Fostering Group Collaboration In Virtual Worlds

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Abstract

In this paper, we investigate the potential of Virtual Worlds (VWs) in fostering group collaboration in Virtual Teams. A team building activity, the Get Together Activity (GTA), was built in Second Life. It consisted of a set of eight activities. The first six intend to offer the participants experiences of transformed social interaction and embodiment, facilitating a certain familiarity with the VW. The last two activities encourage collaborative experience with team members through coordination in time and space. The article reports the design of these activities and places them in the context literature on VWs. Eighty-one participants were invited to fill in a survey evaluating the GTA. The results are presented and analyzed. The results of fourteen structured interviews with a focus group of participants provided more insights.

1. Introduction

Virtual Teams (VTs) are “groups of geographically and/or organizationally dispersed co-workers that are assembled using a combination of telecommunications and information technologies to accomplish an organizational task”, p.18 [65]. VTs enable levels of flexibility and responsiveness at unprecedented heights. Team-members use a variety of Information and Communication Technologies (ICTs) to support synchronous (e.g. videoconferencing, instant messaging) and asynchronous activities (e.g. forums, file exchange). These portfolios of ICTs are now pretty well integrated in the virtual team technological culture. VTs meet additional challenges such as developing interpersonal awareness that arise from using new and evolving communication technologies in a multicultural context [18]. When compared to Face-to-Face (FiF) interaction, using ICTs to communicate over the globe may increase misunderstandings [34] and task distractions [66]. Virtual team-members still have to build shared meaning to encompass time and culture differences when working together. To reduce clashes and promote collaboration in VTs, it is recommended to encourage team building activities at the beginning of the project [50,33,65]. Interestingly, the literature on VTs mostly reports experience of team building activities in face-to-face [55,56,35,60,28,36]. Icebreaking activities have also evolved into more electronic forms [36,11,29,72]. Yet reports of its use in VWs remain scarce [21].

Team building activities, i.e. ice breakers, have been extensively used to improve collaboration in traditional teams. Such activities are usually designed to promote team collaboration and are designed to be engaging and playful. They are useful in achieving cooperation between team-members in traditional face-to-face teams [60,27,36]. The literature on intergroup behavior has demonstrated the importance of such team activities to reduce conflict and encourage cooperation [60]. Organizations are acquainted with the use of team building activities to increase performance [27,36], competence cooperation, and interpersonal communication [27]. Simulation games are specific types of team building activities used to encourage alternatives discussion and reach new solutions for organization [25].

Virtual Worlds (VWs) have some interesting potential for considering them as a useful addition to the actual portfolio of ICTs used to support VTs. However, little is known on how technologies like VWs could support team building activities, while these VWs seem promising [36,11,29]. VWs are defined as an electronic environment that visually mimics complex physical spaces, represented by animated characters or avatars, where people can interact with each other [7]. The main advantages of VWs is that presentation of 3D-objects are low cost, VWs eliminate geographical barriers and they possess endless interaction opportunities [13,37,15]. A well-known application of VWs is Second Life\(^1\). Second Life (SL), launched in 2003 by Linden Labs, is the most prominent amongst VWs.

By means of avatars Transformed Social Interaction (TSI) \([4,6]\) is experienced as a new form of

\(^{1}\) www.secondlife.com
interpersonal communication. VWs are purposefully designed to include communication resembling face-to-face conversation in many ways [46]. Avatars can interact with each other by using text chat, voice and also gestures to express themselves. Such systems are designed with the goal of conveying on-going activity to support sense-making [9]. VWs are mainly used for social meetings, but also for professional meetings [70,33].

VWs are an appealing environment to develop team building activities [38] as 3D spaces might allow compensating for the discontinuities of current collaboration tools’ movement [22,28].

VWs have the advantage that they provide the users experience with multiple forms of presence [41]. In this article we focus particularly on social presence [64], that is the perception of a medium’s ability to connect people [51,61] and telepresence, that is a state of immersion within the environment, also related to flow and enjoyment [44, 3,14]. Indeed, experiences of social presence, immersion, or flow are well-known to VW users. An avatar symbolizes the user’s presence in VWs, immersion is experienced by means of its representation [46]. Such form of embodiment offers the users a “safe” shell to operate from, that can be customized and evolving following the users’ mood [4,46].

In this paper we investigate the potential of VWs to support team building activities fostering group collaboration in VTs. The article reports the design of the Get Together Activity (GTA) and ties the eight designed activities to theory of TSI, embodiment, and presence in VWs. The GTA was tested using the HKNET framework. The HKNET is an integrated learning activity among multiple international institutions that give students the opportunity to take part in a virtual learning experience [54, 24].

The paper is organized as follows. The background section informs us on the interest to use VWs to foster collaboration designing team building activities for VTs. The authors built on VW theories of TSI, embodiment and presence to motivate the rationale of their design. In the second section the GTA is presented in detail. Results of both survey and semi structured interviews are presented and discussed. Limitations of this research are presented before to reflect and conclude on the potential of VWs to promote collaboration in VTs.

2. Theoretical background

Virtual teams

Virtual teams provide the potential to enable work across distances, time zones and geographical and organizational boundaries with links strengthened by webs of communication technologies [39]. Past research shows that national culture, trust, temporal coordination, process of leadership, network structure, social presence, and group history are, on one hand, some of the explicative factors to success in distributed teams [30,31,64,67,10,1,45,42,57,71]. On the other hand, low individual commitment, role overload and ambiguity, deindividuation and social loafing are recognized to be the dark side of the new form of virtual collaboration [30]. By nature of distributed existence and social diversity, virtual teams combine the classical challenges of multi-cultural face-to-face group works as well as the less traditional challenge of new communication technology. Indeed, the limited nature of technology, compared to face-to-face interaction, also raises the specter of un-resolvable culture clash and distraction from accomplishing tasks [67,30,16]. Virtual team dynamics evolve in a social vacuum devoid of the interaction richness present in more traditional team settings [53]. Literature on VTs collaboration emphasizes the importance of team building activities at the beginning of the project [50].

Four types of team building components have been identified. We focus on the interpersonal relation component as proposed by Klein et al. [36] that is strongly related to cognition, affect, process and performance. Ellis et al. [20] report that given the socio-emotional challenges faced by VTs there is a potential match between these needs and the affordances of games in VWs. Congruently, ice-breaking activities focusing on the social and emotional bounding aspects amongst team-members positively influence VTs’ performance [33].

Virtual worlds

VWs have been used to design work places [70] as well as collaborative environments [32]. VWs have been purposefully designed to resemble face-to-face conversation in many ways [46]. VWs support social cues and verbal and none verbal communication channels. The vicinity and directionality rules that apply in such VWs contribute to higher/more social cues simulating real life environments [46].

VWs portfolio of communication modes, e.g. voice chat, text and avatar representation increase affordance for social interaction actually lacking in current collaborative tools [22,17]. VWs support 3D spaces where movements are compensating for the discontinuities of current collaboration tools [22,17].

Transformed social interaction

A VW provides new ways of interpersonal communication: enhancing normal perceptual abilities, multilateral perspective taking, manipulation of the context of interaction in time and space [6]. These are referred to as Transformed Social Interaction (TSI) [4, 5, 6]. In virtual environments, personal information is
become deeply involved—so involved that they lose to create games that encourage game players to create fictional characters that can be only partially customized [8]. Bendford et al. [9] describe users’ embodiment as “the provision of users with appropriate body images so as to represent them to others (and also to themselves) in collaborative situations” (p.1).

Social presence

Virtual environments support TSI and are strong enablers for the users to experience some level of presence [47]. On one hand presence is characterized as social: the perception that there is personal, sociable, and sensitive human contact in the medium [61]. Social presence has been used to better understand online purchasing intention [23]. Social presence has been defined as “the degree of salience of the other people in the interaction” (p.65) [61]. On the other hand, presence in VWs is experienced as “sensorial” or “physical” and describing a state of immersion within the virtual environment, also referred to as “the feeling of being there” or “losing oneself” [41]. Immersion has also been associated to flow and perceived enjoyment [2,68]. Flow is defined as “the mental state of operation in which a person feels completely and totally absorbed” (p.4) [14]. Experience of flow can be achieved with any activity that is mindful and requires people to actively participate [62]. The time distortion found in telepresence situations has been positively related to flow, for example, the intense involvement of individuals using the Web [48]. VWs tend to turn the traditional 2D web into a more experiential 3D environment, providing a sense of space by being more experiential rather than descriptive [37]. Rutkowski et al. [54] wrote that “game designers strive to create games that encourage game players to become deeply involved—so involved that they lose track of time. For marketers and game developers, cognitive absorption, or the state of deep involvement is highly desirable” (p.1-2).

3. Study

Virtual team Settings and Participants

Virtual teams comprising eighty-one participants with an IS/IM background from different parts of the world formed cross-cultural virtual teams. The VTS built websites on specific software topics as part of the HKNET (Hong Kong NETherlands) project. The HKNET is an integrated learning activity among multiple international institutions [53,24]. This project served as an educational environment to introduce VW technologies to the classical ICTs portfolio. More particularly, the team building activity, GTA, was designed and run in the first week of the project and replaced the videoconferencing that would otherwise function as the kick start of the project. In previous years the videoconference session was used as a form of team building session.

Material, Design of the GTA and procedure

VWs are an appealing environment to develop team building activities. However, while VWs such as SL can be downloaded and installed in a minute on almost any personal computer, it takes more time to get familiar with the new virtual environment [58]. It is a challenge for experienced users participating in social activities in their VTs, without knowing the new world. In order to reduce this burden, the GTA intends to increase participants’ familiarity with SL. The GTA design tried to ensure that participants were not overwhelmed. For example, at all the locations where avatars’ actions were required, signs were posted. By ‘touching’ them the avatar could retrieve information about its current activity. After completion of one activity, instructions on navigating to the next activity were presented. After completing the first set of avatar navigation activities, they started to interact with the VW and their team-members to complete the second set of activities.

Prior to the GTA the participants were asked to register in SL and customize their avatar. The exact coordinates that they could enter to start the GTA was handed out. The coordinates helped the participants to arrive at the SL island2 (teleport action). The participants arrived at a registration booth. An avatar programmed with basic artificial intelligence greeted them and instructed them on the way to proceed to find their team-members and team hut. The Dutch (n=40) and Hong Kong (n=41) participants already formed 10 VTs. They met their complete VTs for the first time in-world (i.e., inside the VW as opposed to out-world).

The first iteration of the team building exercise comprised nine activities. Eighty testers evaluated it through a survey. Eight activities were retained from the original 9. The first 6 activities aim to increase familiarity with the VW, as well as experiencing Transform Social Interaction and embodiment. The activities allowed the participant by means of their avatar to teleport, fly, change appearance, move objects, edit text and edit color. While some of the activities may appear trivial, the avatar manipulation activities aimed to provide the participant with an experience of directionality in the VW to increase his/her familiarity with the environment [9,59,63].

2 www.alpineexecutivecenter.com
The last two activities required time synchronization and coordination in space. The team-members had to agree to meet at a certain time to take a picture wearing their in-world traditional customs. Then they took a picture in their hut (i.e., group space) after arranging it with available cultural virtual objects (e.g., Dutch traditional wooden shoes, or Hong Kong miniature temple). The rationale was to make the space more like a place increasing social presence and giving it a warm and cozy aspect. The objects were also for them to engage in cultural exchange and agree as a VT on a simple task. The group picture was the proof that the VT completed the assignment. This snapshot had to be exported out of the VW (out-world) and emailed. As a final reward extra virtual goods were awarded to the VT at the end of the GTA for them to decorate their virtual group place in SL. The VTs had a limited time of 8 days to complete the GTA and deliver the picture. Also, the winning VT received extra free designed clothes for their avatars. The rewards, goals and rules of that team building activity were pre defined and detailed in the online handout.

Table 1 presents the activities, social continuum, avatar actions, in-world interpersonal components and theoretical support. These eight activities are mapped to the literature previously presented and used in the second iteration of the design. Figure 1 presents six screen shots as well as group pictures.

Table 1: Activities, social continuum, avatar actions, in-world interpersonal components and theoretical support

<table>
<thead>
<tr>
<th>Activity</th>
<th>Avatar action</th>
<th>Social continuum</th>
<th>In-world interpersonal components</th>
<th>Inter-personal</th>
<th>Theoretical support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Find the island</td>
<td>Teleport</td>
<td>Individual</td>
<td>Physical movement</td>
<td>Find other avatars and the group place on the island</td>
<td>Transformed Social Interaction TSI [6]</td>
</tr>
<tr>
<td>Avatar manipulation</td>
<td>Fly</td>
<td></td>
<td>Experience of direction</td>
<td>Enhancing normal perceptual abilities, multilateral perspective taking, manipulation of the context of interaction including space and time spatial dimension</td>
<td>Embodiment [9,59]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Learn to control the avatar</td>
<td>Build avatar representation and identity</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Modify physical attribute of the avatar</td>
<td>Communication of cultural and gender identity</td>
<td></td>
</tr>
<tr>
<td>Virtual basket game</td>
<td>Move object</td>
<td>Individual</td>
<td>Learn to manipulate object</td>
<td>Being able to interact in SL using objects and edit text to point at important characteristics of the environment</td>
<td>Transformed Social Interaction TSI [6]</td>
</tr>
<tr>
<td>Wind mill</td>
<td>Edit color</td>
<td></td>
<td>Learn to edit a text</td>
<td>Being able to edit color to for example express emotion in the interaction</td>
<td></td>
</tr>
<tr>
<td>The dragon’s name</td>
<td>Edit name</td>
<td></td>
<td>Change color</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Team bonding</td>
<td>Take picture</td>
<td>Team</td>
<td>Use all previous learning</td>
<td>Setting a meeting, coordinate agenda’s to all be present</td>
<td>TSI [6]</td>
</tr>
<tr>
<td></td>
<td>Decorate hut</td>
<td></td>
<td>Time synchronization and coordination in space with the team</td>
<td>Fostering group identity and collaboration, Winning the extra</td>
<td>Embodiment [59]</td>
</tr>
</tbody>
</table>

Table 986
4. Results and discussion

Survey

Most of the participants took part in the GTA (73%). However, less HKinese filled in the questionnaire (30%). The participants were asked to evaluate each of eight activities. The results of Anova conducted on perceived ease of use and perceived enjoyment were none significant for the variables culture and familiarity. Also no interaction effects were found. Those variables were of interest as familiarity with the system might affect how the technology is perceived [8]. Also, such team building activities are classically designed to be enjoyable and not cumbersome for the participants [8], this to foster collaboration. The participants evaluated the GTA as useful and enjoyed taking part in it. Activities, constructs, items, reliability measures and descriptive statistics are presented in Table 2. The easiest and most fun activity was flying.

Table 2: Descriptive statistics of the second iteration of the GTA scale 1 (strongly disagree) to 7 (strongly agree)

<table>
<thead>
<tr>
<th>Construct</th>
<th>Activity</th>
<th>Items</th>
<th>Cronbach value</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Ease of Use (PEoU)</td>
<td>Teleporting</td>
<td>Teleporting was easy for you</td>
<td>.922</td>
<td>4.84</td>
<td>1.788</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teleporting was clear and understandable</td>
<td></td>
<td>4.49</td>
<td>1.974</td>
</tr>
<tr>
<td>adapted from</td>
<td></td>
<td>virtual basket</td>
<td></td>
<td>4.16</td>
<td>1.952</td>
</tr>
<tr>
<td></td>
<td>Virtual basket</td>
<td>Moving the objects was easy for you</td>
<td>.802</td>
<td>4.41</td>
<td>1.952</td>
</tr>
<tr>
<td>Pavlou and Fygenson [52]</td>
<td>game</td>
<td>Moving the objects was clear and understandable</td>
<td>4.23</td>
<td>2.062</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>------</td>
<td>-----------------------------------------------</td>
<td>-------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>Flying</td>
<td>Flying was easy for you</td>
<td>.885</td>
<td>5.54</td>
<td>1.669</td>
<td></td>
</tr>
<tr>
<td>Naming the Dragon</td>
<td>Editing the name of the dragon was easy for you</td>
<td>.847</td>
<td>4.78</td>
<td>2.248</td>
<td></td>
</tr>
<tr>
<td>Coloring the Windmill</td>
<td>Editing the color of the windmill was easy for you</td>
<td>.872</td>
<td>5.13</td>
<td>1.949</td>
<td></td>
</tr>
<tr>
<td>Wearing traditional clothing</td>
<td>Changing the appearance of your avatar was easy for you</td>
<td>.792</td>
<td>4.68</td>
<td>2.246</td>
<td></td>
</tr>
<tr>
<td>Taking the team picture</td>
<td>Taking the team picture was easy for you</td>
<td>.808</td>
<td>4.37</td>
<td>2.236</td>
<td></td>
</tr>
<tr>
<td>Perceived Enjoyment (PEN) adapted from Koufaris [40]</td>
<td>Teleporting</td>
<td>You had fun when teleporting</td>
<td>.867</td>
<td>4.48</td>
<td>1.919</td>
</tr>
<tr>
<td>Virtual basket game</td>
<td>You had fun moving the objects around in Second Life</td>
<td>.810</td>
<td>4.41</td>
<td>1.952</td>
<td></td>
</tr>
<tr>
<td>Flying</td>
<td>You had fun when flying</td>
<td>.919</td>
<td>5.04</td>
<td>1.763</td>
<td></td>
</tr>
<tr>
<td>Naming the Dragon</td>
<td>You had fun when editing the name of the dragon</td>
<td>.922</td>
<td>4.37</td>
<td>1.877</td>
<td></td>
</tr>
<tr>
<td>Coloring the Windmill</td>
<td>You had fun using the color-picker to edit the color of the windmill</td>
<td>.946</td>
<td>4.11</td>
<td>2.069</td>
<td></td>
</tr>
<tr>
<td>Wearing traditional clothing</td>
<td>You had fun when changing the appearance of your avatar</td>
<td>.921</td>
<td>4.05</td>
<td>2.218</td>
<td></td>
</tr>
<tr>
<td>Taking the group picture</td>
<td>You had fun taking the team picture</td>
<td>.919</td>
<td>4.86</td>
<td>2.048</td>
<td></td>
</tr>
<tr>
<td>Familiarity with Second Life adapted from Novak, Hoffman and Yung [51]</td>
<td>You are very skilled at using Second Life</td>
<td>.787</td>
<td>3.21</td>
<td>2.035</td>
<td></td>
</tr>
<tr>
<td></td>
<td>You know how to control your avatar action on Second Life</td>
<td>3.65</td>
<td>1.891</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>You know more about Second Life than other users of your class</td>
<td>3.55</td>
<td>1.933</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>You have been using Second Life in the past extensively</td>
<td>2.93</td>
<td>2.198</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Semi structured interview

Monitoring scripts were used to track the avatars’ location on the SL island during the time of the whole project. The time logged onto the island and the location of the participants’ avatar were used to identify difficulty in completing the GTA. 73 percent did wear the tag properly and could be tracked. The results indicated that the Dutch team-members spent an average of 278 minutes in SL, and the Hong Kong students about 288 minutes. Four out of the ten VTs completed the team building activity and delivered the team picture in the time frame of 8 days. Ultimately 8 of the 10 VTS finished the activity successfully. We focused on 4 of the 10 team to better understand their drive in participating in the team building activities. The team-members (n=14)
of these successful VTs that completed all eight activities were invited for an interview. They took part in a semi structured interview designed to gain a better understanding of their motivation for participating actively in the GTA. Of interest was what was “special” about these participants. Were they early adopters and therefore more innovative with IT than the other participants, Agrawal and Prasad [3], or simply more absorbed losing track of time while playing [2]? What did they think of the GTA? Did they experience social presence? Could collaboration be fostered while engaged in the team building activity?

The interview lasted 30 minutes, on average. The interviewer followed a strict protocol of 10 questions based on the original scales used in the survey to measure cognitive absorption, personal innovativeness with IT [3] and social presence [61,41].

Overall the interviewees reported to be innovative or technology savvy. They viewed themselves as being more innovative than their team-members and engaged with new technologies. Four of them indicated first waiting for the “bugs” to be discovered and resolved before to engage in using any new technology. One of them stated: “Well I’m not the first to experiment with technology but probably shortly after that. First wait and see what happens and if it seems to work out I will implement it.” Interestingly, this remark is in line with the IT diffusion theory [52].

Previous VW experience among the respondents was reported to be minimal. Only two amongst the fourteen had used VWs before (World of Warcraft and SL). Six respondents mentioned that they completely missed the added value of SL. One stated “In the beginning I liked Second Life because it was totally new and I discovered things and did things. But after a while it wasn’t exciting because it does not add anything I think”. Outcomes were lower than expectations or desires, leading to a disconfirmation effect [19]. These results are in line with the observation that users do not return to SL when added value is lacking [21]. Another remarkable finding was that most respondents felt alone in the SL environment. They did not return to the island in Second Life after the project ended [21].

The majority of the interviewees, nine in total, disliked SL as a VW; “From the beginning I did not like Second Life. This whole virtual stuff I am not a big fan of it” and “I always thought SL was a weird invention for people who did not have a first life so they needed a second life.” SL was perceived most as a platform for leisure and gaming and not for serious collaborative work. They lacked a reason to be in the VW. There was not enough to keep them engaged. Despite this rather negative finding, all of the respondents liked being engaged in SL and being given the opportunity to learn a new technology. This could be explained as dispositional factor such as cognitive absorption with IT [2]. Indeed, all but one of the respondents reported losing track of time while using technology in general. That experience of temporal dissociation can be related to flow. Those results concord with previous research demonstrating that cognitively absorbed team-members are overall better team players in VTs [54]. The participants reported spending more time than they had planned prior to using technology. Interestingly, the participant who did not lose track of time had preset the amount of time to be spent in SL.

All the participants enjoyed the team building activity. The team building activity did succeed in fostering collaboration. A participant stated that: “… what was helpful was that it made us all a little bit closer. We were helping each other and laughing at different stuff. I think it made us closer because we started talking more about things you get to feel a bit freer”. Four respondents shared their emotional bonding experience “…with everybody in a row and taking a picture of it you see it gives a bonding.” Those comments are in line with the work of Ellis et al. [21] and Kanawattanachai et al. [33].

Synchronizing took a lot of time. Multiple communication cues in SL were used to complete the tasks at hand. The “virtual basket ball” activity was perceived as the most useful activity. The respondents felt they could master the physical law of the new virtual space. While the aim was to focus on manipulation of the objects, the participants spent some time teaming up as in the real world around ball games. The respondents helped out other team-members (not necessarily of their own team) during the GTA. They enjoyed the process of getting to know their VTs and other participants of the project in this manner. The “virtual basket ball” activity is a good example of a form of TSI [6]. As often the designed activities are rerouted from their original purpose and let to the creativity of the users [42]. Eight of fourteen respondents experienced a sense of social presence while being in SL as the classical literature will expect [41,61]. One respondent reported, “Funny thing I think so. Because everyone has this unique avatar and we could chat of course. So it would make it more like we were in the presence of our teammates while being 6 time zones apart. We were in the same place”. They particularly reported a sense of togetherness with their team members in SL. One added “The HK team I could not feel their presence, they did not say much”. As stated in literature communication cues are important to assess presence [61]. The participants felt a higher feeling of
SP from students they had already met and know from a face-to-face setting. “I guess yes, I could see their avatar and talk to them and interact with them. So it’s kind of like they were there but they are not.”

Five participants mentioned they enjoyed the experience of customizing their avatar [59]: “Yes I spent more time in SL than expected. At first I did not do anything. But then I downloaded a customization for my character so I had a bit of fun.” Avatar identity was raised as the mayor trust issue when operating in SL. One participant clearly indicates “not knowing who you are talking to makes it difficult to trust someone in VWs.” [59,46]

5. Limitations and future research

Overall, participants perceived SL more as a game than as a communication tool. That aspect is emphasized even more in the HKnese culture [40]. While the participants could perceive a certain utility in the GTA at fostering collaboration in their VTs, they could not make sense of its added value as a technology. The lack of training of the participants with the technology may have been a limitation. It would have been interesting to map all the constructs used to design the team building activity in the survey. We did not gather statistical data on embodiment, or social presence. We focused only on familiarity, PEoU as well as PEN to first of all comply to the definition of a good game [8,20]. The team bonding activities were perhaps not convincing enough for the participants. It required too high a level of time synchronization. Also, it would have been interesting to map the team performance of the VTs against the result at the team building activity. We focused on the VTs that reached the goal in time (n=4 VTs). However, it would have been interesting to interview all of them to get a better grasp on the actual added value of VWs to foster collaboration in VTs. Finally, the GTA was designed to provide a prior experience to the participant using SL for the very first time with the goal to foster collaboration. It may have been more efficient to separate activities in time to allow the participants to accommodate some more with the environment that was new to most of them. Finally, we did not compare technology usage in fostering group collaboration. Our focus was on testing and capturing the added value of VWs more specifically for VTs [26,12].

We intend to address those limitations in a third iteration of the GTA. It will be associated to a more specific team building activity based on the problem solving component identified by Klein et al.[36]. The idea will be pulling apart training and team building. This will surely allow gathering more measure on social presence as well as the TSI experience. The GTA will be applied in a real business setting. Also, we intend to link team building activities to the actual performance of the VTs. It will also be worthwhile to compare technologies in terms of affordance to support such social activities.

6. Conclusion

We realize that despite our efforts in developing the Get Together Activity, most team-members felt overloaded. They had to adjust to the VTs new experience and to a new technology. Participants may have lacked time to adjust. The steep learning curve and the association with gaming are probably slowing down the diffusion of VWs [69]. More training will surely be required to observe clear benefit. Beside the somehow mitigate opinion of the participants, we are convinced that the experience of space and mainly avatar movement and directionality as well as affordances offered by VWs will change the way VTs collaborate in the future.

Overall, we conclude that the designed team building activity was effective in fostering collaboration. This conclusion is both supported by the results of the survey and the semi structured interviews.

According to a recent article published in the International Herald Tribune3, December 8th 2010 “By the age of 21, the typical American has spent 10000 hours playing computer games, and endured a smaller but much drearier chunk of time listening to sermons about this sinful habit.” It will be an interesting challenge to make use of this habit to improve VTs’ collaboration.

7. References


3 http://www.highbeam.com/doc/1P1-187146343.html


