Project SILVER

Deliverable 4.1.1 *Researching the state of the art of GIGL*:
Review, analysis and discussion

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Table of Contents

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1 Management Summary

The present Report aims to review research on serious games used to facilitate intergenerational learning (IGL) in order to successfully develop and implement GIGL (game for IGL). GIGL is a tool that will be used to increase awareness and facilitate IGL in organizational contexts. It is a web-based game, part of the IGL toolkit, that will be developed and tested based on the findings of the present Report. In doing so, it is necessary to examine what is being done in this field, in what context, and what has proven to be effective. Particular interest will be placed in specific success indicators and drawbacks that will help us develop a research-based game likely to have great impact in organizations.

To provide evidence for the present Report, we used desk research with specific key words in Google Scholar. We combined the input from partner countries to create a state-of-the-art Report, which will serve as the basis for GIGL.

The Report begins with an introduction to the topic with specific reference to serious games, description of the methodology, overview of games found in the partner countries and ends with a summary of the findings, discussion and conclusions. Within this Report there is specific discussion and suggestions based on relevant research that will assist in successfully designing, developing and implementing GIGL.

Results from the desk research indicate that there are only few examples of games that facilitate IGL in the partner countries, but not in organizational settings. However, there are numerous examples of serious games used to raise awareness for public issues. Moreover, there is a consistent finding for the lack of success indicators and the expected impact of these games both in short-term and long-term perspectives. Also, in cases where there is a measurable effect of the game to player, there is no reference to this data. In the Report's summary we present a checklist of possible facilitators and barriers to the successful development and implementation of GIGL.

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2 Introduction

2.1 Context

The demographic changes in Europe, with the aging working population increasing, calls for novel innovative measures of knowledge transfer in organizations. The aging diversity of workforces posits great challenges to Human Resources, particularly for knowledge management, skills update and skills obsolescence. Research indicates that life long learning decreases knowledge loss in an organization and promotes effective educational environments. Informal learning has become the basis for developing organizations and can be achieved in different ways, including sharing of experiences interaction and involvement. Intergenerational learning (IGL) involves knowledge building, transfer and innovation between generations within an organization (Ropes, 2011).

2.2 Purpose of Report

This report is the State of the Art Report on Gaming and IGL (GIGL). This report reviews existing serious games in IGL and specifies how these are implemented and whether they are effective in different cultures. In doing so, it will draw information from contributions from six EU partner countries (Finland, Romania, Greece, Germany, Netherlands and Scotland) that form a consortium to develop a "Doing IGL Toolbox" and a web-based game to help organizations implement IGL. The purpose of this Report is to investigate what is currently being done regarding serious gaming to promote IGL including success indicators and barriers relevant to developing GIGL. Specific questions that will be addressed include: 1) What serious (web-based) games are being used in order to facilitate IGL and in what contexts? 2) What has proven effective and why? 3) What were effective implementations and why?

2.3 Methodology

For the development of this report, desk research was performed by reviewing peer-reviewed articles on games and IGL using Google Scholar. The search terms that were included were: intergenerational learning, web-based games and IGL, serious games, games for raising awareness, game-based learning. Results included published articles, conference proceedings, and research reports or agency reports by government and private research organizations. All material that referred to childhood recreational and educational games were filtered out. For relevancy purposes this report reviews IGL game-based training and serious games for raising awareness.

3. Serious Games

Serious games or game-based learning refers to the use of computer games in raising awareness about educational topics, and developing new knowledge and skills by enabling learners to engage and participate in situations that would otherwise be impossible to experience (Corti, 2006). Although there is no consensus in the definition of serious games, most researchers agree that serious games are designed

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for training, stimulation and education in virtual environments, with an element of engagement and pre-defined learning objectives (Susi, Johannesson & Backlund, 2007).

3.1 Learning Using Serious Games

Learning is a cognitive process that implicates numerous abilities. At first glance, learning involves a permanent change of knowledge often built on existing constructs that allow the individual to amplify or alter what s/he already knows (Kimble, 1961). In social sciences, learning usually takes the form of communication between teacher and student with a transfer of information between two or more parties. According to the traditional transmission approaches the learner should acquire facts and concepts, by repetitive mnemonic techniques in a systematic fashion (Ravitz, Becker, Wong, 2000). Constructivists believe that learning is a prolonged self-directed process, during which the individual adjusts or changes beliefs based on new ideas (Ravitz, Becker, Wong, 2000). Learning involves several cognitive processes including, attention, memory (e.g., mnemonic strategies), motivation, emotionality and communication (verbal and non-verbal). Moreover, learning can be experiential, leading to a holistic adaptation to the environment, which encompasses broader learning settings and concepts such as creativity, innovation, flexibility and decision-making (Kolb, 1984). Central to the concept of learning is the acquisition of new skills and competences, through engagement and motivation in formal, non-formal and informal settings. According to surveys, informal training constitutes more that two-thirds of workplace learning (Kim, Hagedorn, Williamson, & Chapman, 2004).

The educational method employed in a learning environment depends on the learning objectives. From a pedagogical perspective the traditional teacher-student based approach appears to be ineffective and rather passive, compared to more modern learning techniques such as “learning by doing” or “experiential learning” (Aldrich, 2005; Pannese & Carlesi, 2007). Although game-based learning is similar to traditional learning in several cognitive aspects implicating common processes and mechanisms, there are noted differences in the learning style and structure. Game-based learning relies more on “trial and error” with minimal instruction, freedom to manipulate the learning conditions (start-end), and a differential role to the trainer being more of a facilitator rather than a knowledge transferor (Hetzner & Pannese, 2009). Knowledge building in game-based learning encapsulates the notion of entertainment and reflection without the challenge of being evaluated on performance by authorities.

The success of learning using serious games lies in the actual involvement of trainee, which in turn, creates increased cognitive links with real-life situations allowing the individual to make relevant associations, to use mnemonic strategies with the facilitation of multi-dimensional educational aids (e.g., visual, auditory). This pedagogical approach promotes engagement, familiarity, and intrinsic learning (i.e., unintentional learning), applicability to work-related situations by transforming the individual from a passive to an active state. Moreover, personal relevancy and content relevancy seem to enhance the learning experience by increasing the levels of motivation and interest to the learner (Bainbridge-Frymier & Shulman, 1995).

3.2 Benefits and Barriers of Game-Based Learning

New technologies have been introduced to our daily activities, especially in younger generations, and game-based learning seems to be a good candidate for training in the workplace. In a recent review, Mitchell and Savill-Smith (2004) discuss the benefits and barriers of using computer and video games for learning. Some of the beneficial aspects of game-based learning include the elevation of several cognitive skills, directly or indirectly implicated in the learning process. Among them are attention and visuo-spatial abilities, memory and motor skills (for those games that require motor responses). Due to the nature of

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game-based training, learners are exposed to new technologies, requiring them to adapt to new learning environments, something that has been a challenge for older workers. Therefore, older generations optimize their learning ability by benefiting both from the content of the training as well as from the exposure to new technologies.

However, several barriers have been noted that fall into two general categories: a) health issues (e.g., cognitive strain, headaches) and b) psychological issues (e.g., social isolation, emotional disturbances). Since the training conditions are learner-centered and highly determined by the individual, there is increased need for evaluating the learning outcomes using specific success indicators. Thus, successful implementation of game-based learning includes determining the specific learning objectives and measuring the learning outcomes in a quantitative and qualitative way. For example, in games, which entail levels of difficulty, or the ability to change scenarios, success indicators have to be adapted to measure individual outcome. Some of these success indicators should measure cognitive engagement and motivation, the acquisition of new skills/knowledge (whether learning objectives have been met), usability and perceived applicability.

4. Overview of Games and IGL

The desk research on games and IGL yielded only few matches to the search terms described in the methodology. Examples of games that facilitate IGL are scarce, while there are no examples of IGL games in the two partner countries (Romania, Finland). For the purposes of the present report, we adopted the CIMO logic (Context-Intervention-Mechanism and Outcome) to address the specific questions described above presenting games that are being used to facilitate IGL and games used for raising awareness. The results of this desk research are presented in table 1:

Table 1. Summary of games used to facilitate IGL and raise awareness in partner countries

Name	Country of origin	Language	Context	Intervention	Mechanism	Outcome
Emergency 2012	Germany	German	Managing rescue efforts during an emergency situation.	The player acts as the emergency dispatcher or officer.	Role-taking in realistic scenarios.	Raise awareness on how to act on emergency situations.
Unknown name, used at Naturschutzzentrum Karlsruhe	Germany	German	Used by visitors to the Naturschutzzentrum Karlsruhe.	Using a joystick, the player controls the height of the flood.	Simulation/ Role-taking	Raise awareness of the dangers of a flood disaster.
East and West Block	Germany UK Greece Portugal Spain Poland	German English Greek Portuguese Spanish Polish	To create a learning experience that promotes self-reflection.	The player is narrated through traveling abroad.	Narrative-based game (Story-telling).	Facilitates Knowledge transfer and IGL and increases European cultural awareness
Tourism	Germany UK Greece Portugal Spain Poland	German English Greek Portuguese Spanish Polish	Hosting a tourist in your country.	The player is transferred to a state, faced by the narrator and hosts a tourist.	Experiential Game	Increase European cultural awareness
Working	Germany UK Greece Portugal Spain Poland	German English Greek Portuguese Spanish Polish	Working abroad	The player takes the role of a person working abroad.	Puzzle-based game (problem-solving).	Facilitates Knowledge transfer and IGL and enables the learner to confront him/her self in another culture.
Name	Country of origin	Language	Context	Intervention	Mechanism	Outcome

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Recreation	Germany UK Greece Portugal Spain Poland	German English Greek Portuguese Spanish Polish	Living in previous generations (50's, 60's).	The player takes the role of entertaining without the new technologies (e.g., internet, computers).	Exploratory Game	Increase the zone of proximal development in social development (Vygotsky)
FloodSim	UK	English	Dealing with random weather conditions across 3 years/ developed for public use.	The player takes the role of a flood policy strategist.	Simulation	Raise awareness on issues surrounding flooding
Nettietsivät (Internet Detectives) game	Finland	Finnish	Teach the practices of Internet, information security, e-commerce and copyright standards.	Small minigames, achievements (in the form of tools)	Thinking	To raise awareness on Internet related practices, especially security.
FoodForce	Finland	Finnish	Humanitarian crisis in a fictional island driven by drought and war.	Six virtual missions that reflect real-life obstacles in emergency situations around the world.	Rehearse, thinking	Raise awareness about world disasters.
Playsign	Finland	Finnish	Chesapeak bay, a natural reserve in eastern coast of America	The player explores how nature into the bay behaves.	Reflect, experiment	Raise awareness on nature.
Galactor game	Finland	Finnish	Security risks about internet and mobile world	The player interacts with "friends" as they shop online.	Problem solving	Raise awareness on internet shopping.
Ilmastopeli (Climate Game)	Finland	Finnish	Climate change	Super-Mario Bros -like game	Thinking, problem solving	Raise awareness to climate change.
Riskipeli	Finland	Finnish	Risk of chemicals	Card-game	Thinking	Raise awareness about the risk of chemical use.
Eenrgiasummaaja	Finland	Finnish	Food/ healthy dieting	The player selects food to eat and sees how it affects him.	Thinking	Raise awareness about healthy eating habits.
Terveellinen ateria (healthy meal)	Finland	Finnish	Food/ Healthy dieting	The player selects food to eat and sees how it affects him.	Thinking	Raise awareness about healthy eating habits.
Petra's planet (by Ludocraft)	Finland	Finnish	Explore different cultures	The player understands how different cultures behave.	Reflect, thinking	Raise awareness on cultural differences.
Novicraft (by Ludocraft)	Finland	Finnish	Being in an island and having to escape by collaborating	3D-games where you control your avatar and communicate through headsets.	Thinking, problem solving, collaboration.	Learn how to collaborate.
'De Grote Teletijdshow' Game Project e-treasure (IGL)	Netherlands	Dutch English	Promote intergenerational learning, Stimulate inclusion and learning. Help elders gain digital competence.	Four-people game two grandparents/elderly people and two kids. It uses the Wii control as the medium.	Knowledge exchange, Knowledge development, Working and learning together. Wii helps coordination, familiarity with new technology	Raise awareness about IGL (between older/elderly persons and younger persons, not in an organizational setting). There is test as a success indicator.

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Name	Country of origin	Language	Context	Intervention	Mechanism	Outcome
Game (The Great Flu)	Netherlands	English	To educate the public about the dangers of and difficulty in containing flu pandemics.	Single-player game acts as the head of the World Pandemic Control during the outbreak of an unknown flu.	Thinking, problem solving	To raise awareness about flu pandemics.
Game (The World Water Game) also the Climate game)	Netherlands	English	To promote the importance of water management.	Multiple players become World Water Managers	Thinking, problem solving, role-playing, collaboration, attitude and behavioral changes take place.	To raise awareness about the importance of water management in a complex environment. No success indicators
Game (Serious game Zorgcontinuiteit)	Netherlands	Dutch	To promote workers' safety within the organization.	Single player is trained by using different scenarios	Thinking in scenarios Real-life situations Force decision making Immediate action Higher levels of knowledge	To raise awareness and create a certain level of knowledge about safety in each employee in the institution, not just safety workers. Increase awareness about the interaction between safety and healthcare

4.1 Games on IGL & Games for Raising Awareness in the Partner Countries

4.1.2 Games for Raising Awareness in Finland

Several games for raising awareness have been presented in Table 1, but there is no game on facilitating IGL in Finland. These serious games address the public and raise awareness on the following topics:

- Extreme weather conditions and climate change
- Safety on the Internet
- Chemical use and exposure
- Healthy dieting
- Understanding cultural differences

Finland has a rich variety of serious games aiming to raise awareness and inform the public. For example Climate game allows the player to explore global warming and climate change. The game itself looks like a Super-Mario game where the character travels from left to right jumping on things and collecting something that looks like heat (probably reducing global warming). Character can also jump on cars and other polluting things to make them stop. At the end of the game the player is informed about how to join non-profit organization called "friends of the earth" to help fight climate change.

Internet detective game and Galactor game relate to safety on the Internet. The Internet detective game begins with a short quiz about security issues. The actual game starts after the player has passed the quiz. The first task in the game relates to digital images, digital rights and how difficult it is to remove something from the Internet. The next task is a crossword puzzle about security risks with Internet shopping. The rest of the games investigate various other security topics.

Risks game is about chemicals. It is a card game where you build a house out of the cards. Each card has a topic (such as transportation, atmosphere, water etc.) and you pair the cards by matching their topics. The suits of the card represent the environment (diamonds), products/services (clubs), chemicals

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(spades) and organisms (hearts). Depending on the suits the pair is either weak or strong and this affects how strong the house of cards will become.

Energiasummaaja and Healty meal are games that try to raise awareness about our eating habits. Energiasummaaja (Energy summarizer) allows you to collect your breakfast (and smaller meals) by drag-n-dropping food and beverages and see how well you would manage if you ate it for breakfast. In Healthy meal you can also define your profile (female, male, age, weight etc.) and again mark down your typical meals and see whether or not you eat enough vegetables and other food items. This game has high levels of personal relevancy that would increase the probability of successful outcome.

The Petra's planet allows the player to explore different cultures. First the player customizes his/her character, and gets a pet toy that can be customized as well. The character and the pet will then explore the world where they meet different people and situations. Petra's planet is a virtual world for children and the aim is to teach about cultural differences, tolerance and geographical special features to children.

Also, games are offered for training on specific topics such as learning about construction, learning the Finnish language and dialects. One such example is Sandbox (2010), a construction process simulation and visualization in an interactive virtual world setting that provides a learning environment covering the domain of small housing development. Sandbox allows the learners to get hands-on experience in the virtual construction site with all the relevant authentic hazards, knowledge requirements and automatic evaluation of the skills and progression. Tests and measurements are used in combination with the practical learning scenarios.

4.1.3 Games for Raising Awareness in Germany

Germany was a partner country of a four-series games developed as part of the multinational e-VITA project, which, amongst other things, " facilitates knowledge-transfer mechanisms which integrate Game Based Learning [GBL] with intergenerational learning concepts" (e-VITA). The project was funded with support from the European Commission and was a collaboration between organizations from Italy, Germany, the United Kingdom, Greece, Portugal, Spain and Poland. This prototype game was a set of four games intended to "increase European cultural awareness by conveying the cross-border experiences of older Europeans" (e-VITA). In terms of intervention it is a single player, problem-based game that puts the player in the role of an individual from the past who lived and worked in a foreign country (or someone who worked in a foreign country for a period of time). In order to proceed through the story, the player needs to solve puzzles by answering relevant questions regarding the country/time period he or she chose to work in. The player can try to answer the question correctly multiple times, but loses points in doing so. Throughout the game, information is provided about the country and culture in which you "work." The specific game of the set of games developed by E-vita, aims to raise cultural awareness, and to change younger generations' attitudes towards older generations and towards other cultures. The game forces the player to actively think about working within other cultures and research/think about the experiences of other generations. Although the game does lead one to conduct research in order to properly prepare the questions, it isn't very engaging (simply reading and answering questions) and it is rather slow.

Examples of other games that raise awareness include Emergency 2012, which provides entertainment and increases understanding of the organizational skills required to manage rescue efforts during an emergency situation. The head developer for Emergency 2012 is Ralph Stock, founder of Quadriga Games in Potsdam-Babelsberg. In Emergency 2012, the player acts as the emergency dispatcher or officer in charge during simulations of rescue missions and is responsible for directing all personnel (ambulances, firefighters, police officers, etc.) during the course of the incident. The game is available for the PC and it offers both free-play and multi-player options. The game puts the player in realistic situations and requires him or her to strategize under extreme circumstances and to cleverly manage both time and

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resources. It thus raises awareness of the complex nature of emergency situations and the organizational and time-management skills required to bring a situation under control after a disaster. Another example from Germany involves a game-like platform used by visitors to the Naturschutzzentrum Karlsruhe in order to increase their awareness of the dangers of a flood disaster. Real engineering data, text and video are presented in a public-friendly, understandable manner and show exactly what happens when a dike collapses. A cartoon-like impression of the action is used to make it accessible and acceptable to children and adults. Using a joystick, the user controls the height of the flood and is able to witness the ensuing physical damage over the course of various time periods (hours and days). 3D interactive technology is used to allow players to explore the different effects of a dike break. Answers are given to questions such as how quickly certain areas will be flooded and when it will become impossible to use a car. The outcome of the game is to raise public awareness about certain potential catastrophes, namely what would occur if a dike collapsed and to sensitize the public to the necessity of implementing catastrophe management measures to prevent a disaster. The game appears fun and is easy to use. Once someone is playing the game, they are provided with a lot of important information regarding flood disasters. The game includes a lot of complex data for those who are more informed, but is also easy to understand on a general level for the less informed.

4.1.4 Games for IGL in Greece

In Greece, there are four games on facilitating IGL, which are part of a EU-project E-vita (mentioned in the previous section) aiming to raise awareness on European cultures. The four games (described in CIMO logic in Table 1) have been developed in several languages including Greek as prototypes and are run by individual players. The mechanism employed focuses on taking roles, and making decisions on potential scenarios that involve traveling in Europe, dealing with different cultures, working abroad and exploring benefits and barriers when doing so.

4.1.5 Games on IGL and Games for Raising Awareness in the Netherlands

In the Netherlands, we detected one serious game that promotes intergenerational learning ('De Grote Teletijdshow' Game Project e-treasure) but not in an organizational setting. The game aims to raise awareness about IGL between older/elderly persons and younger persons as a way to stimulate inclusion and learning. Also, through this game it aims to help elders gain digital competence and to get acquainted with Wii, which helps motor coordination and familiarity with new technology. The game offers a short questionnaire to explore its outcome, but we could not trace results or specific success indicators for the game.

A game recently released by Erasmus Medical Centre in Rotterdam, aims to educate people on the danger of flu pandemics. In the game, the single player acts as the head of the World Pandemic Control during the outbreak of an unknown flu. As the game progresses, the player is required to make decisions like closing schools or airports, to control the virus. There is knowledge-based aspect to the game since it educates the player on the history of pandemics though newspaper articles and documents. There are some drawbacks to the game, as it has very slow tutorial instructions and the access to the game is quite challenging. In all aspects the game is slow and requires a lot of waiting from the player, which could potentially lead to abandoning it. There is low relevancy and realism that is, the player's actions are not linked to the outcome of the game. For example, once the viral spread peaks, the player manages to control it with very few actions. Although the game aims to educate it seems that players might play it for entertainment purposes without necessarily learning from it. As with other games there are no success indicators, which make it difficult to establish the impact of the game.

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Another serious game developed in the Netherlands, aims to raise awareness on the importance of water management in a complex environment and how to improve it through inter-organizational cooperation. In similar fashion, the serious game Zorgcontinuiteit has been developed to raise awareness about a calamity inside their organization's premises; for example a hospital or nursing home. Both games do not appear to have success indicators in terms of outcomes or overall impact to individuals or the society. The water management game has some indicators about whether the actor has reached the goals successfully, but no long-term impact indicators.

5. Report Summary

The desk research that was performed for this report on serious games and IGL yielded only few matches with the search criteria (see method). There are two games that have been developed to facilitate IGL, the e-vita games (in six EU languages) and the Game Project e-treasure developed in the Netherlands (in Dutch and English). Both games have incorporated learning methods that facilitate knowledge-exchange between younger and older generations. For example, the e-vita games involve single players in role-playing, which facilitates experiential learning in realistic scenarios. The e-treasure game facilitates learning through four-player interactions and knowledge exchange but not in an organizational setting.

There are numerous serious games in most partner countries that have been developed to raise awareness on issues like health and environment. These games could provide some helpful information for the purposes of GIGL. One of the key questions of this report was whether these games have proven to be effective and why. Based on our desk research success indicators are scarce in serious game design and implementation. Although in some cases there is brief questionnaire that assesses the player's learning, or the game's effectiveness, there are no reported results of these questionnaires that would provide some indication as to whether the games have short-term or long-term impact to the learner and to society. Naturally, this would be difficult to assess, particularly since there are numerous factors that affect learning and behavior modification. However, in this report we support the need for further follow-up of serious games in terms of effectiveness and success indicators. As such, there is clearly a need to develop ways that determine measurable outcomes in game design and implementation and allow for generalization of findings to raising public awareness. Real-life simulation has been challenging for game designers, however, in order to use serious games to facilitate learning in educational, organizational and social setting we need to develop success indicators to assess their effectiveness, compared to other traditional learning methods.

Importance must also be placed on establishing the specific goals of each game, be it to raise awareness, to change attitudes, to alter behavior, or to educate. However, the literature review on serious games provides good examples of effective implementations that could potentially maximize the impact of the game. The following checklist provides an overview of the most important characteristics that can be used for successful development of serious games for IGL.

- Serious games are more effective when they are personally relevant since they enhance learning associations.
- Serious games with realistic context/situations facilitate learning.
- Engagement can be increased with the use of vivid graphics to attract and maintain attention.
- Care should be taken to ensure easy access, with minimal requirements for installation and play (not many technical requirements).
- Basic instructions should be included (tutorial if necessary).
- Serious games should entail knowledge transfer; therefore they should have an informative aspect.
- Specific goals and expected outcomes assist in the successful development and effective impact.
- Serious games should have clear and measurable success indicators (long-term and short-term).

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- There is need to provide feedback to the player (correct/incorrect response) to increase motivation.
- Successful games are user friendly and contain attractive illustrations (pictures).
- Due to the age of the group involved in this project the game should be short in duration to avoid loosing interest and creating fatigue.

6. Conclusions

There are three basic conclusions that can be derived from this Report:

1. There are only limited games used to facilitate IGL and these have not been implemented in organizations.
2. There is little evidence-based research and decreased use of success indicators that can certify that using serious games facilitates IGL, which provides a fruitful area for research.
3. There are specific factors that determine successful design, development and implementation of serious games with major emphasis on specifying the goals and expected learning outcomes of the game.

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Sources

Aldrich, C. (2005). *Learning by doing. A comprehensive guide to simulations, computer games, and pedagogy in e-learning and other educational experiences.* USA: John Wiley & Son.

Bainbridge-Frymier, A. & Shulman, G.M. (1995). "What's in it for me?": Increasing content relevance to enhance students' motivation. *Communication Education, 44*, 40-50.

Corti, K. (2006). *Game-based Learning; a serious business application.* Available at: http://www.pixelearning.com/docs/seriousgamesbusinessapplications.pdf.

Deep Silver. (2010). Emergency 2012. Available at: Disasters. http://e2012.deepsilver.com/en/emergency-2012/emergency-history/index.html

E-Vita Project Team (Producer). (2010). Working [Game]. Available at: http://www.seriousgames.it/evita/evitaB/

Hetzner, S. & Pannese, L. (2009). E-VITA, life simulations in an intergenerational setting. Available at: http://je-lks.maieutiche.economia.unitn.it/index.php/Je-LKS_EN/article/viewFile/320/302

Kim, K., Collins Hagedorn, M., Williamson, J., & Chapman, C. (2004). *Participation in adult education and lifelong learning.* U.S. Department of Education, National Center for Education Statistics. Washington, DC: Government Printing Office.

Kimble, G.A. (1961). *Hilgard and Marquis Conditioning and Learning.* East Norwalk: Appleton Century Crofts.

Kolb, D.A. (1984). *Experiential learning: experience as a source of learning and development.* Englewood Cliffs, NJ: Prentice Hall.

Mach R. (2010). Serious Gaming? Raising Awareness for Retention Measures and Flood In E. Buhmann, M. Pietsch and E. Kretzler (eds.). Peer Reviewed Proceedings of Digital Landscape Architecture. Available at: http://www.kolleg.loel.hsanhalt.de/landschaftsinformatik/fileadmin/user_upload/_temp_/2009/2009_Proceedings/103_mach-2009-jun01-e.pdf

Mitchell, A. & Savill-Smith, C. (2004) *The use of computer and video games for learning:* Available at: http://www.crito.uci.edu/TLC/FINDINGS/REPORT4/REPORT4.PDF

Pannese, L., & Carlesi, M. (2007). Games and learning come together to maximize effectiveness: The challenge of bridging the gap. *British Journal of Educational Technology, 38,* 438-454.

Ravitz, J., Becker, H.J., & Wong, Y.T. (2000). *Constructivist-Compatible Beliefs and Practices among U.S. Teachers.* Center for Research on Information Technology and Organizations University of California, Irvine and University of Minnesota. Available at:
review of the literature. Learning and Skills Development Agency. Available at: http://www.risk.utah.gov/utc/articles/use_of_games_for_learning.pdf

Ropes, D. (2011). Intergenerational learning: A research framework. In *Working and ageing: Guidance and counselling for mature learners*. Thessaloniki: Cedefop.

Susi, T., Johannesson, M., & Backlund, P. (2007). Serious games- an overview. Available at: http://www.autzones.com/din6000/textes/semaine12/SusiEtAl(2005).pdf.

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