

Journal of Virtual Worlds Research

jvwr.org ISSN: 1941-8477

Volume 3, Issue 2

December 2010

Virtual Worlds for Kids



Volume 3, Number 2

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December 2010

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Beyond Being There: *A Grounded Investigation of the Value of Virtual Worlds for Remote Family Interaction*

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Abstract

In our interdisciplinary project, HI-Masquerade, we investigated the potential of virtual worlds for remote interaction between family members of different generations. In this paper, we report on this study. Our methodological approach consisted of two components. We presented storyboards, visualizing use scenarios, to family members. In addition, we let these family members use a virtual world application at home. By doing so, we triggered both assumption- and experience-based reflection on the sense of using virtual worlds for family interaction. Our findings show that while family members have concerns about virtual worlds (e.g., possible replacement of real life activities), they also see opportunities (e.g., learning together). Family members felt that the virtual world that they had used was not a suitable platform for remote family interaction. Nevertheless, they appreciated the increased offline interaction that it generated because it helped to bridge the children's and adults' worlds.

Keywords: storyboards, Proxy Technology Assessment, virtual worlds, family, remote communication, mediated interaction

Beyond Being There:

A Grounded Investigation of the Value of Virtual Worlds for Remote Family Interaction

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The ability to generate a strong sense of presence is often put forward as a distinctive affordance of virtual worlds. For instance, Bronack, Cheney, Riedl and Tashner (2008) state that this characteristic is one of the main reasons why virtual worlds have the potential to enable more effective communication than other online media. Whether this potential is realised, however, is determined by who uses it and what they want to use it for. In the IBBT project, HI-Masquerade, we investigated whether virtual worlds could be an appropriate medium for communication between children and grandparents, and if so, what the requirements for such applications are.

Several authors have pointed to factors other than presence that may be relevant for the design of family communication technology. In their view, it has to support generations possessing different skills and values (Hutchinson et al., 2003). It needs to strike a balance between providing meaningful interaction and ease of use (Tee, Brush, & Inkpen, 2009). It has to provide a balance between the need to be connected with their relatives and that for privacy (Kahn & Markopoulos, 2009). Finally, it should take into account families' needs for play (Vetere, Davis, Gibbs, & Howard, 2009) and emotional contact (Olivier & Wallace, 2009).

Our work is situated within the domestication framework that considers "what the technologies and services mean to people, how they experience them and the roles that these technologies can come to play in their lives" (Haddon, 2006, p. 195). According to this perspective, ICT use is constrained by the spatiotemporal context (and associated social norms). Thus, what constitutes appropriate and meaningful ICT use can only be understood properly by capturing that context.

In this article, we will describe a qualitative study conducted to understand how children and their grandparents perceive and experience virtual worlds. The perceptions and experiences of three child-grandparent pairs were captured through storyboarding (van der Lelie, 2006) and Proxy Technology Assessment (Pierson et al., 2006). We will report problems and opportunities foreseen by them, as well as how they experienced interaction in a virtual world. We end with a discussion on how these results relate to previous work and design advice for developing a virtual world that is suitable for family interaction.

Methodology

Participants

We recruited three groups including a child between 8 and 12 years old, one of the parents and one of the grandparents. We recruited via the grandparents through various channels including institutions offering adult education, a public library and websites for senior citizens. Although our focus was on children and grandparents, we included parents in our study for several reasons. Besides an important role in the relationship between children

and grandparents, parents also have a considerable impact on their children's media use (Horst, 2009). Finally, we believed they would have a positive influence on their child's compliance.

We selected people with home Internet access and basic competencies in Internet use (e-mail, browsing and so on). We wanted to establish whether and how families that have the means to use a virtual world application for remote communication would appropriate it. Eventually, we found three families who met our criteria. In line with the domestication framework, we first captured families' backgrounds by collecting basic demographic information and establishing their access to and familiarity with related technologies.

Family demographics

The families involved were traditional Belgian middle class households. The tables below show birth year and gender of all family members and the adults' education level (i.e. the highest degree obtained) and professional status. Family members' relationships are also indicated. As can be seen in the tables, the adults were highly educated. While we did not intend to single out this particular socio-economic group, this is likely tied to self-selection. Families with a lower socio-economic status and/or non-traditional family structure may not have seen themselves fit to participate in an in-depth qualitative study.

Family 1	Child*	Mother of	Mother-in-law of
		Parent	Grandparent
Birth year	2000	1974	1954
Gender	Female	Female	Female
Education level		College	College
Professional status		Employed	Employed

* 8 years old at the start of our study. Has one younger sister (°2003) and one younger brother (°2001).

Family 2	Child*	Father of	Father of
		Parent	Grandparent
Birth year	1998	1961	1936
Gender	Male	Male	Male
Education level		University (Phd)	University
Professional status		Employed	Retired

* 10 years old at the start of our study. Has one older sister (°1995) and one older brother (°1993).

Family 3	Child*	Mother of	Father of
		Parent	Grandparent
Birth year	1999	1969	1943
Gender	Female	Female	Male
Education level		University	University
Professional status		Self-employed	Retired

* 9 years old at the start of our study. Has one older brother (°1995).

Technology at the families' homes

Overall, participants had access to a myriad of technologies in their household. At the start of our study (at the end of 2008), all households (parental and grandparental; six in total) had at least one computer with Internet connection, television and phone at their disposal. All parents and grandparents had access to a fixed and mobile phone. While none of the participating children owned a mobile phone, they all had access to a computer that was dedicated to the children in the household. For instance, the girl in Family 1 had her own computer, which her younger siblings could also play with. She also shared an e-mail address with them, although in practice it was hers. The participating children in Family 2 and 3 had their own e-mail addresses.

The grandparental households were relatively less media rich. In part, this is a consequence of them being smaller, but a notable difference between the two types of households is the absence of a game console in the grandparental households. Game consoles were present in the parental household of Family 2 (portable: Nintendo DS) and of Family 3 (fixed: Wii) and used by the children.

Use of and familiarity with communication technologies

For mediated contact between grandparental and parental homes, traditional tools are used to stay in touch: mainly calls and e-mails. E-mail is also the preferred medium for sharing pictorial material between households. Grandparents are the main initiators of remote contact with their grandchild and often this contact is established indirectly. For instance, grandparents end up having a chat with their grandchild on the phone, while they called to arrange something with their son or daughter. Another example of indirect contact is that they would send an e-mail to one of the older grandchildren expecting that they in turn would share it with their siblings.

Although participants had some notion of Skype and chat, most of them had little or no experience with these technologies. Almost none of them had used Skype to communicate with each other, despite the perceived advantages of enabling people to hear and see each other and its inexpensiveness. The grandmother of Family 1 is the notable exception. She regularly uses Skype both professionally and for communicating with friends abroad.

Methods

To investigate whether and how virtual worlds can be an appropriate means for family communication is as challenging as their development. The research question has to be addressed in such a way that family members are engaged together and that their age differences and strong ties are accounted for.

We selected two methods to let family members reflect on whether virtual worlds could be suitable family interaction tools. We used storyboards to trigger family members' attitudes and expectations about family communication through virtual worlds. In addition, we let them use a virtual world application at home so that they could reflect on this particular experience. Two use scenarios, written together with our project partners, guided the selection of the storyboards' content and the application.

Delineating the subject of reflection by means of scenarios

To make the subject of reflection more concrete, we collaboratively wrote two scenarios describing the use of two future virtual world applications by family members. In both, a ten-year old boy and his grandmother use a virtual world application for remote communication. The boy's parents also appear in the story. The first scenario focuses on virtual world use for sharing and reliving past experiences together. This application features multi-touch control and 2D visualization. The second scenario focuses on creative, cooperative play and features gesture control combined with 3D visualization.

Excerpt from the first scenario (translated from Dutch): “*Casper lets his avatar walk towards the reptile cave in the Zoo scene. He places his favorite picture from the Multimedia window into the Zoo scene, next to the cave.*

Casper: ‘Look grandma, here you can see a very funny animal I saw in the zoo. I learned it’s a reptile! Did you know they have many sorts of animals like that in the zoo, like snakes, crocodiles, lizards,... They all have so many colors and skins...’

Grandma: ‘Ooh, it looks a bit creepy, weren’t you scared?’

Casper: ‘No, I think it looked cool. I saw its eggs too, they are very strange.’

Casper selects a picture of the eggs from the Multimedia folder. And shows it to Grandma.

Casper: ‘This is an egg of a real snake. I held a real one when I was there.

Grandma takes a close look at the picture by walking towards it.’”

Excerpt from the second scenario (translated from Dutch): “*‘I want to show you something else, grandma!', Casper says. ‘A bit further on there are very special birds; you can fly along with them. Follow me and you'll see!' Together they walk towards the birds, King Casper takes the lead. The birds look funny. They have fluorescent colors and they have four legs instead of two! Casper explains how you can fly them and in no time they're up in the air: King Casper, LilRose and Dixie. It's like they're on a roller coaster, that they can control themselves.*

While flying, grandma Rose asks Casper to come and see her garden. The sunflowers she planted are in bloom. Casper agrees, he loves helping his grandmother in her virtual garden.”

Eliciting attitudes by means of scenario-based storyboards

To elicit attitudes towards virtual worlds as a means for remote family communication, we showed two storyboards visualizing the written scenarios in which virtual world applications are used. By presenting the scenarios in this format, participants can put themselves in the shoes of the story characters and reflect on what the functionality could mean in their own lives (van der Lelie, 2006).

We experimented with two formats: a story booklet and a picture leaflet. In one session, family members read a booklet out loud that visualizes the first scenario by means of both drawings and text fragments (see Figure 1). We captured family members' comments during reading. Afterwards, we asked whether and how the family members would use this application themselves, as well as what they did or did not like about it.

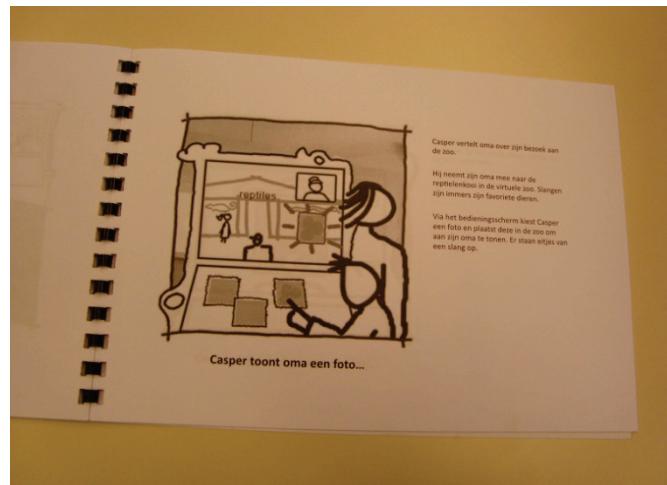


Figure 1. Story booklet that visualized the first scenario.

The picture leaflet visualizes the second scenario by a logical series of computer-modified photographs (see Figure 2). During a second contact with the family members, we asked them to go through the leaflet and mark with post-its in different colors what they liked, disliked and what they found confusing. In contrast to the booklet, the leaflet shows great detail and realism. This is generally discouraged in storyboards, to prevent participants from losing themselves in details (Truong, Hayes, & Abowd, 2006). We deliberately chose this format because we believed that showing photographs of a home setting might enhance family members' capacity to envision their own use of the application. Our findings suggest that this is indeed the case.



Figure 2. Picture leaflet that visualized the second scenario.

Eliciting experienced-based reflection by the means of proxy technology use

To allow participants to reflect on the potential of virtual worlds for family interaction based on actual experience, we let them use technology that resembles the technology envisioned in the scenarios. Participants were able to use this technology, which we call proxy technology, in the comforts of their own home. They monitored their own use and were interviewed afterwards about their experiences. This procedure forms the essence of

Proxy Technology Assessment, which was developed in our research institute (see Pierson et al., 2006).

The selection criteria for our proxy technology were largely informed by the characteristics of the applications in our scenarios. The virtual world application had to be ‘family-friendly’, to allow for remote interaction (i.e., communication, play and cooperation), and to enable exploration through teleportation and free navigation. Preferably, it should also provide a private space (i.e., a kind of home space for the avatar), customization, and the opportunity to share user-generated content. In addition to the functional specifications, we preferred an application that had an intuitive interface, since the learning curve was not our main interest. Finally, to ease recruitment, the application had to run on MAC and Windows operating systems, on laptops and desktops.

We considered several applications, but ultimately selected Chobots (see www.chobots.com). This flash-based web application sufficiently met the criteria set. It has an intuitive interface (see Figure 3), is promoted as a virtual world suitable for the whole family, and allows for the creation of a family of avatars in which the adult controls the children's system settings. Users can explore by selecting a zone in which their avatar consequently appears. They can then walk around in that zone by steering their avatar. They can communicate with each other using emoticons, moderated text chat or picture chat. They can also engage in individual and multiplayer mini-games. In addition, users have a private spot: a home in the virtual world. Personalization is possible to a certain degree, depending on the type of subscription (free or paying). Users cannot share their own content in Chobots. Nevertheless, we have found them to do so on related websites.



Figure 3. Snapshot of the Chobots interface.

Process

As indicated by Karapanos et al. (2009), expectations form a fundamental part of our experiences. They serve as a reference and can also change as a result of experience. Hence, we captured participants' attitudes both prior and after use of the proxy technology.

The first storyboard was shown to family members during the first face-to-face meeting with them. At the end of this meeting, we asked family members to use Chobots for approximately four weeks, giving them time to move beyond the first experimental phase of use. Adult avatars in Chobots had been created beforehand and we added the child avatar to

the "virtual family" during this first contact. The basic features of the application were explained (e.g., how to log in), and could be reviewed in a logbook that was handed over.

In their logbook, participants kept track of their use of Chobots. Automatic data logging was not possible because we had no access to the underlying source code of the web application. For each uninterrupted play session, participants filled in a fixed set of questions concerning when and where it took place, whom they had contact with, their activities and what they did and did not enjoy about it.

After four weeks, we interviewed participants about their experiences with Chobots. This group interview was semi-structured. The topic list addressed both participants' general experience with Chobots (e.g., likes, dislikes, suitability for them as a family) as well as particular experiences of presence. During this second meeting, the second storyboard was presented.

Analysis

To analyze our rich data set, we applied a qualitative approach that is based on Grounded Theory (Glaser & Strauss, 1967). The goal was to achieve a 'thick interpretation' (Ponterotto, 2006) of family members' reflections on the storyboards and experiences with the proxy technology. That is to be able to situate it in the social context from which it arose and to understand underlying motivations. Using NVivo, we first identified concepts that emerged from the data (i.e., open coding). We then proceeded by placing these concepts in overarching categories.

For each separate storyboard session, concepts were categorized as identifying likeable, unlikeable or confusing affordances or instances of envisioned use¹ (if applicable). In the case of the proxy technology, concepts were labeled as identifying experiences of presence (if applicable). Separate nodes were coded for the following aspects of presence as identified in the literature: social presence (i.e., sensing the presence, intentionality and behavior of others), immersion (i.e., the state of being fully engaged by the medium), transportation (i.e., the sense of being present in the mediated environment), and realism (i.e., the sense that the presented content is realistic both on a sensory level and in terms of plausibility) (Biocca, Harms, & Burgoon, 2003; Ijsselsteijn, de Ridder, Freeman, & Avons, 2000; Lombard & Ditton, 1997).

Results

Responses to the storyboards

Family members' expectations were highly similar across storyboard sessions and hence we discuss results from both together. We found that the participating adults, the grandparents in particular, had concerns about potential problems that could arise from virtual world use. Nevertheless, all the family members also saw opportunities that virtual worlds could offer them, as individuals and as a family. Most adults, unlike the children, emphasized the importance of everyday reality and existing relationships when reflecting on the potential of virtual world use.

¹ 'Envisioned use' statements refer to how family members thought they would use the device if they had it.

Potential problems

1. Issues with ease of use and scheduling

The grandparents were concerned that not having grown up with digital games, they lacked sufficient skills to use virtual worlds. They foresaw usability issues as potentially hindering their interaction and perhaps even preventing them from using the technology at all, as shared by one of the grandfathers:

Grandfather, Family 3 (Session 1): "But I think that ease of use will also play an important role (...) if I have to spend a long time on that, then it would be better that I come over here and pick her up and go do something together than spend time there virtually, you know."

As the quote also illustrates, time is of the essence for the busy family members. This relates to another issue signaled in the second session (after proxy technology use). Being able to log in and spend time together online, requires scheduling this in advance. Given the tight and sometimes conflicting schedules of adults and children, this can be problematic.

2. Invasion of privacy

The ability to maintain privacy was a major issue for the adults. They see the virtual world as a public space and anything they bring to this world may start to lead its own life. In line with this concern, one of the parents advocated a clear distinction between a private space, where people manage their own content, and a public space (i.e. the virtual world), where content may be introduced in due time.

Father, Family 2 (Session 1): "I think it's good to have a public and a personal space. In your virtual world, what you have there, that's what you share with other people who also have an avatar running around there. But it could be that you don't want to introduce certain information sources or sounds, etcetera, in that world yet (...)"

Several family members were wary of how a virtual world application might lead to intrusion into their private time. Although valuing their family a lot, they emphasize that each family member has particular interests and obligations and that this should be acknowledged. They may not always be available and willing to commit to a joint synchronous session.

Father, Family 2 (Session 1): "(...) it's something that you have to want to go along with, that you get dragged into. It's actually nice that someone sends you a link of a photo album and that you can go through it at your own pace, while when you have to go there with your avatar and you have to respond at the right time, in the right way, that requires a lot more commitment of course."

Nevertheless, when an invitation comes from someone you cherish, it may be difficult to decline.

3. Addiction and deception

Adult family members had concerns about possible negative effects that virtual world use might have on themselves and on their children. They referred to media reports on it, like the mother in the following quote.

Mother, Family 1 (Session 1): "Now, things like that shouldn't seem too real. (...) I mean, if you hear about those people in Second Life that eventually can't figure out for themselves which life they are leading, that's not, you know..."

They worried about addictive effects, resulting in the replacement of ‘actual’ activities by virtual ones. In addition, they feared that the “constructed” nature of virtual worlds and avatars creates a space for misrepresentation that can be abused. A so-called simulated environment may be a biased representation of the world. People may consciously use avatars to represent themselves as someone they are not. Given these concerns, it is not surprising that adults want to keep an eye on things when their (grand)children are online.

Opportunities

1. Deepening existing relationships

Family members saw particular value in using virtual world interactions to nurture the relationships they already have. This constitutes a positive alternative to replacing these contacts, as the mother mentions in the following quote.

Mother, Family 3 (Session 1): "... if you use it to deepen your contacts, that's something else. But what a lot of people do, they really replace (those contacts), like on Facebook and stuff."

Our participants envisioned several activities of interest that would reinforce or strengthen their existing family ties including joint play, cooperation and exploration in a virtual world. Some of these desirable activities clearly reflect the specific relationships between them and the roles that each generation has. For instance, parents and grandparents imagined how they could guide their (grand)children through a particular place they had visited before or knew more about. The children thought of how they could create something and share it with friends and family through the virtual world to demonstrate their abilities or as a gift.

2. Learning about and exploring the world

In addition to deepening existing relationships, adult family members also saw virtual worlds as suitable environments for learning about and exploring the world. For them, graphical virtual worlds can be a platform for a more engaging and fun form of learning, both for themselves as well as for their children. In the following quote, one of the grandfathers describes that it would be nice if he could visualize his books and thereby help his grandchildren with preparing a school presentation.

Grandfather, Family 3 (Session 2): "Suppose that they (grandchildren) say... well consider for example the nomads in the Sahel region.... I have some books on magnificent reports on their way of life... so that you could indeed say: 'Are you looking for something, could this be something for you to do something on that theme?'"

Our participants were enthusiastic about virtual travel, especially when considering the possibility of experiencing certain locations in three dimensions (as in the second storyboard). Virtual visits were seen as a means for active exploration of places, learning about, or returning to places that are not so straightforward or even impossible to visit (e.g., space, historical places).

Mother, Family 3 (Session 2): “<Girl’s name>, you could go to space!”

Girl: (excited) “Yeah, space, that’s my dream!”

Mother: “They’re learning about that and she’s extremely involved in that.”

3. Practising skills

Some grandparents were interested in using virtual worlds to improve skills that are useful in everyday life. One of the participating grandfathers picked up the idea of gesture tracking (featured in the second storyboard). He thought of how such a system could help him improve his *tai chi* exercises.

Grandfather, Family 3 (Session 2): “...For example, you have a lot of people that do yoga or...I do some tai chi myself... if something like that could help you (...) to do your stuff the right way, yes.”

The other grandfather considered the opportunity for practising particular social skills like giving your condolences to a relative or friend who has lost someone. Although he did not mention this in response to a storyboard, but to a related probe², it is worth mentioning.

Grandfather, Family 2 (Session 1): “If you could try out situations with it and discover what the possibilities are. For instance, when a relative has passed away and you don’t really know how to react, I mean, how to address the bereaved, there are frictions and such, you know. Then you could try that out...”

4. Creative expression: play and experimentation

The children liked the idea of the virtual world as a place where they could bring their fantasy to life. The second storyboard featured the option to transform actual drawings into 3D virtual objects that could be used and altered through gesture control, and the participating children immediately envisioned themselves using this as part of their play.

Girl, Family 1 (Session 2): “You could draw vehicles and get in there and then you could ... or make something where you have to step on a pedal or something like that. A bike and then you have to make certain movements to step.”

Boy, Family 2 (Session 2): “If I would make a dragon, then I would put myself in the armor of a knight and then I would fight it. Or I would be the giant beast!”

The adults saw virtual spaces as places where they could experiment with their environment. For instance, the participating grandmother said she would be interested in trying out different interior decoration ideas and one of the grandfathers had a similar idea about trying out alternatives for his garden.

Use of the proxy technology and recounted experiences

In this section, we will describe how family members actually dealt with the virtual world application that we introduced to their homes (i.e., Chobots) and how they recounted their experiences during the post-interview.

² During the first contact with family members, we briefly demonstrated a virtual world application with predefined chat.

Patterns of usage

Family 1 used Chobots most frequently. In particular, the granddaughter grew quite fond of it. She played over 14 sessions, sometimes even more than one session a day. She and her sister started using Chobots well before their grandmother and explained to her how it worked. On one occasion, grandmother and granddaughter met at the grandchild's house to play Chobots while sitting next to each other, each on their own laptop. Both the grandmother (who played 5 times) and granddaughter explained that they would continue to play Chobots in the future. They also thought about creating more Chobots avatars for, for instance, the girl's little sister who did not have one yet.

Family 2 used Chobots a few times. The grandfather played 5 times in total. The grandson reported playing twice, both times with his grandfather. During the first time, the boy helped his grandfather via telephone. During the second session, they met as avatars in the virtual world. They arranged to meet in advance, again by telephone, at a certain location they both knew. The grandfather explained how they had also talked face-to-face about how Chobots worked. Neither the boy nor his grandfather liked Chobots. For the grandson, it did not have sufficient possibilities, although he did like the mini-games. The grandfather did not find it interesting and he had a bad experience during a particular session in which other users used inappropriate language. He found this particularly disconcerting because he was with grandchildren at that time, learning how to use the application.

The grandfather of Family 3 never used Chobots eventually. He had neither the time nor interest in using it. He explained that he uses technology in a very goal-oriented, pragmatic way. In his opinion, Chobots did not fit that kind of use. He could only imagine using technology for play when he was unable to see his granddaughter. Unlike him, his granddaughter had used Chobots twice. While she does not use the computer a lot and did not do many sessions, she said she had enjoyed it and would like to do it again.

Recounted experiences

Overall, the family members felt that Chobots was not an appropriate medium for family interaction. They had difficulties establishing remote contact with each other and grandparents were not satisfied with the kind of remote contact that was possible. Finally, concerns were expressed about the presence of strangers and the risks that come with it.

1. Barriers to initiating remote contact

For family members, scheduling a remote session in which they were simultaneously available was not a straightforward process. Both grandparents and grandchildren have busy and conflicting schedules. Moreover, parents prefer to be around when their children are online or control access to the Internet, which means their availability is also required. One family mentioned they have a password set on the computer that is connected to the Internet and the child does not know this password.

The family members' discourse further suggests that Chobots stimulated individual use, rather than fostering family interaction. Indeed, many family members reported experiencing strong immersion in the mini-games. They lost track of time, but also awareness of others, both online and offline. Some of the mini-games afforded multi-play, but family members reported having difficulty entering these games together. Some adult family members reported competing for the high-score on a game but stated that the children could not participate in this competition because they would never be able to surpass the adults' score.

Aside from the former issues, certain usability and technical issues also acted as a barrier to initiating remote contact. The family members of Family 1 reported that they had not been able to locate each other in the virtual world. This is likely to be related to the fact that in Chobots, users have to choose between different “duplicate” worlds when logging in, each corresponding to a different server. As a result, users can unknowingly enter two different worlds if they do not verify this.

Identification of other users was also impeded due to the limited customizability of Chobot avatars. Non-paying users can only change the color of their avatar and buy a limited number of attributes with virtual currency that they have won by playing mini-games. As a result, there is little differentiation between such users. Some participants stated that they had on occasion initially confused another user for their relative because they looked the same. In that case, the only distinction was the different user name shown below the avatar.

Finally, there were a few usability issues that may have indirectly hindered remote interaction. As anticipated, certain family members preferred an interface in their native language, instead of English. Most had a sufficient command of the English language to be able to deal with the application. Our youngest participant (girl of Family 1) was initially annoyed because she did not understand the words she saw. Her mother helped her by translating. In addition, the system occasionally froze, which forced users to start over. Finally, when navigating through the world, users sometimes felt that the application did not respond to their actions.

2. Nature of remote contact

Grandparents expressed the desire to see and hear their relatives, which was not possible during remote contact through Chobots. The grandmother said she enjoyed the co-located play with her granddaughter because it allowed them to hear and see each other’s responses. The grandfather of Family 2 indicated that he did not like the indirectness of avatar interaction. The grandfather of Family 3 would rather consider something like Skype to interact with his granddaughter. For the children, the use of avatars was not an issue, but they were aware that their grandparents had difficulties using the system.

Similarly, chat was considered to be problematic. Grandparents feel that it is a shallow and unsatisfactory form of communication. For the children, it is a difficult medium, because it requires a lot of typing. In addition to these general observations, we found that family members had experienced particular usability issues with the communication features of Chobots.

When a family of avatars has been created in Chobots, the adults have control the children’s chat settings. Grandparents were, however, unaware of this. As such, settings remained default, which meant that grandparents could either enter plain text or combine picture icons to chat, while children could only do the latter. Second, the grandmother of Family 1 seemingly confused public chat with leaving a message. While she was convinced that she had sent messages to her granddaughter, the granddaughter never received any. The fact that both features were tagged with the same tooltip (i.e., “Send a message”) is indeed confusing.

In essence, family members did not really feel together during remote contact because of the obtrusive nature of the technology. This obtrusiveness does not merely refer to the computer. For grandparents, the avatar was in many ways a frustrating reminder of the technology between them. It represents something unfamiliar, something they cannot identify with and hence prevents them from feeling like they are together with their grandchild.

3. Presence of unknown users

Throughout the discussion, it was noted that the presence of other unknown users came with both benefits and disadvantages. The children found the games more fun when there were others to play it with. The grandmother mentioned she enjoyed other users' presence, since they made the world feel less "empty", at least when it was not overcrowded. Given that Chobots is a relatively small virtual world, there was an actual risk of overcrowding. Developers tried to remedy this by providing additional servers.

Given that Chobots is an open virtual world, it is possible to encounter strangers who do not have other users' best interests at heart. This became painfully obvious for one of the grandfathers who had a bad experience with some users' poor conduct, as mentioned previously. Chobots works with moderators to counter abuse, but this is not a foolproof system. For the parents and grandparents, this was clearly a difficult matter. On the one hand, they want their (grand)children to be safe from harm. On the other hand, they feel that no system that allows remote contact is foolproof, and that restrictive measures, such as disabling text chat, impede children's ability to learn social skills.

Clearly, there are a number of issues with Chobots. Nevertheless, grandparents enjoyed the increase in offline contact that came with the use of the application. In the following quote, the grandmother replies on a question about whether Chobots had an added value for them as a family.

Grandmother, Family 1: "Yeah, you know what, because we made arrangements to meet and such, yes, we had more contact, that's a fact. In that respect, it's the case. But the Chobots part as such wasn't actually."

Both grandparents that wanted to use Chobots, asked their children how to do so. The children, in turn, were eager to explain. One of the grandparents stated that it had given them a common task, which brought them together. As such Chobots formed a bridge between the children's and adults' worlds.

Grandfather, Family 2: "The positive thing about it, I thought, was that there had certainly been conversations this way between me and (name grandchild), even very long ones, like during that walk, you know, which otherwise wouldn't be so easy, you know. Because we actually only see each other when there are other children around as well. And what happens then? Yes, those children go play with each other, that makes sense. And those older people have each other to nag to."

Discussion

Relating our work to other empirical studies

The development of innovative technologies for family interaction is not straightforward. This may explain why so little research and design work has been done on this matter. Rare exceptions are the work of Vetere and colleagues (2009) and Khoo, Merritt and Cheok (2009).

Most studies focus on the impact of children's ICT use on family life. As Valentine and Holloway (2002) point out, such studies fail to recognize that children's online activities are connected with their everyday lives. Like these authors, we reject a technologically deterministic perspective. Instead, we assume that the value of virtual worlds for families arises from interplay between an application's characteristics on the one hand and family background and interests on the other hand. In particular, we have investigated what

meaning remote interaction through virtual worlds can have for children, parents and grandparents by probing their attitudes and interests and observing how the use of an application plays out in their households.

We found that family members foresee both problems and opportunities. Livingstone and Bober (2006) describe a similar ambivalence among parents regarding their children's online use. On the one hand, grandparents are concerned that such an application will be difficult to use. Parents and grandparents fear that their privacy and the wellbeing of their (grand)children will be at stake and also foresee issues with scheduling a virtual get-together. On the other hand, family members see virtual worlds as places affording joint and individual play, experimentation, exploration and learning. Unlike the children, the adults' focus was on how virtual worlds could deepen existing relationships, as well as knowledge and skills they need in everyday life. Overall, and perhaps not surprisingly, the fears and hopes of family members are clearly shaped by how virtual worlds are portrayed in the press and their experience with related new media.

By introducing a virtual world application at family members' homes, we found differences in how family members dealt with the application, ranging from early rejection to extensive use. In hindsight, participants agreed that the application was not appropriate for remote interaction with their relatives. Family members referred to difficulties to initiate remote contact (due to a combination of application characteristics and their particular family context), the indirect nature of the remote contact and bad experiences with the virtual world as a public space.

Despite the problems that arose during use, grandparents did like the additional contact that came with it. This corresponds with findings that media can be a way for family members of different generations to connect (media in general: Horst, 2009; gaming: Ito & Bittanti, 2009). This is often omitted in the discussion on intergenerational differences (Horst, 2009, p.191-192). Media can function as the subject of both scheduled and fluid forms of social time and of sharing interests and expertise among relatives. In our study, children shared their knowledge about the virtual world application with their relatives and enjoyed being acknowledged for that.

Design guidelines

Based on our results, we have formulated some design guidelines. We describe the rationale and offer suggestions on how it could be implemented.

Guideline 1: Respect the distinction between people's personal, family and public life

Family members want to control what they share with others online. In addition, family members value their family life, but also have other obligations and personal interests.

A sense of control can be provided in various ways. Developers should clearly demarcate public (where content is available for everyone), semi-private and private spaces (where content can only be accessed and managed by the owner or his relatives and friends). At the level of *contact management*, family and friends should be easily distinguishable from unrelated users. Finally, in terms of *time management*, providing asynchronous communication could enable responding at your own pace.

Developers should also consider the actual setting of use. Household members may use the application while other household members are present in the same room, yet engaged in other activities. Hence, use should not disturb others in the household.

Guideline 2: Enable family members to reinforce and strengthen existing relationships

Family members see merit in a medium that adds to their existing relationships rather than replacing them.

This can be accomplished by designing for cooperation rather than immersion. For instance, individual games that are geared towards personal gain should be avoided. Also, games should allow joint play despite different cognitive and ICT skills. Developers might consider creating games in which game play extends beyond the virtual world.

In addition to play, other family practices such as sharing pictures and movies and gift giving could be supported. Both practices contribute to the construction of family identity and bonding. By allowing relatives to exchange user-generated content in the virtual world, sharing content with relatives in a contextualized way becomes possible. Enabling family members to also print received digital content would support gift giving. For example, a drawing or an image of a virtual object could be put up at home.

Guideline 3: Support manageable (grand)parental mediation, while respecting children's need for autonomy as well as guidance

Family members want to keep an eye on their (grand)children's online behavior but often lack the skills. Children, however, have their own interests and desires with regard to using online media that do not always correspond to what their older relatives see as appropriate use.

Many virtual worlds targeting children restrict communication, enforcing 'safe' use. As such developers inscribe themselves in a discourse of 'moral panic' that surrounds these applications. Rather than imposing restrictive control, developers should be aware of and allow different forms of parental mediation to support healthy and safe use.

Appropriate measures depend on the family situation (maturity of the children; ability and willingness of (grand)parents to use the application, ...). In any case, joint navigation and play will benefit both (grand)parents and children. Livingstone and Bober (2006) have shown that parents' assessment of online risks tend to differ greatly from the exposure to risks that children themselves report. By going online together, (grand)parents will be able to make a more accurate risk assessment and children's needs for guidance can be addressed. When children then go online without a relative, they can carry that experience with them.

Guideline 4: Stimulate co-presence by letting family members interact in a direct, physical way

Grandparents do not wish to be represented by an avatar. For them, an avatar complicates interaction with their grandchild. In addition, chat poses difficulties for older and younger family members. The grandparents are not familiar with it and find it superficial, for the children it is not straightforward to have to type everything.

A mixed reality solution in which family members can be represented audio-visually could help. When hearing and seeing each other, they can interact in a way they feel confident about: using speech and gesture, sensing each others' emotional states and responses. In the future, gesturing could become more than a way of communicating with each other, it could be implemented to become a way of controlling the application. Family members enjoyed the idea of physically interacting with an application.

Theoretical and methodological considerations

Besides the strength and implications of our study, we want to reflect on its scope and the further research steps to take.

This study is essentially exploratory. We gave a close analysis of the appropriation process following the introduction of a virtual world technology. This in turn served to guide future development of virtual world applications by establishing what family members consider “appropriate” use. This study was not conducted to advance or refute theoretical claims.

Although empirical, our study was rooted in a particular theoretical perspective, namely the domestication framework. While the domestication perspective allows us to fully appreciate the contextualized nature of human experience, such situated accounts come with a risk of inadequately capturing the sensual and emotional quality of human experience (McCarthy & Wright, 2004). Although we did pay attention to individual experiences, McCarthy and Wright’s framework could be used to broaden our perspective in further research.

Our results are tied to the participants we observed. As explained previously, recruitment resulted in a relatively homogeneous set of traditional, media-rich, well-educated households. Family members’ expectations and experiences will inevitably be related to their background.

Finally, family members’ reflections as discussed here can only provide us with a partial account of their expectations and experiences. Indeed, through their particularities, the selected storyboards and the virtual world application have highlighted certain aspects, while having left out others.

Conclusion

Our results show that the potential of virtual worlds for families cannot be delimited to generating a sense of being together in an online space, but that its value is tied to families’ interests and preoccupations that transcend the online/offline distinction. An important interest is the desire to spend time together as a family. As Horst concludes (2009, p. 192), this desire is a confirmation of the fact that the opportunity to do so becomes more limited as children grow up. As children grow older, their need for privacy and their desire to spend time with their peers increases. As such, the relationship between children’s age and the willingness to share virtual spaces with relatives is an interesting subject of further investigation.

Acknowledgements

This research is part of the HI-Masquerade project, funded by IBBT (Interdisciplinary Institute for Broadband Technology). We would like to thank the reviewer who helped us improve this manuscript. In addition, we thank all project partners. A special thanks goes out to Marjan Geerts and Jan Moons (from Alcatel-Lucent) and Pieter Heytens (designer at IBBT) who contributed to the creation of the storyboards. For more project information see: <http://www.ibbt.be/en/project/hi-masquerade>.

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