Ανοικτό Πανεπιστήμιο Κύπρου

Σχολή Θετικών και Εφαρμοσμένων Επιστημών

Μεταπτυχιακή Διατριβή
στα Πληροφοριακά Συστήματα

Ανάπτυξη ενός Τρισδιάστατου Ηλεκτρονικού Εκπαιδευτικού Παιχνιδιού ως Εργαλείο για Οργανωσιακή Μάθηση και Διαχείριση Γνώσης

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Επιβλέπων Καθηγητής
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Η παρούσα μεταπτυχιακή διατριβή υποβλήθηκε
προς μερική εκπλήρωση των απαιτήσεων για απόκτηση

μεταπτυχιακού τίτλου σπουδών
στα Πληροφοριακά Συστήματα

από τη Σχολή Θετικών και Εφαρμοσμένων Επιστημών
του Ανοικτού Πανεπιστημίου Κύπρου

Αύγουστος 2012

Περίληψη

Η παρούσα Μεταπτυχιακή Διατριβή ερευνά τη χρήση Ηλεκτρονικών Εκπαιδευτικών Παιχνιδιών σε επιχειρηματικό περιβάλλον ως εργαλείο για οργανωσιακή μάθηση και διαχείριση γνώσης. Σε μια προσπάθεια εξαγωγής καταλλήλων συμπερασμάτων ως προς τη χρησιμότητα του παιχνιδιού, την εμπειρία των χρηστών και την αποτελεσματικότητά του σε σχέση με τη δημιουργία, διατήρηση και μεταφορά γνώσης, δημιουργήθηκε ένα τρισδιάστατο ηλεκτρονικό εκπαιδευτικό παιχνίδι το οποίο δόθηκε προς χρήση στο προσωπικό μιας ασφαλιστικής εταιρίας. Το παιχνίδι, μέσα από ένα εικονικό περιβάλλον επιτρέπει στους χρήστες να εκπαιδευτούν ως προς την ιστορία της εταιρίας, τα προϊόντα και τις διαδικασίες, τα τμήματα από τα οποία αποτελείται η εταιρία καθώς επίσης και για το προσωπικό και τα καθήκοντα του κάθε υπαλλήλου.

Γίνεται εκτενής αναφορά σε βιβλιογραφία σχετική με τις εμπλεκόμενες έννοιες. Κάνοντας αρχή από τις έννοιες της γνώσης και της διαχείρισης γνώσης και της σημασίας της σε εταιρικό επίπεδο, προχωρά σε ανάλυση του τί είναι οργανωσιακή μάθηση, ποιός ο συσχετισμός μεταξύ οργανωσιακής μάθησης και διαχείρισης γνώσης και ποιές οι τεχνολογίες που τις υποστηρίζουν. Στη συνέχεια γίνεται αναφορά σε παιχνίδια, ηλεκτρονικά εκπαιδευτικά παιχνίδια, μάθηση μέσω παιχνιδιών, τρισδιάστατες τεχνολογίες και επίσης στην επίδραση των παιχνιδιών στην εκπαίδευση.

Ακολούθως παρουσιάζεται η μεθοδολογία, οι στόχοι, η ανάλυση και το παιχνίδι που αναπτύχθηκε στα πλαίσια αυτής της έρευνας. Το παιχνίδι χρησιμοποιήθηκε για διάστημα 20 ημερών από τους υπαλλήλους της εταιρίας και τα αποτελέσματα της χρήσης εξετάστηκαν με τη χρήση προσωπικών συνεντεύξεων και ερωτηματολογίων εμπειρίας χρήσης. Τα αποτελέσματα της έρευνας παρουσιάζονται σε σχέση με τα ερευνητικά ερωτήματα τα οποία ήταν τα ακόλουθα:

1. Μπορεί να αναπτυχθεί ένα τρισδιάστατο ηλεκτρονικό εκπαιδευτικό παιχνίδι για σκοπούς οργανωσιακής μάθησης;

2. Είναι ένα τέτοιο παιχνίδι αποτελεσματικό για εταιρική εκπαίδευση και διαχείριση γνώσης;

3. Ποιά είναι η εμπειρία των χρηστών σε σχέση με παραδοσιακές μεθόδους για εκπαίδευση και διαχείριση γνώσης;

Summary

This Master's Thesis examines the use of Serious Games in corporate environments as tools for organizational learning and knowledge management. In an attempt to extract proper conclusions regarding the usability of the game, the users' experience and its effectiveness regarding creation, retention and transfer of knowledge a 3D Serious Game was developed, which was given to the employees of an insurance company for use. The game, through a virtual environment, allows the users to train themselves regarding the history of the company, the products, the routines, the departments which make up the company and also the personnel and the duties of each employee.

Extensive literature review is presented regarding the involved terminology. Starting with the terms of knowledge, knowledge management and its importance at a corporate level, it moves on to analysis of organizational learning, the relation between organizational learning and knowledge management and the supporting technologies. Next, there is discussion about games, serious games, game-based learning, 3D technologies and the games effect on knowledge.

Then the methodology is presented, the goals, analysis and the game that was developed for the purposes of this research. The game was used for a period of 20 days from the employees of the company and the results of the usage were examined using personal interviews and user-experience questionnaires. The results of the research are presented in relation with the research questions which were the following:

1. Can a 3D Serious Game be developed as a tool for organizational learning purposes?

2. Is such a tool effective in corporate education and knowledge management?

3. What is the users' experience in relation with traditional methods for education and knowledge management?

Acknowledgments

I would like to thank my family for all the support during all this time. Especially my wife Maria for all her patience and support all these years of my studies. I couldn't have made it if I didn't have the people that I love supporting me all the way. I would also like to thank Dr. Panagiotis Zaharias for all the help. It's been a long trip and the help and knowledge he offered is priceless. This study wouldn't be complete without his help. Thank you all from the bottom of my heart.

This Thesis is dedicated to Demetris and Soteris who left us too early. You may not be physically here with me anymore but you'll always be in my heart. God rest your souls.

Contents

Chapter 1
Introduction

"To be successful in a knowledge economy firms need to create learning organizations."

Don Tapscott

1.1 Definition of Research Problem

It is commonly accepted that in today's "new economy" era, organizational performance depends more on intangible assets and less on tangible ones. And the most valuable intangible asset for an organization nowadays is knowledge. Drucker [24] states that "knowledge is the only meaningful resource today". So based on that, if an organization is able to harness and productively utilize its knowledge, will be able to be more competitive in this "new economy". Knowledge can be distinguished into two main types: explicit knowledge and tacit knowledge. Explicit knowledge is formalized and codified. It is often referred to as know-what knowledge [15]. It is the type of knowledge that can be found in databases, memos, notes, documents etc. Originally defined by Polanyi [62], tacit knowledge is also referred to as know-how knowledge [15]. It refers to experience-based knowledge that has to do also with intuition. It is therefore often quite hard to

be communicated and transferred [58]. Tacit knowledge is found in people's minds. It includes cultural beliefs, values, attitudes, mental models, skills, capabilities and expertise [13].

Knowledge Management (KM) is the systematic management of knowledge and its associated processes of creating, gathering, organizing, diffusion, use and exploitation [75]. KM is all about turning personal knowledge into corporate knowledge that can be widely shared throughout an organization and appropriately applied. Albert defined KM as "the process of collecting, organizing, classifying and disseminating information throughout an organization, so as to make it purposeful to those who need it." [06].

Organizational Learning (OL) can be defined as the dynamic process of creating new knowledge and transferring it to where it is needed and used, resulting in the creation of new knowledge for later transfer and use [47]. The creation of knowledge, the transfer of it but also its retention within the organization is an ongoing process for knowledge development in an organization. OL is related –as a concept- to KM in the sense that in both cases we deal with knowledge and its characteristics, but in the case of OL, we are more concerned about the actual dynamic processes through which knowledge is developed in an organization [77].

A lot of tools and processes are used by organizations for knowledge management. Brainstorming, training, storytelling, mentoring, groupware, document management systems, simulation tools, knowledge repositories, social software to name a few. An evolving technology that is nowadays used by organizations is computer games, and more specifically, Serious Games (SG). Many organizations turn to SG and simulations to train their staff. Such a trend can be based on many reasons. First of all it's the matter of cost savings for the organizations. Having a SG as a training method is much less costly than allocating resources (both internal and external) to do the training in the traditional face-to-face method. Such an argument is more valid especially if an organization needs to train employees that are not physically located in the same geographical area. A SG simulation has no geographical limitations. It can be accessed by anybody from anywhere at any time. Another thing that we need to take into consideration is the fact that new employees nowadays understand better the concept of a game and are more likely to be motivated to train through such a medium. People nowadays need to develop "digital age literacy, inventive thinking, effective communication and high productivity" [16]. These skills are also known as the "21st century skills" [29]. Many young people today are not acquiring these 21st century skills through structured learning environments, but rather through various "cognitively-

demanding leisure" activities they choose to engage with, including online games and virtual worlds [44].

This research tries to answer the following questions:

1. Can a 3D SG be developed as a tool for organizational learning purposes?

2. Is such a tool effective in corporate education?

3. What is the users' experience in relation with traditional methods for education and knowledge management?

1.2 Research Purpose

The main focus in this research is on individuals' training in an organization. Undoubtedly, corporate training and learning is a major concern for any organization. As already mentioned employees are assets for the organization and so is their knowledge, which will be ideally embedded eventually in the organization and be part of the organization's knowledge, available to everybody. So, it is for the organization's best interest to have highly trained and educated employees. Sometimes though, the budget that needs to be allocated for training is too high for the organization. Or in other cases, the training is not very effective due to lack of interest from the employees. These are some of the reasons for the evolution of games as educational tools. Games, and more specifically Serious Games (SG) are evolving and their usage for educational purposes is rapidly growing. In this research, the usage of a SG for educational purposes in a corporate environment is investigated.

The purpose of this research is to develop a 3D SG and use it in a corporate environment with the employees of the organization into study being the test users group. An insurance company was selected (Ancoria Insurance) which has a standard face-to-face employee training procedure currently in use. The developed SG was used as an alternative method of providing the "new employee training". The users that experimented with the game were interviewed and they

provided user-experience feedback through an appropriate questionnaire that was given to them. All the results were coded and analysed in order to come to conclusions as per the research questions defined.

1.3 Structure of Study

The second chapter of this study (first one is this Introduction) presents literature review regarding knowledge, Knowledge Management (KM) and its importance for organizations.

In the third chapter literature review regarding Organizational Learning (OL) is given. What is OL, the types of OL and the relation with KM. Also, the various information technology processes that support OL and KM are presented, along with other tools and strategies that are used by organizations.

The fourth chapter is about Serious Games (SG) and their role as knowledge tools. Again, literature review is presented that covers subjects like games, their characteristics, definitions of SG, related areas, edutainment, digital game-based learning, 3D technologies and effects of games on knowledge.

The fifth chapter is about the implementation of a 3D SG as a KM tool. The methodology, research type and research design approach that was selected is documented and explained and the basic goals for the implementation of the 3D SG are given. The SG is discussed in detail, giving the design philosophy and the ideas and processed on which the game idea was based. Additionally, the Game Design Document is included, which goes into more detail regarding the technical, user-interface, scenario and gameplay aspects of the game.

In the sixth chapter the empirical use and evaluation of the SG are discussed. The evaluation results are presented and all findings are explained in detail. The limitations of the research are also acknowledged and discussed.

The seventh chapter contains the various conclusions that were drawn after examining the evaluation results and users' experience feedback. Finally, ideas for related future research efforts are suggested.

Chapter 2
Knowledge Management

"Knowledge management will never work until corporations realize it's not about how you capture knowledge but how you create and leverage it."

Etienne Wenger

2.1 Introduction

It is commonly accepted that in today's "new economy" era, organizational performance depends more on intangible assets and less on tangible ones. And the most valuable intangible asset for an organization nowadays is knowledge. A few decades ago, the reverse was the case. Norton [60] stated that "the source of value has shifted from tangible to intangible assets". Norton mentions the declining trend in market value attributed to tangible assets (62% in 1982, 38% in 1992 and 15% in 1998) and a corresponding increase in market value attributed to intangible assets (38% in 1982, 62% in 1992 and 85% in 1998). Drucker [24] states that "knowledge is the only meaningful resource today". So based on that, if an organization is able to harness and productively utilize its knowledge, will be able to be more competitive in this "new economy".

2.2   Knowledge Management

As we have already mentioned, knowledge plays a vital part when it comes to success and productivity in a corporate environment. We can find knowledge in the personnel of the organization and their experience, the processes that are included within the organization, the documents, papers, plans etc. The challenge is to get all these intangible assets and harness them in the most productive way. And this is what Knowledge Management (KM) is all about.

KM is the systematic management of knowledge and its associated processes of creating, gathering, organizing, diffusion, use and exploitation [75]. It requires turning personal knowledge into corporate knowledge that can be widely shared throughout an organization and appropriately applied. Albert [06] defined KM as "the process of collecting, organizing, classifying and disseminating information throughout an organization, so as to make it purposeful to those who need it."

There are many different definitions for KM. In general though, we can say that it's all about leveraging the knowledge of individuals within an organization so that this knowledge becomes part of the organization's knowledge and available as an organizational resource to everybody.

2.3   Knowledge

From the time we are born, all our life is somehow directed towards knowledge. Whether it is to learn how to speak, how to walk, how to read, how to play with games etc. Knowledge plays an important role in our personal development. Growing up, we seek more knowledge through study. We want to learn new things and use the things we already know to improve ourselves in our personal life and in our work. So what is knowledge? Looking at the theoretical perspective of the subject, we can define the key issues.

2.3.1   Definition of Knowledge

Knowledge can be defined as facts, information, and skills acquired through experience or education; the theoretical or practical understanding of a subject [01]. Polanyi [62] stated that "we can know more than we can tell".

So, according to Polanyi, knowledge can be defined as what we know. Lee [49] considers knowledge as "information combined with user's ability and experience that is used to solve a problem or to create new knowledge".

Wiig [81] views knowledge as "truths and beliefs, perspectives and concepts, judgments and expectations, methodologies and know-how".

Davenport & Prusak [23] define knowledge as "information in context coupled with an understanding of how to use it". Davenport & Long [22] give another definition of knowledge, stating that "knowledge is information combined with experience, context, interpretation and reflection". So, knowledge is what we know and our ability to know how to use it together with our experience which we use to create new knowledge.

Knowledge is often confused with information. Is knowledge all about information? Is information considered knowledge? Bell [10] defines knowledge as "a set of organized statements of facts or ideas, presenting a reasoned judgement or an experimental result, which is transmitted to others through some communication medium in some systematic form". Porat [63] defines information as "data that has been organized and communicated". Abram [04] moves one step further and views the process for knowledge creation and use as a continuum where data transforms into information, information transforms into knowledge and knowledge drives behaviour and leads to decision-making.

Information is tangible. It's something physical. It is written data, numbers, symbols, facts. It's easily duplicable and transferrable. Knowledge is intangible. It's something spiritual. It is information combined with ability and experience. It's not duplicable and it's transferrable through learning.

We can identify the following key items within every organization: data, information, knowledge and wisdom. In Figure 2.1, we can see how these elements are related through a pyramid hierarchy as documented by Liebowitz [51].

This relationship between data, information, knowledge and wisdom take the form of a pyramid. The data is at the base of the pyramid and moving towards the top one can find information, then knowledge and finally wisdom at the very top.
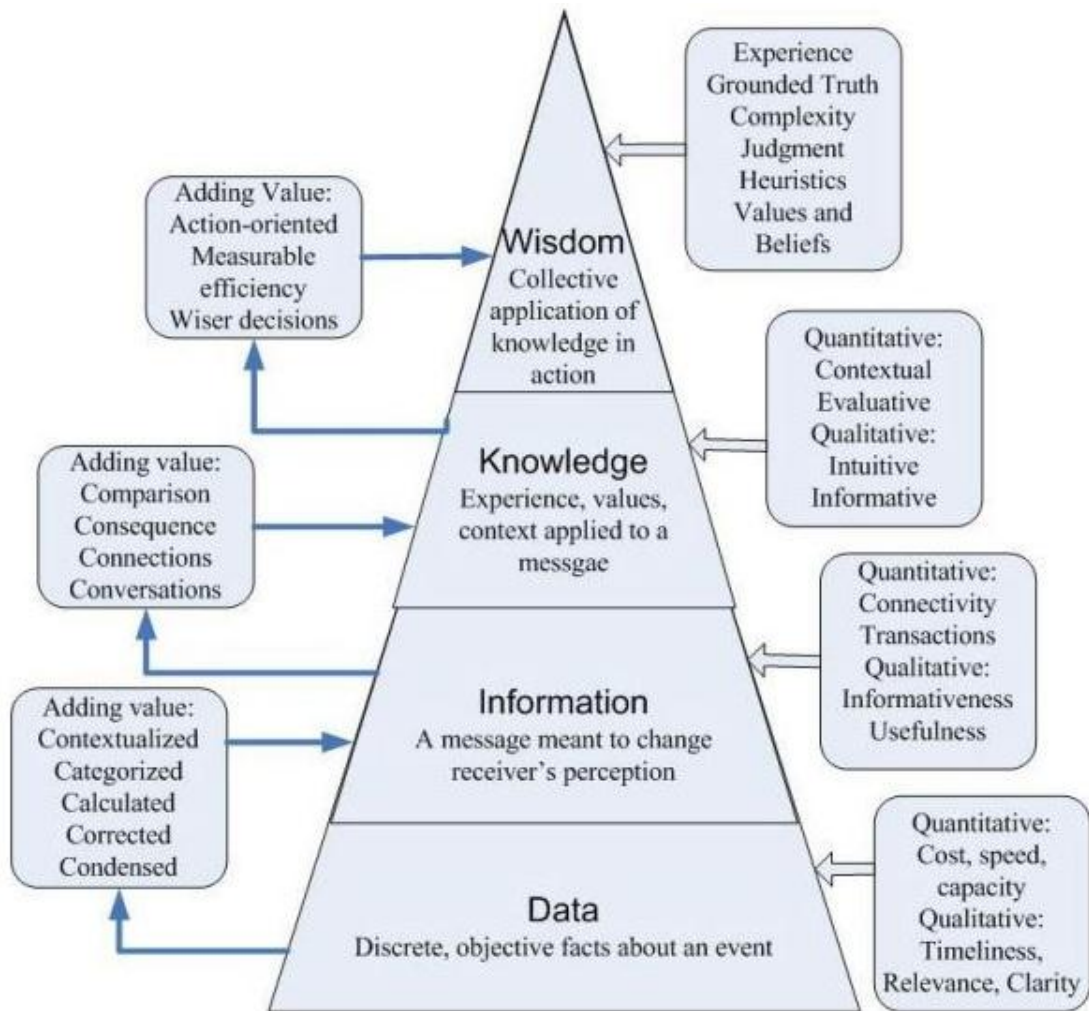
Figure 2.1: relations between Data, Information, Knowledge and Wisdom [51].

- **Data**

Data refers to a set of discrete, objective facts regarding an event. Cost, speed, capacity are some examples of quantitative data. Timeliness, relevance, clarity are examples of qualitative data. Data are not that useful by themselves; they gain more meaning once converted into information.

- **Information**

Information is differentiated from data in the sense that information is "useful". Information is inferred from data, during the process of answering questions like "who", "what", "where", "how many", "when" etc. [70, 72]. Information could be defined as data that are endowed with meaning and purpose [78].

Davenport & Prusak, [23] list 5 processes that could be used to transform data into information:

1. Condensation: data are summarized in a more laconic form.

2. Contextualization: the purpose of the data as such (i.e. the reason for collecting them in the first place) is defined.

3. Calculation: data is aggregated or processed somehow in order to give useful information regarding an event or problem.

4. Categorization: data is assigned a category or specific type.

5. Correction: errors are eliminated.

- **Knowledge**

Knowledge refers to a mixture of experience, values, context information and intuition. In an organization, knowledge is often embedded in documents, repositories, organizational routines, processes, practices and also norms [23]. Knowledge is derived from information that is organized. If questions like "who", "what", "where", "how many" and "when" relate to data and information, questions like "how" and "why" are related with knowledge.

- **Wisdom**

Wisdom is the application of collective knowledge. It is the ability to make correct decisions based on previous knowledge, experience, values and beliefs.

2.3.2   Types of Knowledge

Knowledge can be distinguished into two main types: explicit knowledge and tacit knowledge.

Explicit Knowledge

Explicit knowledge is formalized and codified. It is often referred to as know-what knowledge [14]. It is the type of knowledge that can be found in databases, memos, notes, documents etc. Explicit knowledge is knowledge that is documented and public, structured, fixed-content, externalized and conscious [25]. Explicit knowledge is easily transferred since it's basically facts that are written down, either on paper or electronic media. A user manual contains facts that are considered explicit knowledge. One can take the manual and read it to capture that knowledge. This does not apply to tacit knowledge.

Tacit Knowledge

Originally defined by Polanyi [61], tacit knowledge is also referred to as know-how knowledge [15]. It refers to experience-based knowledge that has to do also with intuition. It is therefore often quite hard to be communicated and transferred [57]. Tacit knowledge is found in people's minds. It includes cultural beliefs, values, attitudes, mental models, skills, capabilities and expertise [13]. Contrary to explicit knowledge, tacit knowledge is not easily transferrable since it has to do with a person's experience and intuition. Tacit knowledge is the act of knowing how to do something without thinking about it [61]. Think about the act of riding a bicycle. One knows how to ride a bicycle without having to think about how it's done. That's a good example of tacit

knowledge. Someone that works next to his father so that he learns how to do the job is just trying to get some of his father's tacit knowledge. Tacit knowledge is an automatic process, requires little or no thought at all and determines how organizations make decisions and influence the collective behaviour of their members [49].

Both explicit and tacit knowledge are valuable assets for an organization. And an organization that wants to make the best out of these assets should manipulate and interact with both the explicit and tacit knowledge that is found in the organization in order to create new knowledge which will eventually be embedded in the organization.

2.3.3   Knowledge Creation

Nonaka & Takeuchi [58] defined knowledge creation as a process of interactions between explicit and tacit knowledge. This interaction leads to the creation of new knowledge. Nonaka & Takeuchi's SECI Process is shown in Figure 2.2.
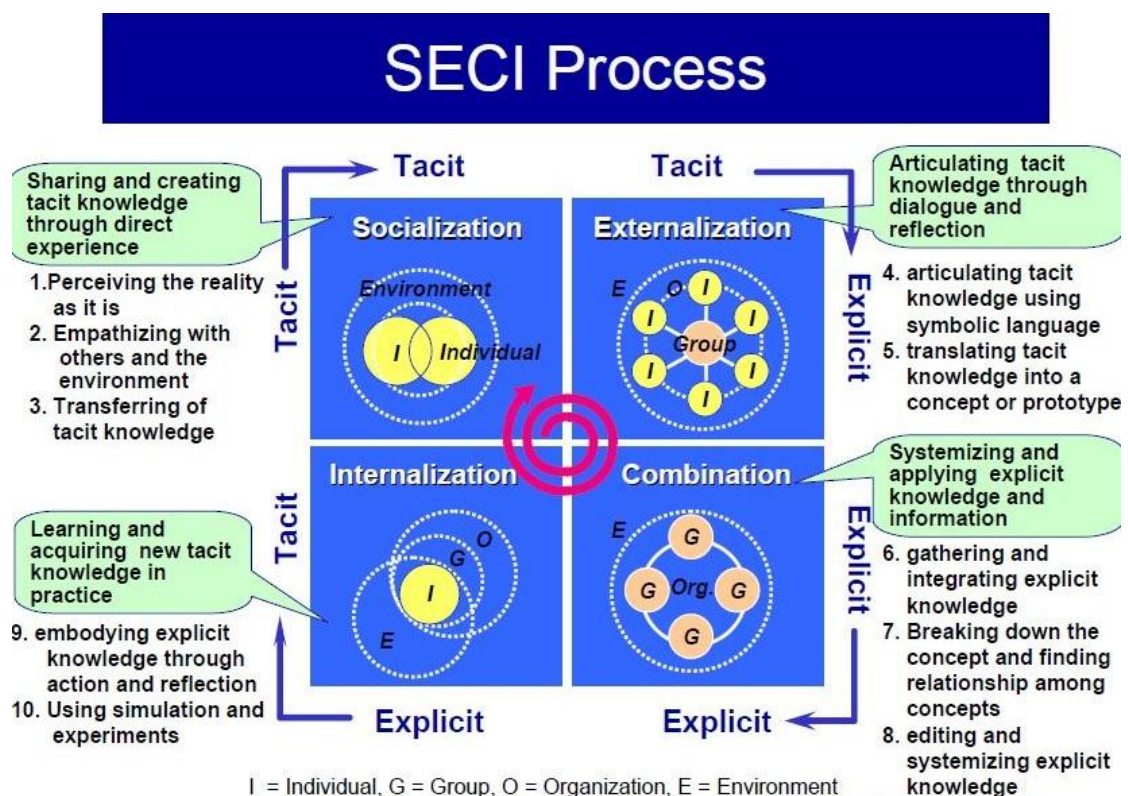

Figure 2.2: The SECI Process – Creation of new knowledge

- **Socialization (S):** the sharing of tacit knowledge between individuals through face-to-face communication or shared experience.

- **Externalization (E):** the expression of tacit knowledge and translation into comprehensible forms that can be understood by others. In other words, in this process we have the conversion of tacit into explicit knowledge and the translation of tacit knowledge into a readily understandable form.

- **Combination (C):** the conversion of explicit knowledge into more complex sets of explicit knowledge through communication, diffusion and systemization of knowledge.

- **Internalization (I):** the conversion of explicit knowledge into the organization's tacit knowledge. Linked to learning by doing, the explicit knowledge becomes part of the individual's tacit knowledge and becomes an asset for the organization.

Nonaka & Takeuchi [58] claim that tacit knowledge can be transferred between people through a process called socialization, which involves observation and discussion. A newcomer will normally need to spend time with existing people in the organization to get to know the routines, procedures and practices that are there. Observation and discussion; think about the example mentioned earlier with the young boy that works along with his father in an attempt to learn the "secrets" of his job. It is through observation and discussion with his father that the boy can get part of his tacit knowledge.

When knowledge is articulated so that it is possible to be represented in text or images, we say that we have knowledge externalization. A very common technique to articulate such knowledge is the process of brainstorming.

Apart from the knowledge creation systematic process as defined by Nonaka & Takeuchi, there is also the retention, transfer and utilization of knowledge as defined in the –so called- General Knowledge Model.

2.3.4 The General Knowledge Model

Newman & Conrad [56] defined what they called "The General Knowledge Model". This model organizes knowledge flows into four basic areas: knowledge creation, retention, transfer and utilization (see Figure 2.3).
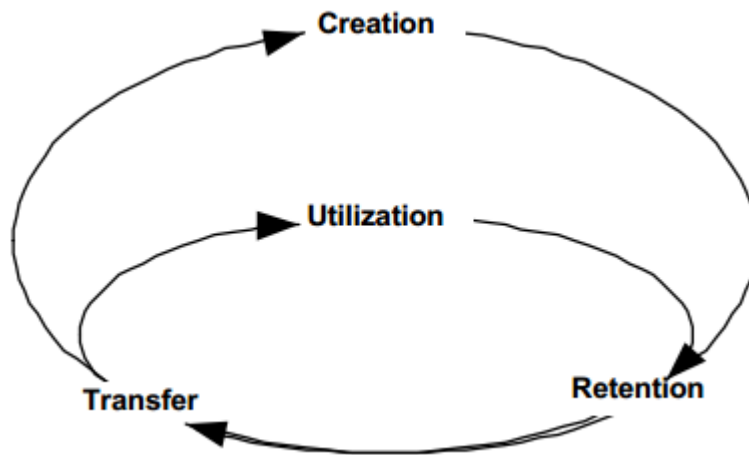
Figure 2.3: The General Knowledge Model

- **Knowledge Creation:** This includes activities that have to do with the entry of new knowledge.

- **Knowledge Retention:** This includes all activities that preserve knowledge and maintain its availability within the system once it is introduced.

- **Knowledge Transfer:** This refers to activities that have to do with the transfer of knowledge from one entity to another. This transfer includes communication, conversion, rendering etc.

- **Knowledge Utilization:** This includes all activities that have to do with the application of knowledge to organizational processes.

2.4 The importance of Knowledge Management

KM in today's "new economy" era is considered a new concept of management that targets the transformation of the intellectual qualities of organizational members to competitive power for the organization [72]. Andrew Carnegie once stated the following: "The only irreplaceable capital an organization possesses is the knowledge and abilities of its people. The productivity of that capital depends on how effectively people share their competence with those who can use it."

It is obvious how crucial KM is for any organization. It's not enough to have employees with knowledge. It's not enough to have well-defined processes and documented routines. An organization needs to circulate that knowledge, enhance it and bring it back into the organization as a resource. The individuals' tacit knowledge should eventually become the organization's tacit knowledge. This will allow the organization to be more efficient and more productive. It will allow for faster responses, better decision making and minimized mistakes with improved quality outcomes. Furthermore, KM improves employees' skills, productivity, efficiency and overall satisfaction.

From what it has already been discussed, we can see clearly that knowledge is important both to individuals and organizations. Therefore, learning is vital again both for individuals and organizations. Learning and knowledge go together. An organization can learn; and it is through that learning that an organization can create abilities that will later on lead to a competitive advantage.

It was mentioned earlier how Albert [06] defined KM: "the process of collecting, organizing, classifying and disseminating information throughout an organization, so as to make it purposeful to those who need it." This process is also known as Organizational Learning.

Chapter 3
Organizational Learning

"Companies...have a hard time distinguishing between the cost of paying people and the value of investing in them"

Thomas A. Stewart

3.1 Definitions

Learning has been defined by a number of researches of the field in terms of acquiring, retaining and transferring knowledge both at the individual and group levels [42, 69]. The ability to acquire, retain and retrieve knowledge Organizational Learning (OL) can be defined as the dynamic process of creating new knowledge and transferring it to where it is needed and used, resulting in the creation of new knowledge for later transfer and use [47]. The creation of knowledge, the transfer of it but also its retention within the organization is an ongoing process for knowledge development in an organization. OL is related –as a concept- to KM in the sense that in both cases we deal with knowledge and its characteristics, but in the case of OL, we are more concerned about the actual dynamic processes through which knowledge is developed in an organization [75].

One might say that since organizations are made up of individuals, it is the individuals that establish the processes and methods that enable the organization to learn and therefore organizational learning is just the sum of all individual learning. This is not the case however. OL is more than just all the individual learning accumulated. Let's take for example the case when an employee leaves the organization. What happens then? Is the organization's knowledge decreased by the sum of that particular individual's knowledge? Well, it shouldn't. Effective KM will allow the organization to retain that individual's knowledge in the organization and keep it as an asset for other individuals to share and build on.

3.2   Types of Organizational Learning

Two forms of OL can be identified: exploration and exploitation [45].

Exploration includes the development of new knowledge or the replacement of existing content within the organization's memory [03, 52, 60]. The idea of Organizational Memory (OM) is that everything that exists in an organization contains some piece of knowledge and is therefore comparable with memory [08]. Walsh & Ungson [78] define Organizational Memory as "stored information from an organization's history that can be brought to bear on present decisions". OM is also known as a method of preserving the organization's knowledge asset base [18].

Exploitation refers to learning that comes through diffusion, refinement and reuse of existing knowledge [47, 52].

Exploration implies organization behaviours that have to do with search, discovery, experimentation, risk taking and innovation, while exploitation implies behaviours that have to do with refinement, implementation, efficiency, production and selection [52]. When it comes to OL, a crucial concern for every organization is how much resources and effort to invest in exploration and exploitation to get the best outcome that will strategically help the organization to evolve. A lot of studies have been conducted and literature comes to a conclusion that there should be a balance between exploration and exploitation to gain the most [52].

3.3 KM and OL

In any organization that wants to make effective actions and take the best decisions towards its development and strengthening of its position in the market, both KM and OL are critical factors for the organization's long-term survival. And both of these fields must be utilized and developed in such extend so as to become part of the organization's culture; they should be embedded within the organization and be utilized continuously.

OL is considered to focus on the process while KM focuses on the content of the knowledge that an organization acquires, creates, processes and uses [26]. So, one can see OL as the goal of KM.

So eventually, we can come to a point where KM and OL will be interdependent and inseparable. They won't be of course identical but one will complement and support the other.

3.4 IT processes supporting Organizational Learning and Knowledge Management

Organizations nowadays are focusing on OL to be more efficient, gain competitive advantage over their competitors and strengthen their market position. And to do so, they use KM to develop a global organizational knowledge repository and identify routines and methods that are used to acquire, store interpret and manipulate information that are either internal within the organization or come from external sources. Knowledge-sharing processes within the organization help increase learning both at the individual as well as the organization level.

Cross and Braid [21] state that employees learn the most by interacting with other employees in the organization. When seeking information, they are more likely to turn to trusted colleagues than to databases. However, information technology (IT) can be a great tool for building relationships in the organization. Ruiz-Mercader et al. [69] point out that there exists a relationship between IT and OL since organizations use IT to collect, process, store and exchange knowledge.

3.4.1   Information Technology

When faced with the term "Information Technology", most people think of PCs, servers, routers, networks etc. According to Broendsted and Elkjaer [14], IT has become an increasingly integrated part of organizational life which enables organization to search for, collect, acquire and distribute knowledge as well as to create an electronic organizational memory. Ward and Peppard [79] identify IT as the tools that facilitate the acquisition, storing, processing, sharing and delivery of knowledge and other digital contents. Ruiz-Mercader et al. [69] define IT as "a generic term for the convergence of computers, hardware, software, telecommunications, Internet, electronics and the resulting technologies". IT can be defined as the infrastructure to KM [17]. The role of IT is to extend human capacity of knowledge creation through the speed, memory extension and communication facilities of technology [09].

Whatever definition we give to IT, the bottom line is that it is a vital part of the knowledge management and learning process in an organization. IT can support the various KM tools that are used by organizations.

3.4.2   KM Tools and Technologies

If we think of KM without the use of IT, we can list the following example tools [05]:

- Training

- Brainstorming

- Communities of practice

- Story telling

- Mentoring

These tools focus mainly on tacit knowledge. When IT comes into the picture, then we talk about "technologies" that can be used. Gupta & Sharma [34] state that these technologies fall into one or more of the following categories:

- Groupware

Groupware refers to technology that is designed to help individuals collaborate. The term embraces *communication tools* (tools for sending files and messages, email, wiki, file-sharing etc.), *conference tools* (chat, forums, audio/video call tools etc.) and *collaborative management tools* (project management tools, workflow tools etc.). Lotus Notes is one of the most popular Groupware tools.

- Document Management Systems

Document Management Systems are tools that help in the publishing, indexing, storage and retrieval of documents in an organization. Such systems deal explicitly with explicit knowledge.

A Document Management System usually embodies the following processes:

1. Capture

2. Classification

3. Indexing

4. Searching and Retrieval

5. Versioning

6. Security

- Expert Systems

An Expert System is a system that emulates the decision-making ability of a human expert [43]. So another term that is commonly used is "Decision Support Systems". Power [64] defines five types of Decision Support Systems (DSS):

1. Communication-driven DSS

2. Data-driven DSS

3. Document-driven DSS

4. Knowledge-driven DSS

5. Model-driven DSS

- Semantic Networks

A Semantic Network is a network that represents semantic relations between concepts. It's a directed or undirected graph that consists of vertices, which represent concepts and edges, which represent relations [76]. Such a network is used as a form of knowledge representation. It's an ideal representation for knowledge that is best understood as a set of related concepts, as shown in Figure 3.1.
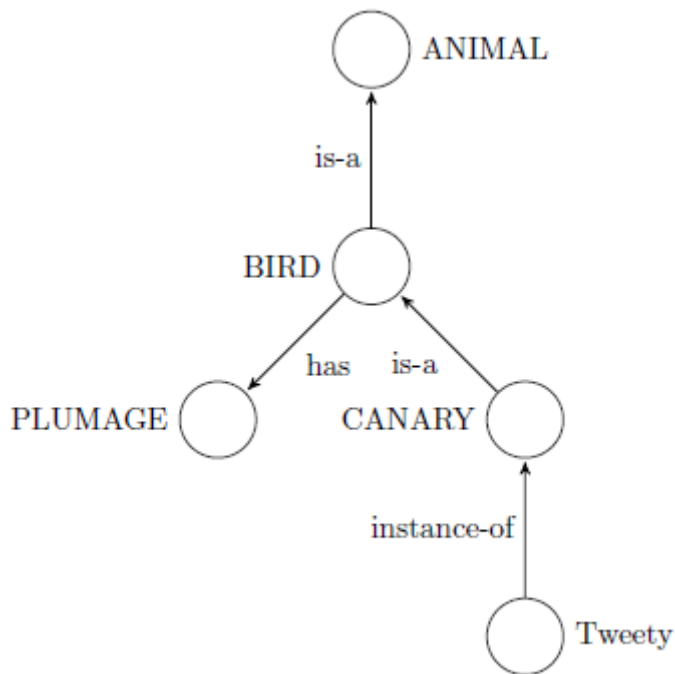
Figure 3.1: An example semantic network

- Relational and Object-Oriented Databases

Relational and Object-Oriented Databases have been used in Organizations as data repositories since the 1980s. Their ability to retrieve all sorts of stored information using formatted questions or requests (database queries) is a great tool for managing corporate knowledge.

- Simulation Tools

Simulation tools can be seen as a virtual medium through which several skills can be acquired [32]. Simulations for training purposes are a common thing in a corporate environment and help improve business awareness and management skills [40].

- Artificial Intelligence Tools

Artificial Intelligence (AI) can be used to support KM. A good example of AI in KM are the Knowledge-based Systems (KBS). KBS solve problems that are normally handled by human "experts". A KBS can be defined as "an intelligent computer program that uses knowledge and

inference procedures to solve problems that are difficult enough to require significant human expertise for their solution" [28].

These technologies focus mainly on explicit knowledge.

If we see things from another perspective we can list some additional common strategies that organizations are using for KM:

- Rewards: motivation for knowledge sharing

- Storytelling: a means for transferring tacit knowledge

- Cross-project learning

- Knowledge mapping

- Communities of practice

- Expert directories: enable the individual seeking for knowledge to reach the experts

- Knowledge fairs

- Competence management: systematic analysis, evaluation and planning of competences of the individual members of the organization

- Collaborative technologies (i.e. groupware etc.)

- Knowledge repositories: databases etc.

- Knowledge brokers: certain individuals within the organization can take responsibility for a specific "area" and be the first reference for any organizational member seeking information on that particular "area"

- Social software: blogs, wiki etc.

Any of these tools/technologies used in an organization have one main purpose: to create, codify and transfer knowledge.

The main focus in this research is on individuals' training in an organization. Undoubtedly, corporate training and learning is a major concern for any organization. As already mentioned employees are assets for the organization and so is their knowledge, which will be ideally embedded eventually in the organization and be part of the organization's knowledge, available to everybody. So, it is for the organization's best interest to have highly trained and educated employees. Sometimes though, the budget that needs to be allocated for training is too high for the organization. Or in other cases, the training is not very effective due to lack of interest from the employees. These are some of the reasons for the evolution of games as educational tools. Games, and more specifically Serious Games (SG) are evolving and their usage for educational purposes is rapidly growing. In this research, the usage of a SG for educational purposes in a corporate environment is evaluated.

Chapter 4

Serious Games as Knowledge Tools

"I hear, I forget. I see, I remember. I do, I understand"

Confucius

4.1 Game Definition

A game is a form of play with goals and structure [54]. A game is a system in which players engage in an artificial conflict, defined by rules that results in a quantifiable outcome [73].

4.1.1   Structure

Structure defines the actions that a player can take and the consequences of each possible action. These are predefined in the game. We can also use the term "rules" to define game structure. A game should have rules according to which the player plays.

4.1.2   Play

Maroney [54] gives 3 different meanings for the term "Play". "Play" used as "interact". The player of the game is actively participating. The game is not fixed, it is created according to the player's actions. "Play" used as "pretend", meaning that game actions are a stand-in for reality. There are of course some games where your actions can have real-life effects like poker. The third meaning for "play" is "fun" or "entertainment". Play is usually associated with fun. A game should be fun to play.

4.1.3   Goal

A player's actions in a game are always directed towards achieving a specific goal. A goal can have many forms in a game. Sometimes it might be a "higher score" compared to other players' performance when the game ends. That score can be presented in points, money, control of spaces on a board etc. A goal can be the trapping of an opponent's key piece (like in chess). Another form of a goal could be to reach a certain point before your opponents (like in a race). And so on. Struggling to reach the goal is a good motivation for any player.

Prensky [65] argues that "computer and videogames are potentially the most engaging pastime in the history of mankind". And he lists twelve reasons to support that:

1. Games are a form of fun. That gives us enjoyment and pleasure.

2. Games are form of play. That gives us intense and passionate involvement.

3. Games have rules. That gives us structure.

4. Games have goals. That gives us motivation.

5. Games are interactive. That gives us doing.

6. Games are adaptive. That gives us flow.

7. Games have outcomes and feedback. That gives us learning.

8. Games have win states. That gives us ego gratification.

9. Games have conflict/competition/challenge/opposition. That gives us adrenaline.

10. Games have problem solving. That sparks our creativity.

11. Games have interaction. That gives us social groups.

12. Games have representation and story. That gives us emotion.

Apart from the creativity, satisfaction, passion and motivation, games give us learning as well. And the evolving category of games that focus more on education and less on entertainment is called "Serious Games".

4.2 Serious Games

Serious Game is the common term for a game with an educational intent. It's a game whose primary purpose is other than pure entertainment. Some use the term "edutainment" to point out the co-existence of *education* and *entertainment*.

There are two particular areas where Serious Games (SG) are extremely useful as training simulations: military and the health sector. In most cases training in a military environment needs to be performed in hazardous environments or circumstances. Using SG as training simulations is a safe and cost-effective alternative compared to what would take to simulate such scenarios in the real world. Same applies for the health sector. Medical practitioners can benefit from realistic

SG, which can help them learn and safely practice complex medical routines, surgical procedures etc.

SG usage is rapidly growing in commercial environments as well. Many organizations turn to SG and simulations to train their staff. Such a trend can be based on many reasons. First of all it's the matter of cost savings for the organizations. Having a SG as a training method is much less costly than allocating resources (both internal and external) to do the training in the traditional face-to-face method. Especially if an organization needs to train employees that are not physically located in the same geographical area. A SG simulation has no geographical limitations. It can be accessed by anybody from anywhere at any time. Another thing that we need to take into consideration is the fact that new employees nowadays understand better the concept of a game and are more likely to be motivated to train through such a medium. People nowadays need to develop "digital age literacy, inventive thinking, effective communication and high productivity" [16]. These skills are also known as the "21st century skills" [29]. Many young people today are not acquiring these 21st century skills through structured learning environments, but rather through various "cognitively-demanding leisure" activities they choose to engage with, including online games and virtual worlds [44].

A key concern when it comes to SG is whether SG or the related –and often overlapping- areas have positive effects. The obvious advantage of SG, as stated by Corti [20] is that they allow learners to experience situations that would be impossible in the real world for safety, cost, time and other reasons.

4.3   SG and Related Areas

There are a number of technologies that are related to SG and are sometimes overlapping in the sense that it is not clear to distinguish where each concept ends and where the related one begins. Such related areas are Edutainment, E-learning, Game-based Learning (GBL) and Digital Game-based Learning (DGBL).

Edutainment

Edutainment comes –as a term- from the join of two other terms: education and entertainment. What the name implies is education through entertainment and it basically refers to any kind of education that also provides entertainment. It was quite popular in the 1990's and was mainly associated with video games with educational aim. Initially, edutainment was targeting young children and it was focusing on games that had to do with reading, math and science.

Edutainment software didn't have much of a success however. It ended up being described as "boring games and drill-and-kill learning" [27]. When the U.S. Army released the video game *America's Army* back in 2002 [33], the SG movement begun. The same year the *Serious Games Initiative* (http://www.seriousgames.org) was founded by the Woodrow Wilson Center for International Scholar and the term "Serious Games" spread widely.

E-learning

E-learning is more of a general idea that refers to computer-assisted learning, computer-based learning, interactive learning and distance-learning [41].

Digital Game-based Learning

Corti [20] considers Digital Game-based Learning (DGBL) and SG to be the two sides of the same coin. According to Corti [20], GBL has the potential of improving training activities and initiatives. Engagement, motivation, role playing, simulation and repeatability are the key issues here.

According to Prensky [65, 66] DGBL is based on two key ideas. Firstly, the thinking patterns of nowadays learners have changed significantly. Today's learners are "native speakers" of the digital media language. Secondly, today's learners have experienced a new and radically advancing form of computer and video games and undoubtedly "this new form of entertainment has shaped their preferences and abilities and offers an enormous potential for their learning, both as children and as adults" [65].

Benjamin [11] proved that realistic graphics in a game are beneficial for the educational value of the game. He argues that realism in educational games has a positive influence on knowledge transfer.

4.4   3D Technology

Thinking about "realistic graphics" or "realism" in general in a game, most probably 3D technology will come in mind. A 3D environment is as close as possible to a real environment and 3D objects resemble real-world objects. And this is realism. A game using 3D technology can be realistic enough with all positive effects that might have, as stated by Benjamin [11].

4.4.1   3D Games and 3D Applications

The educational benefit of games is still questionable by most people. And one can think of at least two reasons for that. First of all, there is lack of concrete scientific evidence that says something like "games improve learning by X%". And secondly, to most people (mostly older people) games are considered to be "just toys". It is these people that only see the entertainment aspect of gaming and cannot open up their minds to understand the educational side of the story. Fortunately, game technology is approached differently.

Nowadays, games make use of 3D technology and offer users a realistic simulated experience that would be very difficult (if not impossible) to experience in the real world. People tend to see this realistic experience very positively. Serious games have been around for a long time, whether as edutainment technologies or simulations.

It should be noted that some people confuse 3D applications with 3D games. Many business people tend to refer to a "game" when they're really just talking about a 3D application. A 3D application can be using game technology. That alone, does not however make it a game! Take for example a 3D simulation software that is used for designing and testing cars. It may be using game technology and an innovative 3D engine but it's not a game. It's not necessarily fun; it doesn't necessarily have any learning or reward purpose. It's a 3D application for a specific business

problem. It's game-like, it uses game technology but it's not a game. Not all 3D applications are games.

Cook [19] suggests two overlapping categories of SG:

- **Games**: applications focused on learning, simulation and fun.

- **3D Applications**: applications that use 3D game technology and techniques to solve business problems.

As can be seen from Figure 4.1:

- There are 3D applications that are not games

- There are 3D applications that are indeed games

- There are games that are not 3D applications
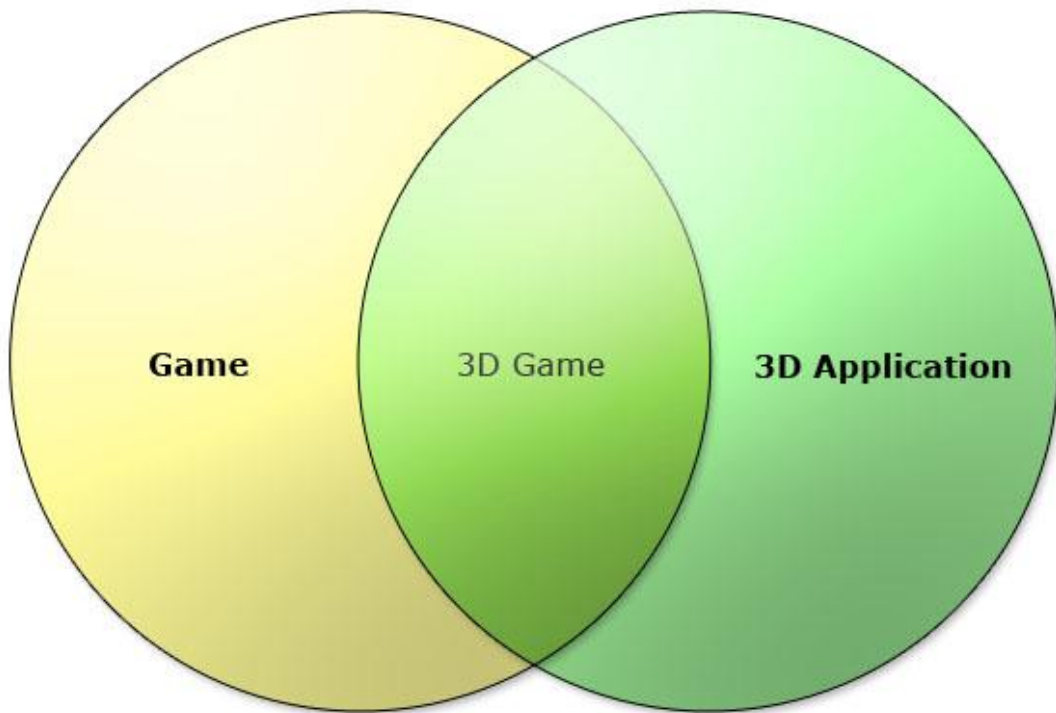
Figure 4.1: Serious Games categories

3D technology can give the game player an experience that is close to real-life in the sense that you can view, move and interact in a 3D environment that emulates reality. In a 3D game environment, the room, the objects, the characters, everything is perceived in 3 dimensions, just like in real life. This is what makes 3D environments realistic.

In a 3D World, the player and any other characters that may be available in the game are presented in the form of an Avatar. In a 3D environment, an Avatar is the graphical representation of the user or the user's alter ego or character [52]. An Avatar can be found in 2-dimensional forms as well, for example as an icon in forums or other online communities.

4.4.2   Games Effect on Knowledge

Research shows that games can enhance knowledge creation and help in knowledge retention [67, 68].

Ricci et al. [68] provide empirical evidence that games can improve knowledge acquisition and retention in military education. Randel et al. [67] conducted an extensive study on educational games in areas such as social sciences, mathematics, physics, biology, language and logic. They came to the conclusion that the use of games is more beneficial than traditional education in improving mathematical achievements and knowledge retention.

Garris et al. [30] argue that well-designed games can be valuable learning tools because they motivate learners to participate in extensive practice of targeted skills in a system that requires learners to engage in both repetitive and decision-making processes. Gaudart [31] also agrees that games increase learner motivation. Garris et al. [30] also reported the relation between games and experiential learning in their model of the game cycle, in which the learners' repeated interaction with the game environment facilitates learning.

Ricci et al. [68] argue that "traditional classroom approaches for teaching knowledge are not always enthusiastically received by young service members who have grown up in an era of computers and computer gaming, and gaming could be considered a potentially powerful instrument for training". Research in psychology of education shows that visual presentation facilitates human's cognitive process [45, 55, 56]. It would be interesting to see how a SG in a 3D environment could act as a KM tool.

4.4.3   Considering User Experience (UX)

SG may be focusing on the educational part but that doesn't mean that the entertainment part should be forgotten. A SG is still a game and the users playing the game are still looking for fun and rich user experience (UX). Any game should be motivational and appealing to the user in order to attract their interest and have success in the gaming market. Simply put, UX can be described as the way someone feels about using a product or system. There are many definitions given by various researches for UX.

"All the aspects of how people use an interactive product: the way it feels in their hands, how well they understand how it works, how they feel about it while they're using it, how well it serves their purposes, and how well it fits into the entire context in which they are using it." [02]

"A consequence of a user's internal state (predispositions, expectations, needs, motivation, mood, etc.), the characteristics of the designed system (e.g. complexity, purpose, usability, functionality, etc.) and the context (or the environment) within which the interaction occurs (e.g. organizational/social setting, meaningfulness of the activity, voluntariness of use, etc.)" [38]

"The entire set of affects that is elicited by the interaction between a user and a product, including the degree to which all our senses are gratified (aesthetic experience), the meanings we attach to the product (experience of meaning), and the feelings and emotions that are elicited (emotional experience)." [39]

Jordan [46] argues that users are cognitive and physical components of a system consisting of the user, the product and the environment of use. Jordan argues that "pleasure" is a critical product quality and defines four different types of pleasure that a product can address: Physio-pleasure (i.e. touch, taste, smell or sensual pleasure), Socio-pleasure (i.e. facilitation of social interaction), Psycho-pleasure (i.e. compliance to the user's cognitive and emotional reactions), and Ideo-pleasure (i.e. compliance to the user's sense of aesthetics or ideological values). Hassenzahl [36] sees quality in two dimensions: pragmatic quality and hedonic quality. Pragmatic quality (PQ) corresponds to attributes like "clear", "supporting", "useful" and "controllable" , while hedonic quality (HQ) corresponds to attributes like "outstanding", "impressive", "exciting", or "interesting". These qualities can be related to Jordan's "pleasure" quality. Hassenzahl argues that pragmatic and hedonic qualities are independent of each other; usable products are not necessarily appealing and similarly, products with problems in usability can still be appealing.

UX is an important thing to evaluate, since it allows for better design of systems, especially games. It's important to know how the users feel about the game, what they like most, what they like the least so that a developer can improve a game and make it more efficient and more appealing to the users.

Chapter 5
Implementation of a 3D SG as a KM tool

"Play is the highest form of research."

Albert Einstein

This study attempts to answer the following questions:

1.   Can a 3D SG be developed as a tool for organizational learning purposes?

2.   Is such a tool effective in corporate education and knowledge management?

3.   What is the users' experience in relation with traditional methods for education and knowledge management?

In order to answer the above questions, an explanatory qualitative research was selected, following the participatory Action Research design. A 3D SG was introduced in an Organization and the learning effects on the employees were studied. The game was based on an existing "manual" procedure of the Organization, namely the training procedure for new employees.

5.1 Methodology

Following is some theoretical background on the methodology and research options and what led to the specific research type and methodology that was chosen for this study.

5.1.1 Research Type

Scientific research can be of three types based on its purpose: exploratory, descriptive and explanatory [12].

Exploratory research is usually conducted in new areas, or as Babbie [07] states, "when problems are in a preliminary stage". The purpose of an exploratory research project is to (1) define the extent of a specific phenomenon, problem or behavior, (2) to generate some initial ideas about the phenomenon and (3) to test if it's feasible to conduct a more extensive study of that phenomenon [12].

Descriptive reaseach refers to the observations, examination and detailed documentation of a given area of interest. The observations made through Descriptive Research are far more reliable than casual observations performed by people that are not scientifically trained, since it satisfies the four characteristics of the scientific method [12]:

- **Replicability**: other researchers can independently replicate a scientific study and get similar (if not identical) results.

- **Precision**: concepts that are often hard to measure, should be defined with such precision and accuracy that other researchers can use those precise definitions to measure the concepts and test the theories behind them.

- **Falsifiability**: a theory should be stated in such a way that it can be disproven. A theory that cannot be falsified is not considered scientific theory.

- **Parsimony**: the process of accepting the simplest explanation when there are multiple explanations for a subject of study.

Explanatory research aims at explanations of observed phenomena, problems or behaviors. If the previous types of research study the *what*, *where* and *when*, explanatory research studies the *why* and *how* of the phenomenon under study. Most academic research falls into this research category.

The purpose of this research is to study how and why a 3D SG can be used as a knowledge management tool for organizational learning in a corporate environment. Inevitably, the explanatory type of research was chosen.

5.1.2 Research Design Approach

Bhattacherjee [12] identifies eight different research designs:

Experimental studies

Experimental studies are those that are intended to test cause effect relationships (hypotheses) by separating the cause from the effect in time, administering the cause to one group of subjects (the "treatment group") but not to another group ("control group"), and observing how the effects vary between subjects in these two groups.

Field surveys

Field surveys capture snapshots of practices, beliefs, or situations from a random sample of subjects in field settings through a survey questionnaire or less frequently, through a structured interview.

Secondary data analysis

Secondary data analysis is an analysis of data that has already been collected and tabulated by other sources.

Case research

Case research is an in-depth investigation of a problem in one or more real-life settings (case sites) over an extended period of time. Data may be collected using a combination of interviews, personal observations, and internal or external documents. Case studies can be positivist (intended for hypotheses testing) or interpretive (for theory building).

Focus group research

Focus group research is a type of research that involves bringing in a small group of subjects (typically 6 to 10 people) at one location, and having them discuss a research problem of interest for a period of 1.5 to 2 hours. The discussion is moderated and led by a trained facilitator, who sets the agenda and an initial set of questions for participants, makes sure that ideas and experiences of all participants are represented, and attempts to build a holistic understanding of the problem situation based on participants' comments and experiences.

Action research (also known as Participatory Action Research)

Action research assumes that complex social phenomena are best understood by introducing interventions or "actions" into those phenomena and observing the effects of those actions. In this method, the researcher is usually a consultant or an organizational member embedded within a social context such as an organization, who initiates an action such as new organizational procedures or new technologies, in response to a real problem such as declining profitability or operational bottlenecks. The researcher's choice of actions must be based on theory, which should explain why and how such actions may cause the desired change. The researcher then observes

the results of that action, modifying it as necessary, while simultaneously learning from the action and generating theoretical insights about the target problem and interventions. The initial theory is validated by the extent to which the chosen action successfully solves the target problem.

Ethnography

Ethnography is a qualitative research design inspired by anthropology that emphasizes that research phenomenon must be studied within the context of its culture.

Grounded theory

Grounded theory is an inductive technique of building theories about a social phenomenon that are based on (or "grounded in") empirical observations of the phenomenon.

Taking into consideration the fact that the SG that was implemented was based on an existing procedure of the Organization under study, one can justify the selection of the Participatory Action Research approach. A "new technology" (the implemented SG) was introduced into the Organization's "normal activities" and the effects of this "action" was studied.

The employees of the Organization had the opportunity to play the game, which was an alternative way of providing the "new employee training" that the Organization has as a standard routine for every new employee. The employees had the chance to play the game as many times as they wanted.

Over a period of 20 days, 11 in-depth interviews took place. The sample of the interviewees was based on all employees that were available. An interview guideline was prepared in advance with 14 open-ended questions. The interviewees were asked questions regarding their level of previous experience with 3D games, the educational content of the game, their "normal" training that they took when they joined the Organization, the knowledge effect that the game had on them, their experience compared to the normal training routine and their thoughts about using the game for future employee trainings. The interviews were anonymous, they were tape-recorded and transcribed.

The interviewees were asked the following questions:

- What is your level of experience with 3D games?

- How long ago did you go through the "new employee training"?

- Did you reach the end of the game? If not, up to which stage did you go?

- Describe the educational content of each stage

- Did you learn anything that you didn't already know? If yes, can you specify?

- Compared to the regular training session that you took when you joined the Company, how would you describe the training session you got through the game?

- How many times did you play the game?

- Would you play it again? Why?

- For someone that is completely new to the Company, do you find the training material available in the game sufficient for an introduction to the Company?

- How much time did you spend on the game?

- If you had to do the "new employee training" again, would you choose the traditional face-to-face training or the virtual one? Why?

- Can you specify the things that you liked the most in the game?

- Can you specify the things that you didn't like in the game?

- Do you think such a game could be used for future employee trainings in the Company?

Apart from the interviews, the users answered a questionnaire regarding their user experience and the aesthetics of the SG application. The questionnaire was based on the AttrakDiff Lite Questionnaire, which is a shortened version of the AttrakDiff2 Questionnaire [35, 37]. It contains 10 items that are presented on a 7-point bi-polar anchor scale. The Questionnaire is designed to measure hedonic qualities, pragmatic qualities and overall beauty and goodness as shown in Figure 5.1.

Pragmatic Quality Anchors

Confusing – Clearly Structured
Unpredictable – Predictable
Simple – Complicated
Practical – Impractical

Hedonic Quality – Identification Anchors

Stylish – Tacky
Cheap – Premium

Hedonic Quality – Stimulation Anchors

Dull – Captivating
Creative – Unimaginative

Overall Appeal

Bad – Good
Ugly – Beautiful

Figure 5.1: the AttrakDiff Lite Questionnaire.

See appendix A-1 for a sample of the Questionnaire used.

5.2 Basic Goals for the Implementation of the 3D SG

The two main goals for the implementation of the 3D SG are firstly to see whether a 3D SG can be used effectively as a KM tool and secondly to examine how it compares with a traditional training procedure in an organization based on the comments of employees who have experienced both methods. Additionally, this research studied the users' overall experience with the game.

5.3 Design Philosophy

In order to understand the design philosophy of the implemented SG, one must have an understanding of the organizational procedure that the SG was based on.

5.3.1   Existing Organizational Procedure

As already mentioned, the main concept of the developed SG was based on an existing procedure that exists in the Organization that was used as the unit of study of this research. Ancoria Insurance, a Swedish-owned Insurance Company located in Cyprus, has a standard routine for every new employee that joins the Company. The -so called- "new employee training".

Once a person joins the Company, appointments are scheduled with the Management and the Head persons of each Department. On each of these appointments, the new employee will have the opportunity to get information regarding the particular Department, its purpose, the people that work in the Department, the main activities, procedures and services. This training procedure is usually completed within a week or less, depending on the availability of the "training" persons. After completing the training procedure, the new employee has a rough idea of what the Company is all about, who does what etc.

Having in mind how this existing procedure works, one can identify certain problems or weaknesses.

- The new employee only goes through this training procedure once.

- The Company needs to allocate too many resources to complete the "new employee training" procedure.

Introducing a SG as an alternative way of providing the "new employee training" could overcome these weaknesses.

5.3.2   Proposed Alternative Procedure

The use of a SG as an employee training tool automatically eliminates the first limitation mentioned above regarding the current organizational procedure. The employee can have unlimited access to the training material and can go through the "new employee training" procedure as many times as he/she wants. This could be beneficial in the sense that it could help digest the information better and keep it fresh in memory.

As far as the second limitation mentioned, again a SG could help overcome that because no human resources are needed for the training. The whole training procedure should take place within a virtual 3D environment whenever the employee wants. No need for scheduling an appointment or allocating company personnel as trainers.

So this is what "*Knowledge Donor*" is all about.

5.3.3   Introduction to "Knowledge Donor"

The SG that was developed was named "Knowledge Donor". The name may imply that it is a game that "donates knowledge". Not quite. In order to understand the idea behind the name of the game, a few things should be explain regarding Ancoria Insurance, the Organization through which the SG was evaluated.

On July 1st 2007, Sievert Larsson, the owner and co-founder of Ancoria Insurance, donated all his shares to Sievert Larsson's Scholarship Foundation. Ever since, all profit from the Company is used for charity. The Foundation's purpose is to facilitate the education of gifted and needy young individuals since its founder believes that by assisting capable, hard-working and promising students from disadvantaged backgrounds to further their education, it will help improve their overall well-being and quality of life.

According to the game scenario, the player is a new employee in Ancoria Insurance and is about to be trained about the history, the products and the people of the Company. As the player progresses through the game, he is faced with several quizzes and missions which –if completed

successfully- reward the player with "money". The player collects the money as a donation to the Scholarship Foundation.

5.4 SG Design Document

The design issues, the scenario and other technical information are discussed in detail.

5.4.1　　Game Concept

This game is an attempt to prove that SG can be used in a corporate environment for knowledge creation, retention and transfer. The game takes place in a 3D world that simulates a business environment and gives the user a realistic feeling of an actual corporate training.

Game Plot

The game scenario is based on (1) an existing company procedure that takes place in Ancoria Insurance for each new employee and is the so called "new employee training" and (2) the fact that all profit of Ancoria goes to charity.

Putting these two concepts together, the scenario of "Knowledge Donor" is as follows:

The player is a new employee of Ancoria Insurance. Certain employees of Ancoria Insurance, their avatar to be more precise, will take the player through a training session that will cover the company creation and history, the products and marketing routines and the personnel of the company. The game consists of three stages. At the end of each stage, the player is tested for the knowledge acquired. Successful completion of the tests will reward the player with money, all of which is collected as a donation to the Sievert Larsson's Scholarship Foundation. The player has 3 lives and all tests have to be completed within specific time limits.

Development Platform

The game was developed having in mind the actual procedure currently in use by Ancoria: one person has several one-on-one sessions with other employees and gets information regarding the company. Therefore, the game was developed as a **single-player** game in a **3D world** that simulates a **business environment**. And since this game is intended to also overcome the weakness of having too many human resources allocated to conduct the new employee training, the SG that was developed does not require the "trainers" to be connected in real-time to provide the training to the game user. The user of the game has interaction with computer-controlled avatars and objects.

Thinking Worlds (http://www.thinkingworlds.com) platform version 3.5.4 was chosen. Thinking Worlds is a tool provided by Caspian Learning (http://www.caspianlearning.co.uk/). Thinking Worlds is a 3D simulations and serious games authoring tool for both novice and expert developers. It allows the deployment of games in various forms: standalone applications, java applets, adobe shockwave, even iOS for deployment on iPhone and iPad. For the purpose of this study, the game was deployed as a Java applet and was available to the users through a dedicated website created for this purpose: http://www.edugame.info
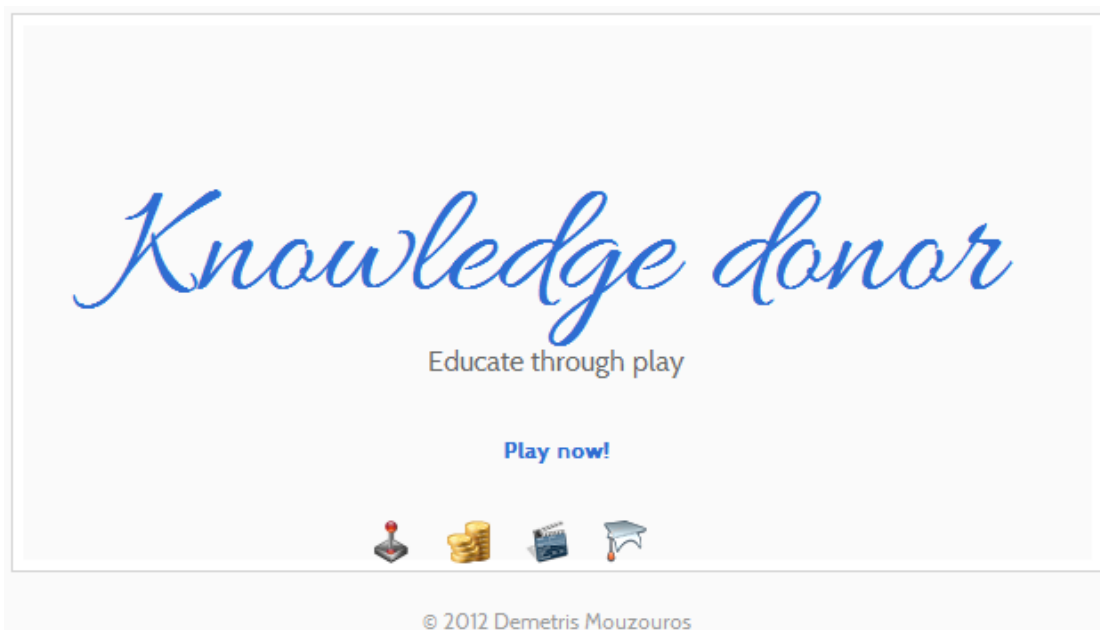
Image 5.1: The main page of the website that hosts the game

Thinking Worlds was chosen as the platform to build Knowledge Donor for a number of reasons. First of all it offers a rapid fully-3D development environment with lots of 3D assets (environments, avatars, objects) and ability to deploy the game in several ways (standalone application, java applet, shockwave, iOS). For the purpose of this study and according to the organizational environment in which the game was going to be tested in, the ideal deployment was the Java applet. All the employees of Ancoria Insurance have Java installed on their machines and the game was deployed on a public website that was created for that purpose. No local installation was needed on any client machine; that is why Java deployment was chosen and hence Thinking Worlds.

Limitations

The game was developed using Thinking Worlds version 3.5.4 and was deployed as a Java applet. This version of the authoring tool supports up to Java version 6. Recently, Thinking Worlds version 3.6.0 was released with support for Java version 7. However, there was not enough time to transfer the game to the new platform and perform adequate testing to release it with Java 7 support. Hence, the "Knowledge Donor" game supports Java 6 runtime environment. It will not work with Java 7 runtime.

5.4.2   Features

General Features

- Huge world consisting of 6 different rooms.

- All the current employees of Ancoria Insurance are present in the game's world with the form of Avatars.

- Full 3D experience: 3D world, 3D objects, 3D characters.

- 32-bit color.

Gameplay

The game consists of 3 stages, each of which has a different educational purpose. On the first stage, the player gets educated about the creation of the Company and its history. On the second stage, the player gets informed about the main products of the Company and the Marketing procedures. Finally, on the third stage, the player gets to know the Departments that make up the Company, who works in which Department and what are his/her duties. At the end of each stage, the player is given tests to evaluate the knowledge gained. Successful completion of the tests allows the player to progress.

The game starts with a brief introduction to the "donation" concept and then the player is placed in the virtual company environment. The secretary will guide him through the procedure and give him appropriate instructions on who to talk to. After the player completes the talking with the persons indicated, he should return to the reception area and talk to the secretary. The secretary will give the appropriate quizzes and/or missions.

The player can move around the game world, open doors that lead to other rooms and talk to other characters that are spread throughout the virtual place. The player can take instructions from any company employee on how to locate a specific person by talking to him/her. When close to a character or object, the player is given "action" options (talk, open, use etc) which can be used to perform tasks.

On the top left part of the screen, a radar screen is displayed that shows the position of characters, doors and other useful objects (that are near to the player's avatar) in relation to the player's current position.

On the top part of the screen the donation money collected so far are displayed as well as the player's lives. During each quiz or mission test, a countdown timer is displayed in the middle-top part of the game screen.

At any given time, the player can press the "help" button to get brief help tips. He can also press the "quit" button to exit the game.

The second time the player plays the game (and every time after that), he is given the option (action) to "skip education". Pressing the "Skip talking" button will allow the player to proceed to the "testing" part of the current stage without having to go through the stage's training session. Similarly, once the player has finished talking to a "trainer" character, he is given the option to "Re-educate" i.e. ask the "trainer" to train him again as many times as the player wants.

This is a typical screen of the game where the various components are shown:
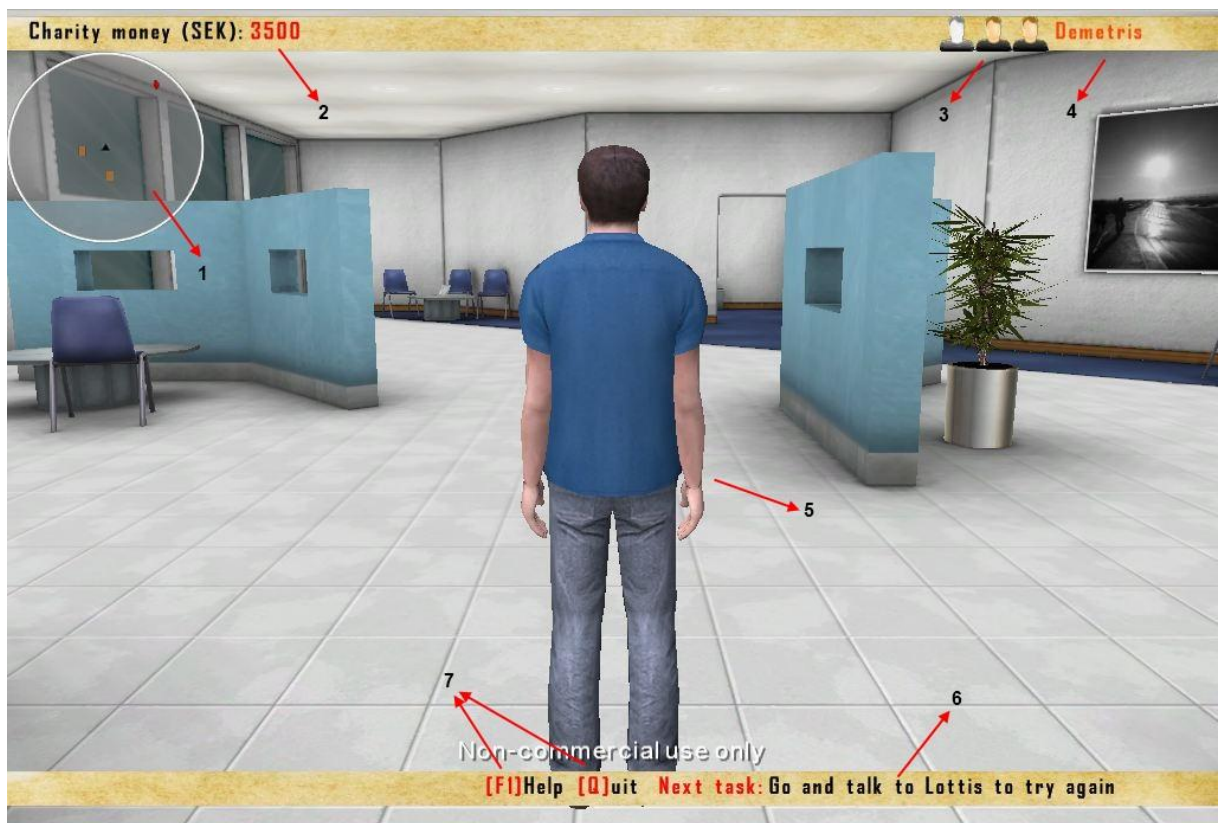
Image 5.2: typical game screen

From Image 5.2 the following can be identified:

1. Screen radar display: show the position of other characters, door and critical objects in relation to the player's position (shown with a black triangle in the middle of the radar).

2. The amount of charity money that the player has collected so far.

3. The player's remaining lives.

4. The player's name.

5. The player's avatar.

6. The next task that the player has to complete. Useful reminder on what's next.

7. Action buttons. Displayed on the screen above are the "Help" and "Quit" buttons.

Quizzes and Missions

After successful completion of the educational part of each stage, the player is tested for his acquired knowledge. The test could either be in the form of a series of questions or in the form of a mission. When the game is launched, random questions are read from the relational database that is used by the game, so that the game player will be faced with different questions each time he/she plays. As far as the missions are concerned (available on second stage), there are 7 pre-defined missions embedded in the game. One will be randomly selected if and when needed.

The player has specific amount of time to complete the quiz or mission. Successful completion of the quiz/mission rewards the player with money; failure to complete the quiz/mission correctly or failure to do so in time leads to money losses. If the player fails he/she loses one life. If all three lives are eliminated, then the game is over, otherwise the player can re-take the quiz/mission but the available time will be decreased.
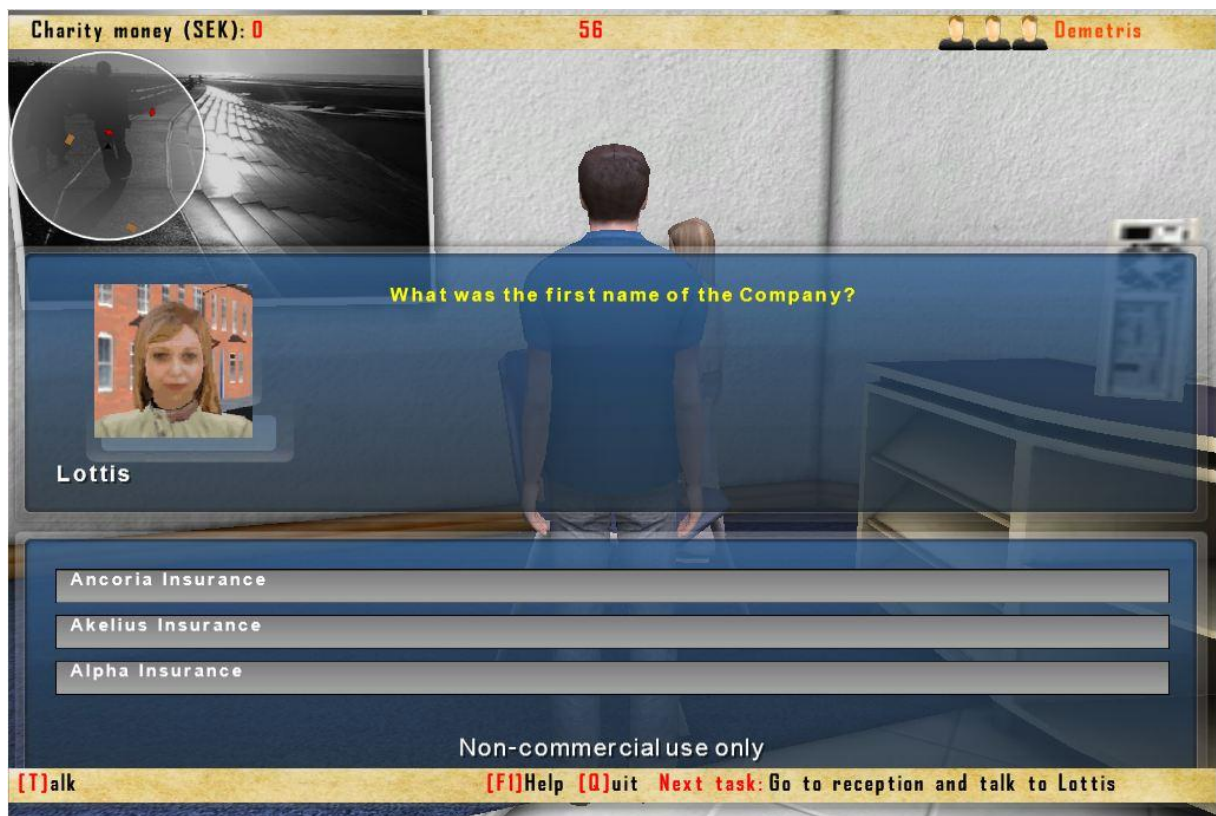
Image 5.3: sample quiz

Image 5.4: sample mission

Image 5.5: time-up message

Game Controls

The player uses the keyboard to play the game. Based on what the player's avatar has near it (other avatar, door etc.) specific "action" key options are shown on the screen and the particular keys are enabled as actions.

Moving the player

The four arrow keys are used to move around. Up arrow to move forward, down arrow to move backwards, right arrow to turn right and left arrow to turn left. Additionally, the player can keep the "Shift" key pressed in order to run instead of walking.

Image 5.6: navigation keys

Open doors

When the player's avatar is close to a door, the "Open" action key is enabled and appropriate option is shown on the screen. Pressing the "O" action key opens the door that is next to the player's avatar.
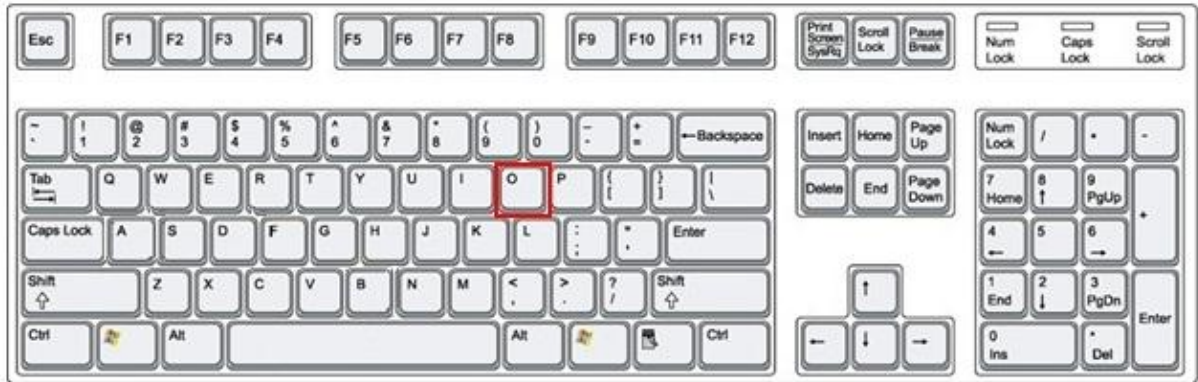
Image 5.7: key to open doors

Talk to other characters

When the player's avatar is close to another character, the "Talk" action is enabled and the appropriate action key is enabled with the appropriate indication on the player's screen. Pressing the "T" action key the player can talk with the character close to him. The whole "talking" procedure follows certain logic. If the character which we selected to talk to is the next person to "educate" the player (based on the gameplay) then the "talk" button starts the education conversation. Otherwise, the "talk" button will be used to ask for and get instructions on how to locate the next "educator".

Image 5.8: key to talk to other characters

Help screen

At any point, the player can press the "Help" button to bring up the Help Screen. The "help" button (F1 key) is always enabled.

Image 5.9: key to show Help Screen

Quit the game

Like the "Help" button, the "Quit" button is also enabled at all times. By pressing it, the player is given a confirmation dialog to confirm if he/she really wants to quit.

Image 5.10: key to quit the game

Use objects

Certain object can be "used" by the player. When the player's avatar is close to an object that can be used, appropriate action is shown on the screen and the specific action key is enabled. Depending on the object to be used, the "use" key triggers a predefined game action.

Image 5.11: key to use objects

Skip talking

If the player is playing the game for the second time (on the same machine) then the option to "skip talking" is given to him/her. The player can choose to skip the education talking part and go directly to the quiz/mission part of the stage.

Image 5.12: key to skip educational talking

Re-educate

The player can skip educational talking if he/she has already being educated at least once. But he/she can to the opposite as well. Once the player has been educated by a character, the "re-educate" option will be given to him/her every time he/she is close to the character that educated him/her. Pressing the "re-educate" action key will start the education talking sequence again. The player can re-educate himself as many times as needed.

Image 5.13: key to repeat educational talking dialog

5.4.3 The Game World

The game consists of 6 rooms. In each room there are company employees with which the player can interact. Several doors are located in various places in all rooms and allow the navigation from one room to another. Not all rooms are directly connected though; sometimes the player has to go through other rooms to get to his destination room. Throughout the game, a third-person camera is used. The player can see his avatar while walking/running around the World.

The six rooms that make up the game's World look are the following:

- **The Reception area**

This is actually more than just the reception. It's a big room with several offices. Apart from the reception, the Swedish Operations Manager is in this room, the Back-office/Customer Service Group Leader, the Sales team and two members of the Back-office/Customer Service team.

Image 5.14: the Reception area

- **The CEO office**

This is the office where the CEO of the Company is located.

Image 5.15: the CEO office

- **The Conference Room**

This is the Conference Room of the Company. The Company Advisor is sitting in that room, discussing with somebody else.

Image 5.16: the Conference room

- **The Marketing office**

In this room, the Marketing executive is situated, along with the rest of the Back-office/Customer Service team.

Image 5.17: the Marketing office

- **The Director's Office**

This is the office of the Founder of the Company, Sievert Larsson. Mr. Larsson also founded the Sievert Larsson's Scholarship Foundation, which became the base idea for the Knowledge Donor scenario.

Image 5.18: the Director's office

- **The Accounting and IT room**

This is another huge room with many offices. The IT and Accounting Departments are placed in this room.

Image 5.19: the Accounting and IT room

5.4.4 Sum-up Questions

What is this game?

It is a 3D simulation of a business environment in which the player, which is a newly hired employee, takes a virtual training regarding the company.

Why was this game created?

This game was created as an alternative method of providing the "new employee training" in an attempt to prove that SG can be used in a corporate environment for knowledge acquisition, retention and transfer.

Where does the game take place?

The game takes place in Ancoria Insurance premises.

Is this a multiplayer simulation?

No. The game is a single-player simulation.

What does the player control?

The player controls the new employee (either a man or a woman).

What does the player have to do?

The player has to navigate through the various rooms and talk to people to complete the training session. During this training session, the player will be faced with quizzes and missions that will test the knowledge gained. Successful completion of quizzes and/or missions will reward the player with money. In the end, the money will be given as a donation to Sievert Larsson's Scholarship Foundation.

How does the game end?

The game ends either when the player has successfully completed all three stages of the game or when all three lives are eliminated. A player loses a life when he fails to complete a quiz or mission. A quiz or mission is considered failed if (1) the player is not able to complete it within the given time limit or (2) the minimum amount of money for the stage is not met.

Is there a high-score list?

Yes. The top 10 donors are listed in the "Knowledge Donor" website (http://www.edugame.info)

Image 5.20: the top 10 donors

Chapter 6
Implementation and Evaluation

"Knowledge must come through action."

Sophocles

The "Knowledge Donor" game was evaluated following a qualitative research. For a period of 20 days (from 02/08/2012 until 21/08/2012) the employees of Ancoria Insurance had the chance to use the game. There was no particular schedule regarding the game usage; each employee played the game whenever he/she had some time to spare. After each play session, an interview was scheduled to get feedback from the users. The interviews were conducted in an anonymous basis. The interview session was tape recorded and later on transcribed. See Appendix A2 for a complete view of the interview data. Along with the interviews, the users were asked to fill-in a user-experience questionnaire which was based on the AttrakDiff Lite Questionnaire [35, 37]. The questionnaire measures hedonic qualities, pragmatic qualities and overall beauty and goodness

through 10 items that are presented in a 7-point bi-polar anchor scale. See Appendix A1 for a sample of the Questionnaire, together with all completed Questionnaires as supplied by the users.

The transcribed interview data were imported into the software QSR NViVO 10 (QSR International Pty Ltd) for logical analysis.

6.1   Evaluation Results

Before viewing the results of the analysis of the gathered data, let's see some information regarding the sample of interviewees:

There were 11 in-depth interviews. The users selected for the interviews were all the users that had the chance to try the game at least once; there was no particular preference either regarding sex, company position or ethnicity. Out of the 11 interviewees, 7 were Female employees and 4 were Male. Additional demographic information can be found on the following table:

Interviewee	Sex	Occupation	Country of Origin
Interviewee #1	Male	IT Manager	Cyprus
Interviewee #2	Female	Senior Developer	Cyprus
Interviewee #3	Female	Senior Developer	Iraq
Interviewee #4	Female	Backoffice / Customer Service	Sweden
Interviewee #5	Male	Company Advisor	Cyprus
Interviewee #6	Female	Office coordinator	Sweden
Interviewee #7	Male	Systems Administrator	Cyprus
Interviewee #8	Female	Marketing executive	Cyprus
Interviewee #9	Female	Backoffice / Customer Service	Sweden
Interviewee #10	Female	Backoffice / Customer Service	Sweden
Interviewee #11	Male	Senior Developer	Cyprus

Table 6.1: Interviewees demographic data

Q1: What is your level of experience with 3D games?

Not all users had previous experience with 3D games. In fact, 6 users out of 11 had no previous experience with 3D games. Only 5 had some experience and from those 5, none declared to have significant experience. Most of them had little experience. This was actually something good and also challenging for the research since it can show how well a 3D SG can work for people that had no previous experience in such environments.

	A : No previous experience with 3D games	B : Previous experience with 3D games
1 : Q1. What is your level of experience with 3D games~	6	5

Table 6.2: Interviewees level of experience with 3D games

Let's see some more detail regarding those users:

Interviewees with no previous experience with 3D games:

<Internals\\Interviews\\interviewee_01> - § 1 reference coded [0,43% Coverage]

Reference 1 - 0,43% Coverage

Next to nothing

<Internals\\Interviews\\interviewee_02> - § 1 reference coded [0,20% Coverage]

Reference 1 - 0,20% Coverage

None

<Internals\\Interviews\\interviewee_03> - § 1 reference coded [0,54% Coverage]

Reference 1 - 0,54% Coverage

No experience

<Internals\\Interviews\\interviewee_04> - § 1 reference coded [1,80% Coverage]

Reference 1 - 1,80% Coverage

None at all. I don't have any experience

<Internals\\Interviews\\interviewee_06> - § 1 reference coded [0,15% Coverage]

Reference 1 - 0,15% Coverage

None

<Internals\\Interviews\\interviewee_11> - § 1 reference coded [0,62% Coverage]

Reference 1 - 0,62% Coverage

No experience

Interviewees with previous experience with 3D games:

<Internals\\Interviews\\interviewee_05> - § 1 reference coded [1,39% Coverage]

Reference 1 - 1,39% Coverage

I've played before but many years ago

<Internals\\Interviews\\interviewee_07> - § 1 reference coded [0,27% Coverage]

Reference 1 - 0,27% Coverage

Basic

<Internals\\Interviews\\interviewee_08> - § 1 reference coded [0,35% Coverage]

Reference 1 - 0,35% Coverage

Familiar

<Internals\\Interviews\\interviewee_09> - § 1 reference coded [0,51% Coverage]

Reference 1 - 0,51% Coverage

Not so much

<Internals\\Interviews\\interviewee_10> - § 1 reference coded [0,33% Coverage]

Reference 1 - 0,33% Coverage

Medium

So we have the following data:

Interviewee	No previous experience with 3D games	Previous experience with 3D games
#1	√	
#2	√	
#3	√	
#4	√	
#5		√
#6	√	
#7		√
#8		√
#9		√
#10		√
#11	√	

Table 6.3: interviewees' replies to Question #1

Let's see the answers to Questions 7 and 8 and see if we can draw some conclusions:

Q7: How many times did you play the game?

	A : Q7. How many times did you play the game~
1 : Played the game 2-3 times	6
2 : Played the game more than 3 times	1
3 : Played the game once	4

Table 6.4: replies to Question #7

Let's see how many times each interviewee played in some more detail:

Interviewees that played the game 2-3 times:

<Internals\\Interviews\\interviewee_02> - § 1 reference coded [2,29% Coverage]

Reference 1 - 2,29% Coverage

Two. Once until the end and once until stage 2

<Internals\\Interviews\\interviewee_04> - § 1 reference coded [0,40% Coverage]

Reference 1 - 0,40% Coverage

2-3 times

<Internals\\Interviews\\interviewee_05> - § 1 reference coded [0,19% Coverage]

Reference 1 - 0,19% Coverage

Twice

<Internals\\Interviews\\interviewee_08> - § 1 reference coded [0,22% Coverage]

Reference 1 - 0,22% Coverage

Twice

<Internals\\Interviews\\interviewee_09> - § 1 reference coded [0,32% Coverage]

Reference 1 - 0,32% Coverage

2 times

<Internals\\Interviews\\interviewee_10> - § 1 reference coded [0,39% Coverage]

Reference 1 - 0,39% Coverage

2 times

Interviewees that played the game more than 3 times:

<Internals\\Interviews\\interviewee_03> - § 1 reference coded [0,78% Coverage]

Reference 1 - 0,78% Coverage

I played it 5 times

Interviewees that played the game only one time:

<Internals\\Interviews\\interviewee_01> - § 1 reference coded [0,26% Coverage]

Reference 1 - 0,26% Coverage

Only once

<Internals\\Interviews\\interviewee_06> - § 1 reference coded [0,11% Coverage]

Reference 1 - 0,11% Coverage

One

<Internals\\Interviews\\interviewee_07> - § 1 reference coded [0,16% Coverage]

Reference 1 - 0,16% Coverage

One

<Internals\\Interviews\\interviewee_11> - § 1 reference coded [0,14% Coverage]

Reference 1 - 0,14% Coverage

One

So we have the following data:

Interviewee	Player 2-3 times	Played more than 3 times	Played only one time
#1			√
#2	√		
#3		√	
#4	√		
#5	√		
#6			√
#7			√
#8	√		
#9	√		
#10	√		
#11			√

Table 6.5: interviewees' replies to Question #7

Q8: Would you play it again? Why?

	A : Q8. Would you play it again~ Why~
1 : Will not play again	5
2 : Will play again	6

Table 6.6: replies to Question #8

Let's see the results in more detail:

Interviewees who are not likely to play the game again:

<Internals\\Interviews\\interviewee_04> - § 1 reference coded [1,84% Coverage]

Reference 1 - 1,84% Coverage

No, it's not my type. Not my kind of game

<Internals\\Interviews\\interviewee_06> - § 1 reference coded [0,07% Coverage]

Reference 1 - 0,07% Coverage

No

<Internals\\Interviews\\interviewee_08> - § 1 reference coded [1,62% Coverage]

Reference 1 - 1,62% Coverage

I prefer one-on-one so I would say no

<Internals\\Interviews\\interviewee_10> - § 1 reference coded [1,73% Coverage]

Reference 1 - 1,73% Coverage

I'm not into this kind of games

<Internals\\Interviews\\interviewee_11> - § 1 reference coded [1,91% Coverage]

Reference 1 - 1,91% Coverage

No. I already know the information given

Interviewees who are likely to play the game again:

<Internals\\Interviews\\interviewee_01> - § 1 reference coded [0,09% Coverage]

Reference 1 - 0,09% Coverage

Yes

<Internals\\Interviews\\interviewee_02> - § 1 reference coded [1,29% Coverage]

Reference 1 - 1,29% Coverage

Yes I'd like to play again

<Internals\\Interviews\\interviewee_03> - § 1 reference coded [0,12% Coverage]

Reference 1 - 0,12% Coverage

Yes

<Internals\\Interviews\\interviewee_05> - § 1 reference coded [0,45% Coverage]

Reference 1 - 0,45% Coverage

Yes why not?

<Internals\\Interviews\\interviewee_07> - § 1 reference coded [0,16% Coverage]

Reference 1 - 0,16% Coverage

Yes

<Internals\\Interviews\\interviewee_09> - § 1 reference coded [0,23% Coverage]

Reference 1 - 0,23% Coverage

Maybe

And the sum-up table:

Interviewee	Are not likely to play the game again	Are more likely to play the game again
#1		√
#2		√
#3		√
#4	√	
#5		√
#6	√	
#7		√
#8	√	
#9		√
#10	√	
#11	√	

Table 6.7: interviewees' replies to Question #8

From all these data that were just presented in detail we can notice the following:

- From the users who had previous experience with 3D games, 4 out of 5 played the game several times. Only one person played the game just one time, but that person declared that will play the game again.

- Half of the users who had no previous experience with 3D games played the game just one time. The rest played several times. One of those users who had no previous experience and played only one time, declared that will play the game again.

So, one can conclude that 80% of the users that had no previous experience what so ever with a 3D SG found the experience *motivating* enough to play and/or plan to play several times. This means that indeed a 3D SG can be a motivating tool for employees. The users who were familiar with 3D gaming played –as expected- the game several times.

Q3: Did you reach the end of the game? If not, up to which stage did you go?

	A : Q3. Did you reach the end of the game˜ If not, up to which stage did you go˜
1 : Reached stage 1	1
2 : Reached stage 2	4
3 : Reached the end of the game	6

Table 6.8: replies to Question #3

More than half of the users managed to finish all three stages of the game. Only one user stayed up to stage 1, the rest went up to stage 2. Looking at the previous tables, one can see an impressive 83,33% of the users with no 3D gaming experience to be among the ones that finished the game! 5 out of 6 "amateurs" reached the end of the game; the other one reached up to stage 2. That could be perceived in several ways. It could be said that the gaming experience was easy enough to reach to the end (even without previous experience) and if we take into consideration the motivational conclusion from previous findings, it could be an indication that this SG would be an "attractive" tool for an employee to use.

One important aspect of this interview research was to see whether it is possible to use that particular SG to create, retain or transfer knowledge.

Q5: Did you learn anything that you didn't already know? If yes, can you specify?

	A : Q5. Did you learn anything that you didn't already know~ If yes, can you specify~
1 : Did not learn anything new	7
2 : Learned new things	3
3 : Refreshed memory for some things	2

Table 6.9: replies to Question #5

Most of the users stated that they didn't learn anything new using the 3D SG. This might sound disappointing but we need to take into consideration another parameter: the replies to Question #2 which asks "How long ago did you go through the new employee training?"

But first, let's see in detail who learned new things and who didn't:

Interviewees that did not learn anything new:

<Internals\Interviews\interviewee_01> - § 1 reference coded [0,06% Coverage]

Reference 1 - 0,06% Coverage

No

<Internals\Interviews\interviewee_04> - § 1 reference coded [1,21% Coverage]

Reference 1 - 1,21% Coverage

I didn't learn anything new

<Internals\Interviews\interviewee_05> - § 1 reference coded [4,51% Coverage]

Reference 1 - 4,51% Coverage

Not really because of the year I've been with the company and the positions I held, I was quite familiar with the things

<Internals\Interviews\interviewee_06> - § 1 reference coded [0,07% Coverage]

Reference 1 - 0,07% Coverage

No

<Internals\Interviews\interviewee_08> - § 1 reference coded [0,09% Coverage]

Reference 1 - 0,09% Coverage

No

<Internals\Interviews\interviewee_09> - § 1 reference coded [0,09% Coverage]

Reference 1 - 0,09% Coverage

No

<Internals\Interviews\interviewee_10> - § 1 reference coded [0,11% Coverage]

Reference 1 - 0,11% Coverage

No

Interviewees that learned new things:

<Internals\\Interviews\\interviewee_02> - § 1 reference coded [4,48% Coverage]

Reference 1 - 4,48% Coverage

Ok, as IT we don't really know much about fund risks, that was new. And it was interesting

<Internals\\Interviews\\interviewee_03> - § 1 reference coded [4,45% Coverage]

Reference 1 - 4,45% Coverage

The facts about the funds and the risks. I just knew that they existed on the website but I didn't know them

<Internals\\Interviews\\interviewee_07> - § 1 reference coded [2,56% Coverage]

Reference 1 - 2,56% Coverage

Some things about the products and policy types

Interviewees that refreshed their memory:

<Internals\\Interviews\\interviewee_01> - § 1 reference coded [3,07% Coverage]

Reference 1 - 3,07% Coverage

I refreshed my memory especially for the products of the company; they are so many that you usually forget

<Internals\\Interviews\\interviewee_11> - § 1 reference coded [2,05% Coverage]

Reference 1 - 2,05% Coverage

Refreshed my memory on some important dates

Let's put all the data in a table:

Interviewee	Did not learn anything new	Learned new things	Refreshed memory
#1	√		√
#2		√	
#3		√	
#4	√		
#5	√		
#6	√		
#7		√	
#8	√		
#9	√		
#10	√		
#11			√

Table 6.10: interviewees' replies to Question #5

Q2: How long ago did you go through the "new employee training"?

	A : Q2. How long ago did you go through the "new employee training"~
1 : Did not go through new employee training	2
2 : Did the new employee training more than 10 years ago	3
3 : Did the new employee training more than 15 years ago	1
4 : Did the new employee training more than 5 years ago	2
5 : Did the new employee training the last 2 years	2
6 : Did the new employee training the last 5 years	1

Table 6.11: replies to Question #2

As can be seen from Table 6.11 two users did not have the "new employee training" at all. These two users have been in the company for 20 years or so and apparently this training was not a standard practice in the early years of the company. 3 users had their training more than 10 years ago, 1 had it more than 15 years ago, 2 had it more than 5 years ago and 1 had it in the last 5 years. Only 2 users had their training in the last couple of years. That means that almost ¾ of the users have been in the company for more than 5 years so it is somehow logical that most of the users declared that they "didn't learn anything new". It's because they have been in the company for a long time, they know its history, they have been dealing with the company products, routines, procedures and obviously they know the duties of their colleagues. But that's just the one side of the story. Let's see in detail the interviewees and when each one had his/her new employee training:

Interviewees that did not go through the "new employee training":

<Internals\\Interviews\\interviewee_02> - § 1 reference coded [2,59% Coverage]

Reference 1 - 2,59% Coverage

I didn't go through the new employee training at all

<Internals\\Interviews\\interviewee_11> - § 1 reference coded [0,81% Coverage]

Reference 1 - 0,81% Coverage

No training taken

Interviewees that had their "new employee training" more than 10 years ago:

<Internals\\Interviews\\interviewee_01> - § 1 reference coded [0,35% Coverage]

Reference 1 - 0,35% Coverage

13 years ago

<Internals\\Interviews\\interviewee_03> - § 1 reference coded [0,49% Coverage]

Reference 1 - 0,49% Coverage

12 years ago

<Internals\\Interviews\\interviewee_09> - § 1 reference coded [0,65% Coverage]

Reference 1 - 0,65% Coverage

Many years ago

Interviewees that had their "new employee training" more than 15 years ago:

<Internals\\Interviews\\interviewee_07> - § 1 reference coded [0,65% Coverage]

Reference 1 - 0,65% Coverage

16 years ago

Interviewees that had their "new employee training" more than 5 years ago:

<Internals\\Interviews\\interviewee_05> - § 1 reference coded [0,49% Coverage]

Reference 1 - 0,49% Coverage

8.5 years ago

<Internals\\Interviews\\interviewee_10> - § 1 reference coded [0,61% Coverage]

Reference 1 - 0,61% Coverage

8 years ago

Interviewees that had their "new employee training" the last 2 years:

<Internals\Interviews\interviewee_04> - § 1 reference coded [0,85% Coverage]

Reference 1 - 0,85% Coverage

About 1.5 years ago

<Internals\Interviews\interviewee_08> - § 1 reference coded [0,53% Coverage]

Reference 1 - 0,53% Coverage

2 months ago

Interviewees that had their "new employee training" the last 5 years:

<Internals\Interviews\interviewee_06> - § 1 reference coded [0,47% Coverage]

Reference 1 - 0,47% Coverage

4.5 years ago

So now the other side of the story appears. The three users that stated that they did learn new things while using the SG are the ones that have been with the company for the longest period! Interviewee #2 (who did not go through the "new employee training") has been in the company since its foundation, interviewee #3 has been in the company for 12 years and interviewee #7 has been in the company for 16 years! And even though they have been in the company for so long, still they were able to get new knowledge from the 3D SG that was introduced. Additionally, the SG was successful in refreshing (retaining) the memory of two other users, both of which have been in the company for many years.

So it is safe to conclude that <u>no matter if you are an old or a relatively new employee in an organization, there is always potential to create new knowledge through the use of an educational 3D SG</u>. And since such a tool can help in "refreshing" one's memory, it can be said that <u>it can help in the retention of knowledge within the organization</u>. If the employees retain their individual knowledge then effectively, the organization retains its organizational knowledge as well. And a 3D SG can help towards that goal.

Q6: Compared to the regular training session that you took when you joined the Company, how would you describe the training session you got through the game?

	A : Q6. Compared to the regular training session that you took when you joined the Company, how would you describe the training session you got through the game~
1 : amusing	1
2 : don't like Lara Croft-style games	1
3 : easier in the brain process	1
4 : fun	1
5 : impossible to pick up all information	1
6 : interactive	1
7 : keeps you interested	1
8 : more fun	1
9 : more informative	1
10 : more thorough	1
11 : more useful	1
12 : more user friendly	1
13 : much detail	1
14 : much faster than a regular training session	1
15 : something new	1
16 : too many rooms	1
17 : too much info	1
18 : too much information for the funds	1
19 : took a while to find everyone	1
20 : very good	1

Table 6.12: users thoughts comparing the virtual training with the traditional one

There were positive and negative responses. Starting with the negative ones the users stated the following:

- "I don't like Lara Croft-style games".

- "Impossible to pick up all information".

- "Too many rooms".

- "Too much info".

- "Too much information for the funds".

- "Took a while to find everyone".

But the positive responses were more:

- "Amusing".

- "Easier in the brain process".

- "Fun".

- "Interactive".

- "Keeps you interested".

- "More fun".

- "More informative".

- "More thorough".

- "More useful".

- "More user-friendly".

- "Much detail".

- "Much faster than a regular training session".

- "Something new".

- "Very good".

The people interviewed showed very positive attitude when asked to compare the training session they got through the SG with the traditional face-to-face one they got when they joined the company. And based on the words they used to describe the virtual training session (interactive, more user-friendly, keeps you interested, amusing etc.) the conclusion derived earlier that the SG is a motivating tool can be justified.

Q9: For someone that is completely new to the Company, do you find the training material available in the game sufficient for an introduction to the Company?

	A : Q9. For someone that is completely new to the Company, do you find the training material available in the game sufficient for an introduction to the Company~
1 : Finds the educational material insufficient for an introduction to the company	4
2 : Finds the educational material sufficient for an introduction to the company	7

Table 6.13: user replies to Question #9

Things are pretty clear here. 7 out of 11 interviewees agree that the training material of the game is sufficient for an introduction to the Company. Let's see what is the opinion of the other 4 interviewees who find the material "insufficient":

<Internals\\Interviews\\interviewee_04> - § 1 reference coded [6,43% Coverage]

Reference 1 - 6,43% Coverage

I find it too much in one go. If you could break it down into smaller bits, especially about the funds there is a lot of information to take in

<Internals\\Interviews\\interviewee_06> - § 1 reference coded [5,30% Coverage]

Reference 1 - 5,30% Coverage

I think you need more information and some of the information can be put in bullet-points. It helps me to remember better what it is put like that

<Internals\\Interviews\\interviewee_08> - § 1 reference coded [7,89% Coverage]

Reference 1 - 7,89% Coverage

The introduction to the company is good but the fund description may not be relevant for everyone (e.g. marketing or for a personal assistant). It's too much information to take on

<Internals\\Interviews\\interviewee_09> - § 1 reference coded [21,44% Coverage]

Reference 1 - 21,44% Coverage

No. It was very confusing to find the people you should talk to. Too much time was spent on walking around and getting lost. Maybe there should be names on the doors, names on the departments etc. to easier find the way. Proper introductions for each person, which department they work in and little information about the job they do. The information about the company and the history were good but the fund information was too much to apprehend for a new employee

There were several thoughts here. Interviewee #4 found the training material "too much in one go". This might be the case but then again, one of the finest advantages of the training through the game compared to the traditional method, is the fact that the employees can take the training as many times as they want, whenever they want, for as long as they want. Therefore the fact that the training material is "too much for one go" shouldn't be a reason to find the overall training material "insufficient".

Interviewee #8 found some of the educational material irrelevant based on her position within the company. Again, this should not be a negative factor for the SG training. In the traditional face-to-face training, everybody is briefly educated about everything. The SG follows the same concept.

Q14: Do you think such a game could be used for future employee trainings in the Company?

	A : Q14. Do you think such a game could be used for future employee trainings in the Company~
1 : Believes the game can be used for future employee trainings	8
2 : Believes the game can be used for future employee trainings with some modifications	3
3 : Believes the game cannot be used for future employee trainings	0

Table 6.14: user replies to Question #14

None of the interviewees believes that the game cannot be used for future employee trainings in the Company. All of them agree that it could be used; some believe that it needs some modifications but most of them find it suitable as it is.

Q11: If you had to do the "new employee training" again, would you choose the traditional face-to-face training or the virtual one? Why?

	A : Q11. If you had to do the "new employee training" again, would you choose the traditional face-to-face training or the virtual one~ Why~
1 : Prefers combination of virtual and face-to-face	3
2 : Prefers face-to-face training	5
3 : Prefers virtual training	3

Table 6.15: user replies to Question #11

Although the interviewees up to this point gave positive feedback about their gaming experience and found the training material of the SG sufficient for corporate training, the replies to this particular question are awkward. Almost half of the users state that they prefer face-to-face training. Only 3 out of 11 prefer the virtual training and 3 other users tend to prefer a combination of the two methods. Let's see why:

I think the face-to-face training can be minimized because you need the face-to-face experience, I don't believe we can replace all the human interaction. I think when somebody comes in, it's good to go around to meet the people and get acquainted with everybody, but yes, for more elaborate training and refreshing the game is really good. I think there should be a combination of the two methods

I would say a combination. I think it can be done by a combination. It's very useful but I also think that to some extend you also need the personal touch with certain colleagues and managers

Depends on the job you will be doing

Interviewee #1 believes that face-to-face interaction is needed because it's good for the newcomer to go around and get acquainted with everybody. The interviewee believes though, that "for more elaborate training and refreshing the game is really good". Interviewee #9 states that it depends on the job you will be doing. In other words, training for some employees could be done through the game, while for others personal experience is better suited. It's not easy to just replace the training procedure; combining the two methods and offering them as training mediums that complement each other might be a good start for future sole training gaming experience.

6.2 User experience (UX) Data Analysis

Apart from the personal interviews, the employees that used the game were given user-experience questionnaires to fill-in. The questionnaires were based on the AttrakDiff Lite Questionnaire, a shortened version of the AttrakDiff2 Questionnaire [35, 37]. A sample of the questionnaire can be found in Appendix A-1 along with all the completed questionnaires submitted by the users.

The questionnaire contains 10 items presented on a 7-point bi-polar anchor scale ranging from 1 to 7. There are four dimensions defined in AttrakDiff questionnaire and each of these dimensions contains a number of items used for evaluating user experience:

- **Pragmatic Quality Anchors**

  UX1.   Confusing – Clearly Structured

  UX2.   Predictable – Unpredictable

  UX3.   Complicated – Simple

  UX4.   Impractical – Practical

- **Hedonic Quality – Identification Anchors**

  UX5.   Tacky – Stylish

  UX6.   Cheap - Premium

- **Hedonic Quality – Stimulation Anchors**

  UX7.   Dull – Captivating

  UX8.   Unimaginative – Creative

- **Overall Appeal**

  UX9.   Bad – Good

  UX10.   Ugly – Beautiful

The Descriptive Statistics are shown in the table that follows:

Descriptive Statistics

	N	Min	Max	Mean	Std. Deviation
UX1	11	1	7	4,5455	2,01810
UX2	11	3	7	5,0909	1,22103
UX3	11	2	7	4,9091	1,81409
UX4	11	1	6	4,8182	1,66242
UX5	11	4	7	5,0000	1,00000
UX6	11	3	6	4,6364	0,80904
UX7	11	2	7	5,0000	1,48324
UX8	11	2	7	5,3636	1,43337
UX9	11	4	7	5,5455	1,03573
UX10	11	3	6	4,9091	1,04447
Valid N (listwise)	11				

Table 6.16: Descriptive Statistics for UX questionnaires

The Descriptive Statistics shown in Table 6.16 can help come to some conclusions regarding the UX evaluation of the game. First of all, UX1 in the above table shows the smallest mean value (4,5455). Even though most of the users gave a mark towards the "Clearly Structured" option, some users found the game "Confusing" and that kept UX1 mean value at a low level. Above the average value but still low compared to the rest. This is somehow justified since most of the users had no previous experience with 3D games. Some didn't have experience with games at all. So, it's no surprise that a few of them did indeed find the 3D experience confusing.

"For me as a person who has never ever played any computer or TV game, it was difficult. I felt stressed and had difficulties moving my player and got confused where to go and what to do." (Interviewee #6)

"It was very confusing to find the people you should talk to. Too much time was spent on walking around and getting lost". (*Interviewee* #9)

UX9 has the highest mean value (5,5455). The minimum mark given by the users was 4 and the maximum was 7 (the highest possible mark). That gives a clear indication that the users found the game to be "Good". This was the main feeling that came out of the individual interviews anyway.

The fact that the users played the game several times and they did find it fun, interesting and challenging shows that it was a "good" game.

"I'd like to play again because I enjoyed it." (Interviewee #2)

"It was fun and I learned things about the funds that I didn't know." (Interviewee #2)

"It is very good as a refreshing tool." (Interviewee #1)

UX3 has a relatively high mean value. So, even though some users found the game "confusing", it appears that most of them also found it "simple". This might sound awkward but this is the conclusion that comes out taking into consideration both the users' UX questionnaires and their respective interviews.

"It was simple, straightforward." (Interviewee #5)

Interviewee #3 had no previous experience with games but yet played the game 5 times and managed to reach the end without spending too much time. So we could assume that the user found the game "simple" enough, not just because the user stated that in the UX questionnaire but also by some opinions expressed during the interview.

"No experience." (Interviewee #3)

"I reached to the end." (Interviewee #3)

"I played it five times." (Interviewee #3)

UX7 statistics also give a high mean value. That means that most of the users found the game "captivating". The game seems to have kept the users' interest at a high level and was motivating enough. Again, this is also shown from the users' comments during their interviews:

"I think the training session is more fun to follow up rather than have somebody just talking to you, especially if it's a long conversation" (Interviewee #1)

Interviewee #2 when asked if she learned anything new using the game stated: *"Ok, as IT we don't really know much about fund risks, that was new. And it was interesting."*

Interviewee #3 was motivated because of the "challenge" found in the game. When asked if she would play the game again, the answer given was: *"Yes because I like the challenge to get everything right"*. Interviewee #7's answer to the same question was: *"Yes, to try to reach the next level"* and the respective answer from Interviewee #9 was: *"Maybe, to get to the end/last stage"*.

These results (UX7) are also related with the results for UX8. Most of the users found the game to be "creative". If a game is creative, simple, unpredictable (that's what the statistics for UX2 show) and good, then most probably it will be captivating for the users.

6.3 Summary of findings

This research was conducted to examine if a 3D SG can be used in a corporate environment for educational purposes. And also to see how the users compare it with a respective traditional educational process. A specific employee training process of an Insurance Company was taken as a basis. The 3D SG that was developed provided an alternative way of conducting the "new employee" training routine. The users that experimented with the game had already taken the "traditional" employee training some recently and others years ago. Most of the users had no previous experience with 3D Games.

The feedback given by the users revealed a positive approach towards this "new technology" and a great interest in playing the game. Even though most of the users declared that they didn't learn anything new through the game, there are users who have been working for the Company for 20 years or so that did learn new things. Also, there were users that mentioned that the game helped them refresh their memory regarding certain things. All of the users agreed that the SG could be used for future employee training sessions in the Company but when asked if they would choose it over the traditional face-to-face training session, almost half of the interviewed users supported the use of the face-to-face method. The rest either prefer the virtual training session or are in favour of the two methods being used together.

The users also reported some problems. Due to the lack of previous experience, either with 3D games or with computer games in general, some users stated that they found it difficult to move

around in the 3D world. Some of them also experienced situations where their avatar was stuck. Another thing reported by many users was the fact that the educational content that had to do with the company products (stage 2) was too much to absorb. Indeed, the information for the funds is too much and of course nobody is expected to absorb all that information in one go. The main advantage of this educational game is that the users can access it and play it as many times as they want and whenever they want. Therefore, they could refer to that huge amount of fund information whenever they need to refresh their memory.

During the interviews, the users where asked to describe the educational content of each of the three stages of the game. Most of the users interpreted the question as "tell me what you learned on each stage" and mentioned that the first stage was about the history of the company, the second stage about the products and the third stage about the personnel.

"The first one talked about the history of the company. Then the products of the company was really very informative, it's something that is good for people, it's good for us to have and for people to be able to educate themselves and refresh themselves because you really hear it all at once and then you forget. It is very good as a refreshing tool. It then described all the departments clearly, what each department is doing, what every person is doing in the department." (Interviewee #1)

"First stage is about the history of the company, second stage is about the products and the marketing and the third stage is about the staff's duties." (Interviewee #2)

"Stage 1 is about the company, stage 2 is about the products." (Interviewee #9)

Some users though, interpreted the question as "tell me how you found the educational content of the three stages" and expressed their thoughts or concerns regarding the educational content and even some suggestions to improve it.

"The information Daniel was giving regarding our products was difficult and a bit boring to read. I would like to have more info what each person is doing. Where they are sitting, for example this person is working with that person and her office is on floor 1 in the second office on your left as you are coming up the stairs. That would help me as a new employee to easier remember who is who, what they are doing and where their office are." (Interviewee #6)

"Too much info when it comes to products." (Interviewee #7)

"If find its too much information especially for the funds. As a marketing person I will never have to deal with a client or recommend a fund to him. Also we are not meant to give advice as to what funds are suited for the investor. We can present our funds but not recommend pick A over B." (Interviewee #8)

This "misunderstanding" of the specific question was not necessarily bad; it gave the opportunity to the users to express their feelings regarding the educational part of the game they played and also it was a good way to verify that the 3 main educational areas (history of the company, company products and company personnel) were clearly indentified in the game's context.

Even though the game was used by users which have been in the organization for a relatively long time, there were users that reported that the SG helped them learn things that were new to them. Some others reported that the SG was a good tool to refresh their memory for things that they had forgotten. In general, the users found the SG fun, interesting and motivational and all of them agreed that it can be used as part of the "new employee training" procedure that exists in the organization. Bottom line is that with the use of the 3D SG, the employees of the organization were able to *create new knowledge*. And the fact that the game can be used to refresh the employees' memory, one can say that it's a good tool to *retain knowledge* in the organization.

6.4 Limitations

This research tried to examine whether a 3D SG can be used for knowledge creation, retention and transfer. By having an insurance Company as the testing corporate environment and 11 in-depth interviews with the organization's employees who tested the game, the study tried to come to some conclusions. However, there were some limitations that should be taken into consideration. The sample of 11 people might be small to generalize the findings and draw more generic results. It is however an indicative population that should be enough to point us to the right direction as far as the research outcomes are concerned. The empirical study took place at a period where most of the employees of the company were on summer vacation (August) so the user sample was rather small.

Another important limitation is the duration of the empirical study. The empirical study was limited to 20 days since there was a strict plan and specific deadlines for the completion of the study. If it was feasible to allocate more time on the empirical study, the user experience might be different and the findings could be different as well. Additionally, the limited time didn't allow for analytical requirements and specifications with the help of the users. If there was enough time and resources for that, then the acceptance and the effectiveness of the game could be even greater.

Chapter 7

Conclusions and Future Research

"Play is not only our creative drive; it's a fundamental mode of learning."

David Elkind

7.1 Conclusions

Based on the user interviews and the data analysis that followed the following conclusions were extracted:

- A 3D SG is a highly motivational tool for employees.

- A 3D SG can help organizational members retain in their memory knowledge that they acquired long time ago.

- A 3D SG can be used for corporate education and no matter how "old" or "new" an employee is, there is always potential for creating new knowledge.

The empirical findings of this study tend to match other research in the field of games as educational tools. Ricci et al. [68] provided empirical evidence that games can improve knowledge acquisition and retention. Garris et al. [30] argued that well-designed games can be valuable learning tools because they motivate learners to participate in extensive practice of targeted skills in a system that requires learners to engage in both repetitive and decision-making processes. Gaudart [31] also agrees that games increase learner's motivation. Finally, Garris et al. [30] reported the relation between games and experiential learning in their model of the game cycle, in which the learners' repeated interaction with the game environment facilitates learning.

Based on the empirical findings of this research and in relation with other research in the same field, a final conclusion can be drawn and the initial research questions can be answered as follows:

1. A 3D SG can be developed and used as a tool for organizational learning purposes.

2. A 3D SG is an effective tool for corporate education and knowledge management.

3. The users found the gaming experience motivating and interesting and they all agreed that such a game can be used for future training sessions. The users see the game as a good complementary method to the existing face-to-face training procedure that is currently in use in the company.

7.2 Future Research

This research came to some conclusions (as discussed above) based on an empirical study and having a real-life organizational procedure as basis for the educational aspect of the SG that was developed.

Future research and experimentation could provide with more accurate and solid results both regarding the acceptance of a SG as an educational tool by the employees of an organization and also the effectiveness of such a tool on knowledge creation, retention and transfer. Future research could be conducted with a larger testing sample and for a longer period of time. If the game becomes a part of the organization's processes for a larger period of time, the employees could be less reluctant in using the game over the traditional "manual" training process. Additionally the game could be designed in such a way as to meet the expectations and needs of the majority of the employees. That would provide significant change in the acceptance attitude of the users.

This game was intended mainly for the training of *new employees* that join the organization. The users that were asked to test and evaluate it were not new employees; they were existing employees with several years of employment history. As a future research target, the game could be tested with completely new employees in an organization to see in action the educational effects of it and whether it is effective in creating new knowledge to the new employee.

Finally, the game could be seen from another perspective and be designed to work in a Virtual World environment with simultaneous access of users, having the trainers' avatars being controlled by actual employees in real time to examine the social effects of such a game regarding corporate training and education.

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Appendix A

"Ease of use may be invisible, but its absence sure isn't."

IBM

A.1 User-experience Questionnaire

This is the structure of the Questionnaire used for the retrieval of feedback regarding the user-experience:

Following are pairs of characteristic for the game you will play.
Try to give a quick answer even if some of them don't seem to perfectly apply to the game. Remember that there is no right or wrong answer; you just express your subjective opinion (one answer for each question).

Please mark with a √ the choice that best expresses you.

	1	2	3	4	5	6	7	
Confusing								Clearly structured
Predictable								Unpredictable
Complicated								Simple
Impractical								Practical
Tacky								Stylish
Cheap								Premium
Dull								Captivating
Unimaginative								Creative
Bad								Good
Ugly								Beautiful

And these are all the user-experience Questionnaires as filled-in by the users of the game:

User #01

	1	2	3	4	5	6	7	
Confusing						√		Clearly structured
Predictable					√			Unpredictable
Complicated						√		Simple
Impractical						√		Practical
Tacky							√	Stylish
Cheap						√		Premium
Dull							√	Captivating
Unimaginative							√	Creative
Bad							√	Good
Ugly						√		Beautiful

User #02

	1	2	3	4	5	6	7	
Confusing						√		Clearly structured
Predictable						√		Unpredictable
Complicated						√		Simple
Impractical						√		Practical
Tacky					√			Stylish
Cheap					√			Premium
Dull						√		Captivating
Unimaginative						√		Creative
Bad						√		Good
Ugly					√			Beautiful

User #03

	1	2	3	4	5	6	7	
Confusing						√		Clearly structured
Predictable					√			Unpredictable
Complicated					√			Simple
Impractical						√		Practical
Tacky					√			Stylish
Cheap					√			Premium
Dull						√		Captivating
Unimaginative							√	Creative
Bad							√	Good
Ugly						√		Beautiful

User #04

	1	2	3	4	5	6	7	
Confusing	√							Clearly structured
Predictable							√	Unpredictable
Complicated		√						Simple
Impractical	√							Practical
Tacky				√				Stylish
Cheap				√				Premium
Dull			√					Captivating
Unimaginative					√			Creative
Bad				√				Good
Ugly				√				Beautiful

User #05

	1	2	3	4	5	6	7	
Confusing							√	Clearly structured
Predictable					√			Unpredictable
Complicated							√	Simple
Impractical						√		Practical
Tacky						√		Stylish
Cheap					√			Premium
Dull						√		Captivating
Unimaginative						√		Creative
Bad						√		Good
Ugly						√		Beautiful

User #06

	1	2	3	4	5	6	7	
Confusing		√						Clearly structured
Predictable					√			Unpredictable
Complicated			√					Simple
Impractical				√				Practical
Tacky				√				Stylish
Cheap					√			Premium
Dull						√		Captivating
Unimaginative						√		Creative
Bad						√		Good
Ugly				√				Beautiful

User #07

	1	2	3	4	5	6	7	
Confusing						√		Clearly structured
Predictable				√				Unpredictable
Complicated							√	Simple
Impractical						√		Practical
Tacky				√				Stylish
Cheap					√			Premium
Dull					√			Captivating
Unimaginative				√				Creative
Bad					√			Good
Ugly					√			Beautiful

User #08

	1	2	3	4	5	6	7	
Confusing					√			Clearly structured
Predictable							√	Unpredictable
Complicated			√					Simple
Impractical				√				Practical
Tacky					√			Stylish
Cheap				√				Premium
Dull					√			Captivating
Unimaginative					√			Creative
Bad					√			Good
Ugly					√			Beautiful

User #09

	1	2	3	4	5	6	7	
Confusing				√				Clearly structured
Predictable				√				Unpredictable
Complicated			√					Simple
Impractical			√					Practical
Tacky					√			Stylish
Cheap				√				Premium
Dull				√				Captivating
Unimaginative					√			Creative
Bad					√			Good
Ugly				√				Beautiful

User #10

	1	2	3	4	5	6	7	
Confusing		√						Clearly structured
Predictable			√					Unpredictable
Complicated						√		Simple
Impractical					√			Practical
Tacky				√				Stylish
Cheap			√					Premium
Dull		√						Captivating
Unimaginative		√						Creative
Bad				√				Good
Ugly			√					Beautiful

User #11

	1	2	3	4	5	6	7	
Confusing					√			Clearly structured
Predictable					√			Unpredictable
Complicated						√		Simple
Impractical						√		Practical
Tacky						√		Stylish
Cheap					√			Premium
Dull					√			Captivating
Unimaginative						√		Creative
Bad						√		Good
Ugly						√		Beautiful

A.2 In-depth User Interviews

A.2.1 Interview Questions

The questions used for the in-depth interviews that were conducted after the users played the game were the following:

Q01.   What is your level of experience with 3D games?

Q02.   How long ago did you go through the "new employee training"?

Q03.   Did you reach the end of the game? If not, up to which stage did you go?

Q04.   Describe the educational content of each stage.

Q05.   Did you learn anything that you didn't already know? If yes, can you specify?

Q06.   Compared to the regular training session that you took when you joined the Company, how would you describe the training session you got through the game?

Q07.   How many times did you play the game?

Q08.   Would you play it again? Why?

Q09.   For someone that is completely new to the Company, do you find the training material available in the game sufficient for an introduction to the Company?

Q10.   How much time did you spend on the game?

Q11.   If you had to go through the "new employee training" again, would you choose the traditional face-to-face training or the virtual one? Why?

Q12.   Can you specify the things that you liked the most in the game?

Q13.   Can you specify the things that you didn't like in the game?

Q14.   Do you think such a game could be used for future employee trainings in the Company?

A.2.2   User Answers

Interviewee #01

Q01. What is your level of experience with 3D games?

Next to nothing.

Q02. How long ago did you go through the "new employee training"?

13 years ago.

Q03. Did you reach the end of the game? If not, up to which stage did you go?

Yes, I reached the end of the game.

Q04. Describe the educational content of each stage

The first one talked about the history of the company. Then the products of the company was really very informative, it's something that is good for people, it's good for us to have and for people to be able to educate themselves and refresh themselves because you really hear it all at once and then you forget. It is very good as a refreshing tool. It then described all the departments clearly, what each department is doing, what every person is doing in the department.

Q05. Did you learn anything that you didn't already know? If yes, can you specify?

No, but I refreshed my memory especially for the products of the company; they are so many that you usually forget.

Q06. Compared to the regular training session that you took when you joined the Company, how would you describe the training session you got through the game?

I think the training session is more fun to follow up rather than have somebody just talking to you, especially if it's a long conversation -if I take for example the part of the Funds- you get tired. While, when you are playing a game you do something interactive and keeps you more interested.

Q07. How many times did you play the game?

Only once.

Q08. Would you play it again? Why?

Yes. I will play it when I need refreshing or when there is new things to learn, provided it's been updated all the time.

Q09. For someone that is completely new to the Company, do you find the training material available in the game sufficient for an introduction to the Company?

Yes, the material is sufficient for somebody that comes in.

Q10. How much time did you spend on the game?

2 hours.

Q11. If you had to do the "new employee training" again, would you choose the traditional face-to-face training or the virtual one? Why?

I think the face-to-face training can be minimized because you need the face-to-face experience, I don't believe we can replace all the human interaction. I think when somebody comes in, it's good to go around to meet the people and get acquainted with everybody, but yes, for more elaborate training and refreshing the game is really good. I think there should be a combination of the two methods.

Q12. Can you specify the things that you liked the most in the game?

The quizzes I think is one of the things that you don't have in the regular training to see if somebody grasps the information. When you are talking to somebody, he is listening but you don't know how much they absorbed or what they did. But when you have the quizzes the other person knows it and pays more attention and then you have a more effective –I believe- session in that way.

Q13. Can you specify the things that you didn't like in the game?

I don't think there is anything I didn't like. The only thing I think that I lacked was the experience to play these games. At first I thought maybe if I had a sign to find out where everybody is and spend less time on that, but then again this is what games are all about, to find things and keep interested.

Q14. Do you think such a game could be used for future employee trainings in the Company?

Yes I think it can be used.

Interviewee #02

Q01. What is your level of experience with 3D games?

None.

Q02. How long ago did you go through the "new employee training"?

I didn't go through the new employee training at all.

Q03. Did you reach the end of the game? If not, up to which stage did you go?

I reached the end.

Q04. Describe the educational content of each stage

First stage is about the history of the company, second stage is about the products and the marketing and the third stage is about the staff's duties.

Q05. Did you learn anything that you didn't already know? If yes, can you specify?

Ok, as IT we don't really know much about fund risks, that was new. And it was interesting.

Q06. Compared to the regular training session that you took when you joined the Company, how would you describe the training session you got through the game?

N/A

Q07. How many times did you play the game?

Two. Once until the end and once until stage 2.

Q08. Would you play it again? Why?

Yes I'd like to play again because I enjoyed it.

Q09. For someone that is completely new to the Company, do you find the training material available in the game sufficient for an introduction to the Company?

For an introduction, yes. They'll need to know more about the systems and that kind of things but that comes later.

Q10. How much time did you spend on the game?

1 hour.

Q11. If you had to do the "new employee training" again, would you choose the traditional face-to-face training or the virtual one? Why?

I think both would be useful. If I had to choose, I would choose the game because you have time to play it again and digest the information.

Q12. Can you specify the things that you liked the most in the game?

It was fun and I learned things about the funds that I didn't know.

Q13. Can you specify the things that you didn't like in the game?

The fact that I had to start again when I got stuck at some point.

Q14. Do you think such a game could be used for future employee trainings in the Company?

Yes, definitely!

Interviewee #03

Q01. What is your level of experience with 3D games?

No experience.

Q02. How long ago did you go through the "new employee training"?

12 years ago.

Q03. Did you reach the end of the game? If not, up to which stage did you go?

I reached to the end.

Q04. Describe the educational content of each stage

On the first stage it was about the history of the company, the second one is about the products, the funds, the types of policies and the marketing. The third is about the individuals, the people, their duties and the employees of the company.

Q05. Did you learn anything that you didn't already know? If yes, can you specify?

The facts about the funds and the risks. I just knew that they existed on the website but I didn't know them.

Q06. Compared to the regular training session that you took when you joined the Company, how would you describe the training session you got through the game?

The training session that I got through the game was very good about the products, the funds and stuff. I didn't get so much detail when I was trained when I came to the company. Maybe because I'm an IT person. So this was more informative than what I got 12 years ago.

Q07. How many times did you play the game?

I played it 5 times.

Q08. Would you play it again? Why?

Yes because I like the challenge to get everything right.

Q09. For someone that is completely new to the Company, do you find the training material available in the game sufficient for an introduction to the Company?

Yes definitely.

Q10. How much time did you spend on the game?

About half an hour each time.

Q11. If you had to do the "new employee training" again, would you choose the traditional face-to-face training or the virtual one? Why?

I think this virtual one because I can always go back and remind myself.

Q12. Can you specify the things that you liked the most in the game?

My favourite part in the game was the talking to the customer and selecting one answer for him. Because that one was long, it was good. It was a risk, it was more high risk.

Q13. Can you specify the things that you didn't like in the game?

The only thing that I didn't like is that if you want to stop it then you have to start again when it comes to collecting money to donate. Other than that I think the game is perfect.

Q14. Do you think such a game could be used for future employee trainings in the Company?

Yes, I believe so.

<u>**Interviewee #04**</u>

Q01. What is your level of experience with 3D games?

None at all. I don't have any experience.

Q02. How long ago did you go through the "new employee training"?

About 1.5 years ago.

Q03. Did you reach the end of the game? If not, up to which stage did you go?

No I didn't. I finished the first stage but then I ran out of time.

Q04. Describe the educational content of each stage

The first stage was about the foundation of the company, the start of it and the history and then the funds.

Q05. Did you learn anything that you didn't already know? If yes, can you specify?

I didn't learn anything new.

Q06. Compared to the regular training session that you took when you joined the Company, how would you describe the training session you got through the game?

If we talk about the training, how can I say…I'm more of a people's person. I do like games but not that kind of games. I don't like the "Lara Croft" games and I find that very similar.

Q07. How many times did you play the game?

2-3 times.

Q08. Would you play it again? Why?

No, it's not my type. Not my kind of game.

Q09. For someone that is completely new to the Company, do you find the training material available in the game sufficient for an introduction to the Company?

I find it too much in one go. If you could break it down into smaller bits, especially about the funds there is a lot of information to take in.

Q10. How much time did you spend on the game?

Half an hour each time.

Q11. If you had to do the "new employee training" again, would you choose the traditional face-to-face training or the virtual one? Why?

It wouldn't be my choice to learn the educational bits on a game like that.

Q12. Can you specify the things that you liked the most in the game?

Finding all the characters.

Q13. Can you specify the things that you didn't like in the game?

I got lost all of the time. So in my opinion it would be better to have let's say one reception and all the doors around it. And because I'm not used to the walking I walked into the wall many times.

Q14. Do you think such a game could be used for future employee trainings in the Company?

Yes, I think so. But as I already said, I still prefer the face-to-face.

Interviewee #05

Q01. What is your level of experience with 3D games?

I've played before but many years ago.

Q02. How long ago did you go through the "new employee training"?

8.5 years ago.

Q03. Did you reach the end of the game? If not, up to which stage did you go?

I did not reach the end. I talked to John and Sievert but I didn't reach the questions, so I guess up to stage 1.

Q04. Describe the educational content of each stage

It was about the company, its history, how it started, the founders, its progress along the years and some of the key events that took place, the changing of ownership, the changing of the name, some of the key product launches that took place.

Q05. Did you learn anything that you didn't already know? If yes, can you specify?

Not really because of the year I've been with the company and the positions I held, I was quite familiar with the things.

Q06. Compared to the regular training session that you took when you joined the Company, how would you describe the training session you got through the game?

I would say it was more useful. It was more thorough and more user friendly. It's a questions and answers session so it's easier in the brain process.

Q07. How many times did you play the game?

Twice.

Q08. Would you play it again? Why?

Yes why not?

Q09. For someone that is completely new to the Company, do you find the training material available in the game sufficient for an introduction to the Company?

Definitely. For the purpose that its intended, for the introduction to the history, the background, I think it's definitely adequate.

Q10. How much time did you spend on the game?

Around 20 minutes to half an hour.

Q11. If you had to do the "new employee training" again, would you choose the traditional face-to-face training or the virtual one? Why?

I would say a combination. I think it can be done by a combination. It's very useful but I also think that to some extend you also need the personal touch with certain colleagues and managers.

Q12. Can you specify the things that you liked the most in the game?

I liked the walkthrough that the game took you through, walking through the company, talking to some colleagues, being diverted to John and Sievert. And the questions. It was simple, straightforward.

Q13. Can you specify the things that you didn't like in the game?

One thing that I didn't like is that it's a bit time consuming to walk through to go from one stage to the next. If you have time and you're not under pressure you can just relax and walk through the game.

Q14. Do you think such a game could be used for future employee trainings in the Company?

Yes I think so.

Interviewee #06

Q01. What is your level of experience with 3D games?

None.

Q02. How long ago did you go through the "new employee training"?

4.5 years ago.

Q03. Did you reach the end of the game? If not, up to which stage did you go?

Yes.

Q04. Describe the educational content of each stage

The information Daniel was giving regarding our products was difficult and a bit boring to read. I would like to have more info what each person is doing. Where they are sitting, for example this person is working with that person and her office is on floor 1 in the second office on your left as you are coming up the stairs. That would help me as a new employee to easier remember who is who, what they are doing and where their office are.

Q05. Did you learn anything that you didn't already know? If yes, can you specify?

No.

Q06. Compared to the regular training session that you took when you joined the Company, how would you describe the training session you got through the game?

Something new and it was fun to try and younger people may like this way but it is not for me.

Q07. How many times did you play the game?

One.

Q08. Would you play it again? Why?

No. For me as a person who has never ever played any computer or TV game, it was difficult. I felt stressed and had difficulties moving my player and got confused where to go and what to do.

Q09. For someone that is completely new to the Company, do you find the training material available in the game sufficient for an introduction to the Company?

I think you need more information and some of the information can be put in bullet-points. It helps me to remember better what it is put like that.

Q10. How much time did you spend on the game?

Did not take time but I played all three stages.

Q11. If you had to do the "new employee training" again, would you choose the traditional face-to-face training or the virtual one? Why?

I would prefer face-to-face, it is easier for me. I can ask questions and take notes on information that I find important.

Q12. Can you specify the things that you liked the most in the game?

It was something new for me.

Q13. Can you specify the things that you didn't like in the game?

For somebody that's never played similar games it was a bit confusing. Maybe better "help" info. On stage three my player moved over to a person and on screen I could see Talk, pressed T but nothing happened. Even when someone showed or informed my player where to go I got totally lost and got more and more confused.

Q14. Do you think such a game could be used for future employee trainings in the Company?

Yes, maybe with some changes and more as an extra information. Something new and more fun to start the training with and then go in deeper face-to-face.

Interviewee #07

Q01. What is your level of experience with 3D games?

Basic.

Q02. How long ago did you go through the "new employee training"?

16 years ago.

Q03. Did you reach the end of the game? If not, up to which stage did you go?

No. Couldn't propose the right product and lost the 3 lives.

Q04. Describe the educational content of each stage

Too much info when it comes to products.

Q05. Did you learn anything that you didn't already know? If yes, can you specify?

Some things about the products and policy types.

Q06. Compared to the regular training session that you took when you joined the Company, how would you describe the training session you got through the game?

Amusing and much faster than a regular training session.

Q07. How many times did you play the game?

One.

Q08. Would you play it again? Why?

Yes, to try to reach the next level.

Q09. For someone that is completely new to the Company, do you find the training material available in the game sufficient for an introduction to the Company?

Yes, but no information was given where each employee is working and his/her duties.

Q10. How much time did you spend on the game?

20-25 minutes.

Q11. If you had to do the "new employee training" again, would you choose the traditional face-to-face training or the virtual one? Why?

The face-to-face training, it's more personal. The game could be a follow up/revision for any new employee.

Q12. Can you specify the things that you liked the most in the game?

The radar screen, the way you could move around the office.

Q13. Can you specify the things that you didn't like in the game?

It wouldn't say places you visited before so if you don't pay attention you might end up going to the same place 2-3 times.

Q14. Do you think such a game could be used for future employee trainings in the Company?

Yes.

<u>**Interviewee #08**</u>

Q01. What is your level of experience with 3D games?

Familiar.

Q02. How long ago did you go through the "new employee training"?

2 months ago.

Q03. Did you reach the end of the game? If not, up to which stage did you go?

Reached stage 2 then failed to answer the questions.

Q04. Describe the educational content of each stage

If find its too much information especially for the funds. As a marketing person I will never have to deal with a client or recommend a fund to him.

Q05. Did you learn anything that you didn't already know? If yes, can you specify?

No.

Q06. Compared to the regular training session that you took when you joined the Company, how would you describe the training session you got through the game?

It took me a while to find everyone in the game as there were too many rooms. Personally I prefer a one on one approach as I believe especially for a new comer it is best to meet in person the people he/she will be working with.

Q07. How many times did you play the game?

Twice. And the second time I had to start all over rather than picking up from where I left off.

Q08. Would you play it again? Why?

I prefer one-on-one so I would say no.

Q09. For someone that is completely new to the Company, do you find the training material available in the game sufficient for an introduction to the Company?

The introduction to the company is good but the fund description may not be relevant for everyone (e.g. marketing or for a personal assistant). It's too much information to take on.

Q10. How much time did you spend on the game?

45 minutes.

Q11. If you had to do the "new employee training" again, would you choose the traditional face-to-face training or the virtual one? Why?

I would go with face-to-face as I feel the game alienates the staff members and it would be better to meet in person as you can joke about things, get to know other staff members.

Q12. Can you specify the things that you liked the most in the game?

It's something new.

Q13. Can you specify the things that you didn't like in the game?

Too much running around trying to find people.

Q14. Do you think such a game could be used for future employee trainings in the Company?

Maybe a shorter version, something that one could complete in 10 minutes.

Interviewee #09

Q01. What is your level of experience with 3D games?

Not so much.

Q02. How long ago did you go through the "new employee training"?

Many years ago.

Q03. Did you reach the end of the game? If not, up to which stage did you go?

Stage 2.

Q04. Describe the educational content of each stage

Stage 1 is about the company, stage 2 is about the products.

Q05. Did you learn anything that you didn't already know? If yes, can you specify?

No.

Q06. Compared to the regular training session that you took when you joined the Company, how would you describe the training session you got through the game?

Way too much information about the products at so short time. Impossible to pick up all information about the different funds.

Q07. How many times did you play the game?

2 times.

Q08. Would you play it again? Why?

Maybe, to get to the end/last stage.

Q09. For someone that is completely new to the Company, do you find the training material available in the game sufficient for an introduction to the Company?

No. It was very confusing to find the people you should talk to. Too much time was spent on walking around and getting lost. Maybe there should be names on the doors, names on the departments etc. to easier find the way. Proper introductions for each person, which department they work in and little information about the job they do. The information about the company and the history were good but the fund information was too much to apprehend for a new employee.

Q10. How much time did you spend on the game?

30-60 minutes.

Q11. If you had to do the "new employee training" again, would you choose the traditional face-to-face training or the virtual one? Why?

Depends on the job you will be doing. If you have to know about the different products etc. you need a face-to-face training.

Q12. Can you specify the things that you liked the most in the game?

It's a game.

Q13. Can you specify the things that you didn't like in the game?

All the walking and getting lost.

Q14. Do you think such a game could be used for future employee trainings in the Company?

Yes. For a brief information about the company and the history.

Interviewee #10

Q01. What is your level of experience with 3D games?

Medium.

Q02. How long ago did you go through the "new employee training"?

8 years ago.

Q03. Did you reach the end of the game? If not, up to which stage did you go?

I reached the end.

Q04. Describe the educational content of each stage

In the first stage it was about the history of the company, second stage was about the products and third one was about the people of the company.

Q05. Did you learn anything that you didn't already know? If yes, can you specify?

No.

Q06. Compared to the regular training session that you took when you joined the Company, how would you describe the training session you got through the game?

Too much information for the funds.

Q07. How many times did you play the game?

2 times.

Q08. Would you play it again? Why?

I'm not into this kind of games.

Q09. For someone that is completely new to the Company, do you find the training material available in the game sufficient for an introduction to the Company?

Yes. This is good for people that are shy and have a hard time interacting.

Q10. How much time did you spend on the game?

2 hours.

Q11. If you had to do the "new employee training" again, would you choose the traditional face-to-face training or the virtual one? Why?

I'm not a big fan of SIM's so this is not for me.

Q12. Can you specify the things that you liked the most in the game?

It's a good idea but needs a bit more work. As I've said before, I'm not a fan of this kind of games.

Q13. Can you specify the things that you didn't like in the game?

I found it irritating and annoying. There should have been a map to make it easier to navigate.

Q14. Do you think such a game could be used for future employee trainings in the Company?

It could be used yes.

Interviewee #11

Q01. What is your level of experience with 3D games?

No experience.

Q02. How long ago did you go through the "new employee training"?

No training taken. I've joined the company in 1994.

Q03. Did you reach the end of the game? If not, up to which stage did you go?

Yes.

Q04. Describe the educational content of each stage

The information given in each stage is ok to get an overview of the company. To use it as a "new employee training" it needs more information, especially stage 2.

Q05. Did you learn anything that you didn't already know? If yes, can you specify?

Refreshed my memory on some important dates.

Q06. Compared to the regular training session that you took when you joined the Company, how would you describe the training session you got through the game?

N/A

Q07. How many times did you play the game?

One.

Q08. Would you play it again? Why?

No. I already know the information given.

Q09. For someone that is completely new to the Company, do you find the training material available in the game sufficient for an introduction to the Company?

Yes.

Q10. How much time did you spend on the game?

30 minutes.

Q11. If you had to do the "new employee training" again, would you choose the traditional face-to-face training or the virtual one? Why?

Although I didn't do the "new employee training", if I had to choose I would choose the virtual one because the new employee can refer to it as many times needed to fully understand the concept, products and rules of the company.

Q12. Can you specify the things that you liked the most in the game?

The concept that an employee explains what he/she does or what his/her department does.

Q13. Can you specify the things that you didn't like in the game?

Since navigation is not of major importance, it should be easier to find your way around.

Q14. Do you think such a game could be used for future employee trainings in the Company?

Yes. By adding more information, product rules and dividing the game into company department modules. For example, one may want to learn about a specific department only.