MIS Quarterly

SPECIAL ISSUE

CO-CREATION IN VIRTUAL WORLDS: THE DESIGN OF THE USER EXPERIENCE[1]

Thomas Kohler
Department of Management and Marketing, College of Business Administration,
Hawaii Pacific University, Honolulu, HI 96813 U.S.A. {tkohler@hpu.edu}

Johann Fueller, Kurt Matzler, and Daniel Stieger
Department of Strategic Management, Marketing, and Tourism, Innsbruck University School of Management,
6020 Innsbruck, AUSTRIA {johann.fueller@hyve.de} {Kurt.Matzler@uibk.ac.at} {daniel.stieger@modellwerkstatt.org}

Emerging virtual worlds, such as the prominent Second Life, offer unprecedented opportunities for companies to collaborate with co-creating users. However, pioneering corporate co-creation systems fail to attract a satisfying level of participation and engagement. The experience users have with the co-creation system is the key to making virtual places a vibrant source of great connections, creativity, and co-creation. While prior research on co-creation serves as a foundation for this work, it does not provide adequate guidance on how to design co-creation systems in virtual worlds. To address this shortcoming, a 20-month action research project was conducted to study the user's experience and to identify design principles for virtual co-creation systems. In two action research cycles, a virtual co-creation system called Ideation Quest was created, deployed, evaluated, and improved. The study reveals how to design co-creation systems and enriches research on co-creation to fit the virtual world context. Practitioners receive a helpful framework to leverage virtual worlds for co-creation.

Keywords: Virtual worlds, Second Life, co-creation, action research, experience design

Introduction: Virtual Co-Creation

"Armed with new connective tools, consumers want to interact and co-create value" (Prahalad and Ramaswamy 2004, p. 5). This article takes a close look at virtual worlds as new connective tools to facilitate co-creation. Co-creation is the process during which consumers take an active role and co-create value together with the company (Prahalad and Ramaswamy 2004). Information and communication technologies (ICTs) provide the opportunity for consumers to engage in an organization's innovation process (Di Gangi et al. 2009). The emergence of the Internet in particular has provided companies with unique and inventive opportunities to capitalize on consumers' innovative potential and knowledge. This has resulted in various approaches to collaborate with consumers during the entire value chain. Most often co-creation occurs during the innovation process, referring to joint product development activities such as generating and evaluating new product ideas; elaborating, evaluating, or challenging product concepts; and creating virtual prototypes.

Recent advances in three-dimensional graphics, bandwidth and network connectivity may herald the next leap of evolution for co-creation. These technical advances lead to the advent of virtual worlds. Virtual worlds, the most prominent example being Second Life (SL), are computer-generated

[1]Molly Wasko was the accepting senior editor for this paper. Kevin Crowston served as the associate editor.

physical spaces, represented graphically in 3D that can be experienced by many users, or so-called avatars, at once (Castranova 2005). Virtual worlds are seen as enabling technology for co-creation for two main reasons. First, incorporating the latest technological advances of virtual worlds into co-creation practice enriches existing web-based methods by allowing real-time, media-rich, and highly interactive collaboration between companies and consumers. Influenced by interactivity and media richness (e.g., Steuer 1992), virtual worlds can increase telepresence (Suh and Lee 2005). Telepresence can be understood as the sensation of "being there" in a mediated environment in time and place (Ijsselsteijn et al. 2000), which creates new ways for virtual product experiences (Jiang and Benbasat 2007). Second, virtual worlds such as SL build on a new mode of production where the host firm facilitates unrestrained consumer freedom and empowerment (Bonsu and Darmody 2008). These user-generated worlds resemble engines of creation that provide the freedom to experiment, leading to unprecedented rates of innovation (Ondreijka 2007). The built-in tools encourage users to iteratively and interactively create almost anything imaginable, while sharing the act of creation with others. The creative activities of virtual worlds have become more visible and extensive, and as the boundaries of the virtual and the real world dissolve, avatars might very well use their creativity to design products with real-world potential (Hemp 2006).

Several companies have tried to leverage the potential of virtual worlds and invited avatars in SL to engage in different co-creation tasks. For instance, the light manufacturer Osram started an idea competition and invited SL residents to contribute lighting ideas. Toyota's Scion brand launched a virtual car model and encouraged participants to modify and customize their cars. Before building the physical hotel, Aloft created a virtual prototype that was discussed and evaluated by consumers in SL (Kohler et al. 2009).

Regardless of the promising opportunities provided by virtual co-creation, few avatars accepted the invitation to co-create. Nascent corporate presences are described as "ghost towns" (Rose 2007). The SL community is more interested in their own homegrown activities than in corporate places (Au 2006). Current co-creation systems such as the ones outlined above fail to attract participation and sustained engagement among users. To encourage participation, the co-creation experience is critical, as is the mental state of users that results from their interactions with the co-creation system (Füller and Matzler 2007; Nambisan and Nambisan 2008; Prahalad and Ramaswamy 2003).

However, there has been little theoretical development, which directly informs the design of co-creation systems. Only recently, the work of Nambisan and his colleagues (Nambisan and Baron 2007, 2009; Nambisan and Nambisan 2008) explored the design of virtual customer environments in the context of online discussion groups. While Nambisan and his colleagues provide a useful framework for the online environment in general, little is known about designing co-creation experiences in virtual worlds. In this paper, we address this lack of knowledge by exploring how to design co-creation experiences in virtual worlds. We tackled this research task with an action research approach and designed and evaluated a co-creation system called Ideation Quest (IQ). We report and discuss the study's results to derive theoretical and practical implications as well as to point toward future research.

Theoretical Framework: Designing Co-Creation Experiences

The work of Nambisan and his colleagues (Nambisan and Baron 2007; Nambisan and Nambisan 2008) contributes to the knowledge base upon which this research builds. Nambisan's work studied customers' actual interaction experiences in the context of online product forums, providing empirical support for Prahalad and Ramaswamy's (2003) assertion that the customer's interactions in value co-creation can themselves be an important source of value. The extent to which interactions in the virtual customer environment offer benefits (cognitive, social integrative, personal integrative, and hedonic) shapes the actual participation. The results reveal that customers' actual experiences and their beliefs about the expected benefits significantly influence their actual continued participation in such forums. In a second step, Nambisan and Nambisan (2008) propose an analytical framework suggesting that virtual co-creation systems have to consider four experience dimensions—pragmatic, sociability, usability, and hedonic—in order to serve participants' needs. The first aspect relates to the customer's experience in realizing product-related informational goals in a virtual customer environment, while the underlying social and relational aspects of such interactions form the sociability component. The usability dimension is defined by the quality of the human–computer interactions. Finally, interactions in virtual environments can be mentally stimulating or entertaining, referring to the hedonic component. Based on these four components of experience, Nambisan and Nambisan (2008) suggest a set of implementation principles and strategies commonly used in online environments. The four experience components serve as the basic underlying framework for our co-creation system in virtual worlds. However, as the design principles depend on the context, it is not known if those are also applicable in other virtual contexts such as virtual worlds

(Hoffman and Novak 2009; Nambisan and Baron 2009). In the following sections, we describe our action research approach, which allowed us to explore co-creation experiences and propose a set of design principles. After the presentation of the results, we discuss theoretical as well as managerial implications of our study.

Method

Action Research

To study the co-creation experience of avatars in virtual worlds and to derive design principles, we applied action research. Action research aims at capitalizing on joint learning by the researcher and subjects within the context of the subjects' social systems (Baskerville and Myers 2004; Susman and Evered 1978). As an iterative process, action research involves collaborative analysis and collaborative change. It brings together knowledge of action research and general theories of the researcher with situated, practical knowledge of the subject (i.e. client) and has, therefore, been described as very appropriate for the highly applied field of information systems (Baskerville and Wood-Harper 1996, 1998). Action research is particularly suited when researchers need to get deeply involved to gain investigative value from an insider's view of a problem context and when the change process itself is the subject being studied (Davison 1999; Street and Meister 2004). In the information systems literature, action research has been described as especially adequate for the development of system design principles (Lindgren et al. 2004). As the purpose of the present study is to explore the avatars' experience during co-creation and to jointly create principles of a co-creation system, action research has been found highly appropriate.

Action research is a collaborative, rigorous, iterative process that goes through several phases in several cycles (Baskerville and Wood-Harper 1998; Davison et al. 2004; Iversen et al. 2004). We conducted a 20-month action research study consisting of two cycles with the following phases: diagnosing, action planning, action taking, evaluating, and specifying learning (Baskerville and Myers 1996; Susman and Evered 1978).

Project Setting

To shed light on the co-creation experience for the design of co-creation systems, we started the IQ initiative in SL in June 2008. In three consecutive projects, the virtual environment featured several stages with co-creation tasks within SL. Participants were invited to immerse themselves in the problem context, explore inspirational stimuli, and take part in creative challenges such as word association and brainstorming, before submitting ideas and evaluating other submissions. Two out of the three projects involved companies (KTM and Philips) that were interested in experimenting with and testing co-creation systems in virtual worlds. Our research team consisted of researchers specialized in innovation and co-creation and researchers specialized in virtual worlds, two of them with extensive experience in SL, setting up vibrant places in SL such as Ballers City—the most popular basketball place in SL.[2] Table 1 summarizes and describes the phases and cycles of our research project.

First Action Research Cycle

Diagnosing

With the intent of identifying design principles for virtual co-creation, the first action research cycle started with an investigation of the current co-creation initiatives. Eight projects were closely monitored and discussed with managers and visitors (n = 23) (Kohler et al. 2009). The initiatives failed to attract sustained engagement; the interest among SL residents in these nascent corporate co-creation systems was poor. There were too few interested participants, and therefore too few activities that made the system a vibrant source of great connections and creations. This raised the pivotal question of how to design the interaction experience during co-creation. To gain an initial understanding of this question, two focus groups were conducted with experienced SL residents directly within the virtual world (n = 17). Participants highlighted that many corporate approaches simply "reproduce the old real life of them" (F2-4), instead of considering the peculiarities of the emerging medium and its unique culture. They emphasized that "one of the reasons commercial spots fail to attract attention is that they are logos thrown over the wall" (F1-1). There is "nothing to do…there is no plan for the company to actually interact" (F2-2). We received valuable insight into the requirements of virtual experiences and gained an initial understanding of the particularities of virtual worlds. Next, experts from the field of co-creation theory and practice were asked to comment on the focus group findings and to reflect on the design of the virtual co-creation experience (n = 12). The results enriched our understanding of the requirements of a co-creation experience and we came to realize that Nambisan's work provided the

[2]New World Notes blog posting, "Tateru's Mixed Reality Headcount," June 18, 2007 (http://nwn.blogs.com/nwn/2007/06/taterus_mixed_r_2.html).

Table 1. Phases and Cycles of the Action Research Project

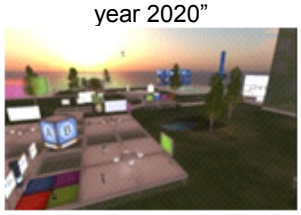
Cycle 1 (online June/July 2008)		Cycle 2 (online February/March 2009)
KTM Ideation Quest "The future motor biking experience" 	Philips Ideation Quest "Sustainable living in the year 2020" 	Green Ideation Quest "Ideas for a more sustainable future" 
Phase 1. Diagnosing		
To get insights into the problems and challenges of co-creation systems in virtual worlds, existing SL co-creation islands were observed and interviews with managers and visitors were conducted; workshop sessions with company representatives and virtual focus groups with experienced SL residents and experts from the field of co-creation theory were carried out. The following working hypothesis was formulated: The problem of lack of interest and insufficient participation and co-creation of ideas and solutions can be resolved by adapting Nambisan's principles to the needs of a co-creation system in SL. Data sources: • Workshop sessions with representatives of the companies (n = 23) • Observation of existing SL co-creation islands • Virtual focus groups (n = 17); in-depth interviews with experts (n = 12)		In-depth evaluation of participant's behavior (time spent, frequent returns, activity, and contribution) in the IQ co-creation system during cycle 1 by the researchers. Working hypothesis: Problems associated with bringing participants to a place are related to the acceptance of the existing SL community, level of immersion, and sociality aspects. Data sources: • Observations of cycle 1 by researchers • Behavioral recordings from the installed log analysis tool on the island
Phase 2. Action Planning		
In collaboration with representatives of the companies, SL experts, and users, a co-creation system based on Nambisan's principles was designed. The principles have been adapted to the particular requirements of virtual worlds (see Table 2).		Four principles focusing on integration and collaboration of the existing SL community, immersion, sociality, and usability were developed.
Phase 3. Action Taking		
The design principles were implemented in two projects. KTM started one week earlier. Therefore, the first lessons from KTM could be implemented in the Philips project.		The developed design principles plus the lessons from cycle 1 were applied to the IQ prototype.

Table 1. Phases and Cycles of the Action Research Project (Continued)

Phase 4. Evaluation	
To evaluate the co-creation systems, user site investigations were conducted. Data sources: • In-depth interviews (5 for KTM; 9 for Philips) • Participant observations • Log analysis tool that generated a heat map indicating the navigation behavior and areas toward which participants gravitate • Total of 190 hours of observing and interaction with avatars Data analysis: • Open coding techniques typical of a grounded theory approach	User site investigations were carried out during the online phase of IQ. Data sources: • Participant observation • In-depth participant interviews (20) • Data from log analysis tool (Heat Map) • 120 hours of observations and interaction with avatars Data analysis: • Open coding
5. Specifying Learning	
Empirical findings were confronted with Nambisan's theory. The following adaptations/extensions suggested as design principles proved to be necessary: • Pragmatic: Develop interactive objects; design to inspire • Sociability: Attract critical mass; encourage collaboration; engage in conversations • Hedonic: Nurture playfulness; provide challenging tasks • Usability: Simplify the experience; provide clear navigation structure; promote intuitive usage	Extension of theoretical framework by the collaborative dimension and proposing the design principle of co-creating the co-creation system. Added new principles: • Pragmatic: Create immersive environments • Usability: Provide individual support • Sociability: Foster informal sociability • Collaborative: Co-create the co-creation system

most instructive theoretical foundation. The two initial studies served as the departure point for the next research phase. The working hypothesis generated in this phase was that the problem of lack of interest and insufficient participation and co-creation of ideas and solutions can be resolved by adapting Nambisan's principles to the needs of a co-creation system in SL.

Action Planning

Informed by Nambisan's theoretical framework and the two initial qualitative studies, we teamed up with representatives of the two companies to develop a co-creation system within SL. The co-creation system involved the following steps. Upon *arrival,* participants were welcomed and received introductory information aimed at sparking a sense of purpose and setting the stage for the following activities. During the second stage of *inspiration,* participants were confronted with informational and entertaining stimuli material in the form of 3D content, pictures, or video. To stimulate participants' creativity, the process featured a number of *challenges* such as word association, knowledge questions, and sentence-completion tasks. Emphasizing the social nature of virtual worlds, semi-structured group discussions were integrated to explore customer needs, work out problems, or examine innovative opportunities. During the idea-generation phase, avatars were asked to visualize and express their ideas either in the form of a 3D model or a text description with illustrative images. All ideas were displayed for the stage of *idea review*, in which participants were able to review, comment on, and judge other submissions for inspiration and to leverage the community aspect. Table 2 lists Nambisan's principles and how they were addressed in IQ.

Table 2. Experience Components and Features in IQ

Experience Component	How IQ Addressed the Requirement/Key Feature
Pragmatic Experience Offer product-related information, information regarding underlying technologies, or its usage	**Welcome Area:** Billboards with product information, product-related videos, virtual product prototype **Product Course:** Virtual product prototypes, knowledge questions, 3D models **Toolkit:** Various parts, product framework, product information **Exhibition Area:** Interacting with other participants and company representatives, rating system
Sociability Experience Enable customers to perceive themselves as members of a group or community	**Welcome Area:** Gathering place **Discussion Tables:** Guided discussions with participants and community members **Exhibition Area:** Build prototypes, talkative environment, commenting system, rating system **Tours:** Fostering talkative environment, shaping participants' expectations **Events**: Fostering talkative environment, shaping participants' expectations **SL Group Tools:** Group form **Expert Users, Company Stuff, and Community Members:** Guiding and fostering discussions
Usability Experience Quality of human–computer interactions	**Island Design:** Open space and spacious buildings **The Road and Road Signs:** Navigation hint and location reference **Teleporters:** Direct access to target destinations **Guides:** Assistance and explanations **Events and Tours:** Introduction and advice
Hedonic Experience Mentally stimulating or entertaining, a source of pleasure and enjoyment	**Word Association:** Creativity game **Knowledge Questions:** Knowledge challenge **Virtual Prototypes:** Trial and error functions **Toolkit:** Building challenge **Idea Box:** Idea submission, rating, and commenting **Discussion Tables:** Mutual avatar rating

Action Taking

This plan allowed us to receive the support of two companies in conducting the first two projects. We collaborated with KTM, the leading producer of motocross motorcycles worldwide, and Philips Design, Europe's largest manufacturer of consumer electronics. The collaboration and the ongoing exchange with Philips Design proved especially fruitful, because the two managers involved had extensive experience in managing Philips' corporate SL island. The co-creation systems were built around the following topics:

- KTM Motorcycle: Motorbike experience of the future
- Philips Design: Sustainable living in the year 2020

Evaluation

Overall, 333 avatars joined the first two projects in IQ. A total of 166 avatars joined the KTM IQ, spent on average 76 minutes on the island, 15 brainstorming discussions took place, and 16 ideas for the motorbike experience of the future were submitted. Taking part in the Philips IQ, 167 avatars spent 80 minutes on average, taking part in 29 brainstorming discussions, and submitting 30 ideas.[3] We interviewed a total of 14 participants (KMT = 5; Philips = 9).

The evaluation of the first cycle focused on the individuals participating in the co-creation system. As Marton (1981) pointed out, it is the subjects themselves who can best describe subjective conceptions of the surrounding world. To gather as much context as possible, the participants were observed moving through the co-creation process and interviewed directly after their experience. In addition, a log analysis tool was used that generated a heat map indicating the navigation behavior and areas toward which participants gravitated.

[3]We only considered those avatars that spent more than 10 minutes on the site as IQ participants. Visitors spending less time were regarded as explorers, who either randomly teleported into this area or came with the intention to visit other activities on the same island.

Table 3. Sequence of Themes

Questioning Route	
Grand Tour Question	Would you begin by telling me the first things that come to your mind after participating in Ideation Quest.
Probes	• If you wanted to bring your friends to participate in Ideation Quest, what would you tell them to get them interested? • If this place could talk, what would it say about itself?
Elements	Could you describe your most outstanding experience during the process?
Motivations and Expectations	• What do you think could be reasons for your friends to join Ideation Quest? • If people hear about Ideation Quest, what do you think they are expecting from it? • Is there anything that we should have talked about but didn't?
Problems and Improvements	• What were the most serious problems that you faced during the process? • Let's talk about what can be done to improve this project. If you were in charge, what kind of changes would you make?
Ending	• What do you think, in general, about using virtual worlds for a co-creation process? • Is there anything that we should have talked about but didn't?
Wrap-up: Summary and Acknowledgment	

For these two projects, the group of researchers spent a total of 190 hours observing and interacting with participants. The interviews were held directly within SL. An interview guideline was prepared in advance and covered a sequence of themes (Table 3). Directed questions were used to find out what happened during the virtual interaction and participants were invited to *reconstruct their experience* (Seidmann 2006).

We selected interviewees who had spent substantial time on the island and performed the large part of the co-creation tasks. Seven of the fourteen participants in the sample were women and seven were men. Respondents' ages ranged from 25 to 55 years and, interestingly, a large share of the interviewees were over 40— fairly high compared to the average SL resident. They spent a considerable amount of time in SL per week (average = 22 hours) and most had been SL members for several months. The reasons to engage in SL ranged from socializing and having fun to exploring the business and e-learning potential (see Table 4 for interviewee list).

Since the communication was chat-based,[4] transcripts were logged with the SL client and readily available for subsequent analysis. Data were analyzed using the open coding techniques typical of a grounded theory approach (Strauss and Corbin 1990). Conceptual labels were placed on responses that described discrete events, experiences, and feelings reported in the interviews. After the initial reading and noting of specific themes in the data, two researchers coded the data set independently. In order to reduce individual coding biases, synonyms were corrected in several team sessions by negotiating meanings and checking with the primary texts. Thus, a one-sided interpretation of the data can be avoided and the validity of the results may be enhanced (Maxwell 2008). Through joint discussions and iterative referrals to the theoretical foundation, we reached consensus and ensured that each factor or theme appeared in the data repeatedly to achieve concept saturation (Glaser and Strauss 1967; Strauss and Corbin 1990). Qualitative analysis software (Atlas/ti version 6) was used to assist with coding (Hwang 2008). The results are organized as they apply to the experience component framework developed by Nambisan. Our intent is to capture the richness and complexity inherent in designing co-creation experiences. Despite this contextual presentation, we hold that the generated principles are applicable to the co-creation experience design within virtual worlds in general.

Pragmatic

The pragmatic dimension is related to the perception of the quality of the information acquisition process aimed at feeding the right knowledge at the right time. Nambisan and Nambisan's (2008) assertion of the significant role of the prag-

[4]Regardless of the fact that the use of voice is the most natural way to carry on shared conversation, and that voice communication would be available, many avatars have not opted to use it, and typing is still the common communication mode. This may be traced back in part to the reluctance of a share of SL users to reveal the physical self and in part to the uncomplicated nature involved in typed chat.

Table 4. List of Interviewees

Code	Interview Date	Gender	Age in Month (SL)	Age in Years (Real Life)	Weekly Hours Spent in SL
P1/2	7/4/2008	Female	16	38	12
P2/2	7/5/2008	Female	13	25	5
P3/1	7/7/2008	Female	12	50	20
P4/2	7/8/2008	Male	22	52	15
P5/1	7/8/2008	Male	8	33	15
P6/2	7/9/2008	Nake	40	45	5
P7/2	7/10/2008	Female	22	41	40
P8/1	7/11/2008	Female	12	49	40
P9/1	7/11/2008	Male	6	55	35
P10/1	7/11/2008	Male	17	39	30
P11/2	7/16/2008	Female	11	40	30
P12/2	7/16/2008	Male	17	50	15
P13/2	7/16/2008	Male	4	46	12
P14/2	7/16/2008	Female	8	44	25
P15/3	3/14/2009	Male	18	49	4
P16/3	3/14/2009	Male	27	56	55
P17/3	3/15/2009	Female	6	42	20
P18/3	3/9/2009	Female	30	57	20
P19/3	3/10/2009	Male	2	–	–
P20/3	3/11/2009	Male	2	51	15
P21/3	3/12/2009	Female	32	66	18
P22/3	3/12/2009	Female	1	43	48
P23/3	3/13/2009	Female	45	44	9
P24/3	3/13/2009	Female	20	50+	20
P25/3	3/13/2009	Male	19	35	12
P26/3	3/14/2009	Male	27	57	20
P27/3	3/14/2009	Female	26	44	49
P28/3	3/14/2009	Male	8	30	12
P29/3	3/15/2009	Female	27	38	14
P30/3	3/15/2009	Female	8	34	17
P31/3	3/15/2009	Female	24	42	30
P32/3	3/15/2009	Female	15	31	–
P33/3	3/15/2009	Male	24	35	20
P34/3	3/15/2009	Female	33	41	25

matic component is well supported by our data and the recommended strategies to implement product prototyping tools, content rating systems, and interaction with peer customers or company representatives as a means to acquire deeper product and product application knowledge proved helpful. Nonetheless, based on our experience with the first research cycle, we propose two additional principles.

Develop interactive objects: To encourage the acquisition of domain-specific knowledge, we incorporated features such as quiz-like knowledge questions and animated product replications. Notably, virtual worlds are able to incorporate levels of interactivity that the traditional web cannot. We found that the objects carrying the product-related content should not be mere decorations but should be characterized by a high degree of interactivity. Systems thus need to elaborate on the interactive capabilities and be "offering something 'tangible' not just information" (P8/1) in order to take participants "out of their habitual ways of thinking about things" (P7/2). Since users of virtual worlds seek experiential understanding, one

way to develop exciting content is to more closely simulate the direct experience of consumers with products. We applied that in developing the KTM motorbike stunt, a prototype that has not yet been produced in the physical world. We made the object fully rideable, with features that allowed users to perform tricks and race through different phases of the quest. We also found that virtual co-creation needs to satisfy the user's "sense of exploration" (P3/1) and reward curiosity, because "Second Life and wanderlust have always been brothers" (P5/2). To examine this suggestion, we incorporated knowledge question objects, dispersed throughout the environment. For instance, questions about a new feature of the virtual motorbike prototype were triggered by touching the wheel that could be found along the roadside. Indeed, interviewees considered this feature a viable learning opportunity with positive effects on their product knowledge. The lesson to take away from this is that interactive features are needed to actively engage the user in the content at a level beyond passive viewing.

Design to inspire: While for the web context, it may be sufficient to focus on fulfilling participants' product-related information goals and enhancing the breadth and depth of product-related content, co-creation in virtual worlds needs to leverage the representational richness of the medium to inspire and stimulate co-creators. We found that incorporated audio, video, and animation effects improved the user experience by attracting attention quickly, creating pleasure and involvement during the course of co-creation. The KTM IQ participants already were quite impressed by the capabilities of the virtual motorbike: "No bike in real life is going to do what these can, but damn wouldn't it be something if they did" (P9/1). The inspirational content allowed this user to "thing beyond the wheel" (P9/1) when generating ideas for future motor biking experiences. For the Philips IQ, we continued to strive to build sensory rich content and integrated animated objects to create a multimodal experience. We replicated a design vision of a sustainable building to successfully inspire co-creators: "Thinking about flower covered buildings that were self-sufficient. Suddenly, I was free of the notion of static structures and thinking of biodynamic organic architecture" (P2/2).

Sociability

Nambisan and Nambisan's requirement of having tools that foster the dialog and help users participate more effectively in group interactions is readily available in SL in the form of Instant Message, chat, or group notices. Beyond that, the consistency of our research efforts underscores the need to place extra emphasis on the sociability component.

Attract critical mass: Early in the process of developing the co-creation environment, we learned that the focus should not lie on the building and on the content of the place but rather on the people and facilitation of avatar-to-avatar interaction. Put into the words of one interviewee, "A build isn't merely about the prim and scripting that goes in it. It's also about the people who hang out in it" (P8/1). In light of the distinctive features of virtual worlds to facilitate real-time synchronous interaction, achieving and sustaining a high level of personal interactivity was found to be a worthy guidepost for virtual co-creation systems. From the interviews and our observations, we recognized early on that the real life rule of people drawing people also applies to the virtual environment. This appears to be especially true for the residents who orient themselves on the green "people" icons and seek to socialize where clusters of people are formed. Enduring visits accordingly happen if there is a certain *critical mass* of people present, which allows for social relationship, or as one participant put it, "come for the attraction, stay for the inhabitants" (P6/2). If the interviewees were in charge of improving the project, many would improve the individual interaction. "Attracting more visitors to the sim would definitely have increased the interactivity. Because much interactivity here on SL is amongst different people who exchange ideas and opinions" (P3/1), argued one participant of the first IQ. Following these requests, our goal was to get enough participants in order to allow for social interactions. We experimented with a number of ways to achieve the required critical mass of participants. *Events* proved to be a mechanism promising success in gathering a certain number of people in a place, at least at scheduled times. We integrated this learning outcome during the first cycle and organized events more frequently. Eventually a returning community did form, and lead to a self-perpetuating effect of people drawing more people.

Encourage collaboration: Interacting with fellow participants is central to many users, as is participants deriving benefits from being part of a loosely knit community, which provides a forum for their activities. Most participants' comments referred to the role of talking to others, getting connected, and the fun of collaboration. One of the main advantages many participants see in the collaborative capacity of SL is "sharing, growing, learning, playing. I love that we can meet with minds from all around the world and experience this together" (P8/1). During the first iteration of IQ, many participants expressed a common wish of experiencing the process together and indicated that the success of the process depended on the performance of fellow participants. As one informant explained, "This part was utterly delightful, but was entirely successful because of smart participants" (P2/2). Thus we designed the experience to nurture discussions and

collaboration. For instance, the discussion table started only when at least four users were present. This encouraged participants to invite friends to the platform and form groups to complete this feature. For many, the project was a valuable platform for collaboration: "It was really great to share our ideas about motorbikes and to watch others create and build their own bikes. Or make attempts to" (P8/1). The same interviewee described how the other participants helped him solve a technical problem and how he was able to learn from discussing with other experts. "I think as humans, we feed off one another's creativity, ideas, and thoughts" (P8/1). This suggests that other participants' ideas and arguments give "a new perspective in some cases" (P7/2).

Engage in conversations: In addition to the social interactivity among avatars, participants of IQ expressed that they wanted to be able to have a conversation with the company and have direct contact with the brand. Thus, experience designers need to create an infrastructure that also encourages collaboration with company representatives. Specifically, they need to add mechanisms for two-way communication, make it very easy for participants to make contact, and actively respond to actions from other participants. They could further encourage discourse by planting conversations and provocative ideas. Drawing upon virtual worlds' unique real-time and social interactive qualities, we found ask-the-expert discussions or presentations from employees useful to establish an open dialogue. Firms need to act with transparency, close the consumer feedback loop, and communicate back to consumers. One participant commented that "People like to know someone is listening, even if all they do is listen" (P9/1). Therefore, companies benefitted from co-creating with consumers. As evidence for this assertion, consider the following quote from one of the participants of the sustainable living project: "mainly to say Philips is not all about light and other devices, but they really like to think with the customer.… It does not give the idea they want to sell light bulbs to you so to speak ;-)" (P7/2).

In sum, embracing the real-time nature of virtual worlds, co-creation systems need to nurture social interaction and collaboration of two types: avatar-to-avatar or avatar-to-company. Through events, talks, tours or discussions, the place comes to life.

Usability

Simplifying the interaction and reducing users' efforts clearly corresponds with Nambisan and Nambisan's usability experience component. They suggest the adoption of clean technical designs with easy-to-use customer interfaces and fast and highly intuitive navigation as design practices. But what does that mean in virtual worlds? Navigating in 3D environments can be considerably different and more complex than navigating a web site and current human–computer interaction usability evaluation methods do not address the vicarious nature of activities performed within 3- space (Marsh et al. 2001). While the SL viewer already predetermines the usability to some extent, we are concerned with the type of usability that results from the design of the environments, processes, and objects in-world.

Simplify the experience: To date, many virtual world places suffer from severe usability problems such as conceptual disorientation or the inability to easily interact with objects. Simplifying IQ was a top priority throughout the development iterations. The goal was to support the process of co-creation in a way that was simple and natural for the participants. Evidently, participants wanted to experience the challenge of co-creation, not the challenge of overcoming the obstacles to effectively operate the software. Hence, co-creation systems should be usable without too much incremental effort, summarized well by one interviewee: "People just want quickness and ease… and no fuss" (P9/1). Because within SL there are "too many roofs and constrained stairways" (P3/1), we learned early in the process that usability considerations include the design of open space and spacious buildings. This makes the usage of camera controls possible and supports ease of navigation.

Provide clear navigation structure: A number of visitors to the KTM IQ reported disorientation while navigating through the place. This is particularly important, considering the open space and various navigation possibilities offered by SL. Users rightly criticized the system for failing to provide clear overviews and navigation paths. The initiative would have benefited from "clear signs as to how to navigate from one area to another on this sim" (P3/1). We realized that in order to reduce the effort of thinking about the interaction, *structure* was essential. For the second prototype, therefore, we employed clear navigation paths and a more rigid structure to define the structure of the process, both in time and space. Hence, the arrangement of the different objects and the design of the environment predetermined possible interactions and created expectations of desired behavior. A main path, from the welcome area through the stages until the final platform, was built to create a reference point, which is always available on the platform. This allowed participants to know where they were and where they needed to go. The response was positive; users liked the structured approach and valued the fact that "something to guide those who may not be sure how to proceed" (P4/2) was available. Accordingly, the organization of the project needs to "provide clear structure

for success" (P2/2). Over the course of the project, we also learned that places should provide relative location, to let users know where they are, where they come from, and where they might be going in the future, spatially, temporarily, and socially. Overview maps were installed and road signs were used to point out directions. Where appropriate, teleports for direct transportation—navigation shortcuts—were available to speed up the process for returning participants.

Promote intuitive usage: One issue that came up repeatedly during the design evaluations was the notion of *intuitive usage*. Co-creation systems need to use highly intuitive navigation features and exploit natural mappings and familiar mental models, rather than symbolic behavior. Avatars seek environments and tools that are self-comprehensive and reduce the personal effort involved. Content creators need to add behaviors and interactivity to objects that exist within a physically simulated world, to allow residents to leverage their intuitive understanding of the real world.

Hedonic

Nambisan and Nambisan point out that participants' interactions with a co-creation system can be mentally stimulating, entertaining, and a source of pleasure or enjoyment. The specific nature of virtual worlds calls for additional principles.

Nurture playfulness: Participants of IQ recognized that co-creation systems compete with more entertaining activities and suggested that the experience "needs to 'feel' like entertainment" (P6/2). They highlighted playfulness as a way to spur interest and pointed out that even if SL is not a game, a co-creation system could incorporate playful elements and game mechanics. We observed that playfulness absorbed users in the activity. Playfulness was mentioned frequently in relation to creativity, as one participant explained: "When playing with a group of creative minds from all over the world—of course it sparks and generates new ideas" (P8/1). To elaborate on playfulness during IQ, we extrapolated the point collection mechanism from game design. The user's goal was to collect as many points as possible along the different dimensions of creativity, collaboration, and expertise. The accumulated points were shown on public leader boards as well as above each individual avatar. Besides tapping into the competitive drive of participants, our experience indicates another requirement that needs to be respected for an effective co-creation system.

Provide challenging tasks: Among the major drivers for participation in the virtual co-creation system was the desire to engage in a challenging task and avatars seeking to have clear goals. Interviewees expressed that the project was a "challenge to think beyond conventions…[and] it is quite a formal, intellectual exercise...[that is] good for me" (P1/2), "I have a mechanical gear head mind from the 60s-70s, it was a great challenge" (P9/1), "I enjoyed stretching my imagination to come up with the ideas" (P3/1). One participant's self-description was "a competitive, curious person that loves to learn and keep up with what's happening in-world," and expressed satisfaction with the process: "I loved it. I think this is a brilliant thing" (P8/1). Related to that finding is the role of clear goals. For many of the interviewed participants, the task was clear and they valued "the opportunity to contribute possible solutions to some really big problems" (P4/2). Thus, one of the main things to recognize is that the co-creation system must provide for enough challenge. The setup has to encourage avatars to set personally meaningful goals, the attainment of which requires activity at a continuously optimal level of difficulty.

Specifying Learning

The first research cycle improved our knowledge about requirements of co-creation systems in virtual worlds and we propose a number of design principles. Experiences with virtual co-creation systems need to cater to the playful and real-time nature of virtual worlds and promote intuitive understanding and interactivity. The theoretical framework proved useful in guiding our design and provided us with a valuable initial understanding of general issues of the user experience. However, our evaluation of the first two interventions revealed a number of barriers that hampered the user experience with co-creation systems. We thus concluded that we needed deeper and richer insight into the co-creation specifics in order to improve the experience and to promote participation. Therefore, we embarked on a second action research cycle.

Second Action Research Cycle

In our second action research cycle, we sought to empirically test the lessons learned by considering them in a third prototype of IQ, which we launched in February 2009. In order not to work within the confines of a company's virtual co-creation system and to freely apply the insights of the first two projects without any restrictions, for the third project no corporate partner was involved. We created the SL co-creation system around the topic "sustainable future." We invited consumers to brainstorm, evaluate, and elaborate ideas on questions such as what new products companies should provide to reduce

energy demand or how people could help each other to live a more sustainable life and what companies could do to support that process.

Diagnosing

In December 2008, we initiated an intensive period of evaluation of the contributions of the first cycle. Since our co-creation focus was on promoting participation to ultimately generate ideas, we realized there was a crucial problem: IQ was only able to generate a limited amount of ideas, out of which few had the potential for commercialization. We realized that in order to get good ideas, we needed more ideas. We divided the challenge of promoting participation in co-creation systems into three tasks. The first task is to create awareness among the residents that the co-creation system exists and bring first-time visitors to the place. The second task is that participants need to be engaged over a sustained period of time with the system. In the third task, participants need to be encouraged to return as part of the community that frequents the place. Data suggested that once participants came to the island, they spent a considerable amount of time with the co-creation system.

Action Planning

Based on our diagnosis, we concluded that the problems associated with bringing participants to a place are closely related with the acceptance of the existing SL community. With regard to the first obstacle, we found the development principle of collaborating with already existing communities helpful. This has proven to be a viable strategy, not only to avoid exacerbating local in-world business people, but also to learn from knowledgeable SL community members. The second problem we identified was the level of immersion the prototypes of cycle one where able to induce among participants. A third problem we wanted to focus on was improving the usability of the experience. Finally, we had to ensure that the ongoing participant discussions were less constrained by our platform.

Action Taking

Guided by our diagnosis, we set out to develop design principles that would improve the experience of the co-creation system. The four design principles explicated below were applied in the design of the third IQ prototype that we developed in collaboration with SL designers and programmers. The basic structure of IQ remained the same, but we adapted the design of each stage according to the lessons learned in the first cycle.

Evaluation

A group of three researchers spent another 120 hours of observations and interviewed an additional 20 participants of IQ (see the list of interviewees in Table 4 for details). The project attracted 266 participants, who spent 85 minutes on average. The top 10 participants spent 21 hours. We are able to refine our design principles and, based on the results, we added an additional dimension to the original framework.

Collaborative

The experiences of the second cycle combined with the fact that virtual worlds like SL are almost exclusively built on user-generated content call for an additional component to Nambisan's original framework. In a radical departure from traditional media models, consumers provide the content to the medium. This requires reconsideration of how co-creation experiences are designed. The early corporate co-creation initiatives indicated that the blind application of approaches that worked for the traditional web context are rendered impossible. An invitation for avatars to actively participate in co-creation is not enough and the mere existence of a formal co-creation structure will not have any effect on the company's performance.

Co-create the co-creation system: Throughout the evaluation of our study, we found the development principle of collaborating with already existing communities helpful in promoting and engaging participation. This has proven to be a viable strategy, not only to avoid exacerbating local in-world business people, but also to learn from knowledgeable SL community members. Moving beyond mere user integration during prototype testing, early on in the process we sought to collaborate with opinion leaders, community builders, and enthusiastic avatars. While for the first two iterations of IQ we followed the traditional approach of opening a ready-made place to users, for Green IQ we collaborated with key potential users in the planning and design stage. We discussed the topic with potential participants directly in SL, invited them to contribute content, and encouraged feedback on how we should proceed. During this process, the participants became less user-like and more partner-like—almost co-developers. For instance, the content of the arrival and inspiration phase was created in collabora-

tion with different organizations and individuals. We scanned the virtual environment for relevant user-generated content and invited contributions to the development of the co-creation system. Various residents from our Green IQ community submitted inspirational objects like windmills, solar-panels, or atomic reactors. This approach requires a high degree of flexibility during implementation. Members of the in-world project team were encouraged to incorporate their experience and ideas for creating the task environment according to the SL standards. This additional degree of freedom is a challenge for management of the development process. But system designers in virtual worlds need to look for ways to provide value to residents and come up with meaningful strategies to enrich their lives. Keeping the avatars' urge to create in mind, the development of a co-creation system can greatly benefit from a mutual discourse with interested avatars, making them co-creators of the system. The role of the company launching the co-creation initiative should, therefore, be to create context, rather than creating content.

Pragmatic

Create immersive environments: Upon arrival at IQ, participants first were required to understand the problem for which they were invited to create solutions. For the first iteration, we relied foremost on text on display boards to explicate the problem situation. Our participants described reading about an idea as flat and boring. They pointed out that it is necessary to "show what the problem is by immersion rather than by instruction" (P1/2). After all, the interviewees agreed that this is the nature of virtual worlds. The residents of SL seek immersive, involving experiences: "if you find out it is about the future way of habitat and you now see how it can be and experience it. That is so great from virtual worlds. I mean you can read about it, but that is so boring ;-)" (P7/2). For the second research cycle, we strived to design the environment in such a way that it featured a high degree of sensory immersion to convey the "feeling you are participating in something which is real" (P31/3). While the first two iterations asked participants to imagine a scenario, adapt a role, and find a solution to this problem, during the third iteration they could actually experience the scenario. Green IQ featured an environment that immersed users in the scenario of a future with "dirty energy" solutions. We strived to appeal to multiple senses. Instead of describing the situation, we relied on 3D models including a coal plant, an atomic reactor, and an oil pump to convey the "dirty" energy impression. We also followed the participants' suggestions and incorporated audio and video effects instead of providing a large amount of text information. The third prototype of IQ welcomed participants with an automatic avatar that welcomed participants and featured video stimuli to capture users' attention quickly.

Sociability

Foster informal sociability: One pitfall some participants encountered when they engaged in the structured group discussion of the first cycle was the failure to build in flexibility. Instead of being a lively discussion, the scripted brainstorming tables became a straightjacket beset with too much structure. Since the discussion was timed, a number of interviews suggested changing the format of this feature. Thus, we programmed the feature to be more flexible in that it was working for any moderator from the community without a time restriction. Hence, we made sure to leave space for informal sociability to intensify the relational dimension of social interactions. Indeed, many great discussions occurred during the second cycle and something that one of the participants mentioned was confirmed in practice: "If they participated in a good discussion, then they'll be convinced of coming back" (P19/3).

Usability

Provide individual support: Providing effective support is critical to reduce users' cognitive costs. From the outset, we had planned to have guided tours every week to lead users through the co-creation system. What we had not anticipated was the extent of support required in introducing visitors into the co-creation task. Providing support proved to be critical: "The fact you have people here doing tours makes a huge difference" (P25/3). In reaction, we proceeded to support users whenever it was possible. In addition to personal support, user-to-user assistance is a useful mechanism. Related to the design principle of co-creating the system itself, we strived to find motivated participants and asked them for help.

Specifying Learning

In this second research cycle, we identified four additional design principles that enrich the original framework and we added the collaborative dimension. The design principles point out that experiences with virtual co-creation systems need to cater to the user-generated, immersive, and social nature of virtual worlds and that individual attention to participants is often required. Beyond adding the collaborative dimension, developing the third prototype has put extra emphasis on the sociability dimension. By encouraging infor-

Table 5. Key Lessons from Two Action Research Cycles	
Pragmatic: • Develop interactive objects • Design to inspire • Create immersive environments	**Sociability:** • Attract critical mass • Encourage collaboration • Engage in conversations • Foster informal sociability
Usability: • Simplify the experience • Provide clear navigation structure • Promote intuitive usage • Provide individual Support	**Hedonic:** • Nurture playfulness • Provide challenging tasks
Collaborative: • Co-create the co-creation system	

mal sociability, the virtual environment could become what Steinkuehler and Williams (2006), quoting Oldenbourg (1999), described as "third places." This intensifies the relational dimension of social interaction through extended connectivity (Kozinets 1999). Table 5 combines the key lessons from both research cycles.

Conclusions

Theoretical Contribution

Synthesizing the insights gained from an action research study that involved numerous data collection strategies and interventions, we generated a set of design principles for virtual co-creation systems. These design principles contribute to the body of literature that seeks to leverage technology for co-creation (Dahan and Hauser 2002; von Hippel 2005) and adds to the initial empirical content of the research agenda implied by Hoffman and Novak's (2009) inquiry into the changed nature of web technologies and optimal experience. While Nambisan's virtual customer environment experience framework (Nambisan and Baron 2007; Nambisan and Nambisan 2008) was helpful in understanding and designing co-creation systems in virtual worlds, it turned out that its application is not sufficient to design an experience that engages and compels participation. This research has enriched the initial framework by the collaborative dimension. In user-generated environments, the system needs to invite users to create or co-create the content they wish to be part of their experience. While the foremost contribution of existing design frameworks is to provide information regarding the technical setup of a co-creation system, the highly dynamic, synchronous, and evolving nature of virtual worlds calls for special guidance on the design and management of the actual process or activities that occur within these settings. In this sense, the design and management of SL experiences strongly resemble similar processes for offline, real-world events such as lead user workshops (von Hippel 1986) or brainstorming sessions (Amabile 1996). The results place extra emphasis on Nambisan's sociality dimension and highlight that virtual experiences in SL heavily depend on real-time interaction and collaboration with other avatars (Marsh et al. 2001; Rijken 1999). The large number of avatars simulating human feeling makes co-creation in SL attractive. Avatars collectively share experiences, welding them together to induce a sense of community (Koh and Kim 2003; Muniz and O'Guinn 2001). The playful nature of virtual worlds underscores the hedonic experience dimension. If the experience fulfills participants' hedonic needs, the efforts involved in a co-creation system are no longer considered work (Yee 2006), and users are collectively able to solve problems that previously could not be solved (von Ahn et al. 2008).

Managerial Implications

For managers, this study implies that utilizing the latest technological advances can help leverage a firm's co-creation initiatives, both by harvesting the medium-related benefits, and by tapping avatars' enthusiasm and creativity. When setting out to collaborate with consumers in virtual worlds, managers need to recognize that an invitation for avatars to actively participate in co-creation and a formal co-creation system is not enough. The critical challenge for co-creation in virtual worlds is not so much in devising the technological infrastructure, but in creating and maintaining an experience for participants. Hence, companies have to think about how they find and attract qualified participants, what events they want to organize during the co-creation project, and how to establish and nurture a community characterized by a shared consciousness of kind and mutual support. The key to be-

coming successful in virtually collaborating with consumers will depend on the ability to aggregate participants, retain them, and encourage them to make contributions.

Limitations and Future Research

There are limitations associated with this study, which should be kept in mind when considering the results. Some of these limitations point toward promising directions for future research. First, this study focused on the design of the experience and the chosen methodology is not able to address questions of causality in relation to the effectiveness of the developed co-creation system. While the iterative advancement of the prototype increased the level of participation (time spent), and contributions (ideas contributed), the outcomes for companies remain speculative and it remains unclear whether a co-creation system focused on the user experience outperforms other mechanisms such as monetary incentives to attract avatars. With regard to the costs and benefits incurred in system design and management of virtual co-creation, this study was not able to make direct comparisons with comparable web-based systems. Additional research is warranted to compare traditional web-based methods with virtual co-creation, to shed light on the question of when best to employ which technology. Each medium has value, and there may be synergistic effects for certain groupings of media. Practitioners and researchers must closely examine the value proposition for virtual worlds. Thus, we see the need for future research on the efficacy of the design principles put forth in this study, as well as on design principles that guide different co-creation tasks. While this study focused almost exclusively on SL as an exemplar of social virtual worlds, it does not sufficiently describe the entire universe of virtual worlds in existence or currently emerging. Future studies may explore and compare how different types of virtual worlds could enrich diverse co-creation tasks. Even if IQ involved consumers in various roles and different activities, the focus was on the specific co-creation task of idea generation. Future research might explore the relative impact of the different experience dimensions for different co-creation tasks. Other important questions for future research may involve the participating avatars—the latest visual representation of companies' potential or actual customers.

References

Amabile, T. 1996. *Creativity in Context*, Boulder, CO: Westview Press.

Au, W. J. 2006. "The Mixed Success of Mixed Reality," (http://nwn.blogs.com/nwn/2006/10/why_mixed_reali.html, accessed October 23, 2006).

Baskerville, R., and Myers, M. D. 2004. "Special Issue on Action Research in Information Systems: Making IS Research Relevant to Practice—Foreword," *MIS Quarterly* (28:3), pp. 329-335.

Baskerville, R. L., and Wood-Harper, A. T. 1996. "A Critical Perspective on Action Research as a Method for Information Systems Research," *Journal of Information Technology* (11), pp. 235-246.

Baskerville, R. L., and Wood-Harper, A. T. 1998. "Diversity in Information Systems Action Research Methods," *European Journal of Information Systems* (7), pp. 90-107.

Bonsu, S. K., and Darmody, A. 2008. "Co-Creating Second Life," *Journal of Marco-Marketing* (28:4), pp. 355-368.

Castranova, E. 2005. *Synthetic Worlds: The Business and Culture of Online Games*, Chicago: The University of Chicago Press.

Dahan, E., and Hauser, J. 2002. "The Virtual Customer," *Journal of Product Innovation Management* (19:5), pp. 332-353.

Davison, R. M. 1999. "GSS and Action Research in the Hong Kong Police," *Information Technology & People* (14:1), pp. 60-77.

Davison, R. M., Martinsons, M. G., and Kock, N. 2004. "Principles of Canonical Action Research," *Information Systems Journal* (14), pp. 65-86.

Di Gangi, P., and Wasko, M. 2009. "Open Innovation through Online Communities," in *Knowledge Management and Organizational Learning, Annals of Information Systems,* W. R. Kind (ed.), New York: Springer Science+Business Media, pp. 199-213.

Füller, J., and Matzler, K. 2007. "Virtual Product Experience and Customer Participation—A Chance for Customer-Centred, Really New Products," *Technovation* (27), pp. 378-387.

Glaser, B., and Straus, A. 1967. *The Discovery of Grounded Theory: Strategies for Qualitative Research*, Chicago: Aldine.

Hemp, P. 2006. "Avatar-Based Marketing," *Harvard Business Review*, June, pp. 48-57.

Hoffman, D. L., and Novak, T. P. 200. "Flow Online: Lessons Learned and Future Prospects," *Journal of Interactive Marketing* (23), pp. 23-34.

Hwang, S. 2008. "Utilizing Qualitative Data Analysis Software: A Review of Atlas.ti," *Social Science Computer Review* (26:4), pp. 519-527.

Ijsselsteijn, W., de Ridder, H., Freeman, J., and Avon, S. 2000. "Presence: Concept, Determinants, and Measurements," in *Proceedings of the SPIE 3959*, pp. 520-529.

Iversen, J. H., Mathiassen, L., and Nielsen, P. A. 2004. "Managing Risk in Software Process Improvement: An Action Research Approach," *MIS Quarterly* (28:3), 2004, pp. 395-433.

Jiang, Z., and Benbasat, I. 2007. "The Effects of Presentation Formats and Task Complexity on Online Consumers' Product Understanding," *MIS Quarterly* (31:3), pp. 475-500.

Koh, J., and Kim, Y.-G. 2003. "Sense of Virtual Community: A Conceptual Framework and Empirical Validation," *International Journal of Electronic Commerce* (8:2), pp. 75-93.

Kohler, T., Matzler, K., and Füller, J. 2009. "Avatar-Based Innovation: Using Virtual Worlds for Real-World Innovation," *Technovation* (29), pp. 395-407.

Kozinets, R. V. 1999. "E-tribalized Marketing? The Strategic Implications of Virtual Communities of Consumption," *European Management Journal* (17:3), pp. 252-264.

Lindgren, R., Henfridsson, O., and Schultze, U. 2004. "Design Principles for Competence Management Systems: A Synthesis of an Action Research Study," *MIS Quarterly* (28:3), pp. 435-472.

Marsh, T., Wright, P., and Smith, S. 2001. "Evaluation for the Design of Experience in Virtual Environments: Modeling Breakdown of Interaction and Illusion," *CyberPsychology & Behavior* (4:2), pp. 225-238.

Marton, F. 1981. "Phenomenography: Describing Conceptions of the World Around Us," *Instructional Science* (10:2), pp. 177-200.

Maxwell, J. A. 2008. "Designing a Qualitative Study," in *The Sage Handbook of Applied Social Research Methods,* L. Bickman and D. J. Rog (eds.), Thousand Oaks, CA: Sage Publications, pp. 214-253.

Muniz, A. M., and O'Guinn, T. C. 2001. "Brand Community," *Journal of Consumer Research* (27), pp. 412-432.

Nambisan, S., and Baron, R. A. 2007. "Interactions in Virtual Customer Environments: Implications for Product Support and Customer Relationship Management," *Journal of Interactive Marketing* (21:2), pp. 42-62.

Nambisan, S., and Baron, R. A. 2009. "Virtual Customer Environments: Testing a Model of Voluntary Participation in Value Co-Creation Activities," *Journal of Product Innovation Management* (26:4), pp. 388-406.

Nambisan, S., and Nambisan, P. 2008. "How to Profit from a Better 'Virtual Customer Environment,'" *MIT Sloan Management Review* (49:3), pp. 53-61.

Oldenburg, R. 1999. *The Great Good Place: Cafes, Coffee Shops, Bookstores, Bars, Hair Salons, and Other Hangouts at the Heart of a Community*, New York: Marlowe & Company.

Ondreijka, C. 2007. "Collapsing Geography (Second Life, Innovation, and the Future of National Power)," *Innovations: Technology, Governance, Globalization* (2:3), pp. 27-54.

Prahalad, C. K., and Ramaswamy, V. 2003. "The New Frontier of Experience Innovation," *MIT Sloan Management Review* (44:4), pp. 12-18.

Prahalad, C. K., and Ramaswamy, V. 2004. "Creating Unique Value with Customers," *Strategy & Leadership* (32:3), pp. 4-9.

Rijken, D. 1999. "Information in Space: Explorations in Media and Architecture," *Interactions* (6:3), pp. 44-57.

Rose, F. 2007. "How Madison Avenue Is Wasting Millions on a Deserted Second Life," *Wired Magazine* (15:8).

Seidmann, I. 2006. *Interviewing as Wualitative Research: A Guide for Researchers in Education and the Social Sciences*, New York: Teachers College Press.

Steinkuehler, C., and Williams, D. 2006. "Where Everybody Knows Your (Screen) Name: Online Games as Third Places," *Journal of Computer Mediated Communication* (11:4), pp. 885-909.

Steuer, J. 1992. "Defining Virtual Reality: Dimensions Determining Telepresence," *Journal of Communication* (42:4), pp. 73-93.

Strauss, A., and Corbin, J. 1990. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*, Newbury Park, CA: Sage Publications.

Street, C. T., and Meister, D. B. 2004. "Small Business Growth and Internal Transparency: The Role of Information Systems," *MIS Quarterly* (28:3), pp. 473-506.

Suh, K.-S., and Lee, Y. E. 2005. "The Effects of Virtual Reality on Consumer Learning: An Empirical Investigation," *MIS Quarterly* (29:4), pp. 673-697.

Susman, G. I., and Evered, R. D. 1978. "An Assessment of the Scientific Merits of Action Research," *Administrative Science Quarterly* (23), pp. 582-603.

von Ahn, L., Maurer, B., McMillen, C., Abraham, D., and Blum, M. 2008. "reCAPTCHA: Human-Based Character Recognition via Web Security Measures," *Science* (321:12), pp. 1465-1468.

von Hippel, E. 1986. "Lead Users: A Source of Novel Product Concepts," *Management Science* (32:7), pp. 791-805.

von Hippel, E. 2005. *Democratizing Innovation*, Cambridge, MA: The MIT Press.

Yee, N. 2006. "The Labor of Fun: How Video Games Blur the Boundaries of Work and Play," *Games and Culture* (1:1), pp. 68-71.

About the Authors

Thomas Kohler is an assistant professor of marketing at Hawaii Pacific University. He received his Ph.D. in business administration at the Innsbruck University School of Management. His research focuses on effective co-creation within social media environments.

Johann Füller is CEO of Hyve AG, a leading innovation and community agency in Germany, and researcher at the Innsbruck University School of Management. He has published in journals such as *Journal of Product Innovation Management*, *California Management Review*, *Journal of Business Research*, and others. His research explores innovation and co-creation communities from multiple perspectives. He advises and speaks to major corporations worldwide in the area of innovation communities, social media, crowdsourcing and co-creation.

Kurt Matzler is a professor of strategic management at Innsbruck University School of Management. His research focuses on co-creation, innovation and strategy. Kurt is a partner of IMP, an international strategy consulting firm, with its headquarters in Innsbruck, Austria.

Daniel Stieger received his Ph.D. in business administration at the Innsbruck University School of Management. He holds a Master's degree in economics, and a degree in engineering. He is managing partner of Modellwerkstatt, a company integrating customers in the engineering process. His research projects include quantitative methods in marketing, studying consumer behavior within online environments, and the adoption of new technologies.