Towards designing an interactive multi-player serious game for business education

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Abstract
Learning through gaming has become a powerful tool towards understanding and supporting knowledge acquisition. Many educational games have been created to facilitate business and mathematical learning. They are often referred to as serious games due to its non-entertainment purposes.

To enable students to learn about business ecosystem formation and sustainability we built Network Service Business Game (NSBG). It is a multi-player serious game.

This paper investigates the learning effects on the students through this game. Feedback is collected from the students over a period of three years corresponding to three versions of the game. This qualitative data is analyzed using grounded theory. Finally, it was demonstrated that serious games (NSBG) was able to facilitate the learning of a new subject (Service economy) by the student while creating an environment of real world experience.

Author Keywords
Serious game, business education, real world experience, game design

Introduction

The growth of the mobile industry and technological advances in gaming hardware have contributed to the rapid adoption of games. Over the years, the use of games has expanded from simply leisure in homes to educational purposes in schools and universities [8]. The introduction of social gaming through Massively multi-player online role-playing games (or MMORPGs) has connected gamers around the globe and helped them to form teams, virtual identities, collaborate and chat online [6]. Playing games has been proven to facilitate learning in an individual [10]. Games are not only used to teach children arithmetic but are also used in business schools to understand how real world business cases can be tackled [4].

The Network Service Business Game (NSBG) [3] is a multi-player business game that was created for an introductory course at Aalto University . It is a serious game that focuses on developing knowledge on business co-operation and network building. The game is a virtual simulation of a space tourism ecosystem. The participants must form ecosystems consisting of multiple companies with complementary roles in order to be able to serve customers. The most profitable ecosystem wins the game. The game provides for four company profiles viz. technology, marketing, operator and supply. Students are grouped into teams of 2-4 members and create their own company for one of the roles. Students then choose business roles (COO, CTO, CEO, VP Marketing and VP Sales) to explore the complexities and chaos involved in writing business plans, negotiating deals to form contracts and taking critical decisions that affect the chances of long-term success of the whole ecosystem. The administrator or the game master, who is normally the teacher, sets the scenario for the game and monitors and supports the students. The game is divided into three rounds and students need to complete a round to move on to the next.

The simulation is designed to mirror a real world experience: it is chaotic and complicated and students must figure out optimal strategies for success with limited information over the course of the game. To provide a real-life user experience, skeumorphism [9] was used in transitions and animations. Social networking sites were used as an inspiration for both interactive timelines and activity bars which helped participants keep track of their action history, upcoming activities, deliverables and deadlines. Detailed analysis of these considerations will be examined in detail in future papers.

The game was conceptualised and first developed in July 2012. Its 3rd version was successfully completed by August 2014. The game has been played three times with over 300 students participating in total. Every year, feedback was collected from students to improve the game and for research purposes. In this paper, we present interface design issues as reported by students and provide guidelines that will be useful for similar future games.

Evaluation

With each release of the game, feedback on the game interface was collected from the participants. This feedback was important as it provided an insight into how participants perceived the game and what could be improved.

Participants

The participants of this study were students of Aalto University who played the game. Their ages ranged from 18 to 30 years old. The participants had different educational backgrounds ranging from technology to design and business.

Data Collection
Qualitative data in the form of game diaries, open feedback in the game's Facebook group and through online surveys from the participants was collected. The participants were encouraged to give honest feedback about their experiences with the game. More than 150 game diaries, 20 open feedback and 40 survey responses were gathered. Data included the participants' game learnings, problems encountered, opinions and suggestions. This paper mainly focuses on data relevant to the user interface. However, the survey responses were used to validate the improvements made and were not used for data analysis.

Data Analysis
A qualitative research method was used to describe and aid in the deeper understanding of participants' experiences. Grounded theory [5] was used as the data analysis technique to group the results and provide design suggestions. This technique includes numerous methods such as open coding, memoing, comparative analysis and selective coding.

Open coding [1] was implemented to comprehend the collected data. Initially, relevant data was broken into chunks of text. These chunks were read multiple times and classified into various categories such as confusion, suggestion, problem, terminology and communication. Methods of comparative analysis [1] and memoing [1] were repeatedly performed to define possible new categories. When no further categories could be formed, axial and selective coding were applied to relate categories to each other and form theories.

Data analysis resulted in theories which were validated in the third version of the game. Validation was done through a survey.

Discussion
In this section, we discuss the results from the above analysis. First, the participants reported a lot of confusion at the beginning of the game. Some participants reported that the terminologies were ambiguous. A participant clearly mentioned, "I could not review my request for proposal (RFP) because it was hidden under the category "Company briefcase", and I didn't know [...]". Some participants were unfamiliar with the business terminologies used, although the terminology was covered during the lectures and was described in the game hand-outs. According to Wittgenstein, this is very certain as he points out that learning any new domain is similar to learning a new language game. Confusion of individual jargons is a critical and unavoidable part of learning a new domain[11].

Second, there was excitement among participants when they could figure out the game in the final phase. Many participants spent a lot more time engaging with the game and showed positive emotions. A participant reported "I have studied accounting and there are no virtual games at the Department [...], NSBG was a very pleasant surprise for me as I didn't expected I would learn so much as initially it was confusing.". Csikszentmihalyi (1997) described this as the state of optimal experience. This also shows that student shifted from an initial state of confusion to the optimal experience [2], demonstrating that NSBG was effective in making the participants learn about the subject.

Third, communication between team members was found to be the most important element in NSBG. Communication among participants was left upto them except for the formal negotiation process which took place on the platform. Participants opted for Facebook as the

primary communication tool for general updates or scheduling meetings. Skype was used for group video chats and Google Docs for collaboration. Phone calls and SMS's were exchanged in an urgent situation such as hours before deadlines. Emails were exchanged as an alternative to Facebook for participants who did not use Facebook. Emails were also used for formal communication between different groups. Many participants complaint about using multiple communication tools as well as private social network. A participant reported, "I don't want to use Facebook for school purpose[s] and there due to multiple communication channels there's a lot of repetitive content and a lot of confusions [...]". In a real world situation, people will use various third party solution for communicating with their external clients. This was encouraged in the game by removing in-game communication channels. Lipson & Day, (2005) in their book mentioned the importance of teaching decision-making skills in chaotic situations to resemble the real-world scenario [7]. NSBG was successful in replicating the state of chaos as in real world situation for making business decisions.

Conclusion

In this paper, a multi-player business gaming environment was evaluated to understand the impact of learning a new subject with the help of serious game. Grounded theory was used to analyze the qualitative data collected. Three themes were identified that supported and validated the effectiveness of the game in learning a new subject. These were: confusion during the initial stage of the game; the state of optimal experience in the later stage of the game and the chaotic real world scenario due to lack of a communication tool inside the game.

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