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How to approach a many splendored thing: Proxy Technology Assessment as a methodological praxis to study virtual experience

Lizzy Bleumers
IBBT-VUB-SMIT, Belgium

Kris Naessens
IBBT-VUB-SMIT, Belgium

An Jacobs
IBBT-VUB-SMIT, Belgium

Abstract

This article introduces Proxy Technology Assessment (PTA) as a methodological approach that can widen the scope of virtual worlds and games' research. Studies of how people experience virtual worlds and games often focus on individual in-world or in-game experiences. However, people do not perceive these worlds and games in isolation. They are embedded within a social context that has strongly intertwined online and offline components. Studying virtual experiences while accounting for these interconnections calls for new methodological approaches. PTA answers this call. Combining several methods, PTA can be used to investigate how new technology may impact and settle within people's everyday life (Pierson et al., 2006). It involves introducing related devices or applications, available today, to users in their natural setting and studying the context-embedded practices they alter or evoke. This allows researchers to detect social and functional requirements to improve the design of new technologies. These requirements, like the practices under investigation, do not stop at the outlines of a magic circle (cf. Huizinga, 1955). We will start this article by contextualizing and defining PTA. Next, we will describe the practical implementation of PTA. Each step of the procedure will be illustrated with examples and supplemented with lessons learned from two interdisciplinary scientific projects, Hi-Masquerade and Teleon, concerned with how people perceive and use virtual worlds and games respectively.

Keywords: Proxy Technology Assessment; virtual worlds; games; methodology; ethnography

How to approach a many splendored thing: Proxy Technology Assessment as a methodological praxis to study virtual experience

Introduction

The study of virtual worlds and games is quite a young field that is not yet fully institutionalized. No real “schools of studies” have been established (Mäyrä, 2008), in part because of the large variety in backgrounds of virtual worlds and games researchers, such as literature, psychology and media studies. The definition of shared concepts and the specification of methodological approaches remain in their infancy.

To capture the user experience of virtual media, researchers tend to adopt frameworks that reduce the complexity of these media. Konzack (2007) for instance identified eight rhetorics dominating game studies, which he compiles into three categories: product-oriented (technology, economy), socio-culturally oriented (anxiety, learning, gender, ideology) and aesthetically oriented (narratology, ludology). These rhetorics shape how researchers approach games and heavily influence research choices such as participant selection and applied methodological angles. Sticking to a single rhetoric is problematic, as a broad and open view on subjects and methods is mandatory in this rapidly evolving field. Mäyrä explains the undesirability of a “master theory” in game studies as follows (2008, p. 10): “*Games, players and their interactions are too complex and interesting in their diversity to allow for all too powerful simplifications.*”

A powerful simplification, often applied in studies of new media, is the strict distinction between the real and the virtual. An example of this reasoning is the application of Huizinga’s (1955) well-known concept of the magic circle to gaming and virtual worlds, in which the game world is seen as an entity closed off from the outside world, a place where acts of a different kind take place. However, as Castranova (2005) argues, the magic circle surrounding social and game virtual worlds is far from impenetrable. In fact, it cannot be impenetrable, given that people move back and forth across this border taking their impressions, their beliefs and habits with them wherever they go. Tuszynski (2008) uses the same argument in a critical reflection on the distinction between virtual and real communication. On the one hand, real-world referents seep into virtual realms through people’s activity. On the other hand, virtual realms change what we know and do in our everyday life. Ultimately, a strict separation of the real and the virtual cannot

be upheld. Doing so can even be problematic, as it obscures potential areas of study such as the mutual shaping of virtual media and the people who use these media and their everyday settings. The goal of this paper is to describe a methodological approach, called Proxy Technology Assessment (PTA), which enables researchers to study mutual shaping with respect to new media use, and to describe how this approach can be applied to the study of games and virtual worlds. Virtual worlds and games were, especially at the end of the 20th century, studied in terms of effects, with its audience considered to be passive. In recent years, ethnographic research of virtual media has grown exponentially, taking into account how people also actively create meaning from experiences with these media. PTA combines several interpretative and ethnographic methods for investigating people's experiences with and use of games and virtual worlds whilst taking into account the social context in which these users are embedded.

Introducing Proxy Technology Assessment

Proxy Technology Assessment (PTA) is a methodological approach that is used to gain understanding about whether and how new technology and new applications may become part of people's everyday life. PTA is conducted by giving future users experience with one or more related technologies (i.e. hardware and/or software) that already exist today. Crucial is that these technologies share as many characteristics as possible with the technology under development. These types of technology are described as proxy technologies. Both the way in which the proxy technology is appropriated and the users' experience-based reflections on these technologies can be used to inform and inspire the development of new technologies in an early stage.

PTA is an operationalization of domestication theory, which puts the user in the center of innovation (Pierson et al., 2006). According to the domestication approach, innovations are not situated at the level of technology as such, but at the level of the everyday practices of the people that use that technology. The entrance of a new technology starts a dynamic process in which the technology, the user and his or her social and physical surroundings undergo changes until a new equilibrium sets in. New practices arise and old practices may be disrupted. For instance, the use of the technology within the home can be the result of a heated negotiation between the family members. It is impossible to capture this process by conducting a single individual lab study.

PTA has been developed to capture this social dynamic by investigating technology use in the natural everyday environment of the user over a period of time.

PTA shows resemblance to technology probes (Hutchinson et al., 2003). In both cases technologies are deployed in the natural surroundings of users to study the adapted and new practices surrounding these technologies. Both PTA and technology probes involve giving users an experience as a reference point to reflect on. They are both applied to gain insights in users' behavior per se and in relation to technology during the early stages of development. They differ in terms of their role in the development process. While technology probes are intended to obtain design ideas, proxy technology assessment requires that a basic idea or concept for a technology has been defined. The primary aim of PTA is to help anticipate whether and how the future technology would fit in with the users' lives in order to guide further development.

The procedure used in PTA can be split into four stages. First, in the preparatory stage, one or more suitable proxy technologies are selected. Consecutively or in parallel, the researcher selects and recruits participants and conducts a careful study of their natural setting. Second, the proxy technologies are introduced to these participants in their natural setting. In the third stage, data are gathered on the use of and experiences with the proxy technology. Preferably, PTA is combined with different methods to allow both method and data triangulation. Finally, the gathered data are analyzed and the results are reported in the form of guidelines or recommendations.

In the following section, we will describe the procedure of PTA in more detail. We will make each step more concrete by giving examples from user research that we conducted within the scope of two projects, Hi-Masquerade and Teleon. Both projects are interdisciplinary projects – funded by the Flemish Institute for Broadband Technology (IBBT) – in which technological research (both by academic and industrial partners) is complemented with user research. The goal of the user research in Hi-Masquerade was to inform the development of a virtual world application to support remote interaction between family members. In the Teleon project, the aim was to make a broad examination of users' experiences of computer and videogames, in order to optimize specific features of future games produced by the project partners. In both projects, the end goal of the project was not a finished product, but rather a proof-of-concept. However, PTA

can be applied in both cases, as it is not dependent on the actual realization of the future technology.

How to conduct Proxy Technology Assessment

At the start of Proxy Technology Assessment (PTA), a concept or notion of the future technology use is required. In particular, three factors should be determined: the characteristics of the future technology, the users for which the technology is intended for, and the setting in which the technology will supposedly be used. These three choices are often made in collaboration with other project partners and can be more or less informed by prior user research. For instance, the selection of certain features may have been inspired by prior participatory design or may have been fixed by the developers as must-haves.

One way to delineate the concept of the future technology is through a scenario that describes project partners' beliefs of what the application would be like, who would use it, where, when and how it would be used. When not immediately informed by prior user research, this story is an idealization, or what Arnowitz, Arent and Berger (2007, p. 301) refer to as a "sunny-day scenario." In any case, the scenario gets revised as user research progresses.

Storyboards can also be used to illustrate a (potential) application and the context in which it is (to be) used in a graphical manner (Truong, Hayes & Abowd, 2006). They can be used complementary to the scenario, for instance, to present the scenario to project partners or research participants. They allow research participants in particular to empathize with the story characters and to reflect on the application's functionality and what it might mean for them (Van Der Lelie, 2006).

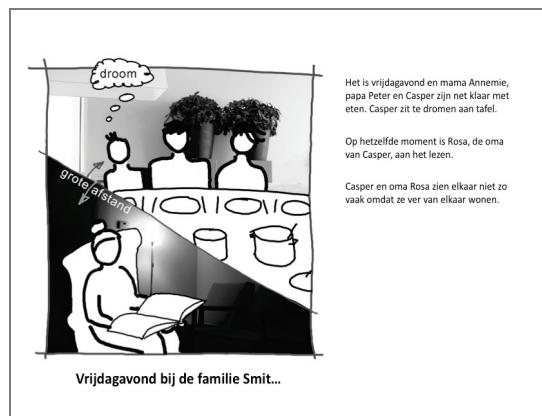


Figure 1. Fragment of the storyboard visualizing the first scenario of Hi-Masquerade.

In Hi-Masquerade, two scenarios were written in collaboration with all the project partners, intended to guide the development of two demonstrators in the project. Both scenarios, illustrated by storyboards (see Figure 1), described the use of a virtual world application by a child and his grandmother in their respective homes, each with a different focus. While the emphasis of the first scenario was more on sharing past experiences with family members, the second scenario was rather on virtual play and cooperation between them.

In Teleon, the project partners broadly described the application the project had to generate. Its focus was a game world, where users could navigate and play games, with emphasis on easy implementation of new mini-games, storytelling and the formation of a dynamic user community. The application would first be PC-based only, but would have to be able to migrate to other platforms. The application had no specified audience in mind, as the developers wished to reach different audience segments in terms of demographics and playing experience.

Preparation

Prior to the actual introduction of the proxy technology, the researcher needs to undertake three actions: Choosing one or more appropriate proxy technologies, selecting, recruiting and profiling participants, and finally capturing the setting to which the proxy technology will be introduced. Each of these research steps is guided by the initial conceptualization of the use of the new technology.

Selecting Suitable Proxy Technologies

The concept of the future technology allows the researcher to compile a set of basic functionalities that the proxy technologies should possess. Aside from these functional criteria, additional criteria are specified. These are more general properties such as ease of use, technical reliability and language. The selected applications should have a transparent interface and function properly. We emphasize that PTA is not a usability evaluation method. The focus is on how and why people would use an application, not on establishing which usability problems

prevent or discourage them from using it. Language can also be a barrier for use; a mismatch with the native language of the users should be avoided.

In Hi-Masquerade, we distilled a set of functional criteria from the scenarios that were written, such as the fact that the application had to be a virtual world that allowed remote interaction and customization. Examples of additional criteria were ease of use, which was particularly important because of the different generations involved, the fact that the application should run both on PC and MAC laptops and desktops and the use of native language, which turned out not to be straightforward. After discarding a number of applications, we found an online web application that featured a small virtual world targeted at family members of various ages and that ran on MAC and PC. Unfortunately, the application was not available in Dutch. However, it was the most optimal application given our set of criteria.

In Teleon, as mentioned previously, the initial concept was rather broad. To deal with the limited set of prefixed features, we chose a large variety of games to address what various user groups would like and what they would not like in such an application. We selected 6 platforms (PC, Microsoft Xbox 360, Sony Playstation 2, Sony PSP, Nintendo DS, Nintendo Wii) and 18 games. Differences in technological features such as mobile vs. domestic hardware, strength of graphics and sound and controlling devices influenced the selection of proxies. The selection of games covered most popular genres such as sports, strategy, MMORPGs, action, platform and sandbox games. The 18 games allowed eliciting participants' reactions to a range of proxies with great variety.

Selecting, Recruiting and Profiling Participants

In preparation of PTA, each envisioned user group has to be described in terms of demographic and/or socio-economic characteristics and other distinguishing features, such as degree of familiarity and experience with related technologies. All these features will be the core of the selection criteria. This means that sampling is done purposively (Bernhard, 2006) instead of probabilistically.

There is not a magic number of participants to engage in PTA. As the goal of PTA is to generate a rich description of how a technology settles within people's everyday life, the approach is grounded on the use of qualitative, interpretative and ethnographic methods (Pierson

et al., 2006), which will be described in more detail further on. PTA does not exclude the use of quantitative methods; it simply cannot be based solely on a quantitative methodology. The intensity of data collection in this type of research limits the number of participants that can be studied properly within a given amount of time. In our view, PTA research can best be carried out within a small sample of participants.

Recruiting participants for PTA research can be very difficult. First, researchers need to identify participants with specific characteristics, whose numbers are usually limited. Also, participation in ethnographic research requires great effort from respondents, since active input is demanded for a longer period of time. Indeed, many people are hesitant to participate in long-term in-depth research. Recruiting by using snowball sampling therefore proves to be highly valuable for this approach. Once you locate a suitable participant who is willing to participate in the study, he or she often knows friends or family with similar characteristics. This participant can then become an informant for your study, either convincing other suitable participants to take part or bringing you into contact with these participants.

Both in Hi-Masquerade and Teleon, snowball sampling was essential because we wanted to recruit user groups, instead of individual users. In Hi-Masquerade, we needed to recruit family members across households (with internet access at each household). In particular, we were looking for family members across three generations: a child between eight and twelve years old, one of its parents and one of its grandparents. We approached grandparents and parents, asking them whether they would be willing to participate with two relatives in a research project of about one year and a half¹. In this way, three groups of family members were recruited. In Teleon, the goal was to involve single households (friends sharing a residence, couples, families with children) in which one of the household members played games. The recruitment of the households took place through a first contact with one household member, who was not necessarily the household member that played games. The total number of participants in Teleon amounted to 15, distributed over 5 households. These 15 participants were followed in their use of the offered proxy technologies for some five months.

As PTA requires great effort and is vulnerable to dropout of respondents, it is vital to keep participants interested in the study. By having the same researcher in contact with the

¹ Participants were informed that they would be contacted maximally six times within this timeframe.

participants during the whole period, from recruiting until the end of the study, a strong social tie is created that can motivate participants to stay engaged. In addition, incentives can be offered to keep participants motivated. For instance, in Hi-Masquerade, family members received tickets for the zoo. Next to money or gifts, PTA research offers participants the unique incentive of being able to use the proxy technology for the duration of the field study. In Teleon, for example, participants had the opportunity to use several gaming devices and games at home together with their friends and family over a period of five months. This was particularly a motivator for the participants that were already more experienced with digital gaming.

Once the participants are recruited, their profile information is gathered, which can be done through a questionnaire (Dreessen & Pierson, 2007). This can help to confirm that the participants meet the selection criteria, particularly when recruitment was done by an external agency. However, the questionnaire also enables the researchers to collect additional information on the social context of the participants, their access and use of particular media, and their answers to project-specific questions (Lievens et al., 2008). In Hi-Masquerade and Teleon participants were asked to fill in basic demographic and socio-economic data as well as answer questions about media access, use and preferences.

Mapping Users' Setting

In line with the domestication approach, an accurate interpretation of the use of and experiences with the proxy technology necessitates a thorough understanding of the setting in which the proxy technology is deployed. Indeed, people's behavior, including their technology use, is intimately connected with the spaces they live in. The setting in which technologies are used influences what users do with them and how they operate them. It is because of this intimate connection that Kuznar and Werner (2001) emphasize that understanding human behavior should begin by drawing a map of the environment in which this behavior is played out. This is exactly what is done in the preparatory stage of PTA research.

The setting that needs to be mapped is determined in advance. It can be a fixed setting such as the home or workplace when studying technologies or applications with limited mobility (e.g. home cinema system, IDTV programs requiring connection to a cable network). However,

the setting can also be dynamic. For mobile technologies and applications for instance, it includes means of transport for daily commutes to and from the homes of friends and family.

With regard to what should be mapped, especially the presence of technologies with resemblance to the future technology is highly relevant. The mapping itself can proceed in two ways. The researcher can draw up a geographical map containing the location of all relevant context elements or let participants draw up a map themselves. In both cases, it is recommended that researchers take photographs of the setting to enrich the map (see Figure 2).

Baillie and Benyon (2008) present a way for researchers to map out both the physical spaces within people's homes and the way people perceive these spaces. Their approach is to create maps based on what they call "technology tours." During a technology tour, researchers walk through the house, both with the entire household and with each of the individual household members in order to establish which technology is present in each room and where it is located, who of the family members uses it and what for. The resulting maps showed that the different household members clearly had differing views concerning the purpose of certain spaces. This approach was applied in Teleon. In the Teleon project, we produced a geographical mapping of the participants' homes, describing the basic architecture, which media technologies they owned and where these were placed in their residences. Placement was often critical, as media devices in participants' private rooms were seen as personal and very often not to be used by other household members. This ownership and familiarity with certain devices acted as a point of reference for the researcher during the data collection and the analysis process.

Instead of drawing up a map of the users' environment, the researcher can also ask participants to draw up a map. Such a map is a direct representation of how users see their environment. Hasbrouck (2007) has effectively used cognitive mapping to gain insight into domestic practices and their relationship with domestic technologies. Together with fellow researchers he asked people to draw maps of their homes and mark the location of objects that take on an important role in their daily activities. Their creations were taken as the starting point for additional questions. This mapping procedure is less invasive. However, there is a risk that participants will neglect or fail to mention the presence of certain technologies, for instance, out of forgetfulness or because of social desirability. In Hi-Masquerade, we let family members draw a map of their home and mark the location of media such as the television. This map was

discussed with them and supplemented with photographs of the media taken by one of the researchers during the following visit. These photographs helped to “verify” the map of one of the households.



Figure 2. Photograph of participant’s living room in Teleon project.

Distribution of Proxy Technology

When introducing a proxy technology to the participants, researchers should install and configure the technology properly and give a demonstration. When conducting PTA, researchers are mainly interested in the actual appropriation of the proxy technology and not in the preceding phase of figuring out how to use it. By equipping participants with operational technology and basic knowledge on how to use it, researchers ensure that the participants smoothly pass this initial phase and are not demotivated by a failure to use it.

It is important to explain to participants what is expected from them with regard to using the proxy technology. For instance, during the Teleon project, households were provided with gaming platforms and households members were asked to try the accompanying games at least once. However, this request was very informal and not bound to rules or deadlines. It is important not to force participants to use the proxy technology, because the lack of use by certain participants can be highly informative. Also during this introduction, practical topics such as making appointments and how they should correctly fill out diaries can be addressed.

It is likely that users cannot keep the proxy technology after the fieldwork has ended. If this is the case, this should be clearly indicated during the introduction. The withdrawal of the

proxy technology is a sensitive issue, as participants may get attached to it. In Hi-Masquerade, we needed to proceed even more cautiously because some of our participants were children. We chose an existing free online web application as proxy technology, which eliminated the issue of having to hand over something and remove it later on. A related effect of the proxy technology introduction on participants was noted in Teleon, where after the field study some participants purchased one or more of the gaming platforms and games that were offered to them as proxy technology.

Studying Proxy Technology Use

PTA studies involve participants using proxy technology over a longer period of time. It is essential to capture as many relevant data as possible during this time. Data can be gathered both while the use of the proxy technology is ongoing, and after the use of the proxy technology has ended. For each time period, different methods are warranted to gather relevant data. During the first period, the use of the technology has to be monitored. During the second period, methods are applied to encourage reflection among participants about the technology and how they used it. At each point in time, the study of the proxy technology use can be supplemented with complementary methods that can help situate the results. We will now describe these methods in more detail.

During Proxy Technology Period: Monitoring Use

In our experience, a period of four weeks is a minimum for fully capturing the use of the proxy technology. When the technology is first introduced, participants will first experiment with the application. Although this already gives them an experience to reflect on, this type of use does not yet show whether the participants are genuinely interested and whether the application truly fits in with their everyday life. It is what happens after this first experimentation phase that is truly interesting for the researcher: is the application abandoned or is it appropriated and how does this take place?

While the proxy technology is in use, it can be monitored in two ways: via automated logging or by means of diaries or logbooks. The advantage of automated logging is its high accuracy, as software in the technology register how the user deals with the technology. When

using diaries, participants have to answer questions about the use of the proxy technology as well as more general questions. These diaries can consist of writing in a paper booklet or answering the questions online, depending on the user group under investigation. In Hi-Masquerade, for instance, where we dealt with young children and older adults, we distributed paper and pencil logbooks in which we kept the amount of writing that had to be done to a minimum. Aside from questions regarding the proxy technology, we also inquired about the relationship between children and grandparents. We encouraged them to fill in their logbook by including a section, in which they shared personal information about each other, that they would be able to exchange after the research was finished. In addition, we gave the logbook a playful layout (see Figure 3).



Figure 3. Extract of logbook used in Hi-Masquerade.

Although diaries or logbooks are a less accurate instrument for keeping track of frequency of use than automated logging, they have the added advantage of allowing researchers to probe users' attitudes and experiences with the proxy technology and other relevant aspects that are not directly related to the technology. In addition, automated logging may simply be impossible, as was the case in Hi-Masquerade and Teleon. In Teleon, we asked participants to fill in a daily diary for seven days during each month of the field study. These diaries included questions about how many hours they used various media and the content they saw, next to

several questions about gaming (such as games played, hours played, goals attained, single or multiplayer). When use of the proxy technology may be infrequent, an alternative to a daily diary is a logbook in which participants answer questions each time they use the proxy technology. This was an effective approach in Hi-Masquerade, in which we asked participants for each session to fill in when, where, how and with whom they had used the application and what they had and had not liked about the session.

During the period in which the proxy technology is in the field, researchers can also observe participants while these are using the technology to complement the self-reports. These observations should not only focus on how a participant deals with the provided technology, but also on what happens in the participant's surroundings. Only the Teleon project involved such observations. We asked participants to play some of the provided games and try to attain a certain goal (e.g. get to the end of level one). Not only did we observe physical and emotional reactions (e.g. screaming at the screen when losing), but also how other members of the household acted when others played. Participants with much gaming experience for instance were very concentrated and showed little emotion while playing, while parents of the participating households often commented on the games their children were playing.

After the Proxy Technology Period: Eliciting Reflection

After the proxy technology period has ended, participants gather with the researchers to reflect on the proxy technology in a post-interview. If a logbook was used, this also can be used as a reference point for the discussion. Interviews in PTA research tend to be semi-structured. A topic list is compiled based on the project-specific research questions, but room is left to discuss the participants' particular experiences. Indeed, in case of non-use, some topics can simply not be handled. The semi-structured interview leaves room for finding out why certain participants did not use the proxy technology. For instance, in Hi-Masquerade a topic list was prepared to probe the participants' experience of presence while using the virtual world. However, one of the family members had not used the application. Hence, we inquired ad hoc about his reasons not to use the application and then extended the discussion to the experience of presence with other media (for a comprehensive review on presence, see Lombard & Ditton, 1997).

Both in Hi-Masquerade as well as in Teleon, we interviewed the participants together as a group. Although both individual and group interviews can be conducted within the scope of PTA, we felt that group interviews were more appropriate here. They allowed us not only to ask what each participant had liked and disliked about the provided proxy technologies, but also to discuss what place the proxy technologies got in the household or family as a whole. In Hi-Masquerade, we found that group interviews had an additional advantage: older family members stimulated the children to give their point of view. In part because the children felt more at ease with their close relatives around, but also because the older family members would quickly notice when a particular question was difficult to answer and then reframed it. This advantage outweighed the social desirability effect that the presence of these family members had.

Complementary Methods

We have found that two methods can be very useful in supplementing the findings obtained by PTA, namely co-creation and gathering feedback through storyboards.

In the broadest sense, co-creation refers to a joint creative activity (Sanders & Stappers, 2008; Sanders, 2006). In the context of designing and developing new technologies, it can be applied to actively engage users in the idea generation process. In this case, co-creation becomes an instrument for participatory design and is referred to as co-design (Sanders & Stappers, 2008). Within the framework of PTA, the researcher uses projective techniques such as making and discussing drawings to elicit desires, dreams and needs with regard to the new technology, its functions and use. Participants are handed tools to produce something that expresses what they think about the technology. Tools suited for this goal can be both electronic (e.g. animation programs), as well as more tangible (e.g. paper, pencils). Because an active creative input is required from the participants, the collected data will be richer than for instance the diary entries. In addition, co-design can help to gather data from participants who were not interested in using the proxy technology. In essence, the artifacts that are created and particularly the users' interpretation of these artifacts will enhance the researchers' understanding of the users' needs and desires and thereby support the formulation of requirements and recommendations that PTA aims for.

The advantages of conducting co-design sessions were clearly noted in Teleon, where we ended the fieldwork with such sessions. Participants were asked to make a collage with various materials, such as pencils, magazine articles and post-it notes. The collage needed to represent all the characteristics of what they conceived to be an ideal game. This creative process was stimulated by the various proxy technologies they had used in the past months of fieldwork. For participants who had used the proxy technology intensively during the fieldwork, we saw highly similar results between the outcomes of the co-design and other applied methods. For those participants who had not or barely used the offered proxy technologies, taking part in the co-design sessions sparked ideas previously not uttered during the field study. The likes and dislikes with proxy technologies were not targeted as this was a central subject of other data collection methods. Instead, the goal was to give users the opportunity to look beyond certain games and let their imagination run free without restraints. For this specific group, we found needs and wants pointing towards being able to control the environment (e.g. no time limit) and easy to use controls.

In Hi-Masquerade, co-design sessions have not been conducted. Because the concept for the future technology was more strongly delineated, the initial focus was on the evaluation of this concept, rather than on enriching it with new ideas. Nevertheless, if time allows, it would be valuable to probe the participants' view of an ideal remote interaction application or virtual world. In particular, we have used storyboards that illustrate a conceptualization of the future technology use to gather feedback from participants as a complement to PTA. Storyboards can be used to capture participants' attitudes towards the future technology as a whole and to gather feedback on specific issues. For instance, in Hi-Masquerade, project partners wanted to know more about how users feel about being embodied by an avatar in the virtual world. Furthermore, storyboards can be used to illustrate the use of features that are absent in the proxy technology. In Hi-Masquerade, for example, the project partners envisioned a 3D visualization of the virtual world. Similarly to storyboards, other forms of prototypes of the future technology can be shown. In Hi-Masquerade, participants were invited to explore the use of an initial demonstrator of the future technology. As a demonstrator it was not yet suitable for home use, but the family members' responses to this technology were a valuable supplement to the findings gathered through PTA. We were able to observe the family members' behavior while using the virtual

world application and their responses to features they had no previous experience with, such as the integration of a video-image of themselves in a computer-generated virtual world.

Analyzing Data and Reporting Results

If applied effectively, PTA yields a “thick description” (Geertz, 1973) of the proxy technology use based on a variety of data (text and audiovisual material). A “thick description” is a description that allows the researcher to situate the behavior in the social context in which it arose, to understand the purpose and intentions behind it (Ponterotto, 2006). The goal of analysis is to arrive at such a rich interpretation (or “thick interpretation” as Ponterotto calls it), which warrants a qualitative approach.

In the past, we have successfully applied an approach that is based on Grounded Theory (Glaser & Strauss, 1967) to conduct our qualitative analyses. In this approach, the researcher first identifies categories and concepts that emerge from text, and then links the concepts into substantial and formal theories (Bernard, 2006). By iteratively analyzing the data, new concepts and findings emerge. Due to the large data output PTA research usually generates, it is necessary to have a clear strategy on how data will be analyzed throughout the research process. In addition, it is recommendable to start analyzing data during the field study. This qualitative analysis is ideally done with the help of specialized software that supports researchers in organizing, coding and linking the data.

The findings obtained for Hi-Masquerade and Teleon illustrate the rich interpretations that can be obtained through PTA. In Hi-Masquerade, we established that family members found the proxy technology that we introduced to them unsuitable for remote family interaction. Through PTA, we were able to look beyond the functionality of the application per se at pinpointing the reasons for this “misfit.” For instance, the busy and very different schedules of the family members made it difficult to arrange for a remote session. We were also able to establish how the use of the technology affected these family members’ everyday lives. The grandparents that used the application appreciated the fact that because they were trying to use the virtual world application together, they had had more actual contact with their grandchildren. It had given them a common ground.

In Teleon, providing a diverse amount of platforms and games proved fruitful, as these proxy technologies sensitized participants about what virtual worlds and games currently offer. The combined use of various methods made it possible to build up a clear understanding of what each of the selected user groups liked and disliked about virtual worlds and games. The combination of interviews, observations, diaries, context information and co-design sessions gave insights in both personal factors (such as experience, time willing to devote to gaming) as well as social and contextual factors (such as social control of family, motivations to play together, see Authors, 2009) contributing to how the technology was used.

Once the analysis is finished, the findings are integrated in the development process by reporting them to those involved in this process: the project partners in general, and the developers, engineers and designers in particular. This requires that the rich interpretation of the researcher is translated into a format that can be understood and put to use by the intended audience. We have found that formulating the findings in terms of the users' requirements (needs, wishes, concerns, desires, etc.) and recommendations (on what the technology should incorporate to support, facilitate, prevent, etc.) is a suitable format. However, it is a challenge to make recommendations sufficiently concrete to be workable; and our experience has shown that recommendations certainly benefit from discussion with the technical partners (Lievens et al., 2008).

Conclusion

In this article, we have described and illustrated Proxy Technology Assessment as a methodological approach for studying the use of and experiences with virtual worlds and games in order to guide the development of new virtual world and game technologies. Through the investigation of the use of proxy technologies (i.e., technologies that share characteristics with the technology under development) in users' natural settings, PTA allows researchers to anticipate whether and how the targeted users are likely to appropriate these future technologies. Based on the insights obtained through PTA, requirements and recommendations for new virtual worlds and games can be formulated.

Although Proxy Technology Assessment can be used on a wide variety of technologies and applications, in this article, we have focused on its particular usefulness for the study of

virtual worlds and games. Drawing from qualitative-ethnographic methodology, domestication theory and Grounded Theory, its strength lies in its potential to draw a comprehensive and highly complete picture of the use of virtual worlds and games. PTA offers researchers the possibility to include both online and offline, technology-related and contextual factors in their studies. Considering the desire to attract new user groups to virtual worlds and games (cf. the success of Nintendo Wii) as well as the wish to better address the needs and wants of existing users, this complete picture of the interplay between personal, contextual and technology-related factors can bring valuable insights for the design of new virtual world and game applications and technologies or even for redesign.

The key component of Proxy Technology Assessment is the combination of multiple methods and techniques within the same research design to understand the (non-)use of a technology (through monitoring tools and observation) within the natural environment of the user (through geographical mapping) and in the light of who the users are and the social web that they are part of (through questionnaires, group interviews, co-design, storyboard sessions). Method and data triangulation is, as such, central within PTA research. Researchers need to link the data provided by the different research methods and need to keep doing so during the research process to constantly generate fresh insights. PTA can be characterized as a relatively open approach in the sense that it allows researchers to add methods depending on the project scope and the technology under development. While qualitative-ethnographic methods are particularly suitable for PTA, quantitative methods may also be applied but are likely to require the recruitment of additional larger user samples. How to integrate quantitative approaches within a PTA framework sets up an interesting topic for future research.

The inherent nature of using multi-method approaches within PTA research places great demands on its participants. Although samples are usually limited due to the specific scope, PTA studies require a prolonged effort of participants to take part, with activities such as giving interviews, being observed, filling in diaries, letting researchers into their residence and participating in co-creation study. As in other longitudinal research, one of the challenges of PTA research is to maintain participants' interest in the study. There are several specific ways to support this. First, being able to use the proxy technology for several weeks can motivate participants. Also, keeping close contact with users that are highly motivated can be useful. This

group of participants often provides new participants that can be included in the studied sample and can also stimulate these participants not to drop out.

We would like to stress the explorative nature of Proxy Technology Assessment. First, although the approach is multi-layered and delivers a broad perspective, it does not enable the researcher to foresee all issues related to the use of the future technologies. A fraction of uncertainty always remains when dealing with human behavior. Second, PTA starts out from a concept or vision of a future technology that is prone to change and may even not be implemented. In essence, this is not problematic for user experience researchers. In any case, a grounded understanding of the proxy technology use is obtained. This openness of the PTA approach gives researchers ample opportunities to study the various and ever-changing aspects surrounding the use of virtual worlds and games.

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