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Studying in a Virtual World the effective use of business meetings.

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Abstract

Virtual worlds are a new class of technology, but are hardly used for business. They offer new possibilities, but can we unlock them? This paper describes the design, implementation and testing of using a 3 dimensional virtual world for idea generation and categorisation. The research follows the design-science paradigm. Three applications inside the virtual world Second Life were built for idea generation and categorisation and tested with a group of experienced Second Life users. The meetings held in Second Life showed a positive attitude towards the effectiveness and fun of the tools. However the overly usage of space can reduce the effectiveness.

Management Summary

Introduction

Do you already have a virtual Business Life? Computers can nowadays be used with a virtual 3 dimensional interface. People meet in 3 dimensional games for many years but are focused on consumers. Business users are left in the cold. Research on virtual learning, virtual economics, usability and other related subjects show the potential of virtual worlds to business users. Can we unlock this potential? The challenge at hand is to use an existing Virtual World in a business setting. However basic business support tools are lacking. During these project a set of tools is created. The goal of this project is to test if a business meeting in Second Life is effective by using these tools.

Research Question

The focus of this research is,if a creative business meeting is held completely in a virtual world does it still function? How can the business user and the process of idea generation be integrated in a virtual world. Both the process itself as well as the organisation of the process is included into the research. This following research question is created:

How can space as provided in Virtual Worlds help in idea generation and organization.

The main research question is split into two parts. One part focuses on the idea generation and the other on the organisation. Two sub-questions are created:

1. **How can the number of dimensions aid in structuring an idea session?**
2. **How can rights management be implemented within the limits of a Virtual World?**

Particularly it is interesting to see if we can make the right setting for a business meeting to work.

Research Design

The design-science paradigm is used, which addresses research through the building and evaluation of artefacts designed to meet an identified business need. The project uses a midterm evaluation to test the progress and a larger test to test the final artefact.

Tools Developed

To aid a business meeting, 3 tools were tested with an increasing richness in dimensions and

features. The requirement for 3 tools came from the need for both a richer as easier tool, which could not be integrated into one tool.

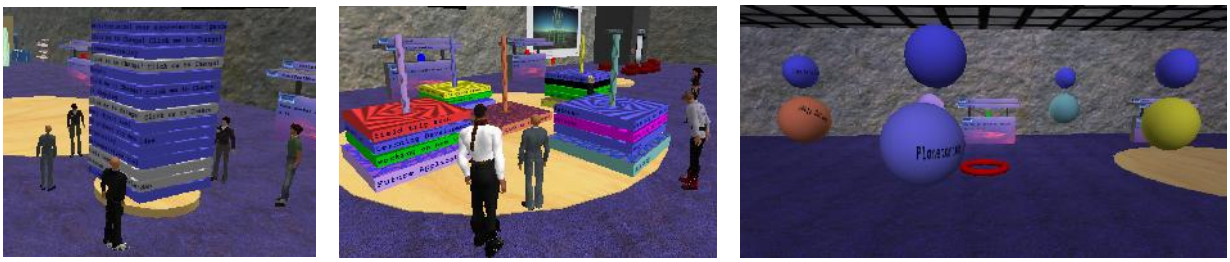


Figure 1: Participants use the three Idea tools (Single Pole, Idea Categorizer and Planetarium)

For the measuring the respondents a virtual voting floor was used. The respondents could rate the tools on two criteria, effectiveness and fun and would position their avatar accordingly.

Figure 2: Votingfloor for measuring the particpants responses

Evaluation of the tools

The evaluation of the tools was done after the participants held a virtual meeting with the tools. The results in their raw form created a scatter plot of the avatars position during the votes (Figure 3). The participants agreed on the limited effectiveness of the third dimension however the fun of doing such a meeting was valued for all tools used.

Overall the tools were perceived to be effective as a whole and the development is coming in an end phase.

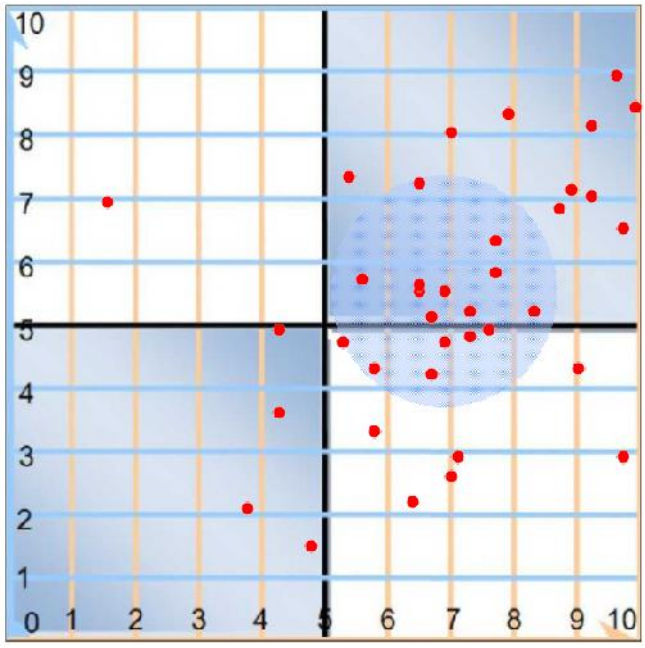


Figure 3: Development state, X-axis: Effectiveness Y-axis: Development State

Conclusions

This research was split into two research questions:

(1)How can the number of dimensions aid in structuring an idea session? The use of space created the option of starting with a simple tool and gradually move to a richer tool. The 1 and 2 dimensional tools were effective in use. However the 3 dimensional tool (Planetarium) was less effective. The added value of the third dimension is difficult to manage and use effective. However we see a large fun factor with all 3 tools. The use of a third dimension can help in a creative meetings to find a solution.

(2)How can rights management be implemented within the limits of a Virtual World? Anonymity in virtual worlds can create problems when those virtual worlds are used for business meetings. Linking a avatar to a real person has to be done. However the usage of in world tools for registration is difficult for users. Instead the external website gives the user a familiar method for registration and rights management. As a benefit this also gives the possibility to present the results of the meeting.

Second Life can be very useful, and offers functionality that can only be found in other virtual worlds. However that doesn't mean that it is suited for all tasks.

Preface

I want to thank Michiel van Genuchten for his help and assistance in bringing this Master Thesis project to an end.

I want to thank Anthony Adams (and everyone associated with the Alpine Executive Centre, especially Sunset) for their vision, support and effort in creating a meaningful and useful group of tools. Also the help in getting the participants which was much needed.

Special thanks goes out to Richard Mulders. His contribution to my project was completely voluntarily. The fun as well as a lot of development work on the website made my Second Life a lot more pleasant.

Jeroen Verhallen

's-Hertogenbosch, July 2009

Table of Content

1. Introduction

Do you already have a virtual Business Life? Computers can extend their ancient 1D character based and current windowed 2D displays into a virtual 3 dimensional interface. Games are first in using virtual worlds for people to meet, a recent example is World of Warcraft (van Lent, 2008). More generic Virtual Worlds, such as Active Worlds and Second Life, exist. These Virtual Worlds offer an empty world to be filled by the users. A economy is created with virtual and real world elements, such as shopping, games and artistic expressions. Companies join virtual worlds to create a presence by creating buildings, shops and virtual representations of their products. All these actions are still focused on consumers and business users are left in the cold. Research on virtual learning, virtual economics, usability and other related subjects show the potential of virtual worlds to business users. Can we unlock this potential?

The challenge at hand is to use an existing Virtual World in a business setting. One of the more complete and ready to use Virtual Worlds is Second Life (SL). SL offers a lot of technical means that are useful for business meetings, such as spatial voice functionality, virtual presence and the ability to manipulate the surroundings. However basic business support tools are lacking. A start has been made with using the Virtual Space of Second Life for decision making, creating the first iterations of business support tools (Molina Orrego, 2008). The goal of this project is to test if a business meeting in Second Life is effective.

2. Goal and Research Design

A business meeting in the real world is a common occurrence, but what happens when we move it to a Virtual World? Myron Krueger, one of the first to use the notion of artificial reality, stated that " it is the relationship that is real, the physical ambience at either end is secondary" (Krueger, 2002). We can use the same analogy for business meetings. The physical form of a business meeting is secondary, as long as the relationship is real. We already have different forms in which a business meeting can be held. Conference calls are very popular as alternative for physical meetings. Video conferences are becoming available to more companies with the improvement of the Internet. And now virtual worlds have become within reach of all computer users. With virtual worlds a problem arises. The representation of the information in a (creative) business meeting in a virtual world could create unprecedented possibilities, and problems. A document in a virtual meeting can be represented in a totally different fashion then in any of the other meetings. Are these new representations still useful to the business user and can we convert them into real world useful documents? The usage of SL however brings also some challenges. Presenting and managing the information in world is a serious challenge. And also when preparing the meeting a lot of work has to be done. In all existing meeting types some sort of document is created as result of the meeting. How can preparing and executing a meeting become a streamlined process which can be done fast and with limited technical knowledge? These 2 questions have lead to the following research questions.

2.1 Research Question

The focus of this research is if a business meeting is held completely in a virtual world does it still function. How can the business user and the process of idea generation be integrated in a virtual world. Both the process itself as well as the organisation of the process is included into the research. This following research question is created:

How can space as provided in Virtual Worlds help in idea generation and organization.

The main research question is split into two parts. One part focuses on the idea generation and the other on the organisation. Two sub-questions are created:

2.1.1 How can the number of dimensions aid in structuring an idea session?

Idea generation and ordering uses text as main communication channel. Research shows that the communication model in such systems is inefficient: Absence of face-to-face communication in a

virtual (internet) environment does hinder the flow and speed of exchanging information. The slow speed of typing and lack of real-time response made it hard for members to exchange information as rapidly as in face-to-face meetings. (Liu 2007). In a Virtual World a face-to-face meeting can be simulated, supported by spatial voice chat and virtual presence. However for discussions no simple tool exists that can help the users to organize and structure a meeting. The previous developed tool (Molina Orrego, 2008) has a steep learning curve, and is limited to 2 dimensions. For this reason three different tools are developed, which differ in the number of dimensions they represent. This creates a step-by-step increase in complexity. Main research question is, does the complexity of the tool affect the effectiveness of a creative meeting?

2.1.2 How can rights management be implemented within the limits of a Virtual World?

Virtual Worlds (VW) are computer simulation programs that allow people from all over the world to visit. Second Life has the option to limit access for a certain region (Island). However this can only be done for the whole island, not for parts of the island (Second Life, 2009). All users get the same rights. For business meetings only the invites should be allowed to join. The challenge is to identify the avatar as a real person with his/her real name and give the appropriate rights for the tools and meetings.

2.2 Research Design

This thesis follows the design-science paradigm which addresses research through the building and evaluation of artefacts designed to meet an identified business need (Hevner, et al. 2004). Such paradigm involves a loop of building and evaluating which is iterated several times. Every loop an artefact is produced that is evaluated and is the starting point for the next iteration. Before this research already 2 generations of artefacts were tested. This research builds on top of previous work, and is seen as the 3rd and 4th iteration of group work in a VW. Because the tools (the artefact) are developed over time the code base also increases over time, which increases the corresponding development and testing/usage time. For this reason a mid term evaluation is done. In this evaluation the progress and development is evaluated to see if it is on track (the 3rd iteration), which clears the path for finalizing the tools (the 4th iteration) for the test phase. The 7 guidelines of Hevner et al. (2004) are used to follow the design-science approach.

The goal of this research (guideline 1) is to create and evaluate the use of varying dimensional tools in a setting that integrates all aspects of group work such as identification, registration and user rights management. The problem relevance (guideline 2) comes for previous research, which

showed that group work in Virtual Worlds is still in its early phases and more research needs to be done. The thorough evaluation (guideline 3) is being planned by using the tools in an experienced Second Life group of 30-50. By using the tools for the evaluation we make sure that the tools are used extensively and the users can evaluate them thoroughly. The innovative solution (guideline 4) is implemented in the artefact itself. The notion of different dimensional representations, from a single stack of ideas to a 3 dimensional planetarium offers innovative ways of categorisation. Rigour (guideline 5) is being guarded by testing simultaneous different approaches to the same problem. The evaluation of the tools is not limited to a single artefact, but the users can compare the different artefacts to each other. The search process (guideline 6) started with the request for more usable and spacious tools. Both areas are being explored and artefacts are being developed which have different spacial representations and usage options. The communication (guideline 7) of the artefacts is done by placing them in working fashion on a virtual public island in Second Life, on which business meetings are being held, tested, demonstrated and used.

3. Background

This research integrates virtual worlds with business meetings. In this chapter the history and development of Virtual Worlds is described. Followed by methods for structuring a creative business meeting via idea generation and organisation and previous efforts in using those methods in a Virtual World.

3.1 Virtual World

A virtual world (VW) is defined as an electronic environment that visually mimics complex physical spaces, where people can interact with virtual objects, and where people are represented by animated characters. (Bainbridge 2007) Where a virtual world also can be a standalone world/single user, the focus here is on virtual worlds that are distributed virtual spaces or places in which people can meet and interact with others, agents and virtual objects (Redfern & Naughton 2002). Sometimes also referred to as Collaborative Virtual Environment (CVEs).

Virtual Worlds advance rapidly. A lot of progress has been made in many of the problem areas that existed a few years ago. 3D rendering, animation, and network distribution of multimedia content is improving constantly. (Jorissen & Wijnants 2005) In Figure 4 the evolution of the digital character (the avatar) is shown, from a simple block form into a humanoid representation as in one of the latest versions of Second Life.

Figure 4: Avatar evolution: blockie (DIVE), virtual humans (recent DIVE), customizable avatar (Second Life) and hologram (CNN). (Jorissen & Wijnants 2005)

The evolution of the VWs over the last decade has created a number of new worlds. But also a number of worlds aren't active any more. However it is clear that the VW as technology will continue to develop. The next decade will offer new initiatives and existing VWs will be further developed (or ended). VWs can be seen as a new class of technology and are still in their infancy. It is not relevant which one will survive. For this project Second Life is used as reference VW. It offers the most complete function set for the development of tools of the different VWs. Especially the creation of own objects and scripts is an essential part of software developing in a Virtual World.

Besides the development options, also the communication options within Second Life are mature (voice & text) and at least match the options of other VWs.

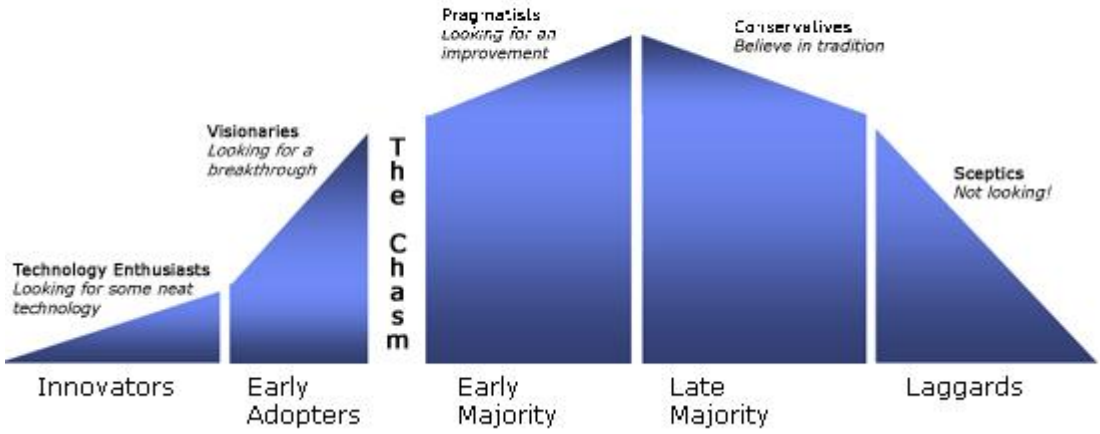


Figure 5: G.A. Moore's (1998) Chasm in the life cycle of a product.

Second Life has shown a growth to 15 million (Sydney Morning Herald, 2009) and is expected to double every year (Gartner Group, 2007). However it also becomes clear that after the first movers ("innovators") and "early adopters" the growth is limited because of limited attraction for new users as can be expected from the Technology Adoption Life cycle model (Figure 5). The usage of Virtual Worlds, as any (new) technology has also an impact for the user. Different studies (Fetscherin and Lattemann, 2008) have been done to investigate the effect of using Virtual Worlds and the acceptance of that technology. All this research shows a great potential, but still requires useful applications for a wide usage and acceptance of Virtual Worlds. This research tries to create such a useful application for creative business meetings. The already existing applications are described in the following chapter.

3.2 Idea Generation and Organisation

Business meetings can have all kind of forms and goals. Also different collections of tools exist to support and structure these meetings. One of the previous research in Virtual Worlds was based on Group Support System (GSS) tools. GSS is a wide range of tools, which includes brainstorming, idea generation, open discussion, idea organization, issue analysis, alternative analysis, questionnaires, polling, group writing, and process modelling (Nunamaker, Dennis et al. 1991). For a better understanding, GSS can be split up into 5 steps (Table 1), Figure 6 shows a graphical representation of these steps.

Table 1: The 5 steps of a Group Support System process (Briggs et al 2006).

Generate / Diverge	Move from having fewer concepts to having more concepts
Converge	Move from having many concepts to focusing on a few concepts deemed worthy of further attention
Organize	Move from less understanding to more understanding of the relationships among concepts
Evaluate	Move from less understanding of the value of concepts for achieving a goal to more understanding of the value of concepts for achieving a goal
Build Consensus	Move from having less agreement among stakeholders to having more agreement among stakeholders

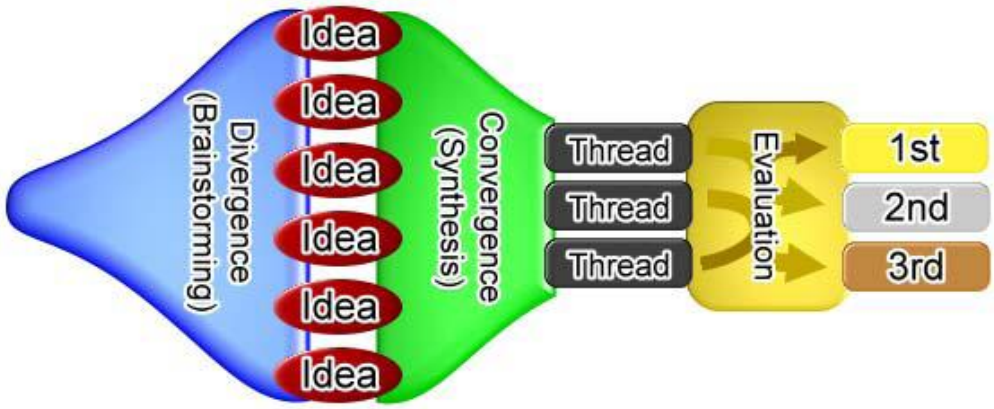


Figure 6: Graphical representation of the GSS process (Helquist et al 2008)

GSS are tools that aim to improve work efficiency by structuring the activities and communication within the group. Molina Orrego (2008) has translated GSS to Second Life (Figure 7) and compared the results to face to face meetings.

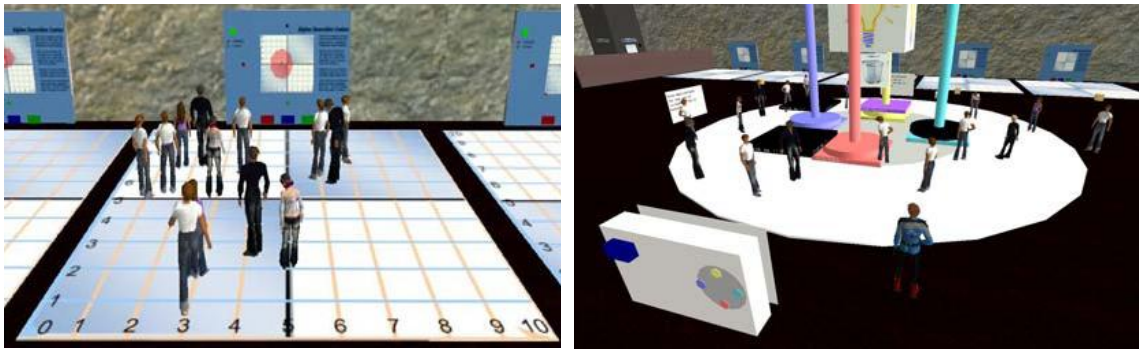


Figure 7: (l.)Multi-criteria voting tool and (r.)Brainstorming and idea organizing tool. (Molina Orrego, 2008)

The results showed that Virtual Wolds have become mature enough to successfully facilitate business meetings, but the tools lacked the effectiveness of existing (non virtual) tools. Especially the Idea generation and categorisation was up for improvement. This research will address this problem and try to find a solution. To be able to test the result of such a solution, criteria should be

decided on which a business meeting can be assessed. For a group to come up with creative ideas humour (McFadzean, 2000) can stimulate group members. “Fun can be a catalyst for an effective meeting. Used appropriately, fun and humour can relieve meeting tedium and level the hierarchical playing field to create an atmosphere that encourages honest dialogue, risk taking, and the sharing of ideas” (Hemsath and Yerkes, 1997 p.98) For this reason fun is taken into account, besides effectiveness.

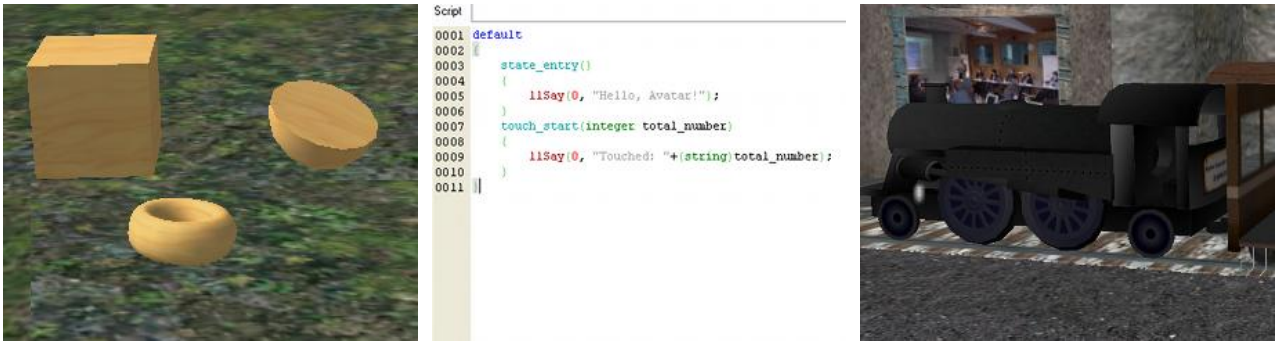
Business meetings can be supported by a lot of technical means however one requirement has to be met in any meeting. A setting has to be created in which participants can join freely and non members can not interfere with the meeting. Within a Virtual World these means are not implemented by default. There are some restrictions possible, but they are only site (island) wide. While in a business meeting the rights are much finer required. In the next chapter the development of the rights management and idea generation and organisation is described.

4. Development of the tools

This chapter describes the development of the tools. The development is done with the design-science paradigm in an iterative way. These set of tools can be seen as the 3rd and 4th generation or iteration within the goal of using (virtual) space in business meetings. The 1st and 2nd iteration, developed by Molina Orrego (2008) are briefly explained,

4.1 Introduction

Development is an integrated part of Second Life. Second Life offers the user an empty space and a set of tools to build their own world. The user can build objects with primitive forms or prims (Figure 8a) and make them interactive with event driven scripts (Figure 8b). The basics are very simple, but combining different prims and letting them interact with each other a rich tool can be build (Figure 8c).



a. *b.* *c.*

Figure 8: Primitive objects & simple scripts combined in a complex object as a train.

Throughout the project many small tests are done to test on feasibility of certain functionality. Also scalability is tested to some extend, to prevent problems later on in the project. Because the complexity can grow very rapidly a clear design and model is generated, to locate problems and make an efficient tool. The Alpine Executive Centre (2009) is one of the visionary islands on which development is going on, implementing business support into Second Life. For this research we use the Alpine Executive Centre in Second Life as development and test area.

4.1 Previous iterations

First steps of using a Virtual World as a group tool were done by Molina Orrego (2008). He developed a set of tools for Group Support Systems in Second Life. The space provided by the Virtual World was used for idea categorization and voting. Figure 9 shows the final version of the tools used.

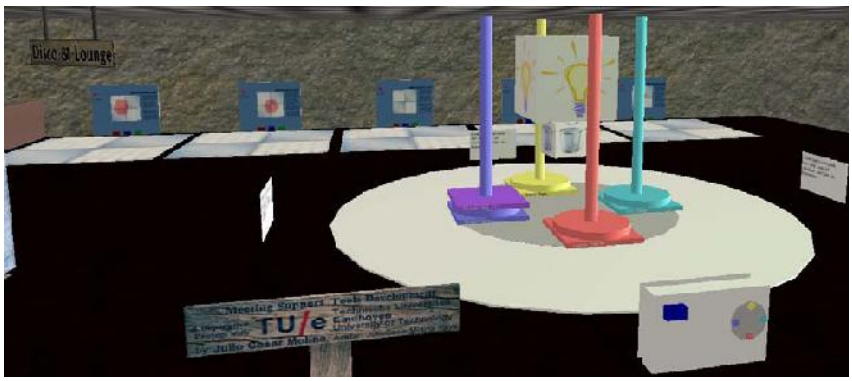


Figure 9: Final (2nd) iteration of Molina Orrego (2008)

In the foreground the idea categorizer is shown. On four poles ideas could be categorized, in the middle of categorizer the “new idea” box and “Trash” box are visible. In the background 5 voting floors are used for registering votes of avatars.

The entering of text and usage of those tools was problematic for the users. The text problem was the most evident for the user. For every idea, comment or other text input a specific channel was created. The user could then use this channel for his input, for example if channel 4 was the idea channel the user would type '/4' followed by the idea text on the chat. This required the user to remember a set of channel numbers. The usage was also more complex. The user would first click on the object to manipulate it, and then click on the object that represented the required action. This also requires a good handling of the avatar by the user. If the avatar is not facing in the right direction he or she cannot see the some or all of the actions. The voting floor had a better response, the user only needed to move his avatar around and didn't need to interact with the tool or input text. The setting up of the tools and managing the different users was a time consuming process for the facilitator. Text files containing the names of the facilitators (users with special rights) and normal users were changed before every meeting. The avatar names were sometimes only available right before the meeting. Maintaining the complete tools was also an issue. The tools were demanding on resources for the server and could not easily be copied. Setting up many tools for multiple meetings or questions could only be done by the programmer, requiring code changes and special procedures. These experiences have generated a list of requirements and design choices which will be addressed in the next paragraph.

4.2 Implementation choices

The implementation choices are based on the functionality offered by Second Life. Not all possible solutions are viable for Second Life. The constant development of Second Life also has increased the possibilities, which opened new options. First the main constraints of Second Life are discussed,

followed by the functionality added since the last iteration.

4.2.1 Constraints

Second Life as a Virtual World offers new possibilities, but also has limitations. The four most serious constraints are discussed. (1) The entry of text from the user can't be done in a nice fashion. The previous option was to use a channel, which means entering a backslash and the channel number in the chat window, followed by the text the user wanted to add. (2) The available resources are limited. The number of basic building blocks (or prims) and processing power is limited. Every object and script in world has to be managed by the server and rendered by the client computer. With an increase of prims and scripts also the load of both the server and client are increased. This creates “time dilation” on the server side, which means that the real time is going faster then the virtual time. Everything is slowing down. On the client side this results in a less responsive client and a lower “frames per second” that is rendered. To guarantee a certain amount of responsiveness and speed the amount of prims is limited (around 6000 on a private island). Using too many prims on a tool could lead to reaching this hard limit. When scripts are overloading the server messages can be lost or reach objects too late. Both creating unexpected behaviour. (3) Rights are managed on a server (Island) based level. An user (avatar) can be allowed or disallowed on the island. Also Build (Rez) and other rights can be given to users. However these rights cannot be easily be given and revoked and are always for the full region. (4) Information is not easily in and exported from Second Life. Second life has no standardized automated process of importing and exporting information, only via copy/paste text can be manually exchanged. Images can only be uploaded when paid for and the only way of exporting images is via screen shots.

4.2.2 New functionality

Since the previous iteration numerous new features and improvements were added to Second Life. There are two features that have the most effect on the development of the next iteration. Accessing websites from within a script created the possibilities to store and return information from outside of Second Life. The possibility to detect where an object was touched by a user. This opened the usage of virtual keyboards and other intelligent interfaces.

4.2.3 Experience

Experiences before and throughout the project are an important source for implementation choices. Especially the limit on script length is an important experience. The longer a script gets, the more complex it becomes to keep out undesired effects. This leads to a “limit” of approximately 500 lines

of code to keep everything manageable. While there is no technical basis for this limit, practically the development becomes really problematic. The second experience is that using one channel with different (readable) messages offers a debug option that helps understanding the tool and find problems in the scripts. The readable messages translate also in more readable code, because the commands send over the channel have to be decoded as well, which is done in plain text.

4.3 Requirements

Besides the limitations of Second Life and the previous iterations a set of requirements is created. These requirements are based on literature background. Because the tools have to be used and supported later on, the reuse of code was an important factor. For this reason a set of objects was created that support the two main research subjects. These objects and requirements are discussed in the paragraph Support Tools.

4.3.1 Idea organization

The process of brainstorming can be implemented in a lot of different ways. The previous iteration of idea organization had produced the Idea Categorizer. Research showed that there is a need for both an easier as well as a more feature rich tool. This creates the dilemma between expanding and simplifying the existing tool. To solve this dilemma the requirement of using one tool for Idea Organization is dropped. First an easier tool is created that helps participants understand the tools faster, and at the same time create a starting point for the brainstorming phase. This tool is called the Idea Generator. Second the Idea Categorizer, based on the previous iteration, is devised. Instead of one single pole a group of poles can be created on which ideas can be stacked. And finally a tool is thought of that could use the 3rd dimension offered by Second Life. This tool is called the Planetarium. Figure 10 shows an impression of how such a planetarium would materialize and move. The idea behind the planetarium is to increase the fun and perspectives: “One aspect of this intellectual dynamism is playfulness. Like little children with building blocks, creative people love to toy with ideas, arranging them in new combinations, looking at them from different perspectives.” (Ruggiero, 1991, pp. 39-40).

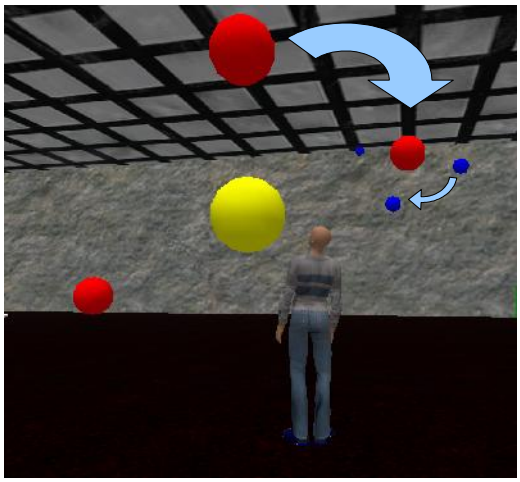


Figure 10: Planetarium concept

The information on the tools should be easily transferred from one tool to the other. This requires that the information is saved in an uniform/transparent way, in which extra information wasn't lost between tools.

4.3.2 Rights management

When tools are developed, that let the Avatars do virtual tasks and activities, all users get the same rights via the virtual world. An avatar is anonymous, and can not be identified as a real person with his/her real name, without any other information. This creates the challenge to link an avatar both visual as technical to a real name/person. The information has to be stored in a central place. Via the external website connection in combination with a database one central storage is created. Because different people can have different roles a scheme is used which included rights for Users, Facilitators and Administrators.

4.3.3 Support Tools

A group of support tools is created to be able to reuse some parts in more tools then only the ones developed for this project. This includes the database connection, keyboard and website. Because of the simplicity of the design of these tools only the implementation is described.

4.4 Modelling

Because the idea organisation and rights management create two different artefacts also two sets of models are created. However both artefacts use the same database. Therefore first the database layout is specified. Second the rights management is discussed. Afterwards the idea organisation model is discussed, which includes the three tools. The support tools are not modelled separately because they rely on the three described models.

For the designing a set of guidelines is used to structure the design (M.A. Jackson, 1975): (1) A program must be easy to understand. (2) A program must be easily adapted to changing problem requirements. (3) The structure of the program must resemble the problem. And (4) a program must guarantee to work to a certain degree. These guidelines seem in current software development an over simplification. However all currently available virtual worlds (including Second Life) are based on event-driven programming. They do not offer any form of up-to-date languages or software development tools. To be able to create manageable code a modular approach is chosen, general parts are split of from the specific functionality.

4.4.1 Database

The database is the central storage of all the tools and permissions. First the permission storage is described, followed by the storage of the tool data.

In Figure 11 the structure of the database is described. The authorisation is done on the Meeting level. The users are given a role which corresponds with certain rights. By putting users into Groups they can be organized inside the web interface. For every time a tool is used a Session is created. The session couples the permission information to a tool. By defining a tool type multiple tools can be used in a meeting and the web interface/meeting selector can detect which tool is used for that session. The visualisation on the website is changed according to the tool type and the meeting selector selects only sessions that match the tool it is configured for.

The other half of the figure consists of the storage of the data. The different data types in Second Life do not match to data types used in PHP or MySQL. To be able to add different data types pairs of attribute-value are created. Groups are created to be able to link different attribute-value pairs, called tuples, together. Every tuple is saved into the items table, and consists of a Field Definition (the attribute) and the corresponding value. These items are then grouped into sets which on their turn are combined in a session.

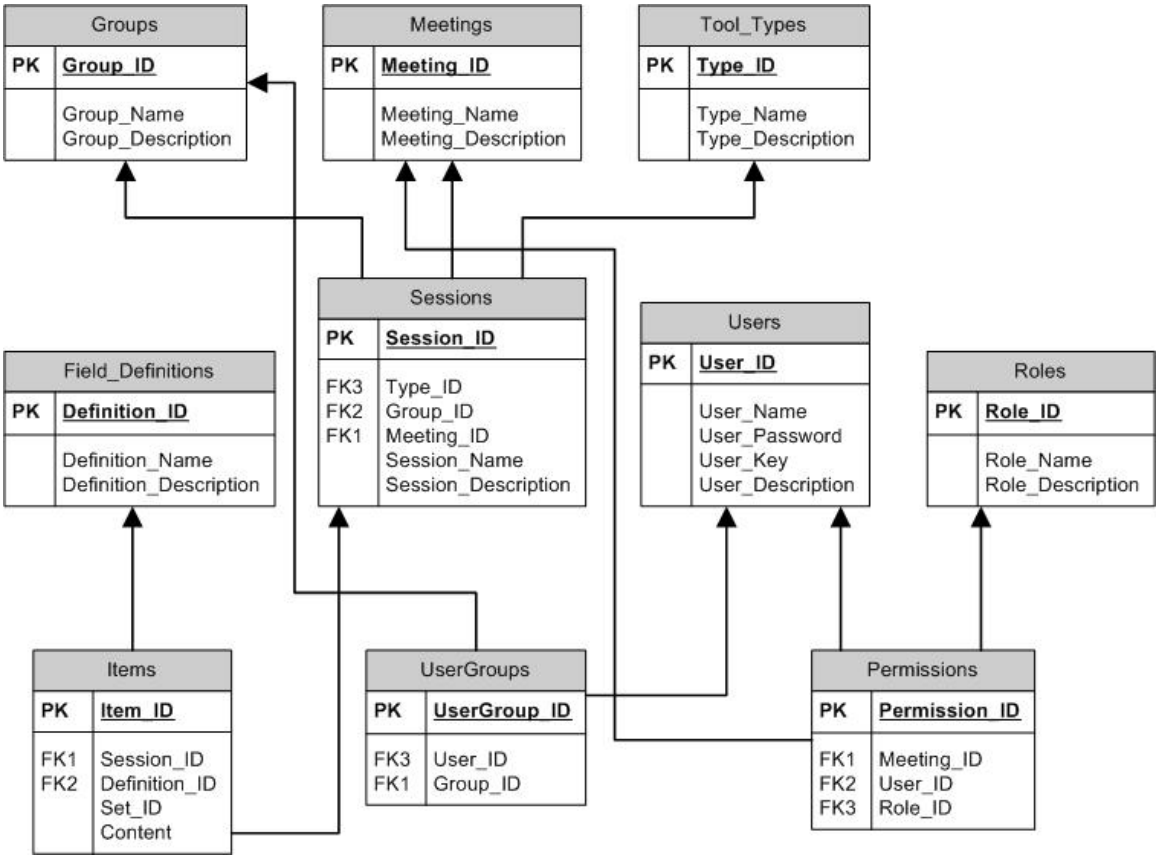


Figure 11: Database structure

All data is transferred and stored as plain text. This prevents problems with conversions between the different data types in Second Life and Php/MySQL.

4.4.2 Rights Management

The rights management is modelled with a class diagram (Figure 12). This has the advantage that objects can be reused if possible and users interact with similar objects to reduce complexity. The NameTag and MeetingSelector both communicate with the database. And the MeetingSelector sends the selected meeting over to the tool via the SetupChannel.

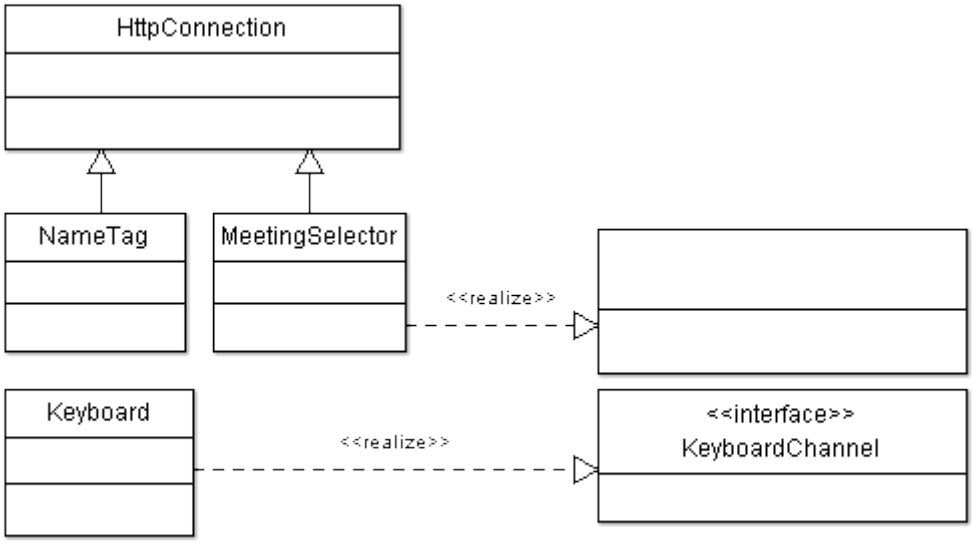


Figure 12: Class diagram of the rights management.

4.4.3 Idea Organisation

The class diagram (Figure 13) shows that the basic building blocks for idea organisation, the idea (IdeaBox) is used in all three tools. The categories (IdeaPole) are also used for all tools, only in the Single Pole situation a custom version is used that includes the tool logic to communicate with different objects.

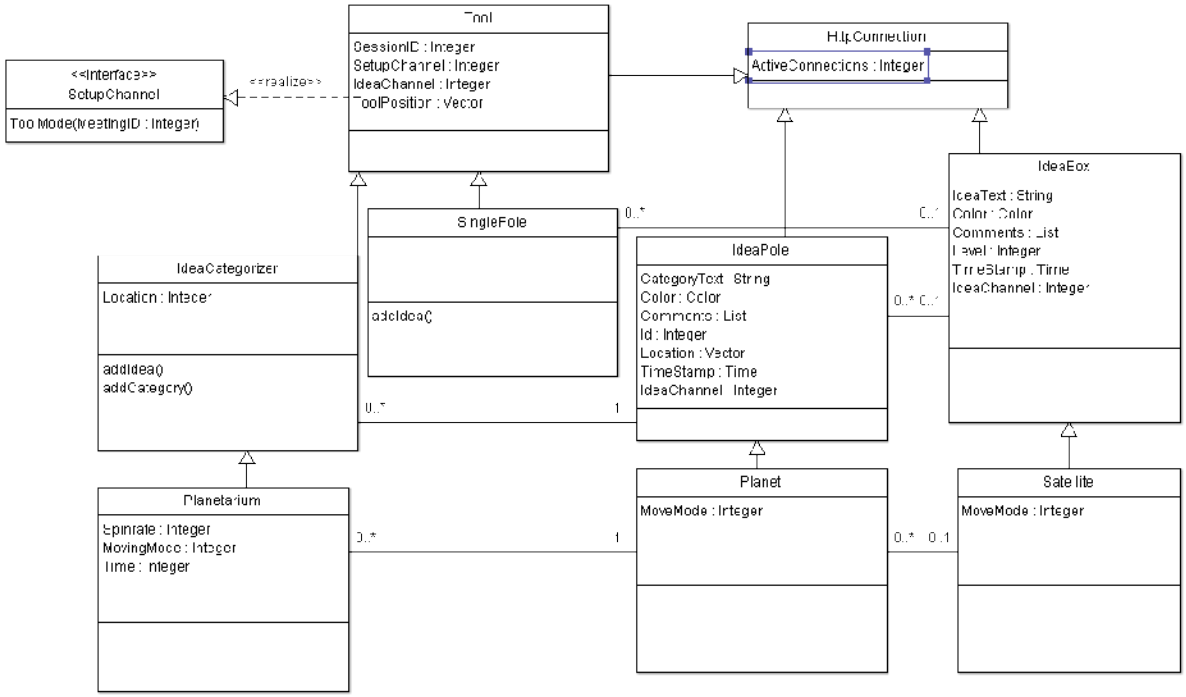


Figure 13: Class diagram Idea Organisation

Second Life uses channels to facilitate communication between objects. In the tools there is a design which uses one channel for the communication of the objects that are on the tool. The SetupChannel communicates with the Meeting Selector which can also be seen in the organisational model. The communication between the objects on the tool is done via the IdeaChannel. No predefined communication protocol is or was available, so a new protocol had to be created. The specification is included in the Appendix.

4.5 Implementation

4.5.1 Idea organization

As starting point three different tools are designed, with their own set of requirements and design. First an easier tool is designed that can help participants understand the tools faster, and also is the starting point for the brainstorming phase. This tool is a Single Pole on which ideas can be stacked, called the Idea Generator. Second the Idea Categorizer is designed. Instead of one Single Pole a group of poles can be created on which ideas (identical to the ideas on the Idea Generator) can be stacked. The functionality of the Single Pole is re-used in Idea Categorizer with the only change is the option of adding more poles. Finally the categories and ideas are changed into planets. Every idea and category is a sphere which floats through the space. The menu structure and behaviour is

similar to that of the Idea Categorizer. However an extra option is created which can change the motion of the planets.

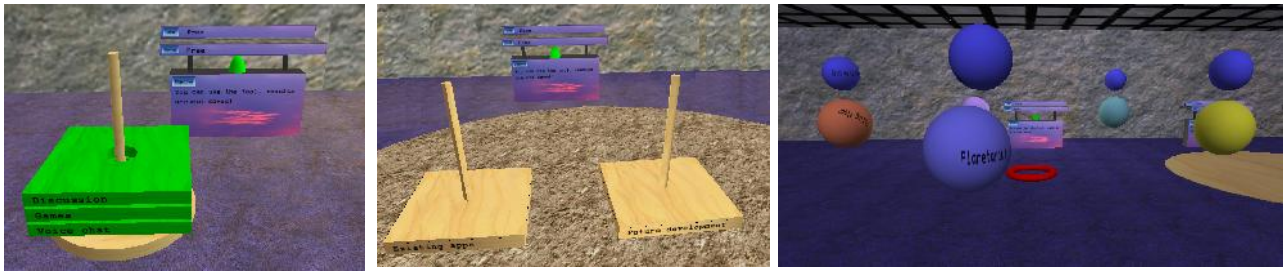
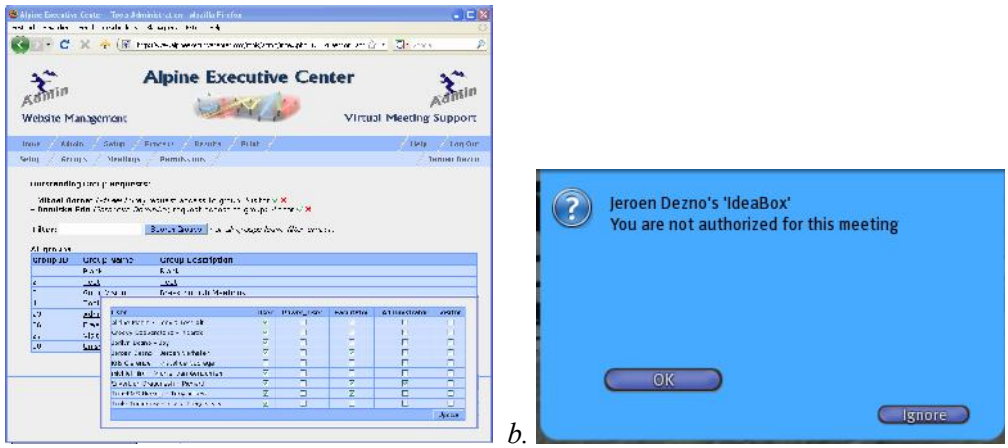


Figure 14: Simple Pole, Idea Categorizer and Planetarium

4.5.2 Rights management

For the End User the rights management is mostly behind the scenes, except for the Meeting Selector and information on the web site. On the Website the rights management is done (Figure 15a).



a. *b.*

Figure 15: User management on the website and in Second Life

When an avatar tries to operate a tool that he or she doesn't have rights for a message appears (Figure 15b), showing the user that he is not authorized.

4.5.3 Support Tools

Keyboard

To circumvent this problem an "on-screen" keyboard was created similar to the keyboards seen on touch devices. The user can then click on the keyboard to enter the text. The keyboard is designed as rotating HUD (Head Up Display). This means that the HUD is not showing when not used, and rotated into the visible area when needed. The keyboard is using the new functionality (llDetectedTouchPos) for detecting were the avatar has clicked on the keyboard. For easy use the keyboard mimics the behaviour of the standard llDialog object in Second Life. The Keyboard is a

complete standalone object which doesn't interface with the database. The Keyboard can be called via a special channel, which shows the keyboard with the question, answer and other information.

Nametag
To link an avatar to user's real name a Nametag is given. This name tag shows the entered real name above the head of the avatar. That way the sometimes cryptic avatar name can be linked to a real person.

Website
A standardized website which can connect all tools together is created. Also the right managements is stored here, including the avatars real name. After the 3rd iteration it also has the option to request to be added to a certain group. With the real name this information is normally enough for the facilitator or owner to decide if the user is who he claims to be. The website also shows the results from the meeting (Figure 16).

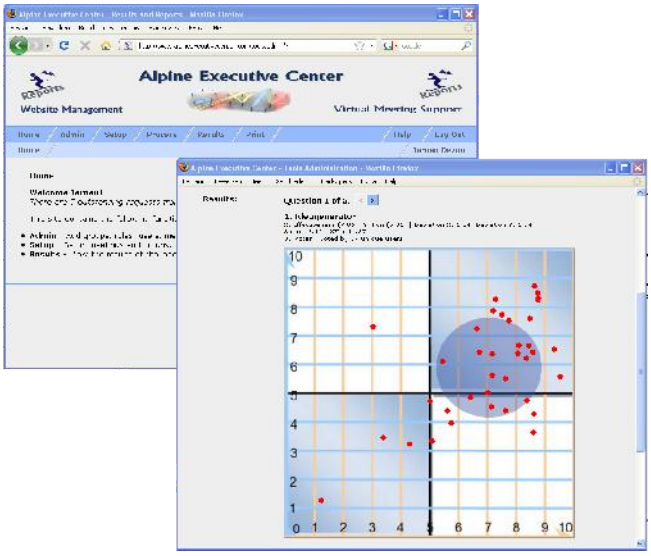


Figure 16: Website with results from a meeting.

Database
Second Life is a protected environment and information can only be exchanged with the outside world via predefined manners. This is done to protect the economy of Second Life. Linden Labs, the owners of Second Life, asks a small amount of money for all textures (images) transferred into Second Life. For passing information in and out of Second Life (text) the keyboard (chat window) can be used as well as an external website. Via a request to a web server information can be passed and acquired. This has to be done in text form and can only be initiated from a script inside Second Life[1]. Because different tools will be developed also different types of data have to be stored in the

1 Further releases of Second Life offer the option of creating a script that functions as a web server. This functionality was added after the main development already had been finished and is not included in the design.

database. This requires the database to be able to store any form of data. After the 3rd iteration the Second Life scripts were split from the main code to keep the tool responsive even with large datasets. Besides the storage also the rights management as described earlier is implemented and stored in the database.

5. Evaluation

In this chapter the testing of the developed tools is described. Two iterations were tested, the 3rd and 4th iteration of the tools. The testing of the 3rd iteration was an intermediate test, to test if the development was going in the right direction and is presented first. The testing of the 4th iteration was a full test with a large number of sessions.

5.1 Intermediate test

The testing of the 3rd iteration was done with 3 different groups and 3 different goals.

The first test was with a group of students. The goal of this test was to detect problems in the registration and stand alone usage of the tools. The participants were given the tools to be used during the course "Software Management Experience". The students were already divided into smaller groups with their own meeting point on the Alpine Executive Centre in Second Life. The Simple Pole had to be distributed throughout the Alpine Executive Centre. However on the higher located meeting points the Simple Pole started to malfunction, while on the lower located meeting points there were no such problems. The height of the platforms interfered with the chosen method of floating the idea boxes and made the idea boxes tumble down to a height they could float at. Therefore the higher meeting points were left out of the test. The remaining participants had some difficulties with registering. The participants needed a lot of time mastering the registration process. Especially because the location of the registration point was central in the Alpine Executive Centre, but the meeting locations were dispersed around the island. It required the participants to teleport to the registration point and back, which meant that they would loose contact with the facilitator. The more experienced and faster participants were able to use the Simple Pole after the initial instructions. However the others had still problems using/finding the registration point, the keyboard and name tag. This was time consuming and some of the participants ran out of time. The more skilled participants had already used the Single Pole and were given an demonstration of the Idea Categorizer and Planetarium.

The first group made clear that the registration process was too complex and required specific knowledge of the implementation. The participants had to start wearing their Keyboard near the registration point to be able to enter their name. This confused some participants, re-entering Second Life near the registration point also required them to enter their name, helping someone to register meant going back to the registration point. While outside of the direct scope of this research, the participants in the first group showed that learning occurred between the participants

and that the participants helped each other with the registration process. After the 3rd iteration the registration process was redesigned. To simplify the registration the entering of the real name was moved to the website. Participants in Second Life were already very familiar with registering on websites. Even for Second Life a registration on a website had to be completed. By moving the registration process outside of Second Life users got acquainted with the website and used an interface they were familiar with. The website offered in a later stage access to the results. When a problem occurred the facilitator saw more easily if the problem was on the website or in world and acted accordingly. A fix was sometimes as easy as reattaching the name tag or keyboard or re-entering their real name.

The second group were experts on the field of Virtual Worlds and collaboration. A demonstration was given and the tools were tested and used. In a discussion session the strengths and weaknesses were pointed out and improvements and suggestions were gathered. The full test should be done by experienced Second Life users with voice enabled (listening required and if possible also speaking). This had to be done to assure that participants were not hindered by a lack of communication or Second Life skills.

The third group were experts on Second Life. They got a demonstration of the tools as well as an insight into the internals of the tools. They had the knowledge to address specific issues inside Second Life and offered solutions or options for current challenges. The technical limitations of the tools, such as the maximum number of ideas or categories, were tested. Also the load on the server was tested when the tools were used to their full extent. The goal was to see if there were issues on the tools and which technical solutions existed.

Only one serious technical problem was found. The number of ideas and categories were both limited to approximately 40 each when loading from the database. On the tool itself more categories and ideas can be created and saved. However bringing them back was not possible. It was an internal problem of Second Life. Fortunately a new version of the server software was released which fixed the problem. Some minor issues occurred because of the use of comma separated strings for transferring information between objects. The stress on the server is limited, even when the tools are fully loaded. Some small optimizations and usability fixes are suggested.

5.2 Sessions

The testing of the 4th iteration was done in 15 sessions with 37 Second Life users. The participants were given a landmark (a virtual location) and a time on which their session would start.

At the beginning of the session all the participants assembled and had to register at the website (Figure 17 left). Registration was successful after their real name was showing on their name tag above their head. When all participants were registered they were invited to the presentation[2] (Figure 17 right).

Figure 17: Participants arrive and register (left) and get an introduction (right)

After the presentation, the participants were invited to start the meeting at the Single Pole. The subject of the meeting was "Applications in Second Life". The participants were invited to add as many applications as they could think of to the Single Pole (Figure 18 left). Every participant added at least one idea to the stack to ensure that they understood and used the interface successful. The total number of ideas was at least ten, to make sure that in the next step there was something to organize.

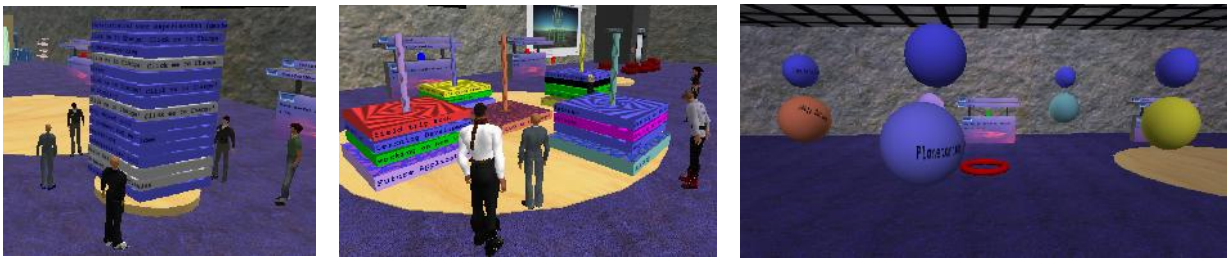


Figure 18: Participants use the three Idea tools (Single Pole, Idea Categorizer and Planetarium)

The ideas were then loaded on the Idea Categorizer and the participants were invited to move the ideas to the different categories (Figure 18 middle). Three categories were predefined (Early uses, Future uses and Current uses of Second Life). All ideas started out on the category "Unsorted". The participants were asked to move the ideas both by "drag and drop" as well as via the menu. The ideas and categories were put on the Planetarium. The participants were shown different views on

2 The complete presentation can be found in the appendix.

the ideas and categories they just came up with. They were invited to modify and interact with the planetarium. (Figure 18 right).

After using the three tools, the participants went to the evaluation phase, and were invited to vote on the Voting Floor (Figure 19). First the concepts of "Voting with your feet" and voting simultaneous on two criteria were explained. On the voting floor they voted on 2 criteria (Usefulness and fun) on the three idea tools as well as the voting floor itself[3].

Figure 19: Votingfloor

After voting on the different tools, one extra question was asked. The current state of the tools, based on the effectiveness versus the development state was tested to asses perceived "readiness" of the tools for business meetings. When the voting was done, the users were offered the results and a drink at the bar. Then there was time to discuss the session and additional feedback was given(Figure 20).

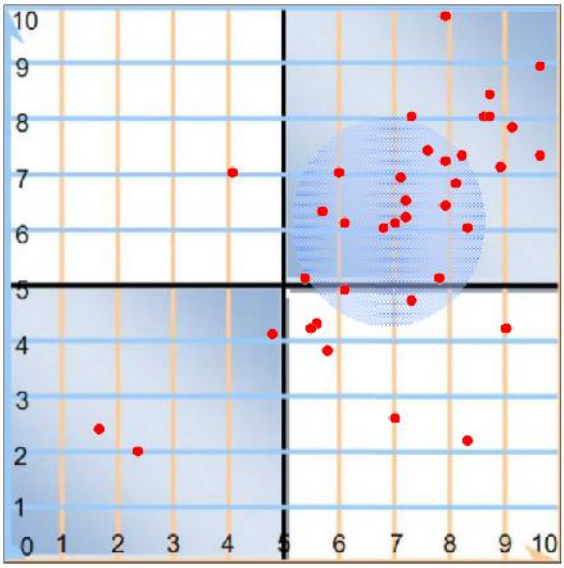
Figure 20: At the bar, discussing the tools

After the drink and feedback the session was ended.

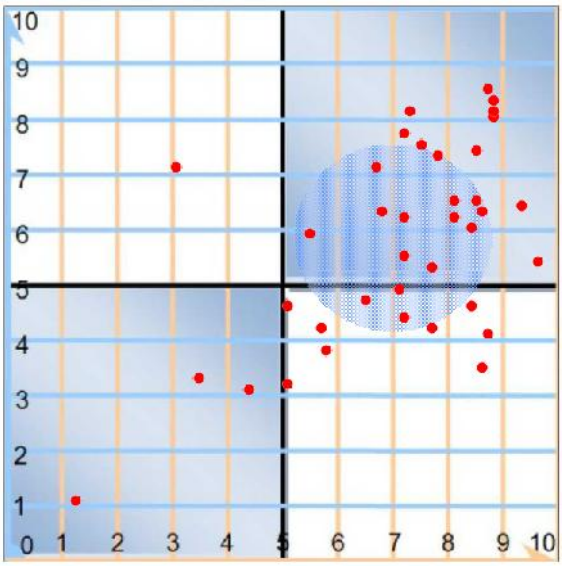
3 The VotingFloor was added later as question, only 18 of the 37 participants voted on this tool.

5.3 Results

37 Second Life users, 20 male and 17 female[4], with diverse backgrounds and age participated in this research. All participants were familiar with using Second Life. The registration process went without any problems, all participants registered correctly. The usage of the Keyboard gave a small issue, a couple of participants had resized their HUD (Head Up Displays) and had to resize them again. All participants had successfully finished their brainstorm meeting and were able to add and categorize ideas. After using the 3 idea tools they were invited on the Voting Floor. There they voted on a scale from 0 to 10 on 2 criteria ("Effectiveness" and "Fun") to evaluate the tools used. (The Voting Floor was added later as question, and therefore only 18 of the 37 participants voted on this tool). Finally they also voted on the development state of the tested tools as a whole on the criteria "Effectiveness" and "Development state". The results of the evaluation of the tools are in Figure 21. For a full statistical analysis, please see appendix A.

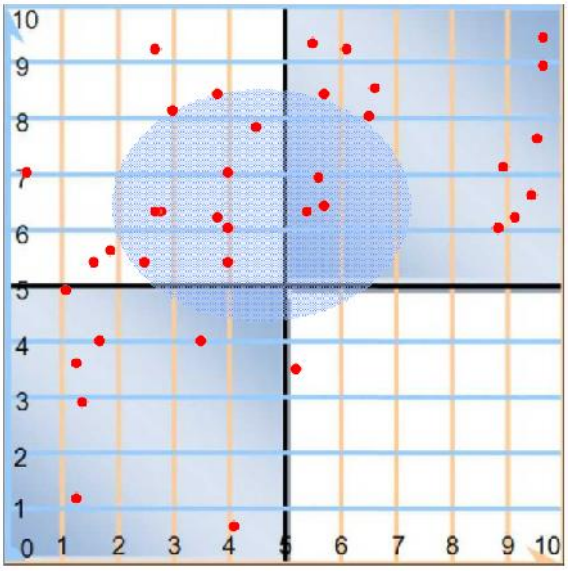


a. Single Pole

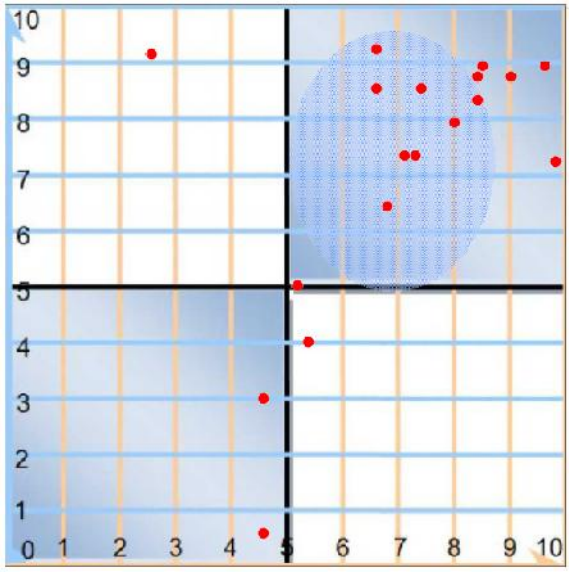


b. Idea Categorizer

4 Gender was based on the actual participant, not the gender of the avatar.



c. Planetarium



d. Voting Floor

Figure 21: The results, X-axis: Effectiveness, Y-Axis: Fun

The results of the Single Pole, Idea Categorizer and Voting Floor are similar on both criteria and can not be statistically differentiated. Those three tools are found to be both Effective (mean of 7.0) and Fun (mean of 6.3). Looking at the scatter plots there might be a correlation between effectiveness and fun. Statistically we cannot prove a correlation, but it is logical that a more effective tool is more fun to use. A larger sample could provide this proof, however the practical value of this conclusion could be doubted. The Planetarium (figure c) shows a similar response on fun (mean of 6.4) as the other three tools, however shows a much lower effectiveness (mean of 4.6) as can be seen in Figure 22. There is also becomes clear that the opinions about the planetarium differ more between the participants then about the Single Pole and Idea Categorizer. (The results of the Voting Floor are not normal distributed and the sample is too small to drawn conclusions).

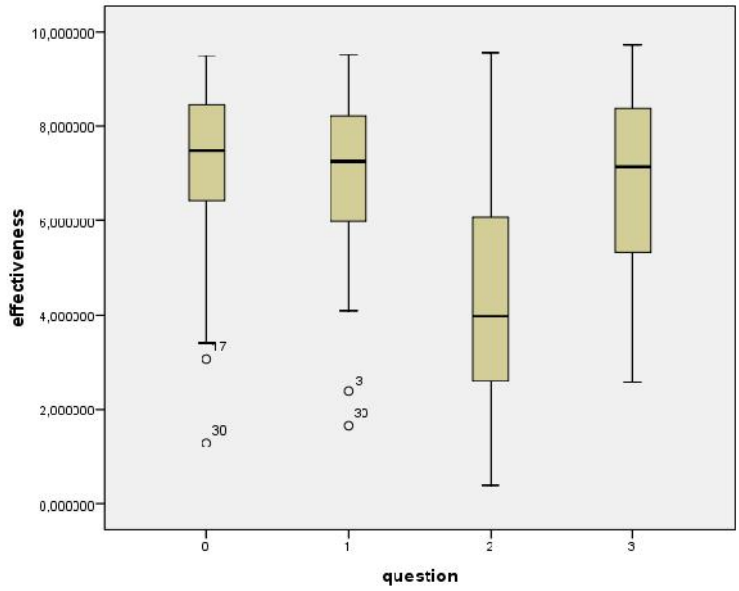


Figure 22: Box plot of Effectiveness (1)Single Pole (2)Idea Categorizer (3)Planetarium (4)Voting Floor

The comments and feedback on the planetarium support this. The fun factor, "*playing football with ideas... only Dutch can have such ideas :)*" is rewarded and some see an added value, "*Opens up their creativity without people knowing it and get discussions started*". This view matches the effect of "fun" as catalyst for the creative process. However the planetarium is mostly seen as a visualisation/discussion tool, not as an idea generation or categorisation tool. This limits the perceived effectiveness of the planetarium. The high loading for fun however shows that for creative meetings the planetarium could have an added value, especially to "toy with ideas".

Besides the votes on the tools individual also on the tools as a group is voted (Figure 23). In this vote the two criteria were effectiveness and development state. With an average response for effectiveness of 6.93 (S.D. 1.83) and for Development State of 5.51 (S.D.1.89) the tools are effective and usable for supporting a business meeting in Second Life.

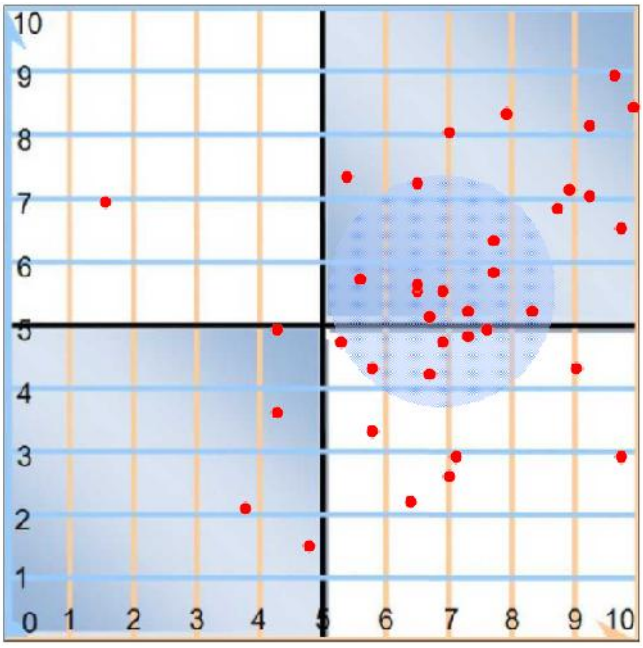


Figure 23: Development state, X-axis: Effectiveness Y-axis: Development State

However some comments are made about the finishing and design of the tools: "*Second Life users are spoiled by the finished nature, they are used to a more stream lined design.*" There was a distinction between the more artistic participants, who use Second Life for art and design work and the participants who use Second Life for business or education. Because all the participants were already familiar with Second Life they can be considered early adopters or innovators, who are more easily attracted to such developments. This has as advantage that participants are positive to new technology: "*I work at an orphanage. There, we often brainstorm. What we've reviewed here is exactly the same method as we use on the job. Just on a whiteboard. But here it works faster and more effective, I think.*" and are less afraid to use it.

6. Conclusions

The main research question of this research was: how can space as provided in Virtual Worlds help in idea generation and organization? Two sub questions were raised.

How can the number of dimensions aid in structuring an idea session? The use of space created the option of starting with a simple tool and gradually move to a richer tool. The 1 and 2 dimensional tools were effective in use. However the 3 dimensional tool (Planetarium) was less effective. The added value of the third dimension is difficult to manage and use effective. However we see a large fun factor with all 3 tools. Fun can aid in finding creative ideas. The use of a third dimension can help in a creative meetings to find a solution. Virtual worlds adds real-time interaction and a sense of presence to computer aided meeting tools. With this set of tools virtual meetings got a step closer.

How can rights management be implemented within the limits of a Virtual World? Anonymity in virtual worlds can create problems when those virtual worlds are used for business meetings. Linking a avatar to a real person has to be done. However the usage of in world tools for registration is difficult for users. Instead the external website gives the user a familiar method for registration and rights management. As a benefit this also gives the possibility to present the results of the meeting.

Second Life can be very useful, and offers functionality that can only be found in other virtual worlds. However that doesn't mean that it is suited for all tasks. Coupling Second Life to an external website opens up Second Life to get information in and out. This can reduce the complexity of in-world tools and processes, making it easier to use it for meaningful things.

7. Future Research

With this research a set tools is delivered that enables business meetings in a virtual world. The tools are ready for more extensive and extended usage. This allows research in Virtual Worlds in adjacent fields, such as asynchronous or anonymous meetings. Already multiple research projects are being planned and executed that use these tools.

M.G. Moore (1989) identified three kinds of interactions: Learner-Content Interaction, Learner-Instructor Interaction and Learner-Learner Interaction in educational research. If the understanding of the Virtual World and its content can be seen as a learning process, all three interactions can help the user (Learner) to better understand the virtual world and its contents. Throughout this research avatars were helping each other with mastering aspects of Second Life and the tools. This Learner-Learner interaction is very interesting for educational use and future research.

Virtual worlds are definitely a technology that will become more important in future developments. The advantages of communicating with other people visual and with audio is clear, but current applications are mostly leisure and research. If more useful applications are developed even the sceptics can be convinced of the advantages. However, not everyone needs a “Second” life, using a virtual world doesn't require a virtual life.

8. Reflection

I was looking to broaden my horizon after my Bachelor Electro technical engineering. Innovation management offered the option to develop myself personal as well as scientific. I have very broad interests, which were satisfied by a wide range of courses in different disciplines. Because IM applies many of these courses on to technical products and companies my electro technical background was very useful. It allowed me to show a different angle to problems to my fellow students and to add practical knowledge when I could apply my bachelor.

Personally I found both the practical and theoretical courses very nice. It allowed me to learn to apply scientific methods and rigorousness and acquire a better understanding of the field of industrial engineering.

This project was a mix between practical development in an unstructured development environment and scientific research in a new area. This created many challenges, both in respect with content as well as personal. The goal of my master was to mature and grow, and I can only conclude that I have learned a lot about myself and this subject throughout this project.

In conclusion I would like to thank my parents who made it possible to do all this.

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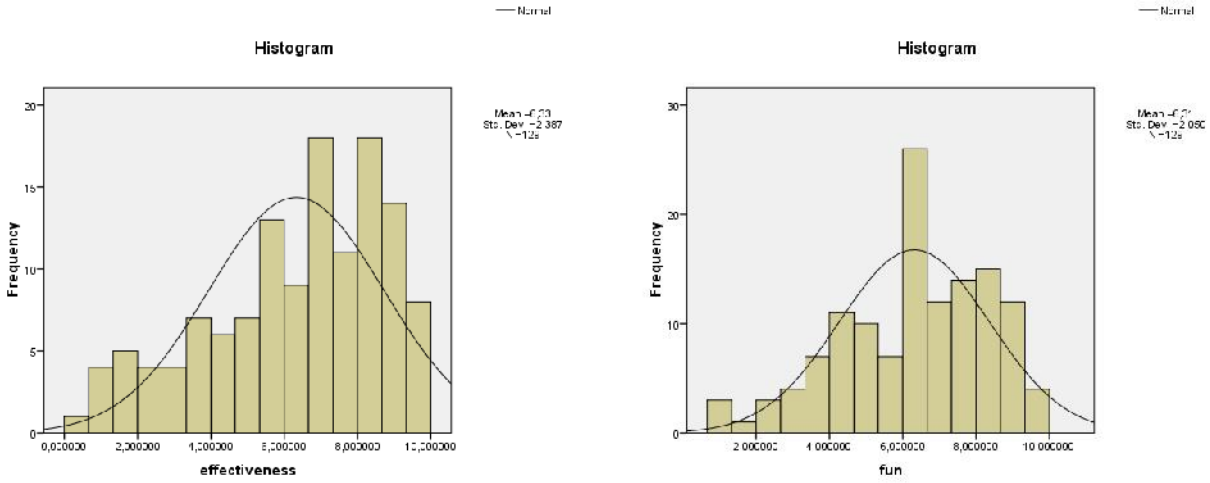
Appendix A: Statistical Analysis

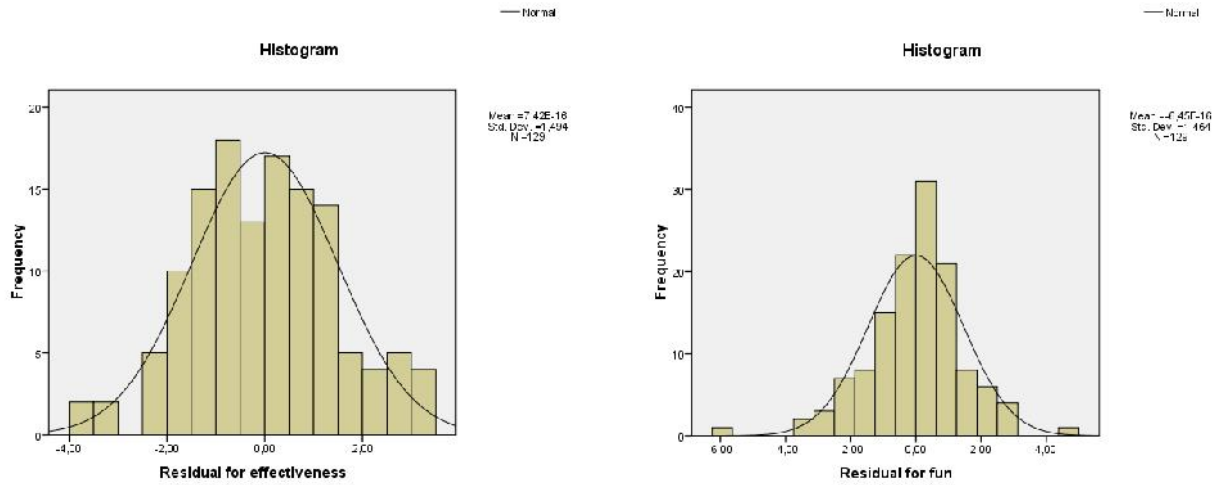
In order to perform a parametric analysis to the dataset (ANOVA), the data should comply with four criteria (Field, A., 2005); (1) the data should be normally distributed, (2) the variances throughout the data should be homogeneous, (3) interval data should be used and (4) data from different participants should be independent.

As can be seen in the histogram (Figure 24), the data is not normally distributed. However the normality in an ANOVA is required on the error, or the residuals of the data (obtained by omitting the 3-way interaction of effectiveness*question*participant and fun*question*participant), that shows a better normal distribution (Figure 25) from which we can conclude that criteria 1 is satisfied.



a. Effectiveness *b. Fun*

Figure 24: Histogram



a. Effectiveness *b. Fun*

Figure 25: Residual Histogram

The small set of 126 samples is both significant for effectiveness and fun (Figure 26) in the Levene's test. Therefore we can assume homogeneity of variance (Field, A., 2005).

Levene's Test of Equality of Error Variances[a]

Dependent Variable:effectiveness

F	df1	df2	Sig.
2,074	36	129	,002

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + participant

Levene's Test of Equality of Error Variances[a]

Dependent Variable:fun

F	df1	df2	Sig.
2,420	36	129	,000

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + participant

Figure 26: Levene's test

Criteria 3 is satisfied since the steps can be considered homogeneous since they are equal steps between 0 and 10. Criteria 4 is difficult to satisfy completely, because participants were participating in small groups and could have influenced each other. However the number of participants per group was small and group think was countered by the researcher the effect was zeroed out.

Since the 4 criteria are met, ANOVA was applied to the four questions. Effectiveness and fun were the dependent variables, while the question was the independent variable. Participant was a random factor and both the main effects and two-way interactions were taken into account.

Tests of Between-Subjects Effects

Dependent Variable:effectiveness

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	Hypothesis	4684,633	1	4684,633	581,739	,000
	Error	314,845	39,098	8,053[a]		
question	Hypothesis	148,655	3	49,552	16,435	,000
	Error	268,338	89	3,015[b]		
participant	Hypothesis	312,070	36	8,669	2,875	,000
	Error	268,338	89	3,015[b]		
question * participant	Hypothesis	268,338	89	3,015	.	.
	Error	,000	0	.[c]		

a. ,891 MS(participant) + ,109 MS(question * participant)

b. MS(question * participant)

c. MS(Error)

effectiveness

	question	N	Subset for alpha = 0.05	
			1	2
Tukey HSD[a]	2	37	4.63522157	
	3	18		6.94932306
	1	37		6.99205765
	0	37		7.06147589
	Sig.		1,000	,997

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 29,275.

Figure 27: Effectiveness

Tests of Between-Subjects Effects

Dependent Variable:fun

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	Hypothesis	4667,471	1	4667,471	698,658	,000
	Error	264,473	39,588	6,681[a]		
question	Hypothesis	18,328	3	6,109	2,126	,103
	Error	255,791	89	2,874[b]		
participant	Hypothesis	257,253	36	7,146	2,486	,000
	Error	255,791	89	2,874[b]		
question * participant	Hypothesis	255,791	89	2,874	.	.
	Error	,000	0	.[c]		

a. ,891 MS(participant) + ,109 MS(question * participant)

b. MS(question * participant)

c. MS(Error)

fun

	question	N	Subset for alpha = 0.05
			1
Tukey HSD[a]	0	37	5.86168981
	1	37	6.15942097
	2	37	6.47153084
	3	18	7.23558806
	Sig.		,051

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 29,275.

Figure 28: Fun

As can be seen from Figure 27 and Figure 28 all main effects of effectiveness are significant, but for fun question is not significant. It is questionable if we are allowed to evaluate the results of the Tukey post-hoc test for fun. But the result would be less interesting anyhow because everything is

in the same subset. If we look at the Tukey post-hoc test of effectiveness we see that question 2 has its own subset. Question 2 (the planetarium) scores significantly lower on effectiveness then the other 3 tools. As participant proved to be significant on effectiveness we can test on outliers (Figure 29). No outliers have been identified.

effectiveness

Tukey HSD

participant	N	Subset 1	2	3
30	5	3.10603640		
18	4	3.67646025	3.67646025	
36	4	4.11387250	4.11387250	4.11387250
35	4	4.78411300	4.78411300	4.78411300
1	4	4.80499075	4.80499075	4.80499075
14	4	4.95413800	4.95413800	4.95413800
23	5	5.35484160	5.35484160	5.35484160
19	5	5.40812380	5.40812380	5.40812380
11	4	5.46858425	5.46858425	5.46858425
32	5	5.53514880	5.53514880	5.53514880
3	5	5.58546460	5.58546460	5.58546460
31	5	5.68477020	5.68477020	5.68477020
4	4	5.70602975	5.70602975	5.70602975
7	5	5.87664040	5.87664040	5.87664040
15	5	5.95684680	5.95684680	5.95684680
29	5	5.98140400	5.98140400	5.98140400
17	4	5.98280350	5.98280350	5.98280350
21	4	6.05388825	6.05388825	6.05388825
12	5	6.40207220	6.40207220	6.40207220
22	4	6.44038950	6.44038950	6.44038950
34	4	6.60069475	6.60069475	6.60069475
5	5	6.80750440	6.80750440	6.80750440
13	5	7.03120140	7.03120140	7.03120140
16	4	7.04656600	7.04656600	7.04656600
9	4	7.12732700	7.12732700	7.12732700
28	4	7.19913125	7.19913125	7.19913125
2	4	7.25021775	7.25021775	7.25021775
26	5	7.49416940	7.49416940	7.49416940
33	5	7.72568680	7.72568680	7.72568680
27	5	7.79745800	7.79745800	7.79745800
6	5	7.86974320	7.86974320	7.86974320
10	5	7.93676900	7.93676900	7.93676900
37	4		8.44337650	8.44337650
20	4		8.55543550	8.55543550
24	4		8.79772575	8.79772575
8	4			9.13238925
25	5			9.33048080
Sig.		,130	,070	,057

Means for groups in homogeneous subsets are displayed.
Based on observed means.
The error term is Mean Square(Error) = 3,957.

Figure 29: Tukey HSD on effectiveness (participants)

Appendix B: Session Script

One hour before meeting start:

Send an invitation to all users, and send a landmark with it. When an user isn't on line the message window will tell so. If the person isn't on line at the time of the instant message, the landmark will be accepted shortly after logging in. This is a nice way of knowing if an avatar is already in the neighbourhood. Example message:

"Reminder: In little under one hour the Evaluation Meeting starts at the Alpine Executive Center, a landmark will follow"

Before meeting start:

Clear the categorizer from all ideas, just 4 poles. {Unsorted Ideas, Existing Applications, Early Uses in SL, Future Applications}. Make sure via the web interface or move menu that the "Unsorted Ideas" pole has the id "0". Copy the PDF to a separate location, rename the file to represent date/time (if not already done). A similar text document is there with comments and suggestions given by the users throughout the meeting. Remove any users from the meeting that aren't going to join the meeting. This will speed up the loading of the user rights.

Start:

Participants will start appearing **(1)**. Offer a teleport to any avatar that isn't there at the beginning of the meeting. When the group is complete start the registration process **(2)**. Let the participants join the ToolsTest group. People can register by clicking on the registration desk.

When the name tag shows up above someone's head he or she is registered correctly. If everything is all right the user should have requested to be added to the right group, and this can be confirmed. Otherwise the user has to be added to the group manually, via the Admin → Group menu.

If everybody got a name tag, continue to the slide show **(3)** and start there, meanwhile add everyone to the right meeting. (Everyone joined the right group, but has to be added to the meeting as well) Add the participants to the meeting with "User"[5] rights.

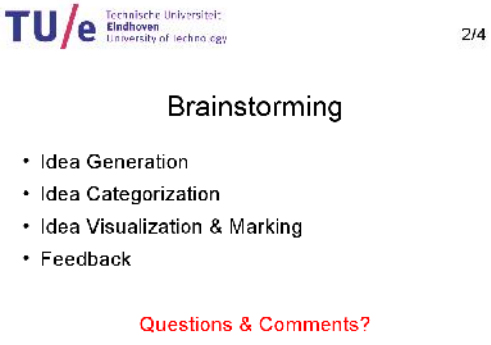
Presentation:

5 Facilitator rights are only necessary for resetting Idea Boxes on the Idea tools, changing the motion on the Planetarium and for registering the votes on the Voting Floor.

Welcome everybody.
Introduction to myself and my project.

Shortly introduce the Alpine Executive Centre, TU/e and that we are doing Meeting Support here.

Explain the 3 stages of brainstorming, which is concluded with a measurement on the voting floor. Questions and comments can be made throughout the meeting



The subject is Applications in Second Life, but can also seen as, “Activities in SL, or what do you do in SL?”. Invite everyone to the first tool.

Single Pole, Idea Generation (4a)

Start the tool via the Meeting Selector and explain what the participants are going to do. Meanwhile the tool is loading the user rights. If many participants are in the meeting or if the rights of previous sessions were not revoked the loading of the rights could take some more time[6]. After the

6 Via a channel listener the progress can be followed, as long as the Meeting Selector is giving out user rights without

explanation everyone can add ideas on the categorizer, a step by step guide:

1. Click on the base of the pole, an idea cube will appear surrounding the person (It can take some seconds before the tool registers everyone.
2. Click on the cube, a menu will appear in the upper right corner
3. Click "Edit" in the menu, the keyboard[7] will appear
4. Type the idea and press submit. The keyboard can be used as a touch keyboard[8].

Make sure that all participants have added at least one idea to verify that everything is working[9]. Re-editing an idea can be done by clicking the idea cube again.

When all participants have added at least one Idea Cube and the total number of Idea Cubes is at least 10, save the Ideas to the database. This is done by selecting a different meeting with the Meeting Selector. Clicking once on the bulb of the Meeting Selector and ignoring the menu is already enough to store the ideas.

Idea Categorizer (4b)

Start the tool via the Meeting Selector and explain that the tool is loading. First all Idea Boxes and Idea Poles will be in the centre on one pile. The tool becomes ready for interaction when all poles and boxes are on their right spot. Meanwhile the user rights are loading. Let the participants move Idea Boxes from one Pole to the other by means of "Drag and drop". The receiving Pole will start blinking to indicate that it is the nearest Pole. As an alternative the participants can also use the menu to select the Pole they want to move the Idea to. In the local chat a list of available Poles with their corresponding number will be printed. If all participants are doing a lot of actions at the same time it can become a bit unclear what is happening and the tool can become less responsive. Leaving the tool recover for a couple of seconds is enough to make it become responsive again[10].

Planetarium (4c)

The Planetarium can be seen as a visual aid to idea generation and discussion. While the planetarium is fully functional and ideas/categories can be organized and added, the added value is the different visualisations. Explain before changing the visualisation, what kind of visualisation

requests, then not all rights have been loaded.

7 Right-click on the keyboard and press "Edit", the size of the keyboard (and all HUDs) can be changed with the Scroll Button

8 Use "/1 Idea text" in the chat window for fast editing ideas.

9 Participants can try out the other features of the Idea Cubes in the menus. They can move the Idea Cubes up and down, colour them, add comments, etc. This will keep the faster participants engaged when other participants are trying to add their first Idea Cube.

10 Use the Meeting Selector to reset the tool if the tool stopped reacting completely or is behaving non normal.

they are going to see. Except for the “dead”-mode, which gives a nice effect for the participants. Participants can also sit down on the spheres and travel with their favourite Idea.

VotingGrid (5)

Explain the concept of “Voting with your feet” and let the participants try out what happens when they walk over the floor. Also point out the board, on which the progress can be followed. When all participants are familiar with the floor, explain the concept of voting on 2 criteria on the same time (2 dimensional vote). When also this concept is clear start registering the positions on the first question[11]. Continue registering the next 3 questions. Explain the difference in criteria on the last question and register the final votes.

Results (6)

Show the participants the link to the results. Explain that there is a PDF-file which covers all results, as well as separate web pages that have the results of the Idea Categorisation and Voting Floor.

Feedback/Bar (7)

Thank all participants for joining and offer them a virtual drink at the bar. In the mean time ask for any feedback or comments on the tools and process.

11 When the facilitator is speaking participants have the tendency to stop walking and keep listening. After each explanation pause for a couple of seconds and check if everyone has moved around. If someone is standing on a different spot then the other participants, let the participant explain why he/she chose that spot, to prevent errors due to not understanding the floor and to get extra feedback.

Appendix C: Tool commands

Both the Meeting Selector as well as the tools use a standardized scheme for transferring information between different scripts. All information is separated by a "¤"[12], which is viewable within Second Life and is not a default key on “US”-style keyboards.

The Meeting Selector can configure the tool in different modes: Free, Active or Set-up (de-activated). After the configuration of the tool, the Meeting Selector is also in charge of authorizing avatars for that meeting. The tool request authorisation for an avatar for a certain level (User, Power_User, Facilitator, Administrator or Visitor) and receives a boolean accordingly (0 = false, 1 = true). Example of a message send by the Meeting Selector to set up the tool followed by a request for authorisation:

→ *Tool_status¤Free¤Session_ID¤16*

← *Avatar_Request¤Jeroen Dezno¤Role¤User*

→ *Avatar_Status¤Jeroen Dezno¤Role¤User¤Status¤1*

The tools use a slightly more compact syntax for internal communication, which doesn't include the definition of the fields in the messages. This is done to be able to use all available message space for data, which is limited in Second Life.

12 Before the "¤" was used all information was comma separated. While this had the advantage of using standardized functions in Second Life, the disadvantage was larger: the use of a comma could interfere with the program. This change was made after the third iteration was reviewed.