virtual worlds can be seen to be included in this list: education-focused, theme-based, community-specific, children-focused, and self-determined. Each of these five classes relates to or arises from particular elements of the taxonomy. Two classes of worlds, defined by the *purpose* element, consist of education-focused and theme-based worlds. Two classes of worlds, defined by the *population* element, are community-specific and children-focused worlds. By contrast, most online social network sites are defined largely by the *platform* element: specifically these sites work with asynchronous Internet platforms (unlike virtual worlds). Games are the only items in Table 3.1 that commonly involve variation on the *place* element, with some very popular games involving collocated players. Concerning the *profit model* element, there is tremendous variation, but a related common element for most open virtual worlds (or other worlds that allow content creation) is that they have in-world currencies. We now briefly describe salient features of the five virtual world classes.

Education-focused virtual worlds provide training in such areas as architecture and design, procedural skill development, and language learning. The fundamental technical preconditions for a world to support education appear to be (a) realistic rendering, (b) expressive

Table 3.1

Taxonomy applied to selected games, online social networking sites, and virtual worlds.

	Purpose	Place	Platform	Population	Profit model
<i>Games</i>					
FPS–Console	Tactical objective	Collocated	Console	1–4 players	FF + extras
FPS–LAN	Tactical objective	Collocated	LANs	1–1000+ players	FF + extras
Internet Scrabble	Strategic objective	Dispersed	Synch	2–6 players	Variable fee
The Sims Online	Thematic objective	Dispersed	Synch	Mass market	Free + extras
World of Warcraft	Tactical/thematic objective	Dispersed	Synch	Mass market	FF + subs + extras + ads
<i>Online social networking</i>					
LinkedIn	Professional networking	Dispersed	Asynch	Business people	Free + ads + extras
YouTube	Themed network	Dispersed	Asynch	Interested in video	Free + ads + extras
Cyworld	Open	Dispersed	Synch–Asynch	Korean and international	Free + extras + ads
MySpace	Open network	Dispersed	Asynch	Young adults–creative	Free + ads + extras
Facebook	Open network	Dispersed	Synch–Asynch	Young adults	Free + ads + extras
<i>Virtual worlds</i>					
ActiveWorlds	Education – Aug	Dispersed	Synch	Educational orgs and mass market	Subs + extras
Forterra Systems	Education – Aug/Imm	Dispersed	Synch	Organization members	FF + variable fee
Vside	Media sharing	Dispersed	Synch	Young people	Subs + extras + ads
HiPiHi	Open	Dispersed	Synch	Chinese Asian, female mostly	Subs + extras + ads
Sony PlaySt. Home	Teen play	Hybrid	Synch	PlayStation owners	Subs + extras + ads
Whyville	Child's play	Dispersed	Synch	8–15 year olds	FPU + extras + ads
Runescape		Dispersed	Synch	Teens, slightly more female	Subs +
Webkinz	Child's play	Hybrid	Synch	4–16 year olds, female mostly	Ancillaries + extras
Entropia	Tactical/thematic objective	Dispersed	Synch	US and EU mostly, mostly male	Extras
Second Life	Open	Dispersed	Synch	Mass market	Subs + extras + ads

Aug – Augmentation, Imm – Immersion, Synch – Synchronous, Asynch – Asynchronous, Hybrid – Both Local and Online Activities, FF – Fixed Fee, Subs – Subscriptions, Ads – Advertising, Extras – In-world activities, FPU – fee per use.

Other worlds include ProtoSphere, Alphaworld, Qwaq Forums, Google Earth-2005, Microsoft Virtual Earth-2006, Imvu, Kaneva, Multiverse, 3B, Flowplay, there.com, 3B International, Teen Second Life, Dubit, Multiple worlds, Stardoll, Habbo, CCMetro, Gaia Online, Zwinktopia, Ty Inc, Club Penguin, Barbie Girls, Nickropolis, Multiple worlds, Neopets, Virtual Magic Kingdom, Gopets, Millsberry.com.

Relevant other dimensions are company, world focus (public or private), currency, whether there is user generate content, the initial cost for users, whether virtual item sales are permitted, whether the world is 3d/2d/2d+, and URL.

Sources: Virtual Worlds Management <http://www.virtualworldsmanagement.com>, [24], and various world web pages.

and behaviorally rich avatars, (c) high performance, and (d) easy-to-use tools for education providers to develop the materials necessary for their objectives. Moreover, these environments usually provide the means for controlling access to a private world to the world's members only. For example, *ActiveWorlds*, among the oldest worlds, released in 1995, is very realistic, with high detail (reflecting particular real-world environments to enable education through *augmentation* of standard real-world, in-class activities) and is appropriate for learning design along with a variety of tools also for importing elements developed in various graphic formats. *Forterra* virtual worlds, originally developed by There.com, are designed to support training-through-simulation (both in *augmentation* and *immersive* styles) for e-learning, military, healthcare, and entertainment industries based on the Online Interactive Virtual Environment (OLIVE) platform.

Theme-based virtual worlds are designed to promote a particular type of content among a community. The *purpose* is to *augment* community members' access to content about the themed topic and to promote community discussion and socializing around the topic. One type of theme-based world revolves around a particular communications medium. For example, *vSide* promotes music, making available both audio and video, and facilitating communication and relationships among members with similar artistic tastes. In particular, *vSide* enables members to go to virtual clubs, corresponding to over 40 different music channels, where they can socialize and enjoy their favorite music or videos, and, if they maintain an in-world apartment, tune into chosen channels without having to navigate and make selections.

Community-specific virtual worlds target membership within a particular country or geographical region, adopting the national language for their interface and primary communication language of their members and the local aesthetic for the look-and-feel of their environment. For example, *HiPiHi* is an open world designed after Second Life, in Mandarin, targeting users from China. More significantly, *Cyworld*, which has features of both a social-networking site and a virtual world, targets South Korean users (and is promoted by the country's largest wireless service provider), boasting 18 million members, with 90% of all Koreans in their 20s having a *Cyworld* account, and further expansion into Chinese, Japanese, Taiwanese, and US versions.

Children-focused virtual worlds and web sites, which also target particular *population* elements, are becoming increasingly popular, and their growth practically ensures the longevity of the virtual world phenomenon. The NY Times (October 28, 2007) reported that the number of unique monthly visitors to Club Penguin more than doubled in the previous year, to 4.7 million from 1.9 million, while the traffic on Webkinz.com grew to 6 million visitors from less than 1 million, according to Media Metrix, an online-usage tracking company [80]. A distinct feature of children's virtual worlds is that most of them are visually simpler, 2D or 2D+, and many offer restricted interactivity. Children's worlds exhibit similar trends as the adult worlds (focusing on education, or socialization or fantasy gaming) although they adopt slightly different economic models than worlds targeted at adults. For example, *Webkinz* features an unusually tight coupling between the virtual and the real world wherein a child that purchases a stuffed animal plush toy receives a login code onto Webkinz World in which the child's avatar is a matching virtual pet who "lives" in a pet-oriented virtual world. *Whyville* focuses on education along with fun, with an *augmentation* approach to the activities it offers to its citizens. In particular, citizens earn clams (the local currency) by engaging in real-world activities, such as restaurant clean up and educational plots, or participating in a WhyEat(Right) challenge. By contrast, *RuneScape*, which targets teens 13 years and older, encourages tightly knit real-world groups to interact within one of the 158 "worlds" to meet at the same time to play. Two other prominent children's worlds are *Habbo*, claiming 7.5 million unique

active users per month [83], and *Club Penguin*, recently acquired by Disney Corporation.

Perhaps the most significant virtual worlds do not focus on any special purpose or activity. *Self-determined* (or open-objective) virtual worlds have varied motivations for participation, but a common thread appears to be *augmenting* the members' real social or business lives. These self-determined virtual worlds have an open *purpose*, target various *population* segments, and utilize diverse profit models. A common element for most open worlds, however, is a currency tradable within the world and limited property rights for created content. Some worlds even have the in-world currency exchangeable for real currencies. Currencies and property rights have the effect of aligning people's in-world objectives with their real world objectives in many domains, including in-world entertainment, entrepreneurship, service delivery, content design, office work, communications, social interaction, etc. In such cases, the world makes possible distant interactions with various people along multifaceted dimensions similar to real interactions, and in some cases even with potentialities that go beyond possible real interactions. An example of a self-determined world is *Kaneva* (derived from "canvas" to denote creativity), which blends virtual-worlds technology and 2D social networking: each registered member has an avatar, a profile (like in 2D social-networking sites), and a home, which they can decorate by importing content they may have in other sites. *Entropia Universe* is a science-fiction world, set on a distant planet named Calypso, somewhere in the middle of the *augmentation/immersion* spectrum, with an in-world currency and economic activities, as well as fantasy-like avatars and hunting and mining activities (somewhat similar to World of Warcraft). *Second Life*, however, is the premier virtual world in this category, and perhaps the most important current virtual world. We turn to an in-depth examination of this world in the next section.

4. Case study of Second Life

The previous section provided an overview of virtual worlds, but to really understand the phenomenon, one should look at world features in depth – particularly if a reader has not had previous experience with virtual worlds. Because of its prominence, its rich user-created content, and its extensive range of technological enablers (also present in other worlds), we believe Second Life (SL) is worthy of an in-depth case study. We accordingly begin by describing the historical growth of the SL environment, including details about the social milieu and business ecosystem. We then describe a survey of how "residents" perceive and utilize the SL environment.

4.1. Historical growth of Second Life

Publicly launched in 2003 by Linden Lab and considered by some users to be the "mother-lode" game, Second Life is really a massive technological and social experiment. In this virtual world, residents can shape the world around them, particularly their virtual property, which is located on simulators (or sims, for short). Residents can write code to manipulate the environment, trade objects and land for money, make or purchase their own clothes, participate in group activities, work, explore, play, and interact socially. Collectively, residents own millions of objects, including buildings and structures in all possible architectural styles, clothing and furniture in classic to avant-garde fashions, cars, boats, and planes, and numerous virtual products – all created in an enormous virtual economic ecosystem (for background see [24]).

In the last five years, SL has grown at an exponential rate. The total number of residents has grown from 1 in 2001, to 2.2 million by December 2006, to 5.5 million by April 2007. By August 2007, there were 8.3 million residents, 2 million of which had been active in the last 60 days; during the same time period, around 20,000–35,000+ users were in-world at any given time. The client is free to download

(at www.secondlife.com), and the only requirement for participants is a good computer graphics card and a broadband Internet connection. The average age of the adult SL world is 33 and the average age of the teen SL world is 15, with 41.1% of all residents female. There is global participation including residents from the U.S. (31.2%); France (12.7%); Germany (10.5%); U.K. (8.1%); the Netherlands (6.6%); Spain (3.8%); Brazil (3.8%); Canada (3.3%); Belgium (2.6%); Italy (1.9%); Australia (1.5%); Switzerland (1.3%); Japan (1.3%); Sweden (1.0%), and many other countries [91].

The SL economy is based on Linden Dollars, a floating currency exchanged in LindeX, SL's official currency exchange service. SL gained substantial media attention when a resident, Anshe Chung cashed out her Linden Dollar holdings in SL virtual shopping malls, store chains, other real estate, and virtual stock-market investments in SL businesses for more than one million U.S. dollars.

A great variety of real-world organizations maintain a presence in SL. Several governments have embassies in SL's diplomacy island (including Maldives, Sweden and Estonia). Many universities own space that they use for course delivery, among them University of Florida, Princeton, Vassar, the Open University (UK), Harvard, Australian Film Television and Radio School, Stanford, Delft University of Technology, and AFEKA Tel-Aviv Academic College of Engineering. More recently, religious organizations discovered SL. In early 2007, LifeChurch.tv, a Christian church based in Oklahoma, opened in SL its twelfth campus – its first in a virtual world. In December 2007, Islam Online, a popular, Egyptian owned Muslim web site, purchased land in SL to allow people to perform the ritual of Hajj. There are also a substantial number of companies with a presence in SL, ranging from IT companies (IBM, Microsoft, SUN Microsystems), news services (Reuters), motor companies (Toyota, Honda, Nissan), and retailers (Sears).

There are at least five key features of the SL environment, which roughly describe the evolutionary development of the environment over the last five years [71].

- (1) SL provides a platform for users to collaboratively develop shared content, including objects used by avatars (e.g., clothing, houses, furniture, and artwork) and software that can be used inside and outside of SL to animate the avatars for games, social activities, and general virtual-reality uses.
- (2) The content serves as a marketing resource for Linden Lab, the company behind SL, to attract residents (customers or circulation, in traditional marketing terms).
- (3) Much of the content is a tradable commodity in the online SL economy using Linden Dollars; even more importantly, because there is an exchange mechanism between Linden Dollars and regular currency, economic activities in SL can lead to real-world income. Not only can the content be traded or transferred, some content can be modified and copied.
- (4) Content emerges as an aesthetic output, with fascinating and beautiful virtual artistry and craftsmanship, alongside mundane structures, haphazard regional planning, and adult content.
- (5) Content is a shared experience upon which people can develop friendships and build larger communities with shared interests.

Many other open virtual worlds have several of the above features in common with SL, but SL has the greatest amount of user-created content. To some extent, this development sequence also serves as a model for the evolution of other virtual worlds.

Why is SL leading other worlds in user-created content? A complete answer to this question is beyond the scope of this paper, but some contributing factors include the following: (1) SL consistently implemented a system of property-rights policies conducive to user-created content (trading of objects, a monetary system, convertibility between Linden and U.S. dollars, efficient communications, search-ability of content offerings, and a system of levels of protection

on replication of objects set by creators of objects); (2) SL provides tools for creation of objects (prims) through an in-world Computer Aided Design system, a scripting language for animation of objects and other functionalities, and facilities to upload images and other digital objects, as well as local institutions with tutorials devoted to teaching residents how to utilize these tools; (3) SL has explicitly engaged in in-world competitions to foster development of business and social applications, and real-world promotions to “spread the word” in traditional media about practical and enticing features of the SL environment; and (4) SL has benefitted from a good measure of luck.

Currently, residents enjoy the beauty of many places, the accomplishment of building things, the fun of dressing up, and the excitement of flirting with and meeting people, but also recognize the addictive nature, that it takes away from their real life and can lead to loss of sleep. As an example of content emerging as an aesthetic output, one hears comments from fellow avatars such as “Svarga is magical!” and “I loved shopping in Nagaya.” The spirit of these comments is very much the same as tourists raving about Zermat in Switzerland, the Li River in China, or shopping in Tokyo (after which Nagaya is designed). As an example of content constituting a shared experience upon which people can develop friendships, there are design classes, many dance night-clubs, some singles' clubs, political interest groups, music interest groups, skydiving and ice-skating activities, and much more.

4.1.1. Social milieu for Second Life residents

Many “residents” are looking for an entertainment escape from their everyday real life; hence the name “Second Life.” Reasons for participating include (a) exploring the environment, (b) sharing experiences with others, (c) meeting people and making friends, (d) making things, and (e) engaging in commercial activities [38]. Amazing opportunities emerge. Some residents hire other residents to build houses through the *prim* building process [78]. In SL, a *prim* (primitive) is the elemental building unit. Avatars can create, shape, combine, and add texture and colors to the surfaces of these units with the aid of an in-world computer aided design system available to all avatars. In this way, the residents of SL create all the objects (except for the real estate and objects created by Linden Lab) in the virtual world of SL. An important question concerns the distribution of activities of the residents. Do most residents participate in SL for entertainment, social reasons, or commercial reasons? How much time do residents spend building, buying, or selling objects? The survey reported in Section 4.2 of this paper addresses several interesting questions such as these.

To interact in the SL environment in an advanced way, consumers must be “technology” forward in their orientation and knowledge [24]. This may broaden over time as more mainstream demographics join the world and further the shift from game and aesthetic design to simply exploring and meeting people. But, for now, according to Michael Dowdle, Vice President of Business Development with Kaneva, a competing virtual world,

“*Second Life* is for the more tech-savvy early adopters. It is a complex open platform to be creative and for building 3-D spaces and items. However for the masses, it can be difficult to use with its steep learning curve for creating virtual items.” [24, page 8]

Thus, SL differs from other worlds that appeal to non-technically oriented people who wish to socialize in an already existing space. For example, MTV's Laguna Beach is a virtual world where users “sit back on the virtual beach and socialize with their friends” [24, page 8]. SL also differs from World of Warcraft where participants have implied objectives, pre-assigned roles, and “evil monsters to shoot” [24, page 2]. SL gives users the chance to be creative, providing tools and an environment where they can fulfill their own vision [24, page 8]. But, although the creators and users of these worlds may dwell on

Table 4.1

Some brands, media companies, universities, and other entities in SL.

Brands	
ABN AMRO: ABN AMBR	238, 15, 22
Adidas: Adidas	104, 183, 55
AMD: AMD Dev Central	124,151,31
AOL Pointe: AOL Pointe	128, 128, 0
Autodesk: Autodesk	128, 125, 54
BMW: BMW New World	195, 66, 23
Circuit City: IBM	10 136, 38, 22
Cisco Systems: Cisco Systems	128, 127, 30
The Connected Home: The Connected Home	
Dell Computer, Main Island: Dell Island	43, 162, 24
H&R Block: HR Block	113,48,37
IBM Sandbox: IBM	121, 154, 33
IBM 1 Virtual Universities Community. Theater I: IBM 1	128, 128, 23
IBM 2: IBM 2	128, 128, 22
IBM 3: IBM 3	243, 105, 23
IBM4 IBM05 / Recruitment Project: IBM 4	130, 183, 22
IBM 6: IBM 6	128, 126, 22
IBM 7 Greater IBM Connection:	
IBM 8 SOA Hub: IBM 8	104, 106, 23
IBM 9: IBM 9	128, 129, 22
IBM 10 Theater M, Circuit City: IBM 10	139, 42, 22
iVillage: Sheep Island	42, 150, 25
Major League Baseball: Baseball	214, 129, 27
Mercedes-Benz: Mercedes Island	128, 128,0
Nissan: Nissan	19, 129, 26
PA Consulting: PA Consulting	116, 119, 27
Pontiac Main Island: Pontiac	179, 96, 24
Reebok: Reebok	111, 100, 97
Reuters: Reuters	127, 98, 25
Sears: IBM	10 95, 32, 23
Sony BMG: Media Island	108, 111, 21
Starwood Hotels: Aloft Island	68, 69, 27
Sun Microsystems: Sun Pavilion	182, 144,55
Sundance Channel: Launching January 2007	
TELUS: Shinda	187, 72, 22
Thompson NetG: Thompson	182, 123, 35
Toyota: Scion City	44, 40, 23
Vodafone: Vodafone Island	128, 128,0
Media companies	
AOL Pointe: AOL Pointe	128, 128, 0
Bantam Dell Publishing (Random House): Sheep Island	123,28,25
BBC Radio 1: BBC Radio 1	128, 127, 32
Choc Hebdo: La Plaine	59, 140, 37
CNET: Millions of Us	226, 30, 38
MTV Laguna Beach Laguna Beach	63, 218, 25
NBC Universal Headquarters: NBC 2	131, 123, 43
Northsound Radio Scotland: Fusion Unity	204, 131, 22
Popular Science, PopSci Future Lounge: Millions of Us	193, 133, 24
Reuters: Reuters	127, 99, 25
Sundance Channel: Sundance Channel	55, 173, 38
The Infinite Mind: Infinite Mind	209, 76, 46
Wired: Millions of Us	203, 228, 23
Government/public entities	
U.S. Congress (Democratic Party) Capitol Hill	128, 128, 0
Swedish Consulate	
Politicians	
Mr. Barack Obama, U.S. Democratic candidate 2008 presidency: Silicon Island	222, 217, 32 (unofficial)
Mrs. Hillary Clinton, U.S. Democratic candidate 2008 presidency: Isles of Intrigue2	133, 137, 604
Mr. John Edwards, U.S. Democratic candidate 2008 presidency: Onnuri	169, 25, 87;
Laguna Beach	219, 113, 23
Mrs Ségolène Royal, French socialist candidate to the 2007 presidency, Comité 748:	
Désirs d'avenir: Bretton	175, 233, 102
Agencies	
Centers for Disease Control and Prevention: Juwangsans	218,223,0
Homeland Security Synthetic Environments for Emergency Response Simulation	
National Oceanic & Atmospheric Administration Meteoara	246, 244, 309
Various non-profit organizations	
Tourism Boards of Intoscana, Tuscany and Galveston, Texas, both launching soon.	
Marketing and Public Relations Firms, fifteen	
Leo Burnett: Millions of Us	193,80,23
Market Research Companies, two	

Table 4.1 (continued)

Various universities, not necessarily offering classes, and some not open to the public, including Ball State University, Center for Media Design: Middletown 196, 179, 31; Harvard Extension School and Law School: Launching soon; New York University: Launching soon; Ohio University, Ohio University Without Boundaries SL Campus: Ohio University 20,36,24; Pepperdine University: Malibu Island; University of Illinois at Urbana Champaign: Cybrary City 220, 138, 24 (Partial list).

Source: [24,16,94]. Numbers indicate in-world SL locations.

the differences, the similarities among these worlds are probably more significant than the differences, and Second Life contains elements representative of many virtual worlds.

4.1.2. Business ecosystem of Second Life

In the SL economic ecosystem, there are numerous business applications and opportunities. Business applications utilize SL in multiple ways as (a) a laboratory for market research, (b) a test market, (c) a large market for advertising, (d) a retailing center, and, (e) a way to generate traffic to eCommerce sites on the Internet.

Concerning SL as a lab for market research, we note that Market Truths has established a business to conduct focus groups in SL [24, page 20]. Concerning SL as a test market, there are several dozen real products that have been introduced in SL as a way for residents to provide early feedback [24, page 3]. Brands that understand the culture of SL and, as such, aim at enhancing SL residents' "in-world" experiences are more successful and innovative than firms that simply import their "real life" strategies into SL [24]. It is even speculated that a lack of options for resident interaction with the brand American Apparel contributed to the closing of their SL store in 2007 [24, page 11]. Traffic numbers (number of minutes spent per week at a brand's SL site) bear this out, and virtual businesses that are addressing residents' personal in-world interests are generating more traffic than some of the real businesses that appeal to residents' real-world activities [24, page 17]. Examples of particularly innovative and popular brands include: Nissan, which sells different kinds of virtual cars, including cars that fly, from an 8-story vending machine; Toyota, which not only sells virtual cars but allows SL residents to customize them, even offering classes on how to do so; and iVillage (a media company that owns woman and girl-oriented content channels), which hosts a "girls' night out" inside SL where avatars congregate at the iVillage loft and enjoy virtual champagne parties, SL fashion shows, and mingling with celebrities such as Arianna Huffington. Locations that generate much brand awareness among SL residents include Reuters, IBM, Toyota, Nissan, and Dell [24, page 12]. Concerning SL as a market for advertising, many brands are promoted in SL, as shown in Table 4.1, in addition to media companies, public relations firms, and universities [24,16,94].

Concerning SL as a centre for retailing, generating in-world traffic depends on creativity of offerings, in-world promotions, and the word of mouth following their release [24, page 11]. In principle, stores should be located in areas within SL where customers might be expected to frequent, such as "malls" with similar retailers' stores. An open question concerns the extent to which a cluster of such stores can potentially draw people to a SL shopping centre that contains virtual stores. It would also be interesting to test what kinds of incentives and environments draw people.

While activities in SL may help generate brand awareness in general and increase traffic to 2D Internet eCommerce sites, currently it appears that virtual store patrons come in-world and plan to stay in-world [24]. The blend of today's Internet with virtual worlds such as SL may mark the beginning the 3D Internet and the brands that have entered SL now will be better prepared for this kind of shift – if and when it occurs. "We are there for a learning experience," said Doug Meacham, Circuit City's manager of infrastructure services, during an interview with Direct

Table 4.2

Benefits and challenges in making brands available in Second Life.

Benefits	
Promote engagement and customer feedback	<ul style="list-style-type: none">Starwood Aloft used their SL location as an inexpensive prototyping solution to gather customer feedback on design for future hotel layouts.Programs in SL are teaching business students about merchandising in the real world by displaying items in virtual stores.Adidas allows customers to design their own sneaker in SL, helping Adidas to design more remarkable “first life” sneakers.Mazda has ventured into designing an experiential marketing vehicle; the car’s designers even appear in virtual form to launch the new model.“Just as the web replaces and extends the capabilities of traditional print media, SL is extending the capabilities of broadcast media and chat. SL now surpasses the intensity of broadcast advertising at an even more favorable price point than print.” [24, Source: MediaPost]The World Economic Forum in Davos, Switzerland is usually attended by prime ministers, celebrities, CEOs and entrepreneurs. But thanks to the democratizing nature of SL, sixty average residents were able to virtually attend most workshops in Davos and talk directly with people such as the Governor of Virginia, Mark Warner, and musician and activist Peter Gabriel. Actress Mia Farrow has also held presentations on behalf of the UN about the genocide in Sudan.Thomson’s NetG corporate training division, which provides custom training solutions for corporate clients on Microsoft and Cisco products, reportedly makes \$10,000 a month by providing training, mentoring, and customized podcasts for their corporate clients in SL.Universities like Harvard Law School have used SL to host virtual classes and conferences, complete with video, sound, and PowerPoint presentations.The University of California, Davis, has created a virtual hallucination simulator to give psychiatry residents a better understanding of what schizophrenic patients actually experience.As a fundamentally social application, SL contextualizes human interaction so friends can say: “We met at Reuters” or “We boogied at Pontiac” or even “we dined on Chicken Kiev at Sublime”.Sears, in partnership with IBM, is working on allowing customers to create a virtual version of a kitchen, complete with exact dimensions and layout. All of the above lead to deepened relationships with customers.
Conduct market research and focus groups	
Create PR/media buzz	
Further existing customer relationships and create new ones; through training.	
Contextualize peer-to-peer and group interaction	
Promote user-driven innovation	
Deepen relationships	
Challenges	
Must make stores and products relevant to the lives of people in-world.	<ul style="list-style-type: none">“Brands that score most highly on the [brand impact] metric tend to go beyond showing their products, provoking virtual versions and web links. They provide opportunities for deeper engagement by making a brand-relevant contribution to the community and creating opportunities for interaction such as co-creation and customization of products.” [24]There is a significant learning curve in SL for new residents. For many it is not clear how to move, chat, teleport, and find places to visit. Only 10% of new residents, affectionately called “newbies”, become frequent residents. Brands must facilitate a more user friendly experience. Suggestions: Provide a more intuitive GUI (graphical user interface), head-up displays (HUDs), and tutorials on how to move around; promote brands on Newbie Island; give freebies.Many brands invest in building simulations in SL, yet fail to market them. A “build it and they will come” strategy does not work; brands must focus on relevant sim design and communications with billboards and other links.Only forty to sixty avatars are able to meet on one single simulator at a time due to capacity and rendering issues with both SL servers and home-based personal computers. Companies should establish experiential touch points with fewer avatars at their sims at a time, rather than plan huge events which may cause lag and server crashing.Title Tags and Descriptions: The title of the virtual location should include a few important keywords, just like title tags for websites. Reebok, for instance, could choose the name “Reebok custom sneakers.” Similarly adding keywords to the description can help virtual stores be found through relevant searches, similar to how descriptions and meta tags work for websites.Link Optimization: One of the first link-building strategies marketers learn is to have their affiliates and partners link to them. In SL, if marketers own multiple properties, they can include billboards encouraging visitors to teleport around to each one. As marketers expand their presence and enlist partners to join, offering teleportation among partners will provide the virtual world equivalent of link sharing.Advertising: Search marketing firms recommend that marketers conduct their paid and natural search campaigns together, either with the same company, or by opening up the communication channels among the different parties. Similarly, marketers should consider how advertising can tie into virtual world optimization.Multiple Engines: In SL, there is one dominant search engine, accessible for every user from a search box that resides at the bottom of the screen. There are also outside efforts to improve the SL search experience, such as Second411, which allows SL store owners to list all their items for sale, and then invites consumers to access its search application.Seed the Traffic. There is an in-world traffic ranking, which is based on, among other things, the number of avatars who are visiting a sim and the length of their stay. Indigenous SL businesses routinely pay avatars to camp out at or dance in their sims, generally, one or more Linden Dollars per hour (less than a third of a penny) effectively boosting their traffic rankings.
Must recognize the need to educate newbies.	
Must promote to residents in-world about new brands.	
Must recognize technological constraints of the new medium. (This includes capacity limitations and search engine optimization tactics, parallel to those for the Internet.)	

Source: Synthesis of various materials in [24].

magazine. “In the near future this is going to be a fairly seamless extension of the web that you deal with today,” [24, page 19].

Table 4.2 summarizes the benefits and challenges facing businesses in SL as identified in [24]. The seven benefits listed are really summarized by the last point: the interaction between a customer and a virtual store or product offers new low-cost ways to engage the customer in deeper relationships. The four challenges all involve thoughtful adaptation of a company’s “real-world” business strategy to SL to address the special characteristics and limitations of the medium. In particular, it is worth adding that it is necessary for virtual businesses to use the same tactics that eCommerce sites use to generate web traffic such as adding keywords to ensure that SL places (such as stores) are returned by searches (in the same way that meta-tags are used in websites) [24, page 14].

4.2. Survey of Second Life residents

We have thus far described the general SL environment, the social milieu, and the business ecosystem, but we have yet to describe the motivations, perceptions, and behaviors of SL residents. To understand

SL, we would like to “get into the heads” of residents. Toward this end, the authors concurrently ran two different surveys (denoted Survey A and Survey B – each with different questions addressing different behavioral aspects within SL). The reason we did not include all the questions in one long survey is that we felt that such a survey would be too long for many respondents, but we did allow the respondents, after completing one survey, the opportunity to answer the other survey.

Each survey required 10 to 15 min of the SL participants’ time. Participants were recruited through the use of four different survey avatars and were randomly assigned to one of the two surveys. Each participant was paid \$150 Linden Dollars for answering a survey, or a smaller incentive amount if they dropped out at some point before completing the survey. Incomplete surveys were removed from the data, as were any records where there were evident signs that the participant was not taking the survey seriously and was merely completing it for the incentive (e.g. the response for 30 straight scale questions was ‘5’). After data cleaning, we had 97 completed responses to Survey A and 100 completed responses to Survey B. For these two surveys, 59 respondents were in common, completing both Surveys A and B.

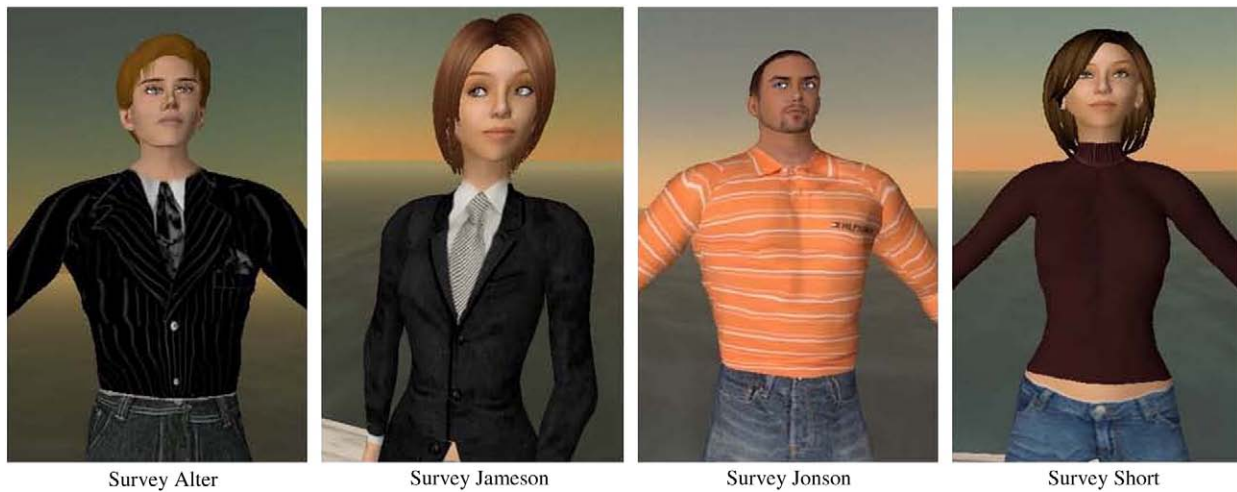


Fig. 4.1. The four avatars that recruited our subjects.

The survey participants were solicited in SL, so it was important to develop and use survey avatars that would attract participants who were most likely to provide valid responses. To test this, we began each survey with four questions measuring the participants' perception of the survey avatar's level of credibility, attractiveness, expertise, and likeability. It has been shown that attractiveness and expertise are key factors in designing effective avatars to interact with online consumers. Attractiveness influences perceptions of likeability while the expertise of an avatar can influence perceptions of credibility [48]. To ensure that our survey avatars were creating positive impressions, we ran a pre-test with the aforementioned questions, and included the questions in the final data collection as well. In both the pre-test and the main data collection, our four avatars received high ratings on a 5 point scale for credibility, attractiveness, expertise, and likeability. The screen shots in Fig. 4.1 are virtual photographs of the survey avatars.

To ensure that a diverse sample of participants was solicited, the following sampling procedure was used. As there are tens of thousands of different places in SL, many attracting different types of participants, we used a randomized approach to decide which places our avatars would visit to recruit participants. Three-letter combinations (every possible combination between AAA and ZZZ) were put into random order. Each letter combination was supplied to the SL "search place" function to yield a list of those places whose name or description contained that letter combination. Concatenating these search lists into one grand list, we selected every 10th place in the list to visit for 5–10 min and look for survey participants to recruit.

We rotated use of the survey avatars so that each survey avatar visited approximately the same number of places. This procedure allows for randomization of letter-combinations, avatar order, and researcher order, while systematically visiting every n th location, all the while, not penalizing any letter-combinations that offered too many or too few search results. In order to make sure data collection from different countries were not penalized (as SL users across the globe log on to SL in different time zones), data collection covered different times of the day, evening, and late night (Mountain Standard Time).

One limitation of our recruitment method was that the solicitation process and the surveys were conducted entirely in English. Although there were not many instances of our research team turning away non-English speakers, we note that our methodology does limit the coverage of our sample to English speakers, and that non-English speakers would not be responsive to our solicitation process.

Survey respondents opened a web-based survey by clicking on a portable sandwich-board worn by our four survey avatars or by clicking on a stationary board in a survey booth on Flotsam Beach in SL to which respondents were directed (see Fig. 4.2). We used the latter method when a given SL place prohibited use of animation scripts, which rendered our stationary board inoperable. The survey began with a consent form and ended with debriefing and cash payout.

4.2.1. Sample demographics

The demographics of our sample are as follows. The average age of SL participants in the study was 30.5 years, with most falling between

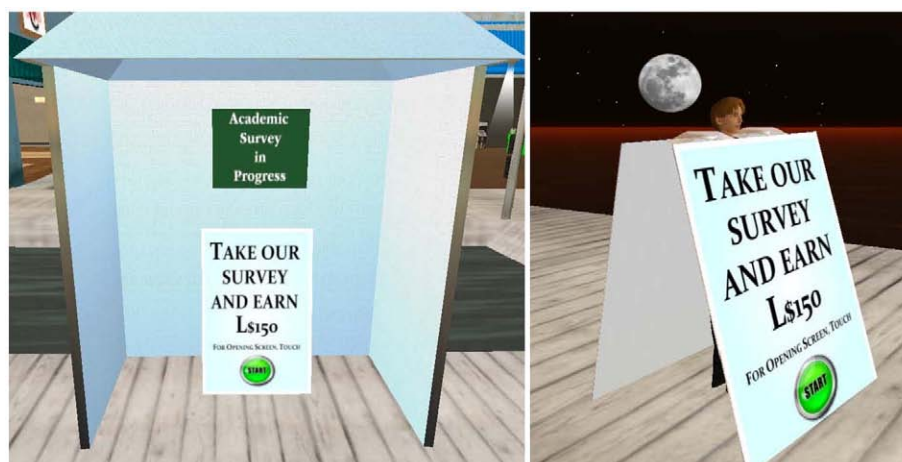


Fig. 4.2. Our survey booth and one survey avatar with sandwich board.

the ages of 20 and 36. Nearly 75% of participants made less than \$60,000 annually, while only 2% earned over \$100,000, and 17% of participants did not wish to divulge their annual income. Most participants had completed high school, completed their undergraduate degree, or at least spent some time in university or college (87%), while only 5% had graduated with their Masters or PhD degree. The gender of participants in the study was split roughly evenly, 53% being female. Participants had, on average, between 20 and 25 h of leisure time per week and half were from the United States of America. Table 4.3 breaks down the countries where the participants in the study reside. All these demographics very closely match similar information about the entire SL population disseminated by Linden Lab, except that 50% of our respondents were from the U.S., which is higher than the U.S. percentage in the underlying population of residents, which was 31.2% in early 2008, when we conducted our survey. This likely arose because our survey was conducted in English. We note that the sample demographics of people that answered Survey A and Survey B were very similar.

In studying the differences between the behaviors of consumers in SL as opposed to how they behave in real life, it is important to consider how they learn and process information. Many of the participants in the study agreed that they learn best through interacting with people, experiencing and doing things. These factors were felt, on average, to be slightly more important than learning through reading, seeing, and hearing. This is not a surprising result: those who participate in the SL environment are able to interact (visually, as well as through chat and instant messaging) with others and are allowed to be experiential within SL. We also used the classic four-pronged model of learning styles presented by Kolb in [57,58] to develop other questions. The four types of learning in that model – concrete experience, reflective observation, abstract conceptualization, and active experimentation – were presented in the survey with specific examples falling into these categories. We found that concrete experience and active experimentation are the more common learning styles for the SL participants surveyed.

4.2.2. Emerging themes

We now describe four key themes that emerged from our surveys. These themes include possible brand crossovers from Second Life to real life; user consumption behavior; avatar appearance and behavior in comparison with real-life; and use of the technology.¹

4.2.2.1. Theme 1: Brand crossovers from virtual worlds to real-life. One perspective that was explored was with regards to business applications inside SL. A consistent theme was pulled from the results of Survey A: there is a strong opportunity for real-world brands to establish a virtual presence, which, in turn, could strengthen their real-world brands. However, we see that, to date, there are few real-world brands with products available for purchase in SL. Fig. 4.3 shows evidence of potential crossover effects from SL to the real world. In particular, real-life brands that establish a virtual presence are more likely to be

Table 4.3
Countries of origin of our sample.

United States	50%	China	3%
Netherlands	9%	Canada	2%
Great Britain	7%	Belgium	2%
Philippines	4%	Germany	2%
Malaysia	4%	All Others	8%
Italy	3%	No Response	6%

remembered in the real world. (Note that a “–7” in the figures below represent a subject’s non-response for that particular question.) A related question indicates that if subjects are satisfied with their experience in a store in SL, they will be more likely to shop at the associated store in the real world. These preliminary results indicate that, if done correctly, real-world organizations could enhance their brand image or create higher levels of brand recognition by establishing a strong virtual presence in 3D environments such as SL.

Fig. 4.4 shows, however, that while 48% of the participants in the study visit six or more stores per month, in general, the majority of stores visited in SL do not have real-world counterparts (59% of participants visited no stores run by real life companies). In the same vein, Fig. 4.5 shows that 57% of participants had purchased a product within SL, but only 6% had purchased a product in real life as a result of having seen it in SL or other virtual worlds. Thus, the potential for taking advantage of potential crossovers between SL and real life does not appear to have yet been fully realized.

4.2.2.2. Theme 2: User consumption behavior. A second emerging theme we see in the results of the surveys relates to people’s activities in SL. We found that, in general, participants in Survey A were more likely to spend time and/or money on their avatar’s appearance or on acquiring/buying virtual objects than they were on what we could call more “productive” activities such as developing real estate (see Fig. 4.6), building, or writing code.

Survey B shows a similar finding illustrating that many participants do not own land (85%), build structures (70%), make furniture or other objects (70%), make art (80%), make or post music (85%), or have employment in SL (82%). We did find, however, in open ended questions, that some people indicate that they “camp out” at in-world stations that pay Linden Dollars for merely standing there or dancing. While a considerable number of participants do not purchase Linden Dollars at all, a small number of the participants in both Surveys A and B have purchased thousands, and even tens of thousands of Linden Dollars. However, the majority of participants spent little to nothing on the purchase of Linden dollars.

Thus, across results from both surveys, we found evidence for a clear divide between people who spend real-life money in order to acquire Linden Dollars to purchase in-world products, and people who don’t (or who spend very little). Despite its origins as a place for collaborative software development, most people participate for social reasons. And when they engage in the use of Linden Dollars to buy things, it tends to be for their appearance (as indicated in Fig. 4.6) or items that enhance their in-world social experience. A minority of people are in SL primarily for business purposes. (We will see further support for these last two points in the discussion that accompanies Figs. 4.11 and 4.12 below.)

4.2.2.3. Theme 3: Avatar appearance and behavior in comparison to real-life. A third emerging theme can be seen in the results from Survey A concerns the relationship between participants’ avatars’ appearance (and behavior) and their real-world appearance (and behavior). This may seem like a superficial issue to those not actively engaged in virtual worlds. We believe, however, that participants soon learn that avatar appearance influences how residents interact with each other, and that it is critical for residents to learn to interpret one another’s appearance, and what this signals for motivations, intentions, and

¹ Our surveys contained other questions beyond what is described above concerning which space limitations preclude reporting. We focus on the most interesting general results above. Survey A addressed behavioral crossovers between SL and real life (RL) concerning preferences for products, shopping places, activities, types of people, groups to join, and whether satisfaction with a virtual activity or product translates to increases in real brand preference; it also asks the types and number of actual purchase made and places visited in SL, allocation of time and money in SL, avatar characteristics, similarity of ones’ avatar and the associated real person, comparison of behavioral traits between SL and RL (such as extrovertedness); factors that lead people to identify with their avatars; and demographics. Survey B focuses on the importance of various technological features of SL to residents’ 3D web experience; which commercial services are viewed as potentially most successful in SL; the importance of various cultural and humanities activities; determinants of places people visit; activities in SL (owning, building, making things, employment, etc.), the relative importance in SL and RL of various activities; and demographics. For a more detailed enumeration of our survey results, see <http://www.business.ualberta.ca/pmessaging/>.

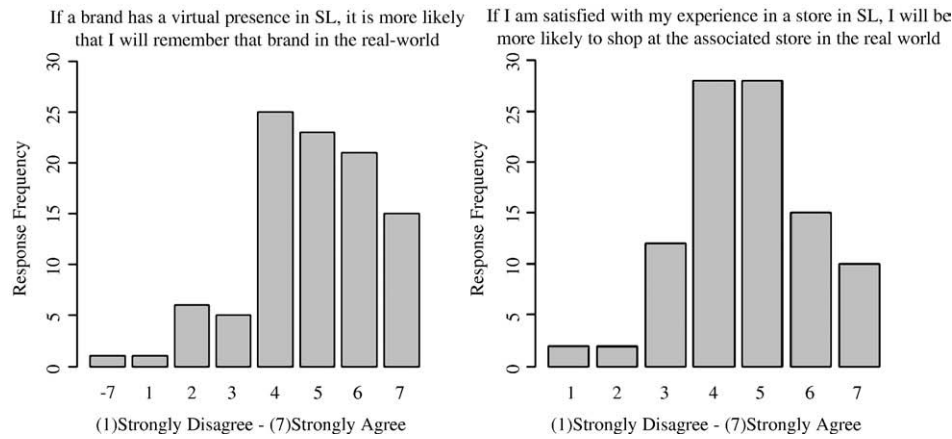


Fig. 4.3. Evidence of potential crossover effects.

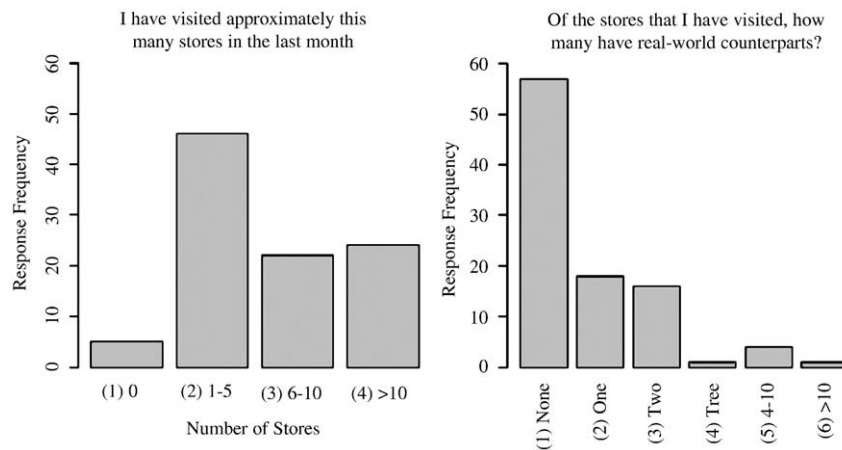


Fig. 4.4. Residents visit stores that lack real-world counterparts.

even age. Indeed, since appearance is the first thing that people see of one another in virtual worlds, an important practical issue for participants (and a future research topic) is understanding how the filter of "appearance" works differently in virtual worlds than in the real world. A related important issue concerns whether people behave differently (e.g., with fewer inhibitions) in virtual worlds.

Fig. 4.7 shows that, while people indicated that their avatar's appearance tends to be similar to their real-world appearance, they also indicated that they embellish and improve upon certain of their real features. In particular, participants responded that they tend to make their avatar's body, hair-style, and clothing somewhat more attractive than those related attributes of their real self. It was also

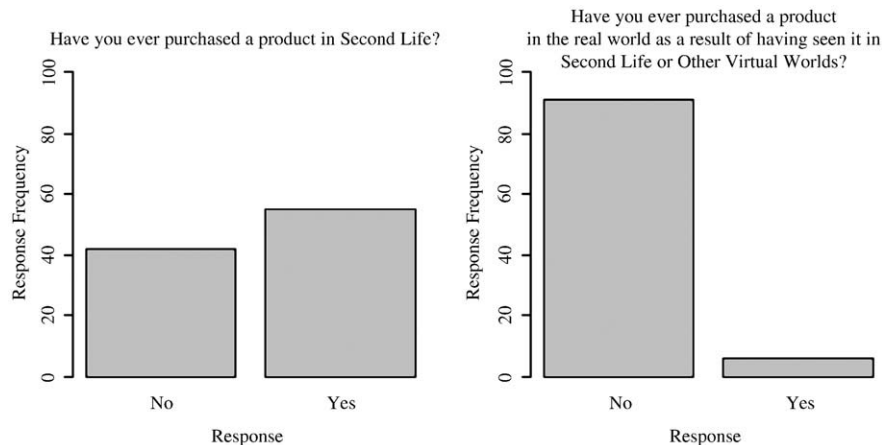


Fig. 4.5. Residents purchase SL products, but not real-world counterparts.

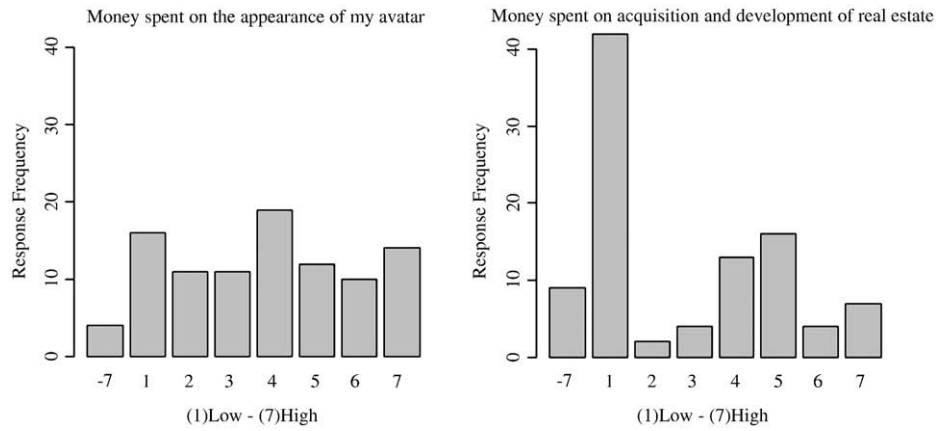


Fig. 4.6. Residents spend more on avatar appearance than on real estate.

reported that participants were more likely to craft their avatar with a younger appearance (as opposed to older), less weight (as opposed to more), and taller (rather than shorter). Most participants said their avatar consisted of a mix of similar and unrecognizable features of their real-life appearance. Participants were almost equally split between responding that their avatar was recognizable or unrecognizable as their real self. Very few participants crafted their avatar's appearance very close to, or completely different from, their real life appearance.

And if appearance is somewhat different in virtual worlds, perhaps behavior is also different. Concerning behavior, Fig. 4.8 shows that

respondents report being somewhat more extroverted, outgoing, superficial, and risk-taking in SL than they are in the real world.

4.2.2.4. Theme 4: Use of the technology. Lastly, questions regarding the use of the technology yielded some interesting results. Survey A participants reported an average SL session length of approximately 3–4 h, and the total number of hours spent in SL was on average, higher than the hours they spent watching movies, television, or playing video games. Fig. 4.9 indicates that many also agreed that SL is a substitute for the aforementioned forms of entertainment. In Survey

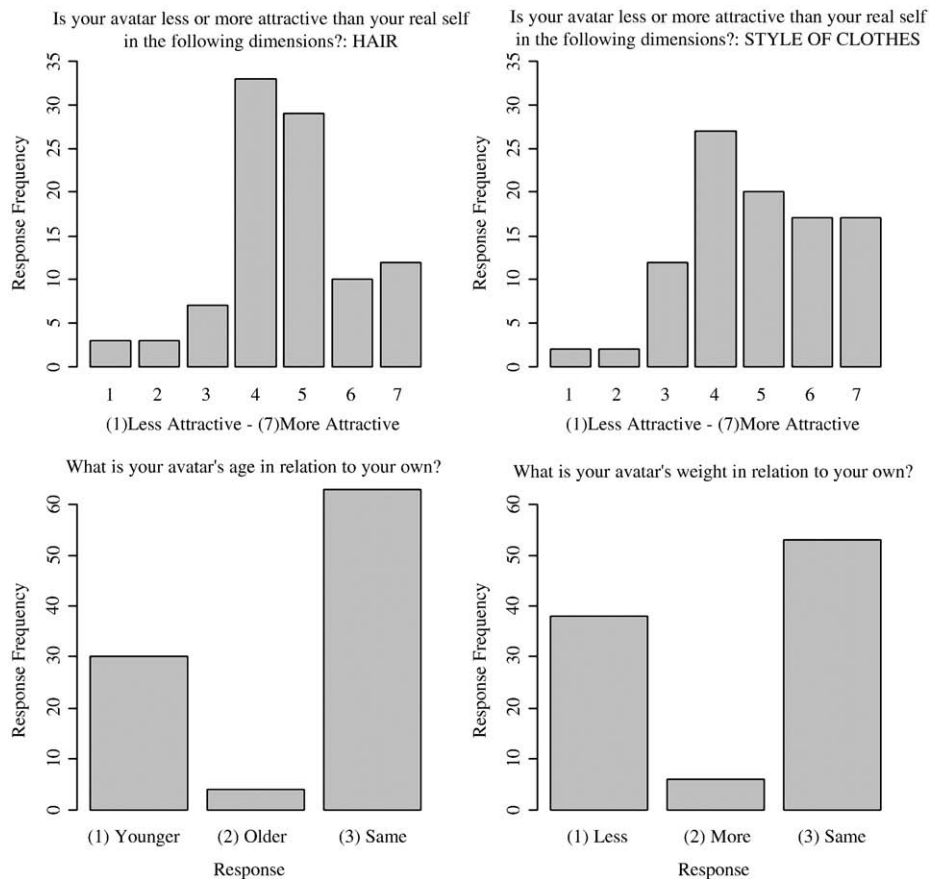


Fig. 4.7. Avatars are somewhat more attractive than real selves – but still similar.

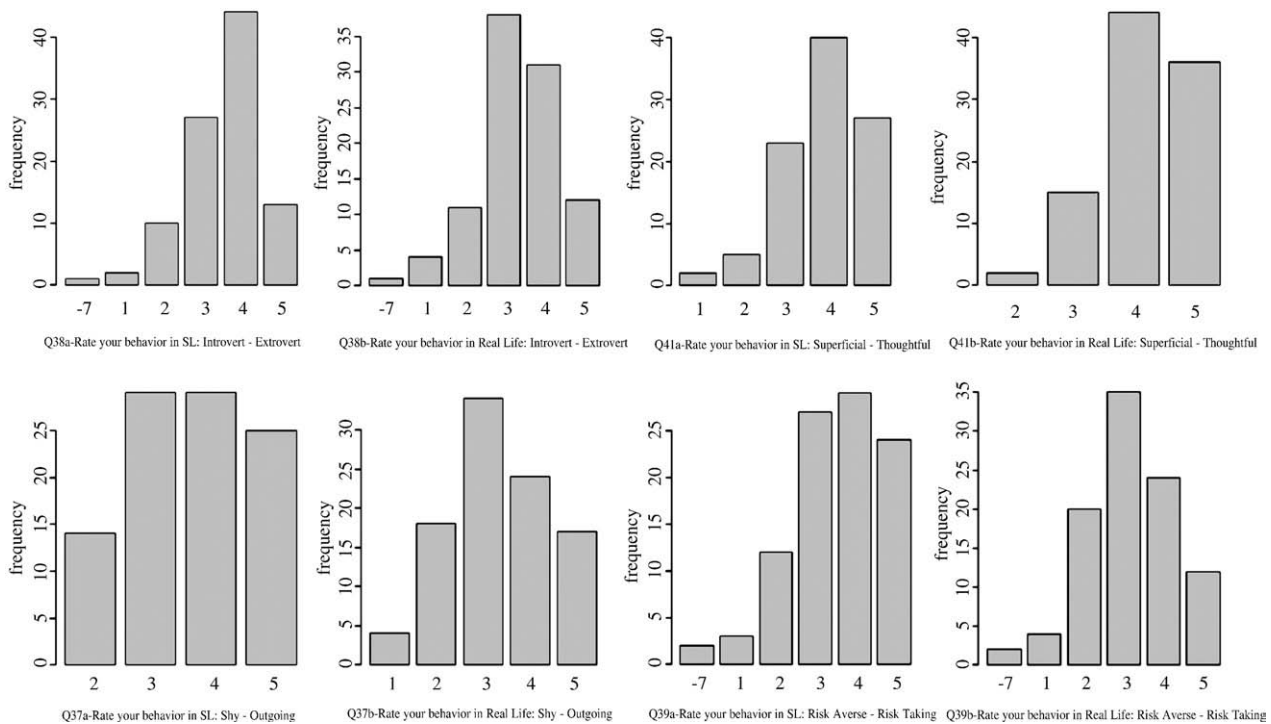


Fig. 4.8. People are more extroverted, outgoing, superficial, and risk-taking in SL.

A, there were very few participants who maintained avatars in other virtual environments (approximately 11%). Similarly, over 70% of participants do not participate in other forms of online social networking like Facebook or MySpace.

Participants in Survey A rated the importance of various possible reasons for participating in SL. Reasons often cited to be important were the following: to meet friends (see Fig. 4.10), to learn about the world and other countries, to experiment with things they could not do in the real world, to see beautiful places, and to participate anonymously in a social environment. At the same time, reasons cited to be unimportant included the following: romance, immobility in real life, loneliness, and to meet a partner in the real world (see Fig. 4.10).

Similarly in Survey B (see Fig. 4.11), participants generally felt that it is more important to take classes, attend lectures and conferences, hold professional meetings, meet potential partners, date, and have sexual relations in *real life* than it is in to take part in those activities in SL. Alternatively, participants placed a slightly higher level of importance on being able in SL to step out from one's normal real-

life behavior and explore behaviors that are considered socially unacceptable in real life.

With regards to services offered in SL, Participants in Survey B were likely to *agree* that the following commercial services could be successfully provided in SL: online education (see Fig. 4.12), entertainment, gaming, dating (matchmaking), and debating. These are services that have been offered online for some time now, and thus it seems likely that those participants are already comfortable with idea of these commercial services over the Internet. At the same time, participants were likely to *disagree* that the following commercial services could be successfully provided in SL: medical advice, lawyer services, government services, and tax preparation (see Fig. 4.12). It could very well be that the sensitivity of private information is a key driver in their preferences away from certain online services. Many people are still wary about the protection of their private information online.

Overall, the data from our explorative case study suggest that there exists much potential for business applications in virtual worlds; and

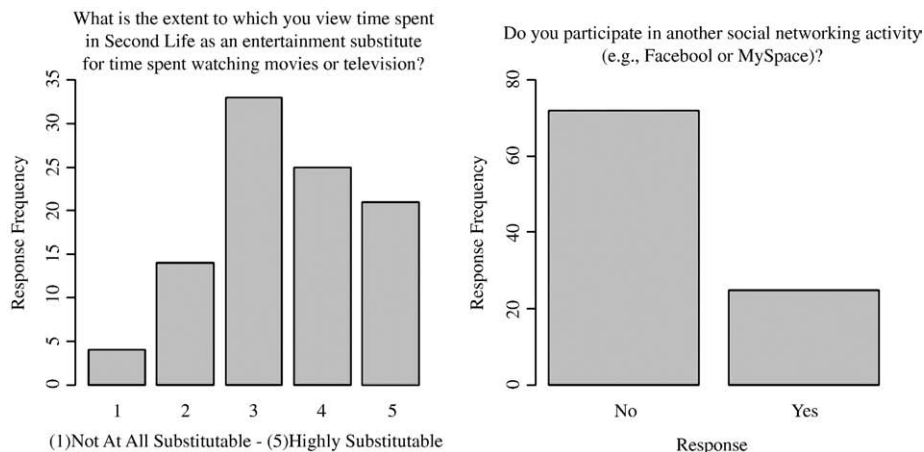


Fig. 4.9. Residents view SL as substitute for movies and TV.

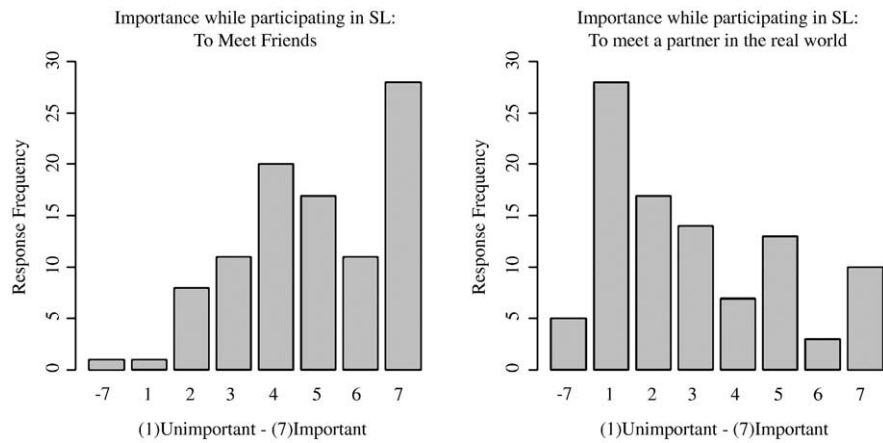


Fig. 4.10. Meeting friends is more important to residents than meeting partners.

even if most people engage in SL for social reasons, they still interact with the businesses there. The data also suggest limitations for certain types of business. Equally interesting, virtual worlds also influence the behavior of people and the functioning of social systems in the environment.

To recap, we have, thus, traced virtual worlds to their roots in gaming and social networking, we provided an overview of some important extant worlds (organized according to our adapted typology), and we provided an in-depth view of the key world, Second Life. A logical next question is, “what’s next?” What are the implications of virtual worlds for society generally? Frankly, we don’t completely know. But we do know that research in numerous fields is

required for an answer, and such research is in progress. In the next section, we describe some of this research.

5. Research about social computing in virtual worlds

Research about virtual worlds began in computing science, engineering, and other applied technological sciences with a focus on the creation and enhancement of virtual 3D environments. Soon thereafter, potential applications in business and education became apparent to practitioners and academics. This work tended to involve normative issues, either (1) identifying potential applications of virtual worlds to improve social welfare, or (2) considering ways to

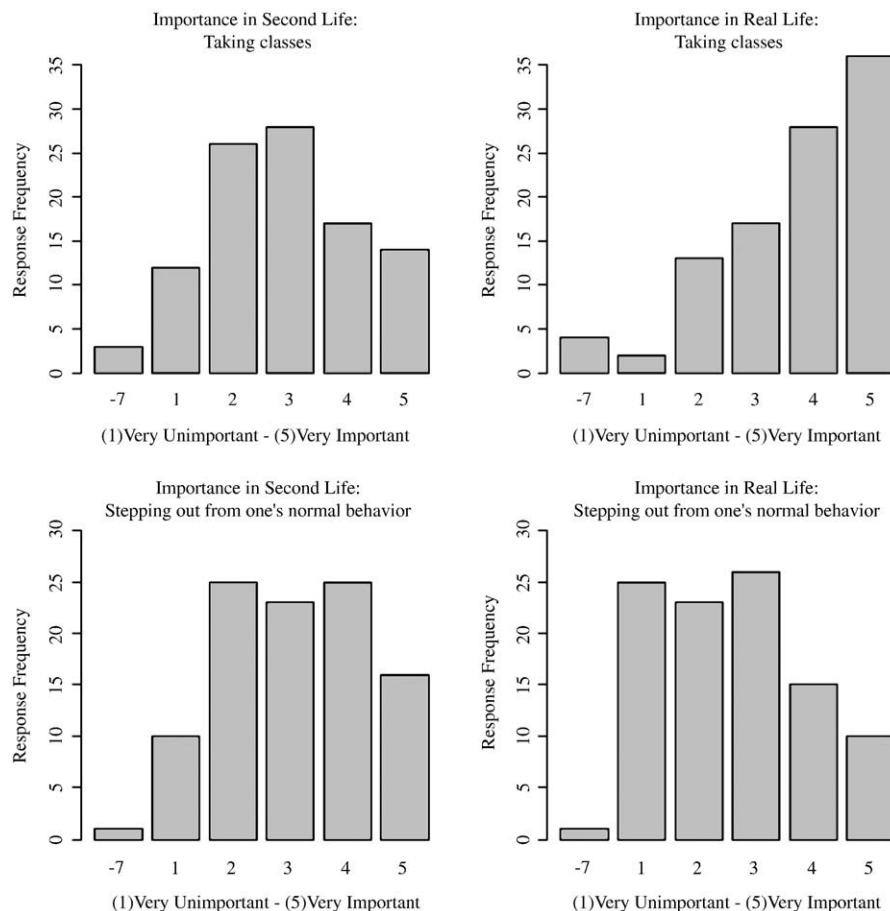


Fig. 4.11. For most residents, taking classes is more suited to the real world and “stepping out” from normal behavior is more suited to SL.

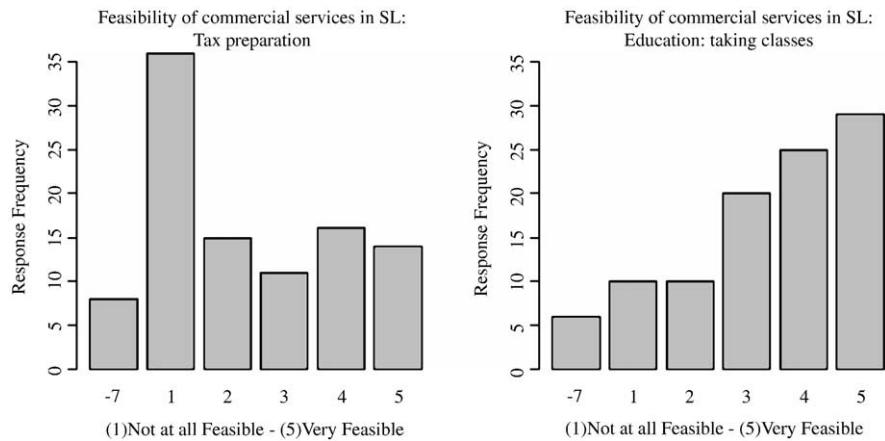


Fig. 4.12. For most residents, educational services are more feasible than tax preparation.

address challenges that may impede attaining this potential. Somewhat later, as larger social, economic, aesthetic, legal, and ethical issues surfaced, scholars began considering topics in social sciences and humanities. This work mostly concerns positive lines of inquiry, addressing either (1) how individuals actually behave in virtual worlds – in comparison with the real world – and/or (2) how social systems function in virtual worlds. Because of the novelty of the subject, much of this work is still in a formative phase – generally not yet definitive enough to reach top journals. For a discussion of some open research topics, see [5] or [43] where applicable social science methodologies are summarized. In this section, for tractability, we focus on business disciplines. We also summarize in tabular fashion important questions in education, social sciences, and humanities.

5.1. Research in business

Important virtual worlds research questions arise in the areas of business strategy, market research, advertising, general marketing, retailing and services, organizational management, management information systems, and organizational collaboration (see Table 5.1). These areas use virtual worlds as a place to do business efficaciously in new ways.

5.1.1. Strategy–business models

A fundamental issue for companies that manage virtual worlds is determining the most suitable business model. The importance of this issue is signaled by the term “business model” constituting the fifth element of Porter’s typology [86]. Common models involve revenue generation through purchase price or registration fees, fee per use, subscriptions, advertising, pay-as-you-go extras, and sale of ancillary products.

The electronic gaming industry, in particular, has been grappling with the issue of revenue generation and several large players are shifting their business models from a single up-front fixed fee to advertising and pay-as-you-go extras. For example, video-game giant Electronic Arts has decided to use a business model based solely on advertising and pay-as-you-go extras for their new game *Battlefield Heroes*. This is the first time a company has released a mainstream video game title for free in North America [85]. The product release will be supported by advertising that will appear onscreen between game levels and in on-line forums related to the game, and a small fee (between \$2 and \$5) for upgrades in weapons and armor.

Such new business models reflect the reality of a slip in sales of games for PCs because of piracy and free “casual games” available on-line and gamers’ preferences for pay-as-you-go fee structures rather than once-and-for-all payments. The former trend is reflected in our

earlier summary of virtual worlds (Section 3) many of which are available for free and often supported by advertising, extras, subscriptions, and sales of real ancillary products. The latter trend is reflected in a survey in which 90% of 1500 gamers indicated they would be willing to watch advertisements before or after playing a game, or during breaks in play, if they could play the game for free (the survey was done by RealNetworks, which operates the popular on-line gaming website RealGames). Yet despite the importance of the topic, surprisingly little research has been done on business models for electronic gaming and virtual worlds, although there have been studies on the development of business models for older technologies such as radio [63].

5.1.2. Market research

An important commercial application of virtual worlds involves market research because of the easy access to large populations of consumers ready to be queried, analyzed, and understood. Much market research is already ongoing, including the following:

- (1) “The First Opinions Panel in Second Life” is a sample of consumers being tracked periodically by a market research firm to monitor common behaviors and attitudes of SL residents.
- (2) There also exist several market-test services for product prototypes and focus-groups services designed to learn how SL residents respond to brands, products, and services [103].
- (3) A number of websites offer a menu of surveys for SL residents which offer Linden Dollars in exchange for each completed survey. Two large websites of this type are www.gameATM.com, a privately run site, and www.MyLindens.com, an official site of Linden Lab promoted on Money Island in SL.
- (4) Some SL businesses provide free virtual products or allow residents to modify virtual products and provide feedback to the company. For example, SL residents can go to the virtual Toyota dealership, buy a virtual Toyota for 300 Linden Dollars (just over US\$1), show it off to their avatar friends, customize it, and provide aesthetic feedback to “real life” Toyota engineers and designers.

A practical set of questions revolves around determining the most efficient mechanisms to use to adapt market research techniques to virtual worlds. We provide a preliminary list of market research issues and how these translate to virtual worlds in Table 5.2.

A key open question concerns the extent to which consumers provide accurate information in virtual worlds about their behaviors in the real world. As preliminary evidence, we did find in our survey of SL residents, that most respondents indicated that market research information collected from them in SL would be meaningful about their real world behaviors and attitudes.

Table 5.1

Research in business and education.

Field	Research questions	References
Strategy	Will VWs* support themselves with a single up-front fee, periodic subscription payments, advertising, pay-as-you-go extras, or sales of ancillary products?	[63,86]
Market Research	How can VWs be used as an environment in which to do market research or for test markets?	[27,42]
Advertising	What is the best way to communicate with consumers in online environments? How do established research findings transfer? For media placement, what are the demographics, psychographics, geographic characteristics, membership sizes, and participation levels of various virtual worlds?	[9,24]
Marketing Management	Product: What product attributes can be experienced virtually? Pricing: For what virtual services and products are people price sensitive? Measure how many such coupons are redeemed and the demographics of the customers who redeem them.	[42,67]
Retailing and eCommerce	How does in-world retailing and service delivery differ from real-world retailing and service delivery? How should an avatar sales agent's appearance be designed? What are the cross-over effects between in-world and real world retailing and service delivery?	[40,48,55]
Management Information Systems and Service Delivery	How can VWs be used for virtual customer relationship management? What new services can be offered in VW environments?	[36,53]
Organizational Issues	How can VWs be used for videoconferences? Can virtual workspaces (office or cross-functional product groups) improve productivity? Can VWs be used for corporate training?	[26,29,74,81]
Industrial Engineering	How can VWs be used to facilitate collaborative design? How is design behavior facilitated or hindered in VWs? Can collaborative design extend beyond new products and industrial processes to arts and fashion?	[23,29,70, 87,89,90]

*VW = Virtual Worlds.

5.1.3. Advertising

Another clear business application of virtual worlds is advertising and communications. Virtual worlds host large populations of consumers who can be targeted with commercial messages and other activities to build brand loyalty. Since virtual worlds compete with television and movies for consumer entertainment time, virtual worlds (and electronic games) may be another relevant medium to include in standard advertising campaigns. Many companies in several industries have scrambled to find ways to utilize the SL platform to connect with customers. A list of 126 prominent real life brands in SL as of August 31, 2007 is provided in [9]. We present a subset of these brands in Fig. 5.1 (for a more extensive list, see Table 4.1).

Examples of brands with substantial virtual presence in SL include IBM (with more than one island), Mercedes, Pontiac, and Nissan in the auto sector, BMG in the media sector, Dell (with an island) in the electronics sector, and PA Consulting in management consulting. Related screenshots are shown in Fig. 5.2.

One should not overstate the current size of any single virtual world as an advertising market, however. For example, SL, if promoted properly, can reach a number of customers equivalent to a midsized to large city. One possible advantage of virtual worlds is that they are populated by a narrow and targetable demographic in terms of age and technology acceptance.

Another consideration is the international composition of most virtual worlds, which has both positive and negative implications for targeted advertising and selection of media. The reach is potentially global, but geographic targeting is much less possible than for such media as newspapers, radio, or local television. Thematic targeting to consumers of particular lifestyles, however, is quite feasible, by focusing on particular themed virtual worlds or electronic games. A basic challenge for advertising agencies engaged in media placement will be to become acquainted with the demographic, psychographic, and geographic characteristics, as well as the membership sizes and participation levels, of the various virtual worlds and electronic games.

It is also worth acknowledging the impact of commercial activities in virtual worlds on brand image in the real world such as the real world publicity generated by opening a new store in SL or by other forms of publicity within SL. For example, there have been articles about SL in many high circulation newspapers and magazines, including the cover of Business Week, the front page of the New York Times technology section, Time, Readers Digest, Financial Times, and Wired Magazine, as well as other media including MSNBC. An estimate of the number of real-world impressions that were made possible by virtue of firms opening outlets in SL is summarized in Fig. 5.3.

An interesting commercial opportunity that has gone relatively unnoticed is reverse placement or the commercial translation of

Table 5.2

Market research issues in virtual worlds.

Techniques	Standard methods	2D internet	Virtual worlds
Focus groups	In conference or living rooms; low cost	Online conferences with audio and video links	Avatar conferences in-world with audio and video links, including 3D demos
Mail surveys	Standard mail. Low cost/low response	By email and cell phone	Email and instant messaging
Phone services	Medium cost/medium response	Can use VOIP	Includes voice
Intercept surveys	High cost/high response	Banner links at other sites	In world intercept; choice of location critical
Hybrid surveys	Various costs	Mail recruiting, interactive web recording	Recruiting by email, IM, or intercept
Pre-market forecasting	Lab and follow-up surveys to determine trial and repeat	Web site can be used for follow-up	In-world lab very feasible
Test markets	Very expensive	N.A.	In-world roll-out
Sampling method	Various approaches for representative and convenience samples	Self-selection bias may be present; recruit via email	Can sample by avatar name, interest group, demographic, or location (intercept)

Adidas, Amazon, AMD, AOL, Bain & Company, Bantam Dell Books, BBC Radio 2, Best Buy Co. Inc, BMD, Calvin Klein, Circuit City, Cisco, CNET, Coca-Cola, Coldwell Banker, Comcast, Crayon, Daily Telegraph, Dell, Fiat, H&R Block, Heineken, IBM, ING, Intel, Leo Burnett, Major League Baseball, Mazda Europe, Mercedes Benz, Microsoft, MTV, NBA, NBC, Nissan, Phillips, Playboy, Pontiac/GM, Random House/Bantam, Reebok, Renault, Reuters, Sears, Sony, Sprint, Starwood-Loft Hotels, Sun Microsystems, Talis, Thompson NETg, Toyota, Visa Europe, Warner Bros Music, Wired Magazine, Xerox, and Yankee Stadium

Fig. 5.1. Prominent brands in second life (also see [9]).

fictional brands or products from virtual worlds into the real world as suggested in [27]. There are a few examples of such activities in SL, one being the Aloft brand of Starwood Hotels and Resorts, which was released in SL just before it was launched in the real world [106].

Researchers still know very little about the best way to talk to consumers in online environments or how well-established research findings transfer to virtual worlds and electronic games. Recognition of the importance of this issue, however, is shown by the theme of an advertising conference in May 2008 (*27th Annual Advertising and Consumer Psychology Conference*) which was “Virtual Social Identity and Consumer Behavior.”

5.1.4. Marketing management

Not only are virtual worlds useful for market research, but they can also be viewed as entirely new markets in which to do business [41,43]. There are at least two important questions that arise in this context: (a) How should virtual services be marketed, in general? And (b) how does marketing virtual services differ from marketing real-world products? These questions involve rethinking various questions concerning all elements of the marketing mix: product, price, promotion, and place. Table 5.3 presents questions and issues for each of these marketing elements. A key issue concerns how consumer behavior and product acceptance differ in-world from the real world. We believe that virtual products and services should be such that they enhance the resident's experience in-world, but this opinion should be scrutinized objectively. A related question is whether consumer behavior in-world influences real-world behavior.

5.1.5. Retailing and eCommerce

Stores have been demonstrated to be viable in virtual worlds such as SL (Fig. 5.4 shows a typical shopping mall and a freestanding store). Two questions immediately arise: (1) How should delivery of retailing and services differ in virtual worlds, in the bricks and mortar world, and on the Internet? And (2) are virtual worlds scalable to become a future 3D platform for eCommerce? We elaborate on these questions by comparing bricks and mortar stores, the Internet, and virtual worlds on several retailing dimensions in Table 5.4.

To manage retailing in virtual worlds, the questions we raise in the right-most column of Table 5.4 will need to be addressed. One particularly important issue for retailing in virtual worlds arises from

recognizing that avatar sales agents can provide personalized service. Two papers discuss the effectiveness of using avatar sales agents [40,48]. In [48], it is argued that an avatar can anthropomorphize a Web-based interaction and make the shopping experience more personal. A similar conclusion is reached in [40], after conducting an online experiment with 2,223 participants to investigate the potential of human-like virtual sales avatars to increase consumer trust in electronic commerce. Both studies suggest that it is desirable for avatar sales agents in eCommerce to be likeable and credible.

An important question concerning avatar sales agents involves how the sales avatars should look. There is evidence [48] that moderately involved shoppers were more persuaded by attractive-looking avatars, and highly involved shoppers were more persuaded by somewhat more expert-looking avatars. Attractive avatars were persuasive for moderately involved shoppers because of the avatars' likeability, whereas expert avatars were persuasive for highly involved shoppers because of their credibility.

Another set of very important issues involves possible cross-over effects between in-world and real-world retailing and service delivery: (1) To what extent would satisfaction with in-world retailing or services help increase traffic to a company's real-world retailing and service activities? (2) Concerning promotions, would distribution of coupons in-world that are redeemable in real stores, or similar offers, translate to successful generation of real-world store traffic? Our case study of SL in the previous section provides some evidence for affirmative answers to these two questions. And, if this is true, several further questions arise: (3) What demographic of people should be targeted with such retail promotions? (4) What kinds of people will appreciate in-world retailing? And finally, (5) What kinds of products and services are amenable to in-world retailing?

As more firms offer retailing and services in virtual worlds, the questions of this section will become increasingly important. Many of these questions will also become important, generally, if we see an evolution towards a 3D Internet based on virtual worlds.

5.1.6. Management information systems and service delivery

Building on the retailing discussion, virtual worlds provide a space for an ongoing interface between customers and service personnel engaged in the service-delivery process. A discussion is presented in [53] regarding how a firm can extend the range of a company's



Fig. 5.2. Corporate locations.

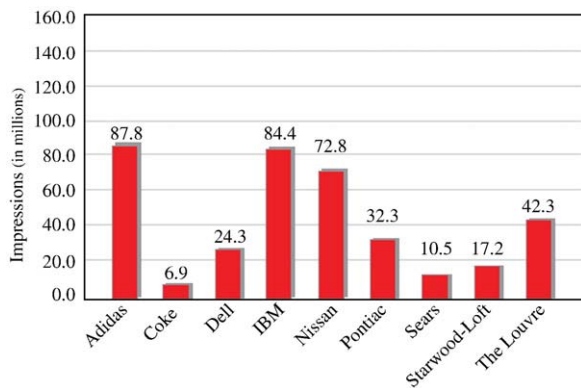


Fig. 5.3. Impressions after appearing in Second Life*. * Total impressions after appearing in SL means mentions of SL in relation to the Company Name multiplied by total impressions for that medium (includes online, print, and broadcast), January–May 2007. Source: [24].

enterprise resources to deliver services in the virtual worlds and should consider the kinds of services that are suitable for delivery in virtual worlds. In particular, this makes virtual worlds an attractive medium for pursuing customer relationship management. A roadmap for companies that want to leverage virtual worlds for virtual customer relationship management (vCRM) is provided in [36]. In addition, virtual worlds provide a way to share information within a company, by making service offices available within the company.

5.1.7. Organizational and collaboration issues

Virtual worlds can influence how and where work gets done. The organization of the future can bring people together virtually using several technology enablers present in these worlds: (a) shared voice, similar to telephone; (b) shared visuals of avatars, similar to video conferencing; (c) shared active databases; (d) shared computer aided design systems such that designers from around the world can collaborate on design projects in-world; (e) shared photos, music, and video; and, generally, (f) shared repositories of digital files (similar to wikis), shared folders on an Intranet, and shared space on social computing sites such as Facebook or MySpace.

These enablers make possible the use of virtual worlds to support remote collaborative activities. Members of distributed teams can teleport their avatars for meetings anywhere in a virtual world. An example of such a virtual meeting is shown in Fig. 5.5 (from [29]).

Table 5.5 presents ways in which virtual worlds can support organizational and collaborative activities. One can imagine a variety

of types of collaborations in a multitude of domains. Applications also exist in the medical sciences, as a platform for collaborative research, and for consulting or counseling in various fields.

Utilization of virtual worlds in these ways raises some additional questions. Would the use of remote team collaboration represent a disruptive innovation for organizations or would it add to existing inter-firm communication systems? How well do people function in virtual teams? How can virtual world technology support sophisticated design systems?

5.2. Research in education, social sciences, and humanities

In addition to the opportunities and issues that virtual worlds bring to the business arena, virtual worlds raise myriad research issues for education, social sciences, and humanities. For reference purposes, we summarize relevant questions and past research in Table 5.6. Many of these questions remain open. Highlights briefly follow.

5.2.1. Education

Virtual worlds can overcome many of the limitations of Internet and television-based distance learning [18,66]. Virtual education can include synchronous face-to-face interaction, group interaction, voice communication, examination of 3D models, and projection of visual information in a PowerPoint window. Over 150 universities have a presence in SL, and some of them already use SL for classes and tutorials [38]. Library science also sees great potential to link real-world researchers within these virtual worlds without geographic boundaries and to attract the current generation of young people to use library services more readily [32,102].

5.2.2. Social sciences

Since repeated virtual interaction of many people creates culture, a basic sociological research question asks whether the norms and standards of social behavior (in such areas as etiquette, cheating, gift-giving, and modesty) in virtual worlds are different from those in the physical world. From the perspective of psychology, virtual worlds are characterized by anonymity, distinctive rewards, punishments, modes of learning, and potentialities, and, consequently, a key question is whether people's behaviors, motivations, and personality traits in virtual worlds differ from those in the real world. From the perspective of political science, as avatar-based interest-group communities grow, questions arise concerning suitable distance governance of such groups or communities. Closely linked with political issues are economic, legal, and regulator issues. About half of virtual worlds permit user-generated content, more than half have an in-world currency system, and, thus, virtual worlds provide environments

Table 5.3

Issues concerning marketing elements in virtual worlds.

Marketing element	Issues
Product	In [67], the authors examine which product attributes can be experienced virtually with the current technologies by applying the theories of cognitive fit and media richness. The paper also points out that these product attributes and their moderating effects on the relationships between virtual reality and product knowledge, attitude and purchase intention should be studied further so that companies can make decisions on the investment in their presence in virtual worlds and the marketing strategies most appropriate for their products (possibly including co-creation and collaboration with consumers). For example, Calvin Klein is launching a fragrance in SL, CK In2U, despite the fact that a virtual world is a scentless environment. The question here is: what products or services are suitable for virtual worlds?
Pricing	A key issue regarding pricing concerns whether people respond to Linden Dollar prices exactly as predicted by economic theory based on the exchange rate between Linden Dollars and real dollars. We found, for instance, that subject fees in Linden dollars were very powerful in eliciting responses. That is, a \$150 incentive was often considered to be attractive for many residents, even though this translates to only about 60 cents U.S.
Promotions	In [9], the concept of advertising in virtual worlds, such as SL, is introduced and an agenda is created for future experimental research in this exceptionally new domain. Noticing that not all product attributes can be experienced virtually, it is pointed out in [42] that companies should think about the difference between targeting avatars and targeting their creators. The questions here concern (a) how advertising and promotions in-world differ from advertising and promotions in the real world, and (b) what possibilities exist for cross-selling between virtual worlds and the real world.
Place	Virtual worlds can be thought of as new channels of distribution – new forms of 3D eCommerce. People can go to these worlds to remotely conduct their real business. This could involve shopping at SL sites for Sears or Circuit City and touching objects in order to “tunnel” to the associated eCommerce sites to shop for and buy real merchandise. It could also involve a Swedish citizen abroad going to the in-world Swedish embassy to take care of business such as updating a passport.



Fig. 5.4. Two retailing environments in SL.

where people can create and sell property, make or lose money, and interact with each other and with organizations in rich and seemingly real ways. Important questions thus arise about the currency system in virtual worlds, the measure of the Gross Domestic Product of each virtual world, and the contribution of virtual production to real Gross Domestic Product in the U.S. and other countries. Academics and professionals are also starting to explore related legal issues such as the property rights in virtual worlds, taxation, and the interplay between real and virtual laws and regulations (i.e., is creation and making available applicable types of digital content in virtual worlds classified as “broadcasting” for the purpose of Canadian broadcasting regulations).

5.2.3. Humanities

As is immediately apparent to visitors, virtual worlds provide scope for the development of arts and humanities. Although residents come from diverse international origins, values, and cultures, the energy and creative efforts of virtual residents in the arts and humanities seems to take on a life all its own. Casual observation suggests that much initial activity centers on virtual recreation of real masterpieces (both in art and architecture). In addition, famous plays (i.e., Hamlet) and live concerts have been performed in SL [30]. Virtual worlds also constitute a useful forum to disseminate and evaluate architectural prototypes to diverse groups before building real scale models (which may be examinable in only one place), and certainly before building the real thing. But, perhaps most significantly, virtual worlds provide a place for creation and international exhibition of new forms of digital arts, architecture, and other digital content.

5.2.4. Sexuality

Sexual exploration and interaction exists in a number of virtual worlds, including Second Life. The “jury is still out” on the question of how and why sexuality is expressed virtually [49] and whether in-world sexual practices change people’s real world sexual practices and values. There is also debate about whether a virtual sexual relationship constitutes infidelity: on the one hand, there is no real physical or visual contact, but on the other hand, consent, communication, and shared virtual experiences are present. In any case, the press has reported real divorces stemming from virtual infidelity.

6. Conclusion

This paper examines the past, present, and possible future of virtual worlds. First, this paper traces the history of electronic gaming and social networking websites, as antecedents of virtual worlds. These antecedents account for a progression of socio-technical innovations that gave rise to virtual worlds. Second, this paper describes the state of virtual worlds in aggregate by canvassing several important virtual worlds, organized according to a proposed five-element taxonomy. Third, the paper provides a description of Second Life, the most prominent open virtual world, covering the history, social milieu for participants, and business ecosystem. Fourth, the paper conducts two surveys to ascertain residents’ perceptions of and behavior in Second Life. Fifth, with an eye towards the future, the paper provides an in-depth summary of past research and future needed research in several business disciplines. Last, the paper provides a cursory summary of key

Table 5.4
eCommerce issues in virtual worlds (VWs).

Retailing dimension	Traditional retailing decisions	2D eCommerce	3D eCommerce
Assortment	Choose which categories and brands to offer	Specialty assortment more possible; may augment in-store presence	How can dynamic visualization technologies help consumers navigate through large assortments?
Store location	Plan site near customers’ homes and work, traffic flows, and destination points	Manage traffic with links, banners, and high rankings on search engines such as Google	In which VWs should a firm choose to sell? Which in-world locations work best? How can store traffic be generated in-world?
Layout	Organize assortment by category, vendor, price-points, or usage occasion to facilitate consumers’ decision making	Layout type may be selected or customized by user; site-specific recommendation systems help customers locate merchandise	Should layout be fixed or customizable when shopping? How will recommendation systems be used?
Shopping experience	Manage aesthetics, logistics, and customer flow	Use accepted principles of web-design and graphics arts	Is it better to have avatars shop in the presence of other avatars or dedicate environments solely to one avatar at a time?
Service	Manage human and in-store automated points of contact	Manage web-based points of contact	How should avatar sales agents and web-based links be managed?
Pricing	Choose pricing (often static and uniform)	Customized pricing possible	Should customized pricing be used?
Buying and logistics	Use centralized buying with decentralized distribution to stores	Distribution can be centralized globally	Should distribution be handled in same ways as traditional eCommerce?



Fig. 5.5. A videoconference in Second Life. Source [29].

questions and past research involving virtual worlds in education, social sciences, and humanities.

In the process, we demonstrated that the gaming industry helped enable widespread dissemination of such important socio-technical innovations as user-controlled avatars, multi-user interaction, 3D animation, open-objective environments, MMORPGs, and user-generated content. Social networking helped enable widespread dissemination of easily created profiles (including support for textual, audio, and video content); a trusted circle of friends and capabilities for both public and private message dissemination; and new media elements (e.g., blogging, instant messaging, chat, notifications, introductions, content reviewing). In addition, the structure of extant virtual worlds derives from the structure of various classes of social networks (geography-based, demographic-based, theme-based, etc.). To describe this structure, we adopt, modify, and refine the proposed typology of virtual communities presented by Porter in [86], consisting of five elements (purpose, place, platform, population, profit model). These elements describe the critical questions that journalists, marketers, and service providers are taught to ask: (1) For what purpose? (2) Where? (3) How? (4) Who? and (5) How much?

Our two surveys of residents of Second Life suggest several things. First, concerning potential brand crossovers, residents report that real-life brands that establish a virtual presence are more likely to be remembered in the real world. But although almost half of residents visit six or more stores per month, the majority of stores visited in SL do not have real-world counterparts. And only 6% of respondents had purchased a product in real life as a *result* of having

seen it in SL or other virtual worlds. Second, concerning user consumption behavior, most participants do not own land (85%), build structures (70%), make furniture or other objects (70%), make art (80%), make or post music (85%), have employment in SL (82%), and the majority of participants spent little to nothing on the purchase of Linden dollars. A minority of people are in SL primarily for business purposes. Third, concerning avatar appearance, although the appearance of residents' avatars tends to be similar to residents' real-world appearance, there is also an apparent tendency to embellish and improve upon certain of features. In particular, participants tend to make their avatars' bodies, hair-styles, and clothing somewhat more attractive than in real life. Residents also reported using avatars that are younger, lower in weight, and taller than their real selves. Furthermore, residents report being somewhat more extroverted, outgoing, superficial, and risk-taking in SL than in the real world. Fourth, concerning the use of technology, residents reported an average SL session length of approximately 3–4 h, and the total number of hours spent in SL was on average, higher than the hours they spent watching movies, television, or playing video games. Only 11% of participants maintained avatars in other virtual environments. Reasons cited for participating in SL included to meet friends, to learn about the world and other countries, to experiment with things they could not do in the real world, to see beautiful places, and to participate anonymously in a social environment. Participants felt some value in SL of being able to step out from one's normal real-life behavior and explore behaviors that are considered socially unacceptable in real life. Participants also indicated that the following commercial services are reasonable candidates for successful introduction in SL: online education, entertainment, gaming, dating (matchmaking), and debating – but not medical advice, lawyer services, government services, and tax preparation, (which require revealing private information).

Looking toward future applications, we provided a synthesis of ongoing and likely future research in business, and also briefly canvassed issues in education, social sciences, and humanities. Assumptions are also waiting to be challenged because much current application (and research) fails to take full advantage of the potential of virtual worlds. Important business issues that need study concern how best to take advantage of virtual worlds to do the following: (1) employ the most suitable business models, (2) conduct efficient market research, (3) communicate with and advertise to customers, (4) market virtual services, (5) engage in retailing and e-commerce (differently from the Internet), (6) assist with customer relationship

Table 5.5

Organizational and collaborative activities in virtual worlds.

Organizational/collaborative activity	Description
Training in virtual worlds	Companies can use virtual worlds as a space for training personnel [81] by setting up virtual tutorials in-world and offering classes featuring real-time interaction of instructor and student avatars. Virtual worlds permits standardized and relatively low-cost training for employees online who may be dispersed geographically.
Team collaboration in virtual worlds	Virtual worlds can be used for ongoing remote team collaboration. In [26] it is argued that it is desirable to “replicate the experience of working physically alongside others; allow people to work with and share digital 3D models of physical or theoretical objects; and make remote training and counseling more realistic by incorporating nonverbal communication into same-time, different-place interactions.” This is taken a step further in [8] where it is suggested that many offices of the future may not even exist in the real world stating that your office might be “defined as the IT equipment that you wear.”
Virtual product rooms	A <i>virtual product room</i> is described in [74] which involves a collaborative workplace or laboratory for product design (with functioning CAD systems) and software development (with a complete scripting language). In such an environment, employees could work together to build product prototypes, architectural models, and also “collaborate, streamline processes, control document versions and store, locate and reuse information” [74].
Remote design and project teams	Virtual worlds can provide an attractive vehicle for decentralized, multi-location, and multi-disciplinary collaborative product development and design. Several authors have elaborated on how such design and project teams can function with suggested managerial frameworks, and others have studied the functioning of collaborative design in behavioral settings [29,39,87,89,90,111]. Systems and tools have also been designed to accomplish collaborative design in virtual worlds. Some virtual worlds have built-in CAD systems, but it has also been suggested that, for greater functional capability adapted to particular industries, it would be desirable to link 3D virtual worlds to conventional CAD systems [70]. AutoCAD, produced by Autodesk, and Mentor Graphics' aids with printed-circuit board layout software lets people work on the same design at the same time [29]. An additional application area includes collaborative arts and fashion design [23].
Other human resource activities	Virtual worlds can be used to support human resource functions involving recruiting, on-boarding, and preliminary interviewing.

Table 5.6

Research in education, social science and humanities.

Field	Research questions	References
Education	How can VWs be used for education and distance learning? How should teaching pedagogy be adapted to a virtual classroom? What topics are particularly suitable for classes in virtual worlds? Is an instructor responsible for any harassment suffered by students' avatars? What are the comparative advantages of learning in virtual worlds verses traditional classroom environments or the Internet? What types of learning tasks and for what types of learners might virtual worlds provide a good match? Will most Internet learning evolve to use virtual reality technologies? How can we assess the effectiveness of education in virtual worlds? How does the instructor avatar's appearance influence student motivation?	[12,14,15,22,38,56]
Library Science	How can public and academic libraries and universities and colleges make use of immersive environments to enhance the service experience for their clients? Can libraries use gaming as a way to attract young people back into libraries? Can universities and libraries use VWs as part of their formal course offerings or library services? Should information schools be offering formal programs and specializations in the topic area of social computing? Can real-world researchers be linked?	[32,102]
Sociology	Are norms and standards of social behavior in VWs* different from those in the physical world? How? What are the norms for etiquette, cheating, and gift-giving in VWs? How do the technological features of particular in-world environments influence social behavior in these environments? Do behaviors and attitudes learned in VWs affect behaviors and attitudes in the real world? How? In particular, do VWs influence attitudes toward violence, sexuality, and conservatism? Does the time spent in a VW serve a desirable function? Or are VWs an unproductive distraction, even to the point of being an addiction? What social values and norms will evolve involving VWs?	[2,3,20,51,92,96,110,112,113]
Psychology	How do people's behaviors in VWs differ from their behaviors in the real world? What are people's motivations within VWs? What are the lifestyles of and personality traits of people who choose to participate in VWs? Do VWs reflect or influence consumers' self-concepts or role identities?	[37,68,72,107,112,114]
Political Science	What is the extent of self-governance and the common forms of governance in VWs? How are avatar-based communities different from web-based communities? How do existing governments and political campaigns utilize VWs?	[43,69,77]
Legal Issues	Do end-user license agreements (EULAs) provide too much developer discretion to control the environment? Should VWs be regulated (as compared to regulation of ISPs)? And how will laws and regulations influence creativity and productivity in VWs? How should intellectual property be protected in VWs?	[1,6,7,19,35,43,44,61,65,73,75,76,84,93,95,98]
Economics	What are the implications of the monetary system in various VWs? Are virtual casinos gambling? Are virtual profits taxable? Why do some VWs develop and flourish and others fail? What is GDP of VWs? Should taxes apply? Should minimum wage apply? What are the required elements for supporting growth and innovation in VWs? What factors influence the Linden\$ and US\$ exchange rate? What is the velocity of money and what are its determinants?	[17,43,64,95]
Arts and Humanities	How are the arts and humanities (e.g., music, the performing arts) disseminated in VWs? Is there a new form of art emerging in VWs? Is there a stock of "cultural capital" developed in VWs?	[20,33,109]
Sexuality	How is sexuality expressed virtually? Do people experiment more? Does in-world sex change people's real world sexual practices and values? Does a virtual sexual relationship constitute infidelity?	[49,82,99,101]

*VW = Virtual Worlds.

management, and (7) bring employees together to do work virtually (and with less travel). We think that, properly used, virtual worlds will be instrumental with helping with all of these areas, and some authors even suggest that the 3D Internet will become as important to companies in five years as the Web is now [26].

Overall, we believe that the study of virtual worlds and social computing is in its infancy compared to many other areas of research. But despite the novelty of these worlds, the fact remains that real people are sitting behind the screens. Their online behaviors have not been deeply researched, but the people themselves have. There exists a wealth of potentially relevant theory across multiple disciplines that can be studied and tested in virtual spaces. Given the representation of one's behaviors with an avatar, the research into tensions between real and virtual identities has not matched its potential. Such a topic could be examined with the lens of many disciplines and to a much greater extent than what has been studied to date. Business and computing science could further pursue this topic, but so could sociology, psychology, and any number of social sciences. The humanities could provide a diverse and rich perspective on this relationship. The researchers themselves can adjust their own avatars into ideal forms for studying any given topic. Gender, age, race, and any other number of considerations may be masked entirely in favor of appearing to participants as a point of light, metal sphere, or whatever a researcher's imagination might create.

That said, this freedom brings with it a need for caution. Assumptions that can be safely made about the physical world may not necessarily hold true in virtual worlds. It is vital to conduct any research in methodical and well-tested steps, perhaps even more so than in the real world. These new realms present us with both new potentialities and risks, and it is best to recognize the full extent of both.

Appendix A. Prominent virtual worlds

This section provides descriptions of several prominent virtual worlds discussed in Section 3.

A.1. Education-focused worlds

ActiveWorlds is among the oldest metaverses in existence, released in 1995. Initially, it consisted of a chat window and a window where 3D graphics were rendered as one walked through a virtual city and required that the 3D files were local to the client, running on Windows platforms only (the server runs on linux: www.activeworlds.com/products). *ActiveWorlds* soon solved the problem of streaming the descriptions of the 3D objects and enabled users to continuously send and update descriptions of 3D worlds. The world's population includes "tourists" (for free) and "citizens" who pay a membership fee. In

addition, “peacekeepers” are a voluntary group of citizens who help new users, resolve disputes, and try to prevent harassment and vandalism in the world. Tourists are restricted from some worlds, cannot reserve a unique name across visits, have only two choices of avatar (one male and one female), are “visible” in chat, cannot talk, and their buildings can be deleted and edited by other tourists. Citizens may own worlds on which they can build complex artifacts, whether “from scratch” using the AW IDE, or by reusing the large collections of community-built elements. This type of two-tiered membership is commonly seen in a variety of worlds, whose profit model relies on subscriptions. A variety of tools also exist for importing elements developed in a variety of graphic formats into the world. AW worlds appear very realistic with high detail (usually reflecting real-world environments to enable education through *augmentation* of the usual in-class activities), appropriate for design learning, however, to the best of our knowledge, it does not appear that they support dynamic simulations for procedural training.

Forterra Systems was originally developed by *There.com*, who also developed *There*, and was subsequently sold to *Makena*. The *Forterra* virtual worlds are designed to support training-through-simulation (both in *augmentation* and *immersive* styles) for e-learning, military, healthcare, and entertainment industries based on the Online Interactive Virtual Environment (OLIVE) platform. OLIVE provides tools for easily building realistic environments; it offers a variety of prefabricated parameterized objects that can be easily customized to build realistic world simulations. It also offers a special-purpose set of tools for developing, customizing and manipulating avatars, and a framework for realistic sound communication and corresponding avatar animation [34]. *Forterra's* profit model is based on a fixed fee and fee-per-use combination. Its clients include the U.S. National Institutes of Health for emergency-disaster training, the U.S. Department of Defense for military-personnel training – therefore *Forterra* worlds have tightly knit populations based on membership of these organizations – and they have received seed funding from In-Q-Tel of Arlington, Va., the strategic investment firm of the U.S. intelligence community [60].

A.2. Theme-based worlds

vSide is the most prominent example of virtual worlds designed with a focus on media and entertainment. Its owner, *Doppelganger Inc.*, reports that members spend 11 h per month in the world, compared with an average of 2 h per month for typical social networks [25]. *vSide* members can go to virtual clubs, corresponding to over 40 different music channels, where they can socialize and enjoy their favorite music or videos provided by *vSide* partners, such as *Down-town Records*. *vSide* supports the creation of a rich variety of avatars for their members. Avatars can earn “*Respekt*” by discovering interesting details hidden in the world’s architecture, making friends or visiting stores. They can also buy “*Creds*” from in-world ATMs in order to buy clothes and other items – in a pay-as-you-go for extras model. As a member’s *Respekt* increases, they can have an apartment and other special privileges (like buying specially restricted clothing) in the socially stratified *vSide* world. Currently, members cannot create content; all content is provided by professional artists. Once a member has an apartment in the world, the member can tune into his or her chosen channels without having to navigate and make selections in the channels area.

A.3. Community-specific worlds

Cyworld is a 2D/3D social-networking site that was originally launched in 1999 in South Korea and was subsequently acquired in 2003 by SK Communications (SKU), Korea’s largest wireless service provider. It has since substantially expanded with Chinese, Japanese, Taiwanese, and US versions. Similar to MySpace or Facebook, *Cyworld* members create their own home pages, which can include an

unlimited number of photos, documents, and other media. Unlike MySpace and Facebook, *Cyworld* homepages are 3D and can be decorated with digital furniture, art, TVs and music. The service itself is free, but homepage customizations are paid for with the world’s digital currency, called *dotori* (Korean for “acorns”), which cost 10 cents each – in a pay-as-you-go for extras model. *Cyworld* is now reported to be larger than YouTube in terms of daily video uploads and second to iTunes with number of songs sold [31,50]. *Cyworld* has had a large impact on Korea’s Internet culture, boasting 18 million members, with 90% of all Koreans in their 20s having a *Cyworld* account (<http://en.wikipedia.org/wiki/Cyworld>).

HiPiHi is the Chinese counterpart of SL launched for private Beta testing in March 2007. It was expected to be available in 2008 (http://www.hipihi.com/news/trends_placard010e.html) but appears to be facing problems that have indefinitely delayed its public launch. The environment has an English interface but few members are speaking English. The look-and-feel mimics that of SL with a more “Eastern aesthetic”, reflecting the fact that it is, at least in the beginning, targeting a population of mostly Chinese users [88].

A.4. Children’s worlds

Webkinz features an unusually tight coupling between the virtual and the real world. When children purchase a *Webkinz* plush toy in real stores, they receive a secret code to log onto the virtual world of *Webkinz* and get a matching virtual pet. After “adopting” the *Webkinz* virtual pet, the child receives (a) a free 2D+ room in which the virtual pet can live, (b) a free virtual “extra” consisting of some virtual item the virtual pet can use, and (c) two thousand units of *Kinzcash*, the *Webkinz* World virtual money. The virtual world also includes games, places to purchase extras for the pets with *Kinzcash*, and social networking features such as email to friends (for security purposes, the content is limited to just 16 predetermined messages, such as “my pet seems sick”). Upon sharing a password with a friend in the real world, their virtual pets can coexist and interact in the same virtual environment (in a limited form generally similar to SL). A further real-/virtual-world tie-in is that, upon buying a real physical accessory for a *Webkinz* plush toy (e.g., clothing, pet carriers, etc), the child receives a code for a similar virtual item for their virtual pet. Quantity bonuses offer a further incentive: with the tenth, fifteenth, twentieth, and twenty-fifth adoption of a *Webkinz* pet, the child receives an extra item for any of the child’s menagerie of virtual pets.

Whyville has a population of over 3 million, and focuses on education along with fun. It was founded by *Numeleon Inc.*, headed by Dr. Bower, a professor of Computational Neuroscience at the California Institute of Technology. *Whyville* membership is free. When children log on to *Whyville* they get 200 “clams”, the *Whyville* currency. Initially, children have to take a “chat license test” before they are allowed to chat with other members of the world. Children under 13 can take the test only after their parent approves their membership with a fax. *Whyville* takes an *augmentation* approach to the activities it offers to its citizens. Citizens can earn clams by engaging in real-world activities, such as restaurant clean up and educational plots, including tracing the origin of a “whypox” epidemic or participating in a *WhyEat* (Right) challenge, for example. All income-earning activities are recorded in the member’s salary ledger. *Whyville* also introduces children to civic life and politics: citizens can participate (run for office and vote for a representative) in senate elections. The senate members are supposed to hear issues from citizens and try to resolve them or forward them to city workers (company employees). The *Whyville* avatars are simply faces; children make their face with parts made by other *Whyville* citizens who have part-designing licenses. Face parts cost clams although there are also free face parts in a special location, *Grandma’s house*. Without a paid membership, face parts disappear after three months [105].

RuneScape. This 3D MMORPG is operated by Jagex, Ltd. and targets a wider range of ages, including teens 13 years and older, and even adults. It offers free accounts or monthly paid memberships, which provide access to additional features (new areas, quests, and items). Players customize their avatars and set their own goals. *RuneScape* has 158 “worlds” (each exactly the same) in order to manage the fact that there are millions of registered players and only two thousand players may be active in any one world at a time. This restriction seems to have given rise to a phenomenon where tightly knit real-world groups arrange to meet in a specific world at the same time to play. Players interact with other players through chatting, trading items (produced using skills or raw materials), fighting each other or game monsters, and collaborating on quests. Quests are story lines that players can choose to complete. In addition to quests, players engage in activities to enhance their skill levels in a variety of ways. A player's skill level determines their chance of success in battles and other non-combat activities. Unlike *Webkinz* and other games for younger players, *RuneScape* players have full freedom in the content of their chats, which are, by default, public. Players can have a list of “friends” with whom they engage in private chat. A player can also compile a list of “ignores”: people who cannot engage in chat with that player. In *RuneScape*'s economy, players trade items earned through non-combat activities and sell them for “gold pieces” or “gp” or collect gold by killing other players, taking their possessions and selling them for gold, successfully completing quests, killing monsters, or finding gold pieces on the ground. Unlike some other worlds, *RuneScape* game items and gold cannot be sold or exchanged for real money (real-money trading is prohibited). *RuneScape* also interjects random events to reduce the chance that players are using automated programs (macros) to complete repetitive tasks, which earn players skill level and / or gold pieces.

A.5. Self-determined worlds

Kaneva (derived from “canvas” to denote creativity) was originally launched in 2004 and currently boasts approximately 600,000 members. *Kaneva* blends virtual-worlds technology and 2D social networking: each registered member has an avatar (as in other virtual worlds), a profile (like in 2D social-networking sites), and a home, which they can decorate by importing content they may have in other sites. In particular, *Kaneva* has modified the YouTube player so that it can be streamed through *Kaneva* TV sets. In addition, they plan to stream regular Internet TV stations through these same sets. *Kaneva* also supports the formation of groups among its members and endows groups with an open space to develop as they wish. This feature of automatically giving space to members and their groups is rather unique among virtual worlds.

Entropia Universe is a science-fiction world, set on a distant planet named Calypso, and is designed to be in the middle of the *augmentation/immersion* spectrum between SL and World of Warcraft. Members' avatars are fantasy-like and popular activities include hunting and mining. *Entropia* was launched in 2003 and it has reached over 580,000 registered accounts. The most distinguishing innovation of *Entropia* is probably its economic model. Membership is free and members inside the world use PEDs (Project Entropia Dollars) to buy things. Members can also earn PEDs through their in-world activities. PEDs are exchanged according to a fixed rate and so unused PEDs can be converted back to real-world currency without losing value. The value of major items within the world, like real estate or bank machines – and thus implicitly the value of PEDs – is established through public auctions [21]. In March 2007, *Entropia* was the first western virtual world to expand into China, partnering with Cyber Recreation Development Corp. (CRD), an online entertainment company supported by the Beijing Municipal People's Government to create a cash-based virtual economy for China [104].

References

- [1] A. Adrian, *TM*: avatars as trade marks, *Computer Law & Security Report* 23 (5) (2007) 436–448.
- [2] C.A. Anderson, An update on the effects of playing violent video games, *Journal of Broadcasting and Electronic Media* 44 (1) (2004) 78–93.
- [3] C.A. Anderson, B.J. Bushman, Effects of violent games on aggressive behavior, aggressive cognition, aggressive affect, physiological arousal and prosocial behavior: a meta-analytic review of the scientific literature, *Psychological Science* 12 (5) (2001) 353–359.
- [4] W.J. Au, *Playing God*, *Lingua Franca: The Review of Academic Life* 11 (7) (2001) 12–13.
- [5] W.S. Bainbridge, The scientific research potential of virtual worlds, *Science* 317 (5837) (2007) 472–476.
- [6] J.M. Balkin, Virtual liberty: freedom to design and freedom to play in virtual worlds, *Virginia Law Review* 90 (8) (2004) 2043–2098.
- [7] J.M. Balkin, B.S. Noveck (Eds.), *The State of Play: Law, Games, and Virtual Worlds*, New York University Press, New York, 2006.
- [8] D. Barnes, DAVOS: Office of the Future, *The Banker*, Jan. 2007, p. 1.
- [9] S. Barnes, Virtual worlds as a medium for advertising, *Database for Advances in Information Systems* 38 (4) (2007) 45–55.
- [10] Blizzard, World of Warcraft® Surpasses 11 Million Subscribers Worldwide, *Blizzard.com*, 2008, Retrieved November 29 2008, from <http://www.blizzard.com/us/press/081028.html>.
- [11] I. Bogost, Videogames and ideological frames, *Popular Communication* 4 (3) (2006) 165–183.
- [12] K.M.N. Boulos, H. Lee, S. Wheeler, Second Life: an overview of the potential of 3-D virtual worlds in medical and health education, *Health Information and Libraries Journal* 24 (2007) 233–245.
- [13] D.M. Boyd, N.B. Ellison, Social network sites: definition, history, and scholarship, *Journal of Computer-Mediated Communication* 13 (1) (2007) Article 11.
- [14] S. Bronack, R. Riedl, J. Tashner, M. Greene, Learning in the zone: a social constructivist framework for distance education in a 3D virtual world, *Proceedings of Society for Information Technology and Teacher Education International Conference*, 2006, pp. 268–275.
- [15] M.J. Bugeja, Second thoughts about Second Life, *Education Digest* 73 (5) (2008) 18–22.
- [16] Business Communicators of Second Life Wiki, retrieved November 14, 2008 from <http://slbusinesscommunicators.pbwiki.com/>.
- [17] E. Castronova, On virtual economies, CESifo Working Paper No. 752, Category 9: Industrial Organization, 2002, pp. 1–39, Available at: http://ssrn.com/abstract_id=338500.
- [18] M. Childress, R. Braswell, Using massively multiplayer online role-playing games for online learning, *Distance Education* 27 (2) (2006) 187–196.
- [19] P.E. Christ, C.A. Peele, Virtual worlds: personal jurisdiction and click-wrap licenses, *Intellectual Property & Technology Law Journal* 20 (1) (2008) 1–6.
- [20] H. Cole, M.D. Griffiths, Social interactions in massively multiplayer online role-playing gamers, *CyberPsychology & Behavior* 10 (4) (2007) 575–583.
- [21] S. Crews, Interview: David Simmonds on the Business of Entropia Universe, *MMO Gamer*, Nov. 2007, Retrieved November 30, 2008 from <http://www.mmo-gamer.com/?p=300>.
- [22] M.J. Dickey, Three-dimensional virtual worlds and distance learning: two case studies of active worlds as a medium for distance education, *British Journal of Educational Technology* 36 (3) (2005) 439–451.
- [23] S. DiPaola, D. Dorosh, G. Brandt, Ratava's Line: Emergent Learning and Design Using Collaborative Virtual Worlds, 2004, Retrieved November 30, 2008 from <http://ivizlab.sfu.ca/research/colabdesign/dipaolaF1.pdf>.
- [24] Diversified media design and market truths limited, combined storey, *The Virtual Brand Footprint: The Marketing Opportunity in Second Life*, 2007.
- [25] Doppelganger, Inc. (2007) Retrieved November 30, 2008 from <http://www.prnewswire.com/cgi-bin/stories.pl?ACCT=104&STORY=/www/story/08-14-2007/0004645013&EDATE=>.
- [26] E. Driver, P. Jackson, C. Moore, C. Schooley, Getting Real Work Done in Virtual Worlds, *Forrester Research*, Jan. 2008.
- [27] D. Edery, Reverse product placement in virtual worlds, *Harvard Business Review* 84 (12) (2006) 24–24.
- [28] Economist, Computer Games: PC Parties, 2004, Retrieved November 27, 2008 from http://www.economist.com/world/britain/displaystory.cfm?story_id=E1_PQDNRP.
- [29] C. Edwards, Another world, *Engineering and Technology* (2006) 28–32.
- [30] A. Edwards, Hamlet on Second Life, Feb. 2008, Retrieved March 1, 2008 from <http://www.intute.ac.uk/artsandhumanities/blog/2008/02/28/hamlet-on-second-life/>.
- [31] J. Ewers, Cyworld: Bigger Than YouTube? Sept. 2006 Retrieved March 1, 2008 from <http://www.usnews.com/usnews/biztech/articles/061109/9webstars.cyworld.htm>.
- [32] M.G. Farkas, Social Software in Libraries: Building Collaboration, Communication, and Community Online, Information Today, Medford, New Jersey, 2007.
- [33] Federation of American Scientists and SRI International, Harnessing Virtual Worlds for Arts and Humanities (2008) Retrieved March 4, 2008 from http://www.fas.org/programs/itp/emerging_technologies/humanities/.
- [34] Forterra Systems, On-line Interactive Virtual Environment (OLIVETM) A Multi-User, Virtual World Software Platform (2006) Retrieved March 1, 2008 from http://www.forterrainc.com/PDF/Olive-Technical-Report_1206.pdf.
- [35] B. Glushko, Tales of the (virtual) city: governing property disputes in virtual worlds, *Berkeley Technology Law Journal* 22 (2007) 507–532.

- [36] L. Goel, E. Mousavadin, vCRM: virtual customer relationship management, *Database for Advances in Information Systems* 38 (4) (2007) 56–60.
- [37] A. Grabowski, N. Kruszewska, Experimental study of the structure of a social network and human dynamics in a virtual society, *International Journal of Modern Physics* 18 (10) (2007) 1527–1535.
- [38] L. Graves, A Second Life for higher ed, *U.S. News & World Report* 144 (2) (2008) 49–50.
- [39] L.F. Gül, M.L. Maher, Studying design collaboration in design world: an augmented 3D virtual world, *International Conference on Computer Graphics, Imaging and Visualisation (CGIV'06)*, 2006, pp. 471–477.
- [40] H.B. Hans, M.M. Neumann, T.E. Haber, F. Mader, Virtual sales agents, *Proceedings of American Marketing Association Conference: 2006 AMA Winter Educators' Conference*, vol. 17, 2006, pp. 226–231.
- [41] B. Haven, J. Bernoff, S. Glass, K.A. Feffer, A Second Life for Marketers? *Forrester Research*, May 2007.
- [42] P. Hemp, Avatar-based marketing, *Harvard Business Review* 84 (6) (2006) 48–56.
- [43] A. Hendaoui, A. Limayem, C.W. Thompson, 3D social virtual world: research issues and challenges, *IEEE Internet Computing* (Jan/Feb 2008) 88–92.
- [44] L. Herman, R.J. Coombe, L. Kaye, Your Second Life? Goodwill and the performativity of intellectual property in online digital gaming, *Cultural Studies* 20 (2/3) (2006) 184–210.
- [45] L. Herman, J. Horwitz, S. Kent, S. Miller, The History of Video Games, *Gamespot*, 2008, Retrieved November 30, 2008, from <http://www.gamespot.com/gamespot/features/video/hov/>.
- [46] D. Hewitt, Computer and Video Game Industry Reaches \$18.85 Billion in 2007, Jan. 2008, Retrieved February 11, 2008, from http://www.thees.com/newsroom/release_detail.asp?releaseID=8.
- [47] Hinton, We live here: games, third places and the information architecture of the future, *Bulletin of the American Society for Information Science and Technology* 32 (6) (2006) 17–21.
- [48] M. Holzwarth, C. Janiszewski, M.M. Neumann, The influence of avatars on online consumer shopping behavior, *Journal of Marketing* 70 (4) (2006) 19–36.
- [49] J. Hughes, From Virtual Sex to No Sex? *Ethical Technology*, Feb. 2007, Retrieved November 30, 2008, from <http://ieet.org/index.php/IEET/more/hughes20070228/>.
- [50] M. Ihwan, E-Society: My World Is Cyworld, *Business week*, Sept. 2005, Retrieved November 30, 2008 from http://www.businessweek.com/magazine/content/05_39/b3952405.htm.
- [51] J. Jansz, L. Martens, Gaming at a LAN event: the social context of playing video games, *New Media & Society* 7 (3) (2005) 333–355.
- [52] S. Jarvenpaa, D. Leidner, R. Teigland, M. Wasko, Call for papers – new ventures in virtual worlds – submission deadline September 15, 2008, *MIS Quarterly* (2007), Retrieved April 1, 2009, from <http://www.mcombs.utexas.edu/virtual-worlds-conference/NewVentures.pdf>.
- [53] M.D. Kadavasil, K.K. Dhara, X. Wu, V. Krishnaswamy, Mixed reality for enhancing business communications using virtual worlds, *Proceedings of the 2007 ACM Symposium on Virtual Reality Software and Technology*, 2007, pp. 233–234.
- [54] K. Kelly, Will Wright: The Mayor of SimCity, *Wired*, January 1994.
- [55] H. Kim, K. Lyons, M.A. Cunningham, Towards a theoretically-grounded framework for evaluating immersive business models and applications, *Proceedings of the 41st Annual Hawaii International Conference on System Sciences*, Computer Society Press, 2008, 10 pages.
- [56] J. Kirriemuir, The Second Life of UK academics, *Ariadne* 53 (2007) Retrieved November 30, 2008 from <http://www.ariadne.ac.uk/issue53/kirriemuir/>.
- [57] D.A. Kolb, *Learning Style Inventory: Technical Manual*, McBer and Co., Boston, 1976.
- [58] D.A. Kolb, *Experiential Learning*, Prentice-Hall, Englewood Cliffs, NJ, 1984.
- [59] L. Kolodny, Global Video Game Market Set to Explode, *Business Week*, June 2006, Retrieved November 30, 2008 from http://www.businessweek.com/innovate/content/jun2006/id20060623_163211.htm.
- [60] D. Kusher, Winner: Make Your Very Own Virtual World with OLIVE Continued, *IEEE Spectrum Online*, 2008, Retrieved February 11, 2008, from <http://www.spectrum.ieee.org/jan08/5838/2>.
- [61] F.G. Lastowka, D. Hunter, The laws of the virtual worlds, *California Law Review* 92 (1) (2004) 3–73.
- [62] F.G. Lastowka, D. Hunter, Virtual worlds: a primer, in: J.M. Balkin, B.S. Noveck (Eds.), *The State of Play: Law, Games, and Virtual Worlds*, New York University Press, New York, 2006.
- [63] H. Leblebici, G.R. Salancik, A. Copay, T. King, Institutional change and the transformation of interorganizational fields: an organizational history of the U.S. radio broadcasting industry, *Administrative Science Quarterly*, 35 (1991) 333–363.
- [64] L. Lederman, "Stranger than fiction": taxing virtual worlds, *New York University Law Review* 82 (6) (2007) 1620–1672.
- [65] P. Lee, The growth in the computer game market is leading to real legal issues in virtual worlds, *Lawyer* 19 (19) (2005) 14–14.
- [66] M.B. Ligorio, H. Van der Meijden, Teacher guidelines for cross-national virtual communities in primary education, *Journal of Computer Assisted Learning* 24 (1) (2008) 11–25.
- [67] T. Liu, G. Piccoli, B. Ives, Marketing strategies in virtual worlds, *Database for Advances in Information Systems* 38 (4) (2007) 77–80.
- [68] E.T. Lofgren, N.H. Fefferman, The untapped potential of virtual game worlds to shed light on real world epidemics, *Lancet Infectious Diseases*, 7 Ed., 2007, pp. 625–629.
- [69] I. MacInnes, Property rights, legal issues, and business models in virtual world communities, *Electronic Commerce Research* 6 (1) (2006) 39–56.
- [70] M.L. Maher, P.-S. Liew, G. Ning, D. Lan, An agent approach to supporting collaborative design in 3D virtual worlds, *Automation in Construction* 14 (2) (2005) 189–195.
- [71] T.M. Malaby, Coding control: governance and contingency in the production of online worlds, *First Monday*, Special Issue Number, vol. 7, 2006 Retrieved November 30, 2008 from <http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/1613>.
- [72] K. Mangan, Virtual worlds turn therapeutic for autistic disorders, *Chronicle of Higher Education* 54 (18) (2008) A26–A26.
- [73] Mayer-Schönberger, J. Crowley, Napster's Second Life? The regulatory challenges of virtual worlds, *Northwestern University Law Review* 100 (4) (2006) 1775–1826.
- [74] S. McMahon, Virtual project rooms streamline project management, *KM World* 14 (9) (2005) 6–6.
- [75] B.E. Mennecke, W.D. Terando, D.J. Janvrin, W.N. Dilla, It's just a game, or is it? Real money, real income, and real taxes in virtual worlds, *Communications of the Association for Information Systems* 20 (2007) 134–141.
- [76] M. Methenitis, A tale of two worlds: New U.S. gambling laws and the MMORPG, *Gaming Law Review* 11 (4) (2007) 436–439.
- [77] M. Moore, French Politics in 3-D on Fantasy Web Site, *Washington Post*, March 2007, Retrieved March 1, 2008 from http://www.washingtonpost.com/wp-dyn/content/article/2007/03/29/AR2007032902540_pf.html.
- [78] M. Moxley, Do Avatars Dream of Electric Streets? A Virtual Fantasia of China, *Walrus Magazine*, September 2008, Retrieved November 14, 2008 from <http://www.walrusmagazine.com/articles/2008.09-field-notes-avatars-dream-electric-streets-mitch-moxley-second-life/>.
- [79] S. Murray, High art/low life: the art of playing grand theft auto, PAJ, *A Journal of Performance & Art* 27 (80) (2005) 91–98.
- [80] M. Navarro, Pay Up, Kid, or Your Igloo Melts, *New York Times*, October 2007 Retrieved November 30, 2008, from http://www.nytimes.com/2007/10/28/fashion/28virtual.html?_r=1&oref=slogin.
- [81] C. Nebolsky, N.K. Yee, V.A. Petrushin, A.V. Gershman, Using virtual worlds for corporate training, *Proceedings of the 3rd IEEE International Conference on Advanced Learning Technologies (ICALT'03)*, 2003, 2 pages.
- [82] N. Nobel, Aesthetics and gratification: sexual practices in virtual environments, Working Paper, Trinity University, San Antonio, TX, 2006.
- [83] C. Nutt, AGDC: Haro On Making Habblo A Success, September 2007, Retrieved November 30, 2008, from http://www.gamasutra.com/php-bin/news_index.php?story=15397.
- [84] C. Ondrejka, Escaping the gilded cage: user-created content and building the metaverse, in: J.M. Balkin, B.S. Noveck (Eds.), *The State of Play: Law, Games, and Virtual Worlds*, New York University Press, New York, 2006.
- [85] V. Pilicci, Video Game is Free – Just Watch Onscreen Ads, *Winnipeg Free Press*, February 2008 Retrieved March 1, 2008, from <http://www.winnipegfreepress.com/canada/story/4127803p-4721275c.html>.
- [86] C.E. Porter, A typology of virtual communities: a multi-disciplinary foundation for future research, *Journal of Computer-Mediated Communication* 10 (1) (2004) Article 3.
- [87] J.M. Ragusa, G.M. Bochenek, Collaborative virtual design environments, *Communications of the ACM* 44 (12) (2001) 40–43.
- [88] C. Roger, Interview: HiPiHi, a 3D Digital World from China, June 2007, Retrieved March 1, 2008, from <http://en.onsoftware.com/interview-hipihi-a-3d-digital-world-from-china/>.
- [89] M.A. Rosenman, G. Smith, M.L. Maher, L. Ding, D. Marchant, Multidisciplinary collaborative design in virtual environments, *Automation in Construction* 16 (1) (2007) 37–44.
- [90] U. Roy, S.S. Kodkani, Product modeling within the framework of the world wide web, *IEE Transactions* 31 (7) (1999) 667–678.
- [91] Second Life Economic Statistics, Retrieved November 30, 2008 from http://secondlife.com/whatis/economy_stats.php.
- [92] J.L. Sherry, The effects of violent video games on aggression: a meta-analysis, *Human Communication Research* 27 (3) (2001) 409–432.
- [93] B. Shira, Even in a virtual world, 'stuff' matters, *New York Times* 156 (54062) (Sept. 2007) 1–9 Retrieved March 1, 2008, from <http://www.nytimes.com/2007/09/09/business/yourmoney/09second.html>.
- [94] SimTeach Wiki, retrieved November 14, 2008 from http://simteach.com/wiki/index.php?title=Institutions_and_Organizations_in_SL.
- [95] A. Sipress, Where Real Money Meets Virtual Reality, *The Jury Is Still Out*, *Washington Post*, Dec. 2006 Retrieved March 1, 2008, from <http://www.washingtonpost.com/wp-dyn/content/article/2006/12/25/AR2006122500635.html>.
- [96] J.M. Smyth, Beyond self-selection in video game play: an experimental examination of the consequences of massively multiplayer online role-playing game play, *CyberPsychology & Behavior* 10 (5) (2007) 717–721.
- [97] S. Song, J. Lee, Key factors of heuristic evaluation for game design: towards massively multi-player online role-playing game, *International Journal of Human-Computer Studies* 65 (8) (2007) 709–723.
- [98] J.H. Soraker, Global freedom of expression within nontextual frameworks, *Information Society* 24 (1) (2008) 40–46.
- [99] J. Stein, My So-Called Second Life, *Time Magazine*, Dec. 2006, Retrieved March 1, 2008 from <http://www.time.com/time/magazine/article/0,9171,1570708,00.html>.
- [100] N. Stephenson, *Snow Crash*, Penguin Books, 1992.
- [101] K. Subrahmanyam, P.M. Greenfield, B. Tynes, Constructing sexuality and identity in an online teen chat room, *Journal of Applied Developmental Psychology* 25 (6) (2004) 651–666.
- [102] K. Swanson, Second Life: a science library presence in virtual reality, *Science & Technology Libraries* 27 (3) (2007) 79–86.
- [103] D. Terdiman, A Winning Business Plan for 'Second Life', *Cnet: news.com*, Feb. 2007, Retrieved March 1, 2008, from <http://www.news.com/A-winning-business-plan-for-Second-Life/2100-1025-3-6160433.html>.
- [104] Virtual World News, Entropia Universe Signs Deal With Beijing Municipal People's Government, May 2007, Retrieved February 10, 2008, from http://www.virtualworldsnews.com/2007/05/entropia_univer.html.

- [105] Virtual World News, Bankinter Opens Branch in Whyville, Oct. 2007, Retrieved February 10, 2008, from <http://www.virtualworldsnews.com/2007/10/bank-inter-opens.html>.
- [106] T.Wasserman, Videogames, Second Life Seen as Launch Pads for 'Fake' Brands, 2007, Retrieved March 5 2008, from http://www.brandweek.com/bw/magazine/current/article_display.jsp?vnu_content_id=1003538546.
- [107] L.S.Whang, G.Chang, Lifestyles of virtual world residents: living in the on-line game "lineage", *CyberPsychology & Behavior* 7 (5) (2004) 592–600.
- [108] D. Winter, Arcade Pong, 2008, Retrieved February 10, 2008, from <http://www.pong-story.com/arcade.htm>.
- [109] R.Wolff, All the Web's a Stage, *ARTNews*, Feb. 2008 Retrieved December 1, 2008 from: http://artnewsonline.com/issues/article.asp?art_id=2443.
- [110] S.I. Woodruff, T.L. Conway, C.C. Edwards, S.P. Elliott, J.C. Woodruff, Evaluation of an internet virtual world chat room for adolescent smoking cessation, *Addictive Behaviors* 32 (9) (2007) 1769–1786.
- [111] T.G. Wyeld, The pedagogical benefits of remote design collaboration in a 3D virtual environment: a case study, *Fifth IEEE International Conference on Advanced Learning Technologies (ICALT'05)*, 2005, pp. 824–826.
- [112] N. Yee, The demographics, motivations, and derived experiences of users of massively multi-user online graphical environments, presence, *Teleoperators and Virtual Environments* 15 (3) (2006) 309–329.
- [113] N. Yee, J. Bailenson, The Proteus effect: the effect of transformed self-representation on behavior, *Human Communication Research* 33 (3) (2007) 271–290.
- [114] N. Yee, J. Bailenson, M. Urbanek, F. Chang, D. Merget, The unbearable likeness of being digital: the persistence of nonverbal social norms in online virtual environments, *CyberPsychology & Behavior* 10 (1) (2007) 115–121.

Paul R. Messinger is Associate Professor of Marketing at the University of Alberta School of Business and IBM Faculty Fellow in the Centre for Advanced Studies program at the IBM Toronto Laboratory. He has recently served as Principle Investigator of the Research Alliance "Harnessing the Web-Interaction Cycle for Canadian Competitiveness" for the Social Science and Humanities Research Council of Canada, Director of the University of Alberta School of Retailing, and Director of the Canadian Institute of Retailing and Services. Paul's research focuses on e-commerce, 3D mediated virtual worlds, service science, emerging retail formats, dynamic pricing, and recommendation systems; his publication outlets include *Marketing Science*, *Journal of Retailing*, *Journal of Economic Dynamics and Control*, *Journal of Virtual Worlds Research*, *Journal of Business Research*, and *Journal of Retailing and Consumer Services*. For more details, see <http://www.business.ualberta.ca/pmessaging/>.

Eleni Stroulia (<http://www.cs.ualberta.ca/~stroulia>) holds M.Sc. and Ph.D. degrees from Georgia Institute of Technology and is a Professor with the Department of Computing Science at the University of Alberta. Her research addresses industrially relevant software-engineering problems with automated methods, based on artificial-intelligence techniques. Her team has produced automated methods for migrating legacy interfaces to web-based front ends, and for analyzing and supporting the design evolution of object-oriented software. More recently, she has been working on the development, composition, run-time monitoring and adaptation of service-oriented applications, and on examining the role of web 2.0 tools and virtual worlds in offering innovative services to support the current practices of online communities.

Kelly Lyons is an Associate Professor in the Faculty of Information at the University of Toronto. Prior to joining the Faculty of Information, she was the Program Director of the IBM Toronto Lab Centre for Advanced Studies (CAS). Through her management and technical roles at IBM, Kelly has collaborated on research projects in the areas of data management, collaboration, distance education, privacy, social computing, and services science. Her current research interests include services science, social computing, data management, and business intelligence. Currently, she is focusing on technologies, work practices, and business models that support and mediate human-to-human interactions in services. Kelly has co-authored a number of papers, served on program committees for conferences, given many keynote and invited presentations, and co-chaired several workshops. She holds a cross-appointment with the Department of Computer Science at the University of Toronto, is a member of the University of Toronto's Knowledge Media Design Institute, is a member of the Board of Management of the Centre for Communication and Information Technology (CCIT), a division of OCE, Inc, is an IBM Faculty Fellow, a Member-at-Large of the ACM Council, and an adjunct professor at Dalhousie University and at York University. She is very interested in promoting Women in Technology initiatives and has given several presentations to young people and teachers on this topic. More details can be found on her webpage at: <http://individual.utoronto.ca/klyons>.

Michael Bone joined the University of Alberta in 2007 as a PhD student in Marketing. His research areas lie in the domain of consumer behavior and consumption practices. Specifically, his research interests include fairness and justice with regards to dynamic pricing strategies, environmentally-responsible consumption, sustainable marketing, consumer behavior in virtual markets, and consumer well-being. Prior to joining the University of Alberta, Michael worked in the Market Research field as an analyst.

Run H. Niu is an assistant professor of Operations Management at Webster University School of Business and Technology, St. Louis, Missouri, USA. She received her Ph.D. degree in Management Science from the University of Alberta School of Business. Her research interests include joint decision problems on the interfaces of operations and marketing, power in supply chain management, business applications in virtual worlds and Second Life, and referral rewards management in retailing.

Kristen Smirnov is a doctoral student at the School of Business at the University of Alberta, in the marketing area of consumer behavior. She is currently involved in research on intangible goods, services, and advertising elements, including virtual worlds, entertainment products, and physical appearances. Previous educational work includes a BA in Business Administration from the College of Idaho and a MBA from Boise State University.

Stephen Perelgut, MSc, is IBM Canada's University Relations Manager working out of the IBM Centre for Advanced Studies in Markham. He graduated from the University of Toronto's Department of Computer Science with his MSc in 1984. Since then, he has helped start a software company, Holt Software Associates Inc., which he ran as Vice-President before leaving to join IBM. He is currently in charge of IBM's University Relations within Canada and works with universities across Canada as well as linking to other academic and research institutions around the world. He has been the Chair of the Consortium for Software Engineering Research (the leading software engineering research group in the world and recognized by the NSERC Leo Derikx Synergy Award in 2000), Chair of NSERC Grant Selection Committee 334 (Communications, Computers & Components Engineering) and he is currently sitting on the NSERC Global Partnerships Program (GPX) Selection Committee for the ISTC. Within IBM, Perelgut provides oversight for all linkages between the company and academia including research collaborations, recruiting, sales and technical skills exchange. In that role, he was part of another NSERC Leo Derikx Synergy Award in 2006. As well, he manages research projects relating to Services Sciences, Management and Engineering (SSME).