Simulation Games Usage for Decision Support: Example of the Near Beer Game

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Abstract: Simulation games present valuable pedagogical tool in many different areas, e. g. education, finance, production, sales, supply chain, and employment process. The main reason for their usage is that theoretical knowledge is not enough to understand the business processes. Simulation games improve learnig, since they actively involve participants in virtual world and encourage them to apply theoretical knowledge and facilitate their understanding of business processes. Use of simulation games is increasing every year, especially in students' and managers' education, as they enable participants to acquire new skills and learn how to make decision through practice. Involvement in simulation games, enable participants to learn how to make decisions, how to improve their decisions through analysis and feedback at the end of the game, without any consequences. The goal of the paper is to describe simulation games and their role in decision making process. In this paper, we want to show how simulation games can support and improve decision making process at the example of The Near Beer Game.

INTRODUCTION

Constantly development of information and communication technologies (ICTs), especially from 2000s, has made great changes in our everyday lives, especially in the area of doing business and education process. Regardless of time and space, ICTs usage enables that knowledge acquiring and knowledge transferring are available and business activities and process are feasible and possible [2].

Simulation games have proven to be a very valuable pedagogical tool, since decisions made during the game allow immediate analysis and feedback [9]. The goal of simulation games is to actively engage participant into a virtual world where decisions can be made without any consequences. During a simulation game, participants learn about decision making process, leadership, team work, managing business processes. In addition, simulation games allow participants to learn-by-doing [1]. Simulation games can be used in many different areas, e.g. finance, production, sales, logistics, distribution, marketing, management, entrepreneurship, medicine, aviation.

Decision-making process presents a complicated process which implies potential benefits as well as potential costs [13]. Goals which planned to be achieved are often incomplete, uncertain or contradict to each other [17]. Business decision-making process is very important process because managers have to make right decisions which will have positive influence of future business activities. There are many different methods and decision support systems which allow managers to have an active role in management planning process and making decisions about business strategies and their implementation [11].

Simulation games are often used to improve management decision-making processes. Therefore, simulation games are valuable tool in management education. They enable managers to understand better business processes and how decisions influence business strategy. Simulation games enable participants to understand how different external factors and situations influence on their decisions and at the same time facilitate the process of rational decision-making [15].

The purpose of the paper is to present and define simulation games and their usage for decision support. The goal of the paper is twofold: (i) to define simulation games and their characteristics and (ii) to analyse simulation games usage for decision support presenting selected simulation game The Near Beer Game. We decided to analyse The Near Beer Game [22], which is very popular simulation game that enable participants to understand better supply chain management and all its complexity.

SIMULATION GAMES

Simulation games can be defined as computer programs that represent simplification of a real system [12]. Simulation games present educational tool that complements and enhances traditional approaches of teaching [8]. In other words, simulation games con-

front participants with real business situations in an interactive way which allows faster understanding of decisions and actions [2]. Through simulation games participants improve their skills, competencies and creativity [6] and understand better the consequences of their wrong decisions [5].

Simulation games have their background in board games, existing for more than 3000 years B.C. [6]. Their first usage was related to military training and war strategy creation [3], [16]. However, modern simulation games appeared in the late 1950s [19], starting with Top Management Decision Simulation, developed by American Management Assosiation and The Top Management Decision Game, developed and used at University of Washington [6]. Today, in 21st century, development and implementation of information and communication technologies in educational process provide new tools and methods for innovative teaching approach and simulation games become one of important segments of learning process [16].

There are many benefits for participants of simulation games usage. Stavroulia [16] mentioned that simulation games enhance cognitive learning, foster participants' motivation and engagement and prepare participants to real world situations. Vos and Brennan [18] consider that usage of simulations as educational tool helps their users to improve their specific skills such as communication, problem solving, critical thinking, decision-making, and analysis of data. Learning through simulation games, managers will understand better business processes and gain experience that will help them in business decision-making process in complex situations [6]. However, there are also some obstacles in using simulation games. The main challenges related to simulation games usage are high costs, lectures who are not ready to change their way of teaching, low and undeveloped technological infrastructure [6]. Vos and Brennan [18] highlighted that users of the simulation games, such as students, can feel a lack of control when they use a simulation because there is a lot of information they must absorb in a short period of time.

SIMULATION GAMES AS A DECISION SUPPORT TOOL

Decision making presents a process which results in the selection of one choice between several alternative possibilities in order to achieve given goals. In other words, decision making includes several criteria in order to rank alternatives of a decision [14], [17]. In order to make a good, accurate and qualitative decision, it is important for business makers to have access to qualitative information and different decision support methods and tools [11]. Besides decision support methods and machine learning algorithms simulation games could also be used in decision-making process. Čerić [7] considered that simulation games present a very useful decision-making tool because they enable participants to better understand the business system. The most valuable benefit is that simulation games usage for decision-making offer participants to simulate different experiments that can be evaluated without any risk. There are also several similarities

among group decision support system and simulation games while both of them are interactive, appropriate for the support of complex decision-making process and suitable for complex structured problems [12].

Managers are facing with specific business issues every day and their main activity is to make right and correct decisions which are in compliance with business strategy and goals. According to Ben-Zvi [4] simulation games present a link between theoretical knowledge and real business problems and allow participants to practice decision-making under controlled settings. Le Bars and Le Grusse [11] summarise following advantages for participants of simulation games in decision-making context: fast feedback on consequences of their decision; possibility to test and explore their ideas; analysis of achieved results gives them feedback to better understand decision they made.

OVERVIEW OF SIMULATION GAME: THE NEAR BEER GAME

The Near Beer Game is a very popular simulation game, available on the Forio online platform. Forio is online platform that consists of a large number of useful and educational simulations and applications, which are used all around the world, including businesses, universities and government agencies. Forio platform users can choose among many different simulation games, which cover many different business areas, such as supply chain management, entrepreneurship, finance and accounting, innovation, leadership and management, sales, marketing and many more. Some of the simulations can be run for free, but for some of them potential users need to pay a certain price. Forio Store contains simulations which price range from 50 $ per seat to 150 $ per seat. Some of the simulation games which are available on Forio Simulate have limited access, but there are some of them which are free to run and copy. Selected and analysed game, The Near Beer Game is a simulation which is available to everyone, so all users can copy the simulation and explore the model for free [21].

The Near Beer Game is a computer simulation game in which player is trying to be better than the computer program. Also, in this simulation game players have perfectly available informations and there are no breakdowns in communication. The game is available on the Forio platform [21], [22]. The Near Beer Game is online game and every user can play it and explore the model of the simulation for free. Until 12th November, 2016 this simulation game was run for almost 370 000 times. The main purpose of the game is to indicate the supply chain management complexity, even with usage of perfect informations and without breakdowns in communication. Creator of the Near Beer Game is Michael Bean, co-founder of the Forio platform. The game itself is one of the most popular games on the platform [20], [22].

The Near Beer Game is very similar to the original The Beer Distribution Game because they focus on many similar business issues. The original Beer Game was developed in the 1960s at the Massachusetts Institute of Technology's (MIT) Sloan School of Management and is now commercially available from Innovation Associates in Framingham, Massachusetts to present participants and introduce them with the complexity of the Supply Chain Management [10]. The original game was created as a board game which represents a replica of the beer production and distribution system. The game is played in teams and there are four possible positions that player can represent: Factory, Distributor, Wholesaler and Retailer [10]. Also, players at each position have to collaborate and act as a team, but they cannot communicate with other players (except when they are making orders). The main problem for every player is how much to order. Those players who have the best score and the lower total cost are winners of the game.

The Near Beer Game consists of the two difficulty levels – novice and expert. The first week of the game is the same for both levels – at the beginning of the game there are 10 cases of beer available and claimed. At the novice level, customer demand increases to 15 cases of beer per week and at the expert level, customer demand increases to 50 cases of beer per week. Every week participants get notifications about production, is there too much or not enough cases of beer. Figure 1 presents the first week in simulation game at the novice level.

At the beginning of the simulation there are 10 orders from customers. There are no backlogs or unfilled orders. First of all, it is important to determine how much raw material has to be ordered. Also, participant has to constantly follow development of other values and notifications about production. In this example, is it possible to see that the amount of finished goods is 20 cases of beer, so it can be concluded that orders from customers can be fullfilled. Besides the simulation review, the game also includes the graphical review of the following components – new customer orders, total customer orders, lost orders, inventory and shipments. Total orders from customers are represented as sum of the new orders from customers and cumulative unfilled orders. The amount of finished goods depends on the value of raw materials which were ordered. Although the simulation seems quite simple, few attempts are needed to win the game.

The best way is to run the game several times in order to understand it better and to achieve better results at the end of the game. Bottom row of the simulation represents amount of materials in transit from vendors and the amount of materials in brewing process, so it is important for a player to keep track of it. Unlike the original board game that includes interaction with other players, the simulation game is more predictable because the main opponent is computer program. After several attempts it is possible to find out that accumulation of greater amount of finished goods at the beginning of the simulation reduces backlogs through the game. Figure 2 presents achieved result of the game at the novice level.

Figure 1: The Near Beer Game – beginning of the game
Source: *Forio; The Near Beer Game (2016) [21], [22]*

Figure 2 shows that the problem is solved within 4 weeks, which is considered to be the best possible result that can be achieved. As the Figure 1 showed, the amount of the finished goods at the beginning of the game is 20 cases of beer.

At presented moment of the game, 15 casees of beer that have been ordered from vendors are being wait, and another 15 cases are in the process of brewing. The customer orders and the amount of finished goods have to be balanced so it is possible to determine how much materials have to be ordered. Because the sum of the amounts of material in transit, material in process of brewing and finished goods is 40, raw materials for additional cases of beer in the first week of the simulation have been ordered. If 5 additional cases of beer are added to the amount of 40 cases of beer, it can be concluded that materials for 15 cases of beer have to be ordered every week until the end of the simulation game to achieve supply chain equilibrium.
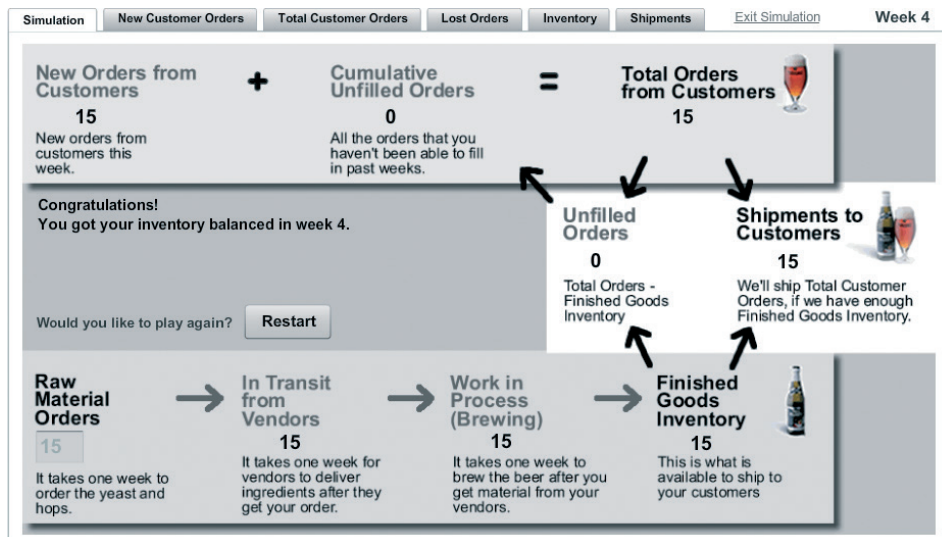
Figure 2: The Near Beer Game – final result of the game

Source: *Forio; The Near Beer Game (2016) [21], [22]*

The Near Beer Game enables participants to understand better the supply chain management and facilitates the processes of decision-making. Main disadvantage of the game is that in the real business situations informations are not perfectly available like in the simulation. Also, real business situations are not predictable like those situations in the simulation game. However, the Near Beer Game is very useful exercise to gain valuable experience in supply chain managemet.

CONCLUSION

In this paper we have defined and analysed simulation games and we have explored the possibilities of their usage in education process and as decision support tool. Simulation games allow participants interactive learning and dealing with real business situations and how to be more successful in business decision-making. In addition, simulation games, forces participants to develop critical thinking, to work in a team with limited resources and to practise decision-making under uncertainty, to apply theoretical knowledge to solving business issues with eliminated risk and with no consequences. At the end of the simulation game, there is a feedback, where participants discuss about their business decisions and analysed correct or incorrect decisions in order to improve

their performance. Simulation games as a decision-support tool and as an educational tool, are more and more used and applied in different areas, while they enable participants to work, make decisions, and manage companies compelling with competitiors in virtual reality, where mistakes can be made without any consequences.

The analysed game, The Near Beer Game, explains how to better understand difficulties in the supply chain management, giving its users an opportunity to deal with real business situations. In this simulation game, participants deal with all necesery information and it is possible to predict further steps, which is quite different from real business situations. In order to improve their business decisions it is important for participants to include their theoretical knowledge, several diferent simulation games, situation on the global market and their previous business experience. There are many different simulation games related to decision-making process, and participants have to choose them according to specific business area.

In future research, it would be useful to engage students in playing the Near Beer Game in teams to see their results and explanation of their decisions. They should be engaged in novice and expert level to get better insight into supply chain management and to see differences between these two levels. Also, future research should focus on analysis of simulation games dealing with supply chain management where participants could be involved in longer time of period of decision-making process. Analysis of simulation games which encompasses a more comprehensive set of business functions, a realistic business situation, and a marketplace with competition will provide a more realistic environment for participants where they can learn more about decision-making process but in safe environment of simulation game. In further research, more attention should be paid to different decision support methods and algorithms with their detailed analysis and explanation that will help students to achieve better results and have better understanding of simalation games and their usage in decision-making process.

There are also several limitations of this work. This simulation game is simplified version of the The Beer Game. In order to use simulation game that will enable participants to gain valuable experience in decision-making process it is important to choose simulation game in which they will compete against other participants through specific time period. The analysis of a larger sample of simulation games related to decision-making process will enable a better measure of the performance of each participant.

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