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A Design Research Approach to Developing User Innovation Workshops in Second Life

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Abstract

The Design Science Research approach is increasingly being applied in the field of Information Systems (IS) research. The philosophy behind design science research is that new scientific knowledge can be generated by means of constructing an artifact, and the core of this approach is a problem-solving process used to develop the artifact. As virtual worlds are a relatively new IS medium, limited attention has been paid to investigating the use of design research in virtual worlds. Nevertheless, it is considered a relevant approach as much research in the field of virtual worlds involves the design of virtual spaces to support some kind of business activity. As such, the research purpose of this paper is to investigate the use of the design research approach in virtual worlds. In this paper, we describe and take a practical perspective of a specific case study in which design research was developed and used for a specific project. The specific project in focus is the development of a user innovation workshop inside Second Life for a start-up company interested in gaining insights and ideas for the development of its product.

Keywords: virtual world; design science research; user innovation; entrepreneurship

A Design Research Approach to Developing User Innovation Workshops in Second Life

Introduction

Virtual worlds or immersive environments, such as Second Life and Active Worlds, have been around for some years now. After the initial hype that virtual worlds would unleash new unlimited commercial success, the focus is now on more pragmatic and serious applications of virtual environments. Several authors have identified a classification for how both profit and non-profit organizations can use virtual environments, including areas such as marketing and PR, support for mass customization, virtual markets/shopping, communication and collaboration, consumer research, innovation, virtual education and learning, and recruitment (e.g., Barnetta, 2008; Breuer, 2007; Grosser and Klapp, 2008). Whether it is running shoes to be displayed or new courses for teaching students, in both cases a virtual space is needed for the virtual activities to take place. In most cases, it requires that a new virtual space be created in a virtual world, such as Second Life, that suits the organization's specific needs. Such a virtual space consists of a certain landscape and or building, e.g. shoe display or classroom, and several objects, e.g., shoes or discussion boards, with which avatars might interact. However, the design aspects of virtual spaces in the virtual environment have not received much attention in the literature. Still this is a relevant aspect as transferring something from the physical world to the digital world might require a different approach (Parsons et al., 2008). Moreover, the design process itself requires attention to ensure that the various design needs are inventoried, several alternatives explored, and that finally a virtual space is created addressing the initial needs. Such an approach is valuable for practitioners but also for researchers who focus on the creation of an artifact to create new knowledge. In this paper, we turn to the Design Science Research (DSR) approach that has gained considerable popularity in the IS domain as a research method in which the IS development method itself or the outcome of the development process is the subject of study (Hevner, March, Park, & Ram, 2004). We believe that the DSR as a research method can also be useful for those researchers developing virtual spaces or objects within these spaces. This leads us to the following research question for our research:

RQ: Can we use Design Science Research as an approach for developing virtual spaces in virtual worlds?

To investigate our research question, we describe a case study in which we applied the DSR approach to build a virtual space and virtual objects with the purpose of conducting virtual user innovation workshops in Second Life. The case study company that is involved is a Swedish internet startup, RunAlong, in the e-services industry. RunAlong is developing an international web community, primarily for women joggers, that is entirely designed through a user-driven innovation approach based on a series of physical user innovation workshops. The beta site was launched in Sweden in the summer of 2009. This paper describes the design (and application) of virtual user innovation workshops that were based on the physical workshops with the purpose of collecting further information from runners from across the globe.

The paper is structured as follows. In section 2 an overview is provided of what is known in the literature about the design of virtual spaces for virtual worlds, with a focus on the design process. Next, the Design Science Research approach is discussed in section 3 describing the background, design, and examples. In section 4 the application of the DSR approach is demonstrated and we explain how we designed the virtual user innovation workshops and how it has been evaluated in several iterations to improve the design. Finally, the conclusions, limitations, and implications for practice and theory are discussed in the conclusions.

Design of Virtual Environments

Regardless of the promising opportunities provided by virtual worlds for real world companies, one major challenge impeding development is the lack of interest in virtual corporate places among avatars. On a general level, many reports point toward nascent presences being ghost towns (Rose, 2007), and the SL community is more interested in their own homegrown activities (Au, 2006). To encourage visits and engagement, the design of the virtual environment is critical. Only when avatars experience an environment that features immersive and appealing surroundings as well as interactive and engaging objects will they visit the place, spend time there, and return again.

Previous researches (Donovan & Rossiter, 1982; Crosby, Evans, & Cowles, 1990) have also found evidence of the influence upon user and customer behavior generated by the layout of a physical environment as well as by the objects present in it. One study by Bitner (1992),

introduced a model focusing on the environment influences upon the behaviors of customers and employees in the service industry and stated among their conclusion that “*the physical setting can aid or hinder the accomplishment of both internal organizational goals and external marketing goals.*” A different angle was investigated by McCoy and Evans (2002), who looked at the relation between the physical environment and creativity, identifying the existence of a relation between the creative potential of a subject and the features present in an environment (e.g. the view of a natural environment promote creative performance).

In view of this established body of knowledge about the importance of the environment, it is no surprise to find an advanced literature about the design of web-based systems, including also a number of useful design principles. However, virtual world research that has emerged only recently has not yet been accompanied by any theoretical development that directly informs the conceptualization of virtual environments and guides their design.

For the web-based context, Nambisan and his colleagues’ work (Nambisan & Baron, 2007; Nambisan & Nambisan, 2008) contribute to the knowledge base that is the basis for this research. The authors studied customers’ interaction experiences in the context of online product forums and proposed 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, Nambisan & Nambisan (2008) suggest a set of implementation principles and strategies commonly used in online environments such as 1) design to encourage customer innovation, 2) link the external to the internal, 3) manage customer expectations, and 4) embed the virtual customer environment in CRM activities.

In a seminal article, Hoffman and Novak (1996) proposed that creating a compelling website depends on facilitating a state of flow. Flow is the term introduced by Csikszentmihaly (1977) to describe a highly enjoyable and rewarding ‘optimal’ experience, where challenge and skills match. Flow has been applied to various online activities, such as browsing (Novak et al.

2000), playing games (Chen 2007; Hsu and Lu 2004) or engaging in computer-mediated communications (Ghani and Desphande 1994; Trevino and Webster 1992). Csikszentmihalyi (2002) identified the following elements that determine flow: clear goals, immediate feedback, balance between challenges and skills, merge of action and awareness, exclusion of distractions from consciousness, no worry of failure, self-consciousness disappears, distortion of sense of time, and an autotelic activity. For the internet context, additionally telepresence and interactivity are considered antecedents of flow (Hoffman and Novak 1996). However, in a recent update Hoffman and Novak (2007, p.17) point out that “In examining flow in virtual worlds such as Second Life, there are a number of ways in which our original conceptual model (Hoffman and Novak 1996) could be augmented.” Indeed, while the application of the findings of web-based customer integration research to virtual worlds may provide some interesting insights, the translation is difficult as virtual worlds are in some respects significantly different from the traditional web. Navigation in a 3-D environment, avatar-mediated communication and the interactivity with virtual tools pose unique issues for virtual design.

Only few recent articles directly inform the design process of virtual environments. For instance, Murphy, Owens, Khazanchi, Zigurs & Davis (2009) take a social-technical stance and present a conceptual model for metaverse (i.e. virtual worlds) research consisting of five components: 1) the metaverse 2) avatars, 3) behaviors, 4) metaverse technology capabilities, and 5) outcomes. The authors highlight the interaction of avatars and name a range of topics such as representation, presence, and immersion. However, the article neither provides concrete insight about the design of the virtual environment nor about the design process itself. Similarly, Drettakis, Roussou, Reche & Tsingos (2007) do not consider creating a particular virtual environment but focus on the tools needed to create a virtual environment in the field of architecture and urban planning. One important criterion for improving such tools is the level of realism provided. The study provides useful insights in the design process of such a tool, as they explicate how they specified requirements, developed, and improved a prototype based on testing and evaluation.

A third article by Parsons et al. (2008) explores the usefulness of virtual worlds, to create a learning environment. Before building the learning environment, the researcher should develop an analytical framework to guide the thinking about developing virtual learning environments.

Looking at the design process of the virtual university, the authors recognized the potential of virtual environments and developed the analytical framework for that purpose. Although, the actual design process of the virtual environment has not been made explicit, one can identify concrete steps such as needs analysis and development.

While this early research sheds some initial light about the design of virtual environments, to date the designers of virtual world spaces have a hard time finding useful information that inform their design decisions. As such, our intent in this paper is to investigate whether we can use Design Science Research as an approach for developing virtual world spaces.

The Design Science Research Approach

In this research, we propose to investigate the application of a more structured and rigorous approach, i.e. Design Science Research (DSR), towards the design and development of virtual spaces in virtual worlds. The Design Science Research approach stems from the Engineering Sciences where design methodology has been studied for a long time (Cross, 1984; Eekels & Roozenburg, 1991). The first publications about the application of design principles to IS research date back to the early 1990s with publications from researchers such as Nunamaker, Chen & Purdin (1991) and March & Smith (1995). Through publications of Hevner et al. (2004), Vaishnavi and Keuchler (2004), Peffers Tuunanen, Rothenberger & Chatterjee (2008) and Jones & Gregor (2007), this approach has increased of late in popularity among researchers in the IS domain. At its core, DSR is a problem solving process that is used to develop an artifact similar to design in the engineering sciences. Furthermore, the philosophy behind DSR is that scientific knowledge can be generated by means of constructing an artifact (Guba & Lincoln, 1994; Hevner et al., 2004; Vaishnavi & Keuchler, 2004). According to Hevner et al. (2004), this approach is supposed to bring more rigor to the IS domain that is focused on studying new IT artifacts and its applications. These IT artifacts can be in the form of constructs, models, methods, instantiations, or better theories and are developed to enable a better understanding of the development, implementation, and use of information systems (Vaishnavi & Keuchler, 2004).

Although there are many contributions to the domain of Design Science Research, Peffers et al. (2007) are the first to propose a comprehensive design science research methodology. They define a methodology, based on a definition by DM Review, as “a system of principles, practices, and procedures applied to a specific branch of knowledge.” Principles of DSR are already described above to some extent and are further elaborated in the several publications that are referenced. The Practice Rules are according to Peffers et al. (2007) very well described by Hevner et al. (2004) who provide seven Design Guidelines. Finally, procedures have been defined amongst others by Vaishnavi & Keuchler (2004), and Peffers et al. (2007) further extend this process description and demonstrate its use in four case studies. Both the practice rules and procedures will be elaborated in more detail because it concerns the methodology that we propose to apply to the design of processes and corresponding environments in virtual worlds.

As mentioned above, the practice rules as defined by Hevner et al. (2004) consist of seven guidelines for DSR. The first two guidelines concern the outcome of the design research and problem awareness. In other words, a new and innovative artifact needs to be developed (guideline1) that is a response to a clear and relevant business problem that is identified by the researchers (guideline 2). The next four guidelines concern the design and development of the IT artifact. First of all, the utility, quality and efficacy of a design artifact must be demonstrated through evaluation methods (guideline 3). This requires that proper evaluation measures and methods are defined before the start of the development phase. Second, the outcome of the research should have a clear research contribution and should not be limited to an artifact that is only useful for practitioners (guideline 4). Third, proper research methods should be applied in developing the artifact (guideline 5). Fourth, the design process is typically a searching process in which several iterations are needed to tweak the artifact to the initial requirements (guideline 6). Thus, it is important in the research design to plan for such iterations. It should be more than just a trial and error process and should have a good theoretical basis and use established data collection and analysis methods such as for instance case study research. Finally, the last guideline is about communication of the research (guideline 7). As with other research, its results should be published in order to create a cumulative knowledge base.

Vaishnavi & Keuchler (2004) describe the procedures of the DSR methodology through five steps that they adopted from Takeda, Veerkamp, Tomiyama & Yoshikawam (1990) as they are very descriptive and accentuate the problem solving nature of DSR to. The five steps are presented in figure 1, and although it suggests a sequential order, there can be some overlap in the steps and several iterations can also take place, especially in the development and evaluation phase.

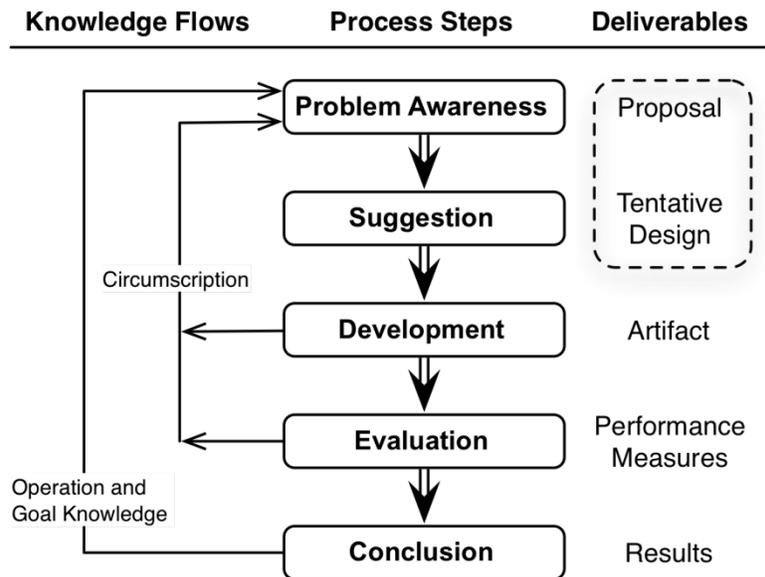


Figure 1. Design Science Research general steps (Vaishnavi & Kuechler, 2004).

In a generic way, the steps can be explained as follows. The first step, problem awareness, is the realization that there is a particular problem in business, society or science. Once the problem has been defined, one can start to investigate the problem at hand a bit further and search for any available literature and then to suggest a possible design solution in the form of an artifact – step 2. In step 3, the artifact, which should solve the identified problem, is developed. After building the (prototype of the) artifact, it needs to be evaluated against pre-defined evaluation criteria (step 4). During the process of developing and evaluating the artifact, questions might be raised that require a re-formulation of the problem resulting in further iterations (step 5). Moreover, the development and evaluation process are iterative, as the developed artifact is not expected to be right the first time. Below we map the seven guidelines

onto the five steps (table 1) and in the next section, we elaborate on this five-step process using examples that are relevant to our research.

Step	Guideline
1. Problem awareness	1. A new and innovative artifact needs to be developed 2. The artifact needs to be a response to a clear and relevant business problem that is identified by the researchers
2. Suggested design	3. Proper evaluation measures and methods regarding the utility, quality and efficacy of a design artifact need to be defined. 4. The research outcome needs to have a clear research contribution and not only be limited to usefulness for practitioners.
3. Development	5. Proper research methods need to be applied in developing the artifact. 6. Several iterations are needed to tweak the artifact to the initial requirements.
4. Evaluation	3. The artifact needs to be evaluated using the evaluation measures and methods previously defined.
5. Conclusions	7. Results need to be communicated to practitioners and researchers.

Table 1. Mapping of seven DSR guidelines onto the five steps.

Two examples of Design Science Research are by Gemmil et al. (2004) and by Levantakis, Helms & Spruit (2008). The research by Gemmil et al. (2004) concerns the design, development and deployment of directory services middleware for scalable multimedia conferencing applications. Although they do not refer to the formal application of a Design Science Approach in their paper, it clearly complies with at least five of the seven DSR guidelines mentioned above. They start with a clear problem description and formulate design challenges, e.g., related to security in large-scale conferencing applications, which are the main criteria for their new design. Then they actually build their design in a test-bed and test to what extent their design solves the identified problems. Their paper shows the result is an artifact, they follow a problem solving approach, and they publish about the research in a ViDe H.350

‘cookbook’ to make their results widely available. The second example involves the application of a reference method for knowledge auditing as the artifact of the research (Levantakis et al., 2008). For developing the reference method, they use a DSR approach based on the DSR process mentioned above and combine it with Method Engineering techniques. Based on a literature review, several current information and knowledge auditing methods are found. The creation of the reference method is based on the idea of the smallest common denominator of the other methods. After developing the reference method, it was then tested in a case study organization to demonstrate its value and possible shortcomings. In this case, the results were also published in a separate report containing a full description of the reference method.

Case study: Design process of a user innovation environment

We now turn to our research in which we investigate the application of DSR to a case study. Below we describe how we applied the five steps of the DSR approach to the development of a user innovation workshop in Second Life that included the design of the virtual space in which the workshop takes place as well as virtual objects.

Step 1: Problem Awareness

The first step concerns awareness about a relevant business problem. In this research, problem awareness was initiated by an entrepreneur in the context of her start-up, RunAlong.se, a web community for joggers. The entrepreneur had adopted a user innovation approach for her venture, involving the users from the ideation phase through the service release process in order to tailor the product to user needs. During the process of involving the users in a series of workshops in the physical world in Stockholm, Sweden, the entrepreneur discovered several significant shortcomings with this process. The workshops were onerous and more importantly they were limited in terms of insights because investigating only very local users gave a very restricted view. Due to limited financial resources, the entrepreneur was therefore looking for potential ICT supported solutions to bring runners together from all over the world to discover their specific needs and values and to incorporate these into the development of her web community for joggers. Participation by one of the authors in the physical workshops in

Stockholm led to discussions with the entrepreneur regarding the limitations of these physical workshops and her interest in investigating an alternative approach to user innovation.

Step 2: Suggestion

In this step, potential areas for solving the problem are researched and a suggestion concerning a solution is made. Based on the input of RunAlong.se, we searched the existing literature concerning user innovation (c.f. von Hippel) and co-creation processes supported by ICT and also studied the practices of international companies such as Nokia, Philips, Coca-Cola, and Toyota in this area. The latter three aforementioned companies were chosen as they have been experimenting of late with the user innovation/co-creation process in virtual worlds, e.g., showing new products to (potential) customers and collecting feedback that is then fed into the innovation process. We found that the approach towards innovation in virtual worlds has been typically based on the traditional literature on user involvement in innovation in physical worlds. Two relevant contributions in this field are the Lead User Method (LUM) and the Co-creation approach, where the first is the more formalized of the two approaches (Herstatt & von Hippel, 1992; Olson & Bakke, 2001; Hienerth & Pötz, 2006). The core element of LUM is the involvement of lead users, or those users who face needs that will be in a marketplace before the bulk of that marketplace realizes these needs. The most recent version of the lead user method consists of four steps (Hienerth & Pötz, 2006), the last being the lead user workshop (LUW) where lead users from diverse fields and domains selected in the previous steps are brought together in one location to generate innovative ideas. The second approach is co-creation, which doesn't present a formalized method yet. Co-creation is less concerned with the type of users involved, it rather focuses on orchestrating high-quality interactions, also called experiences, as the key to unleashing innovation (Prahalad & Ramaswamy, 2004).

We considered both approaches in designing our user innovation approach within a virtual world, providing valuable structures upon which to elaborate. One common element we found between the two approaches was the use of workshops to unleash user creativity. The use of workshops is seen as a key element in successful innovation processes since they enable and support interaction between users as well as different ways of involving them. Additionally, the way in which users are involved in the innovation process is argued to have a strong influence on

the innovation outcomes (Gruner & Homburg, 2000), suggesting that design activities that maximize the engagement of the users (Magnusson, Matthing & Kristensson, 2003) lead to the most innovative outcomes. Diversity of user backgrounds is also acknowledged as an element supporting innovation because it represents an opportunity to create new interdisciplinary insights, especially when supported by a conducive process and a stimulating environment (Grant, 1996; Swan, Newell, Scarbrough & Hislop, 1999). Virtual worlds can greatly facilitate both these conditions as engagement can be created through various means, such as simulation or role play, and the diversity of user backgrounds is possible due to the ubiquity of virtual worlds (Ondrejka, 2007). As a result, we were of the opinion that the design of virtual user innovation workshops would have a clear research contribution to the area of user innovation in addition to being of use to the entrepreneur.

The potential of workshops within virtual worlds for supporting user innovation led us then to suggest this approach to the entrepreneur as a solution to her problem uncovered in step 1. The entrepreneur immediately accepted our proposal as she felt that it solved her problem very well. Subsequently, we then focused on developing proper evaluation measures and methods regarding the utility, quality and efficacy of the virtual workshop and environment

Step 3: Development

Taking into account RunAlong's needs as well as the insights from the literature, we developed the virtual world user innovation process outlined in Table 2. The process comprises four steps, where the name of each step indicates its goal, complemented with a customized environment within the virtual world of Second Life. According to the practice of LUW (Hienerth & Pötz, 2006), the process is an intertwining of discussion in small groups as well as a plenum discussion to favor the interaction without overlooking the knowledge transfer. The duration of the entire process was set to about 75 minutes, leaving a time buffer before exceeding the allotted 90 minutes, generally considered the upper-limit within virtual worlds after which the participation and contribution tend to decrease sharply.

Process steps	Literature reference
1-Get Inspired	Swan et al. (1999); Hienerth and Pötz (2006); Gladwell (2005)
2-Get Active	Hienerth and Pötz (2006); Schakade and Kahneman (1998)
3-Get Creative	Hienerth and Pötz (2006); Coyne et al. (2007)
4-Get Critical	Hienerth and Pötz (2006)

Table 2. Process steps and literature references.

We chose the virtual world of Second Life as the “site” for our workshop due to its relative user-friendliness and the ability to create a process easily and relatively cheaply as well as the ability to reach out to a diverse set of users across the globe. For developing the workshop environment in Second Life, we carefully evaluated the principles guiding the design of digital environments, especially taking into consideration the characteristics of virtual worlds. A relevant study is the work by Nambisan & Nambisan (2008) mentioned above, concerning the design of innovation activities in virtual customer environments (VCEs), based on the four components constituting the customer experience: namely, pragmatic, sociability, usability, and hedonic.

According to Nambisan & Nambisan (2008), the effectiveness of customer participation in a VCE can be greatly increased through leveraging and emphasizing the digital environment’s features as well as its design. Among the principal actions suggested to favor the customer experience are features that favor social cues offering clear guidance about the process, thus allowing for a high degree of autonomy. These features are to then be complemented by the use of simulation capabilities that increase the user experience. Recognizing that Nambisan & Nambisan’s (2008) research focused on the traditional web, we needed to make additional adjustments accounting for the specifics of virtual worlds. Ondrejka (2007) indicated four critical areas of intervention: 1) process duration, 2) availability of multiple communication channels, 3) a playful environment that 4) solicited the user to participate and being active during the process. The combination of the work by Nambisan & Nambisan (2008) and that of Ondrejka (2007) provides key design principles for designing virtual spaces that are applied in this research.

Below we discuss first the basics of the virtual workshop environment in Second Life and then the workshop process we designed to take place in this environment.

The Digital Environment in Second Life

As suggested by both Nambisan & Nambisan (2008) and Ondrejka (2007), participants within digital environments benefit greatly from the presence of visual cues. In the case of a three-dimensional environment, each location and object can carry a specific meaning that can be used to guide the users through the process. In view of this opportunity, the workshop environment was designed on two levels and further divided into smaller areas to support the user focus during the process (Figure 2). The first level of the environment featured a welcome area with informative boards showing details about the process and a running track. The latter was built based on one of the VCE design criteria (Nambisan & Nambisan, 2008), suggesting that “flow technologies” create stimulating experiences leading to creativity. The second level of the environment is composed of three platforms: one main platform and two elevated smaller platforms. The main platform is dedicated to the plenum activities of the introduction and the concluding activities of discussion and voting with the support of an interactive board. The two side platforms are allocated to break-out sessions for brainstorming in an environment equipped with questioning tables, sitting pods and inspiring posters showing pictures of runners exercising in different places and weather conditions.



Figure 2. RunAlong Innovation Workshop Area.

The Workshop: User innovation approach within a virtual world

Step 1: Get Inspired

When the participants arrived, they were presented with several informative panels providing a summary of the workshop steps. In addition, they were invited to receive some running gear consisting of running shorts, a RunAlong t-shirt and running shoes. The giving away of running gear was designed to create a feeling of group spirit by dressing in the same gear as well as to provide an ice-breaking moment for people to interact with one another. The avatars were then invited to take an immersive run (Figure 3) on the track around the workshop area. These activities played a great function in the desirability dimension, stimulating the playfulness of the participants and enabling them to experience the situation, as suggested by Gladwell (2005) as crucial in gaining insights otherwise difficult to acquire only through thoughts. In addition, these first activities were useful in creating interaction and interest in the event since workshop participants did not all arrive at the scheduled time. Individuals thus had something to do while they waited for the event to start once all the participants had arrived. Once all participants had arrived and had received the running gear as well as taken a run, all participants were asked to move to the plenum area on level 2. When all were in place in the plenum area, the workshop

moderators then provided a brief introduction of the workshop purpose and some insights into the upcoming activities. Step 1 lasted around 10 minutes.



Figure 3. Get Inspired, step 1.

Step 2: Get active

After Step 1, the moderators split the participants into two groups based on where the avatars were sitting on the plenum platform, i.e. those who were sitting on the left side of the platform were asked to move to the left break out session area and those on the right to the right break out platform. The break out sessions (Figure 4) took place on the dedicated break out platforms with a group of participants and a facilitator. Discussions were driven by the questions that appeared on the discussion table controlled by the moderator. The questions focused on the challenges faced by the participants and as well on emerging trends they have experienced or have learned about in their local environments, thus unleashing knowledge for discussion and new ideas (Table 3). Before the start of the discussion, one of the participants was invited to be the note taker for each group for the session. The facilitator moderated this discussion as well – encouraging individuals to contribute as well as to keep the discussion moving. Step 2 took about 15 minutes.



Figure 4. Get Active, step 2.

Step 3: Get creative.

The participants continued working in the break out setting (Figure 5) and were invited to discuss in detail the aspects concerning the development of a web community for runners (Table 3). The values were the first theme of discussion, asking what participants see as the most appropriate values to be represented in the web community with which they can identify themselves. Then the discussion moved forward to brainstorming about features that the participants would consider useful and attractive for perspective runners, i.e. users of the web community. The facilitator continued to moderate this discussion. Additionally, the note taker was given the option to continue to take notes or to pass this task to another participant. Step 3 took about 15 minutes.

Step 2. Exploring running needs and trends
Think about the last really good run you experienced. What is it that made this a great run?
What are the major challenges of running in your home area?
Is there anything specific in your home area that you would change when it comes to your running experience?
What are some new running trends in your home area?
What is the most unusual way that you have seen people engage in running activities?
What changes in running do you foresee in the next 5 years?
Step 3. Unveiling values and features for RunAlong
Thinking of our discussion, in your opinion what are the values that a community site should inspire?
Think about the values you would like to see incorporated in a running community. Can you describe the look and feel of the site?
What are the features of other community sites that you like?
What new features would you need on a site that you haven't seen on any other sites?
Imagine you use this community site. Can you describe step by step what you would like to find when you move around the site?

Table 3. Break out session questions.

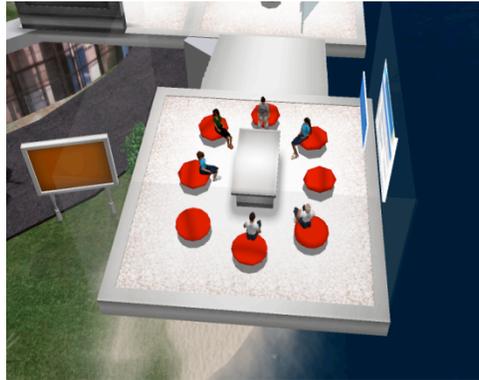


Figure 5. Get creative, step 3.

Step 4: Get critical.

After finishing the discussions in the breakout sessions, participants gathered together on the main platform, where the note takers summarized the outcomes of their discussion group for the other group. Here the goal was to exchange ideas and to create a moment of discussion between the two groups. The group was then introduced to a tool called the BrainBoard with a trial session in which the facilitators demonstrated how to use the board. The purpose of this session was to encourage the participants to brainstorm around two areas for the entrepreneur: 1) what values the website should embody and 2) what functions the website should offer. Through the use of the BrainBoard, the participants were able to write their values and ideas features onto the board through the Second Life chat function as well as to vote on which ideas and then to vote on their favorite ones. The purpose of the Brainboard was to enhance interactivity in the session, allowing the users to interact with a tool and to easily display their own ideas as well as to summarize the outcomes of the workshop (Figure 6). The session concluded with a short wrap up from the entrepreneur commenting on the session and the ideas proposed. This final step took about 20 minutes.

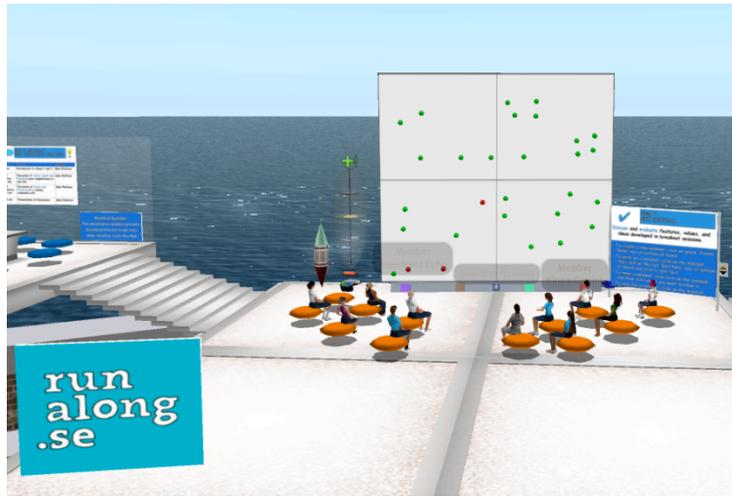


Figure 6. Get critical, step 4.

Step 4: Evaluation.

To evaluate the user innovation workshop process and the Second Life environment supporting it, four workshop sessions were organized, evenly distributed between the months of August and October 2009. The recruitment of participants for these workshops targeted enthusiastic runners and experts in web-design, experience design, and community development as well as individuals interested in innovation in virtual worlds. Contrary to the lead user method (von Hippel, 2005), selection of the participants relied on the potential of users to self-select themselves, driven by their self-interest in sharing their knowledge to potentially benefit from the results (Harhoff, Henkel & von Hippel, 2003). The potential participants were invited to join the workshops through multiple digital communication channels: advertising banners on numerous sites and group notices within Second Life, announcements posted to related groups on social media sites like Facebook and LinkedIn, Twitter, and announcements on traditional internet channels such as mailing lists dedicated to Second Life users and information scientists. The recruitment attracted a total of 21 participants, mainly from the United States and Europe, mostly sharing a passion for running and the enthusiasm in supporting the development of the web-community. Noticeably, the sample presented a large number of academics and researchers, likely due to their higher involvement within virtual worlds. The total number of participants was comparable to the number of participants in RunAlong's physical workshops and to user innovation workshops in general (Herstatt & von Hippel, 1992; Hienert & Pötz, 2006).

In line with Drettakis et al. (2007), each workshop was evaluated by the authors through direct observation during the workshop execution. In addition, at the end of each workshop, the participants were invited to take an online survey through clicking on a presentation board that then opened a web browser with an online survey (using Survey Monkey). Participants were encouraged to answer the survey through the offer of 500 Lindens (just under USD 2) for a completed survey. The first survey section covered questions relating to the participant's demographics: location, age, occupation, running experience, SL experience, and innovation experience. The core of the survey was then based on the four components of Nambisan and Nambisan's (2008) VCE experience to better understand how well our workshop fulfilled these components: 1) pragmatic, 2) sociability, 3) usability, and 4) hedonic. In addition, we asked one question related to "flow" (Csikszentmihalyi, 1996), which is tightly linked to creativity (Amabile et al., 1996) as previously explained. The interview questions are presented in the appendix. In total we received 18 completed questionnaires out of 21 total for a response rate of 86%.

After the series of workshops, a number of participants were also contacted to further discuss the process as well as their experience during forty-minute interviews based on a semi-structured template. The interview questions can be found in the appendix. In total, we interviewed 10 participants as well as the entrepreneur.

Evaluation Results

The process evaluation considered the participants' perspective, collected through a total of 18 completed questionnaires and 10 interviews among a representative sample of the participants selected on the bases of their answers to the survey as well as to reach participants who did not complete the survey. The data collected from the participants showed a very positive sentiment with regard to the capacity of pursuing user innovation within virtual worlds. One participant commenting on the workshop stated: "I did not expect the second life platform to be so suitable as it was for this kind of workshops. Also, the voice chat and chatbox-chat ran alongside each other really nice. Before the workshop I did not expect it to run so smoothly." The analysis of the results aims to shed light on the strength of the process, virtual space and hence the virtual world in fulfilling the VCE dimensions. Our analysis shows that the three aspects of hedonic,

pragmatic, and usability were considered valuable during the idea generation and screening while the aspect of sociability was not discussed to a high degree.

Hedonic. Several participants described the process of taking a run on the track as fun and even if there was some initial skepticism, they found themselves recalling one of their usual runs in real life. This was a first indicator of hedonic fulfillment but was not considered the only one. Receiving running gear was commented on by several people as supportive for the attitude and perceptions of pursuing a common purpose. One person commented, “I liked the clothing that everybody was wearing – taking everybody into the spirit of the fact that there was an overarching goal and a consulting capacity.” However, one of the participants, noticeably using SL for the first time, indicated having little inspiration from this activities suggesting from his perspective the use of a short movie about running. The activity that, however, was found more stimulating to the hedonic dimension, regardless of the participant’s background, was the break out sessions because the storytelling encouraged people to think about their own experiences while making connections with other participants, unleashing their creativity and a sense of pleasure from having contributed.

Pragmatic. We found a prevalent trend of people who recognized an overall easiness in appropriating new knowledge in the workshop, and numerous ideas emerged in the first part of the break out sessions in which participants discussed the needs and trends of runners in their local environments. The opportunity to learn more about the situations encountered in different countries was appreciated by all the participants, in line with the finding of Harhoff et al. (2003) who proposed the beneficial effect of diversity in supporting discussions. In very few occasions did language appear to be an issue in terms of hindering some non-native speakers from contributing more actively. However, some of the participants felt like they were unprepared for some of the discussions as one participant commented, “Well, I could contribute what I knew, I like running, but I don't know how much I actually know about the needs and trends in my home market. So my contribution was based on the observations while running around.” This was, however, in line with the research team’s expectations and provided the ground to seed further discussions. Few participants were inclined to have an initial presentation illustrating the current web community for runners but recognized the likelihood to inhibit the generation of novel ideas.

Usability. The design of the environment was highly appreciated among the participants, who indicated that it was easy to navigate due to the wide use of signs and boards conveying the right amount of information and at the right time to support the process. A second aspect that greatly impacted the usability of the process was the presence of facilitators, considered crucial in orchestrating the break out sessions and supporting people encountering either technical or practical difficulties. However, some problems did emerge, fundamentally related to the use of the two communication channels, chat and voice, at the same time and with the use of the BrainBoard. The two-communication channels, created an initial “frightening” feeling among the inexperienced participants, but after they became familiarized with them, they found them useful because they allowed participants to share ideas at anytime without the risk of forgetting them. The second issue concerned the use of the Brainboard, a new tool for the majority of the people, requiring a small learning curve to understand the functioning and in few cases requiring the participant to ask for help from the facilitator to input their ideas because they could not successfully interact with it.

VCE dimensions, however, provide only a partial view of the ability of virtual worlds to support innovation. As mentioned above, research suggests that the state of “flow” is an important element in designing innovation processes (Csikszentmihalyi, 1995). During the interviews as well as in the survey, we found mixed answers with respect to flow. Interestingly, those who did not experience flow were those who admitted being busy in the physical world with other activities simultaneously. For example, one person even said that she was multi-tasking as we heard her phone ring on several occasions, and she said that she had to participate in a real life telephone conference at the same time. The inexperience of some participants in managing their avatar was also found by few as a cause of distraction. However, while this slightly affected the flow feeling, it is a clear indication of engagement with the technology. In some cases, a strong feeling of a state of flow was noted in the survey answers. For example, one person stated, “At one point, I suddenly realized that it was a virtual discussion, somehow it did feel like a real-world discussion.”

Our last step in the evaluation was to discuss with the entrepreneur, highlighting aspects of the workshop process itself as well as the outcomes of the workshop (e.g., values and features) gained through interviews and the analysis of the results. Overall, the entrepreneur was

enthusiastic about the workshop process and was in agreement with the other participants that the breakout sessions were the most absorbing activities. The absence of a drawing tool in the workshops appeared to challenge the entrepreneur, who considers such a tool as a valuable complement for the participants to visualize ideas concerning web design. Looking at the outcomes generated, the entrepreneur found several valuable inputs with great market potential that were not developed in the physical workshops. A comparison between the features selected by the participants and the ones discussed during the break out sessions highlighted a rather high capacity of the group in contributing emerging potentially relevant ideas.

Step 5: Conclusions.

While we did not find that the problem revealed in step 1 needs to be reformulated, in our design and running of the workshops, we did find that these virtual workshops can work very well in terms of facilitating user innovation and do help to solve the problem identified in step 1. This is supported by the interviews with some of the workshop participants and the entrepreneur who confirms that the outcome is a workable avatar based innovation process that produced results that are considered valuable by the entrepreneur.

In terms of evaluating and refining the workshop, our evaluation approach in which we both conducted interviews as well as online surveys enabled us to refine the workshop three times. For example, one refinement concerned the note taking activity, which initially was done on note cards, but observing the participants during the first workshop we realized that the local chat could have been a more suitable tool for the purpose. This is because it allows sharing the salient points of the discussion with all the participants, who can then directly contribute and reflect upon them, increasing the interactivity and also stimulating the hedonic aspect of the project. In general, the improvements were more of a fine-tuning nature than of an overhauling one.

An issue that remains after the iterations is the technology hurdle. During the workshop, it became clear that for some participants it was their first or second experience in Second Life meaning that they were still struggling to find out how to move and communicate. Furthermore, some participants experienced problems because they could not connect to Second Life, for example from their work office, because firewalls blocked required Second Life ports.

Consequently, some Second Life experience is therefore desirable for running a workshop in the future.

In addition, if we look to the literature that we reviewed and applied in our development of the workshops, we find that this did provide a sound basis for designing the virtual workshops. The aspects of VCEs: hedonic, pragmatic, sociability, and usability, as well as flow enabled us to ensure that we considered all these aspects in building the environment. However, as mentioned above, the aspect of sociability was not discussed that much by the participants in the evaluation step. One of the reasons for giving the participants the same t-shirt and shoes was to promote sociability by giving them a feeling of identity and sense of belonging, as discussed in the literature on communities (Wenger & Snyder, 2000). Perhaps this act was insufficient to create this sense of sociability or perhaps the aspect of sociability is not of that much importance in user innovation environments.

Having said the above, one final question we need to ask is whether the approach of virtual innovation workshops was the appropriate approach to choose. Could the entrepreneur achieve the same or better results through a different approach, e.g., bringing people from across the globe physically, conducting a video conference, or even just an online questionnaire? Turning to the international entrepreneurship literature, we find that one of the major challenges to internationalization is the ability to access foreign market knowledge. These knowledge-gathering activities are particularly challenging for small firms, which compared with large firms have limited financial and managerial resources and limited network and information resources as well as a lack of experience in such activities (Coviello and McAuley, 1999, Melen 2009). In recent years, attention has been turned to the internet as a means to gather foreign market knowledge; however, there is considerable debate as to whether the traditional internet actually can be used to gain experiential foreign market knowledge. Thus, reflecting on the positive outcomes in terms of results from our virtual workshops as well as the inability of the entrepreneur to afford bringing together participants physically, we posit that the development of virtual world innovation workshops was the right approach to take.

Discussion and Conclusion

Returning to our research intent to investigate whether we can use Design Science Research as an approach for developing virtual world spaces, we find that this approach greatly facilitated the development of virtual innovation workshops through a clear structure. Using this structure enabled us to first critically evaluate the problem – was it really a problem that was faced by the entrepreneur? When we turned to step 2, the guidelines of building in evaluation as well as making a research contribution encouraged us to review various bodies of literature, e.g. user innovation and virtual customer environments, and then use these to help design the environment and the objects and then to build the structure of the evaluation. Step 3 of development encouraged us to ensure that we built in the proper research methods and step 4 enabled the continuous improvement of the workshop between iterations. The iterative nature of the design process is considered to be essential in improving the design in several cycles. During the evaluation, we found it important to involve the different stakeholders and to use different methods for collecting feedback during and after the workshops. Interestingly, step 5 encouraged us to write this paper so that we could disseminate our findings to others interested in building innovation environments. Moreover, we plan to continue our research in this area and build on these findings.

Summarizing, the contribution of this research is twofold. In the first place, this research contributes to the design process of virtual spaces. It demonstrated that the DSR approach is a useful, but generic, approach and that still relatively little is known about the particular needs and criteria for designing virtual spaces. Nevertheless, we think that our research shows how the DSR approach can exert more rigor and relevance to research concerning applications in virtual worlds (of which our user innovation application is just one example). In the second place, the research resulted in an avatar-based innovation process and supporting virtual space in the virtual world of Second Life. This process is tested in several iterations, and both the feedback of the participants and entrepreneur indicated that it is a workable solution.

We realize that our study also has some limitations. First of all, it was already mentioned that the DSR approach provides a generic process for the design of virtual spaces. Hence, the process should be adapted to the specific situation of the design of virtual spaces. Furthermore, we have conducted only one case study in which we created only one artifact. Further research should investigate the application of the DSR approach to other virtual world situations to

determine if it can be applied or how it should be adapted. While there are significant limitations, we would nevertheless like to suggest that the use of the DSR approach in virtual worlds by practitioners could enable them to better design virtual environments. Moreover, our study has revealed that the application of Nambisan and Nambisan's components of Virtual Customer Environments as well as the concept of flow are valuable in the design of virtual innovation environments. We would like to then suggest five aspects of virtual innovation environments: hedonic, pragmatic, sociability, usability, and flow. Clearly, one area for further investigation is the relative impact and interplay of the five aspects to determine to what degree each impacts the user innovation experience outcomes as well as if there are other aspects that should be included. Finally, another area for further research is in the area of entrepreneurship. For example, to what degree are virtual worlds conducive to the acquisition of valuable experiential foreign market knowledge by entrepreneurs in the physical world. Another question is to what degree avapreneurs, or entrepreneurs whose primary entrepreneurial activity is in virtual worlds (Teigland 2009), can involve customers in the development of new products and services through user innovation activities in-world.

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Appendix A – Participant’s Interviews

Component	Question	Answer
Pragmatic	Have you learned something through this RunAlong workshop that you could apply to running or some other aspect of your life? If so, what?	Open
	What ideas did you get from the workshop about using virtual worlds for innovation in your work or elsewhere?	Open
Sociability	Did you feel a sense of camaraderie (i.e., that you had a lot in common) with the other workshop participants? Please explain.	Yes/No Open
Usability	What is your opinion of the RunAlong workshop in terms of process and functionality? For example, moving around, knowing what to do, etc.	Open
	Did you experience any difficulties in participating in the workshop?	Yes/No Open
	How well could you contribute your knowledge about running needs and trends in your home market to the discussion? Please explain.	Open
	How well could you contribute to the discussion about values and features of a running site? Please explain.	Open
	Did anything hinder you from being able to contribute to the discussion?	Yes/No Open
Hedonic	What was the most engaging part of the RunAlong workshop? Why?	Open
	What was the least engaging part of the RunAlong Workshop? Why?	Open
Flow	The word "flow" is used to describe a state of mind sometimes experienced by people who are deeply involved in some activity. One example is the case where a professional athlete is playing exceptionally well and achieves a state of mind where nothing else matters but the game; he or she is completely and totally immersed in it. The experience is not exclusive to athletics: Many people report this state of mind when playing games, engaging in hobbies, or working. Activities that lead to flow completely captivate a person for some period of time. When one is in flow, time may stand still, and nothing else seems to matter. Flow may not last for a long time on any particular occasion, but it may come and go over time. Flow has been described as an intrinsically enjoyable experience. Thinking about your experience in the RunAlong workshop, did you feel at any time that you were in a state of flow? Please explain.	Open
Workshop evaluation	What recommendations do you have for improving the RunAlong workshop?	Open
	After my experience with this workshop, I plan to participate more often in innovation activities in virtual worlds.	1-5 scale Strongly disagree to
	After my experience with this workshop, I plan to participate	

	more often in innovation activities in real life.	Strongly agree
	I would recommend this workshop to my peers.	
	I would like to run an innovation workshop like the RunAlong workshop at my work or elsewhere.	
	Overall, how did you enjoy the RunAlong Workshop experience?	1-5 Extremely unenjoyable – Extremely enjoyable
	How valuable is a workshop like the RunAlong workshop for organizations and their innovation activities?	1-5 Extremely unvaluable – Extremely valuable
	Do you have any other comments for the RunAlong crew?	Open
Other	What story would you tell others about your participation in this workshop? For example, is there something exciting or unexpected that happened during the workshop, etc?	Open
SL & RL	If the RunAlong workshop had been a real world activity in my hometown, I would have participated.	1-5 scale Strongly disagree to Strongly agree

Appendix B – Participant’s Interviews

High level goals of the project
- Investigate whether virtual worlds can provide a medium for SMEs to acquire foreign market knowledge to facilitate their internationalization process
- Examining the use of avatar-based innovation activities by SMEs to interact with foreign customers and the degree to which objective, and more importantly experiential knowledge, can be acquired through this medium
Interview goals
- Evaluate the design of the workshop process and the workshop environment in SL
Approach
- Semi-structured interviews
- Participants are interviewed after partaking in the co-creation activity directly within Second Life
- Communication will be text-based?
Grand Tour question
Would you begin by telling me what were the first things that came across your mind after you have participated in the workshop?
Usefulness of approach and understanding of customer needs
What do you think in general about using virtual worlds for real world innovation?
What would you consider the most positive thing of using VWs for real world innovation? (e.g. easiness of reunite people, opportunity to simulate a run ...)
In what way did you find the workshop valuable to discuss running needs and trends?
Process
What do you think about the process and the single steps of the workshop?
Were the process steps sufficient to get a good overview of the values and features of a running community in your opinion?
Was it easy to contribute during the workshop? Why?
Were the workshops well facilitated/lead? i.e. Did you feel stimulated to contribute?
Workshop environment in SL
What thoughts did you have when you experienced the workshop environment?
What did the environment facilitate?

When you experienced the workshop environment what were your big questions?
Did you consider the environment inspiring?
Experience
What did you like best about the workshop?
Could you describe your most outstanding experience during the workshop?
Identity
Do you think that your representation as an avatar in Second Life influenced your contribution to the workshop?
Problems and Improvements:
What were the most serious problems that you faced during the workshop?
Let's briefly talk about what can be done to improve the workshops. If you were in charge, what kind of changes would you suggest?
Ending
Is there anything that we should have talked about but didn't?