

Integrating online simulations in business education: A case study on developing decision-making skills

This article presents a case study on how online simulation games impact decision-making skills in business education at the master's level, with particular focus on Budapest University of Business and Economics. Computer-based simulations that bridge the gap between theory and practice enhance employable skills such as teamwork, problem-solving, and communication. Despite challenges such as cost and alignment with course objectives, simulations are valuable when properly implemented and when instructors play a key role in mitigating obstacles such as computer anxiety. Simulations using the critical incident method are especially effective in promoting deep learning, encouraging reflection, and developing critical thinking amid uncertainty and under stress. Our findings show that well-designed simulations support the development of decision-making skills and critical thinking and offer a practical, engaging learning experience that benefits students' understanding of complex business scenarios.

Keywords: *online simulation game, business education, decision-making, employable skill, critical thinking*

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1. Introduction

In 2020, researchers in Hungary, after studying the use of technology in Hungarian higher education, determined that introducing and operating a hybrid system involving distance learning via digital means would be feasible (Majó-Petri et al. 2020). Although budgetary restrictions and instructors' inexperience would challenge that effort (Aczél 2017), other research has shown that the rewards would be worth it. Among other advantages, digital gamification not only supports employability (Fromann and Damsa 2018) but also highly motivates students (Baksáné Varga and Horánszky 2023). To realize those rewards, however, teachers would need to adopt appropriate pedagogical approaches (Muhi, Kőrösi and Esztelecki 2015).

The case study that we present in this article contributes to academic knowledge on using technology in Hungarian higher education, specifically by exploring how online simulation games support the development of business decision-making skills in business education at the postgraduate level. It examines how the instructors in the case integrated the simulation into a specific business course and how the students evaluated their learning experience. In this article, after reviewing the academic literature on the advantages and challenges of using online simulation games in higher education, we describe the course and the simulation game in the case. We next analyze the students' evaluations before presenting our conclusions and recommendations.

2. Literature review

Similar to non-computer-based simulations (e.g., role-play and board games), computer-based simulations (e.g., gaming simulations, training simulations, and modeling simulations) are used widely to support students' learning. In general, simulations in education attempt to imitate real-world phenomena and processes that are difficult for students to experience in real-world settings, mostly due to the risks, cost, or timescale involved. They support both deeper learning through repeated elements and the development of employable skills, especially self-management, teamwork, business awareness, problem-solving, and communication and literacy, including the application of information technology in the case of computer-based simulations. Another advantage of simulations is that they support students in making strong connections between theory and real-life contexts. At the same time, the related costs and other internal issues can be challenging for academic staff as they plan to implement online simulation games in their classes (Fitó-Bertran, Hernández-Lara and López 2015; Kuczera 2021; Lean et al. 2021).

Regarding the development of practical skills, simulations have been found to be highly efficient tools (Boon, Kok and Aziz 2019; Denisova et al. 2023; Tao, Yeh and Hung 2015). Online simulations, as every other type of technology-enhanced learning, prepare students for work in digital environments, but they are ultimately just tools. For that reason, academics play an important role in aligning simulations

with the requirements of their courses and supporting students' learning process by developing their confidence and professionalization (Bolton and Emery 2021). With a proper design and support from instructors, online simulation games offer benefits that outweigh any potential negative effects (Sequeira and Martins 2013). Among others, students' subject-level knowledge and experience with online games can mitigate any computer anxiety. In the process, instructors using simulation games should consider how to best weight game scores in assessment (Pina and Bordonaba-Juste 2018) and are advised to align the game with the course, as well as to ensure that the game's difficulty is neither too frustrating nor too easy for students (Matute-Vallejo and Melero-Polo 2019).

In studies on the successful deployment of online simulation games in higher education, students' satisfaction has emerged as being a key element. To that end, communication between learners and educators matters the most (Becirovic, Ahmetovic and Skopljak 2022). Online tools have also been found to be especially useful in reducing learners' mental and physical fatigue by breaking the monotony of traditional educational activities (Berezina et al. 2022). Dukalskaya and Tabueva (2022) have additionally argued that the optimal learning model for students' satisfaction combines a traditional approach and the use of digital technology. Beyond that, students appreciate being involved in solving a variety of tasks related to potential issues in the workplace. Role-play linked with technology can also be effective not only for developing various skills and personality characteristics but also in motivating and entertaining students. Such combinations of education and entertainment (i.e., "edutainment") holistically integrate pedagogical methods such as action-based learning, inquiry-based learning, and project-based learning (Gerashimova and Oblova 2023).

An important feature of online simulation games is *gamefulness*—that is, playability within the frame story—meaning that students need a certain level of freedom to act differently and to choose different strategies at every step (Ashworth 2010). For an online simulation to be effective, game design is paramount. From an educational standpoint, such games need to focus more on activating prior knowledge and putting that knowledge into practice than on the acquisition of novel knowledge. Striking a balance between gameplay and learning is also recommended, in which the latter should be supported by written and/or visual content instruction and regular feedback (Ke 2016). Online games can also be somewhat competitive so that learners are stimulated by competition with other learners, whether human or virtual (Labat 2008). On that count, intragroup competition has been found to be positively motivating, whereas an overly competitive learning environment can become detrimental. To avoid that situation, separating assessment from performance during the game is one possible solution (Whitton and Hynes 2006).

In online simulations, it is also possible to press pause, whether figuratively or quite literally, and step back from the situation in order to reflect on it or share feedback. A useful feature of online simulation games for business education in particular is the possibility to introduce critical incidents such as changes in

currency exchange rates or even a global crisis. Such critical incidents disrupt the decision-making process and prevent students from adopting routine approaches to decision-making by forcing them to reconsider their decisions (Lean et al. 2021). Online simulation games indeed provide effective platforms for applying that so-called critical incident method, which can stimulate learning by requiring reflection on what has happened and why. Critical incidents are unanticipated and can result in major changes, which can lead to transformational learning experiences. Combining online simulations with the critical incident method allows students to experience and reflect upon critical incidents in a safe environment, which results in impactful learning (Lean, Moizer and Newbery 2014). Despite those known benefits, the integration of online simulation games into education remains underexamined, and further investigation and experimentation are recommended (Tomatir 2021).

Delving further into business education, business simulation games have been found to greatly improve students' critical and higher-order thinking skills, including decision-making skills (Alkaabi 2022; Baena Rojas, Suárez Brito and López Caudana 2023; Dumblekar and Dhar 2021; Hernández-Lara, Serradell-López and Fitó-Bertran 2016). Such games have also been found to be particularly effective in developing decision-making skills regarding strategic and financial issues (Lai and Siau 2003). For strategic decision-making, simulations provide a competitive environment in which rival companies' decisions affect the planning and implementation of strategies selected by students. The software shows the results of decisions after each round, which subsequently need to be channeled into the decision-making process in the next round. Groupwork within the framework of business simulation games also provides opportunities to make decisions in various executive roles, which contributes to learning about consequences and taking responsibility for such decisions (Lean, Moizer and Newbery 2014; Schmuck 2021). The decisional alternatives offered by business simulation games additionally support the understanding of logical relations between variables that define typical managerial decisions and the scientific validation of decision-making (Maican and Lixandroi 2011).

Today's global business arena calls for professionals who possess critical thinking skills, the ability to assess situations comprehensively, the motivation to consider and meet various requirements, and appropriate decision-making skills. In fact, employers and business partners expect those competencies from managers (Cruz-Sandoval et al. 2023; Dydrov and Salganova 2023). Decision-making in particular, regarded as a soft skill, is increasingly valued by employers; its development has thus become an important aim of higher education (Munkácsi and Városiné 2023).

On the topic of decision-making, there are situations involving uncertainty, stress, and risk in which the tasks of formulating strategies for action and communicating with others to coordinate the implementation of the strategies demand quick thinking. Traditional classroom learning does not provide the most suitable environment for developing decision-making skills needed to address complex, urgent business

problems. Indeed, facilitating that skill through teaching and learning activities in a classroom is not an easy undertaking, and replicating a complex, uncertain scenario in a traditional classroom is rarely achievable. By contrast, simulations, especially virtual ones, have been found to facilitate higher-level decision-making skills in educational contexts (Comfort and Wukich 2013). Instructors aiming to develop decision-making skills should know that active learning approaches are suitable to that aim, including having students work in small groups to discuss the context and the possible alternatives related to certain decisions, reflect on their own decision-making, and critically analyze the results of their decisions. That approach can support students in experimenting with rational as well as intuition-based decision-making, because in stressful situations people may indeed act on impulse (Greenbank 2010). A simulation game, however, helps students to appreciate the importance of informed decisions by integrating textbook knowledge into practical problem-solving (Liu and Olson 2011).

3. Materials and methods

The case study is a qualitative research methodology widely used in the social sciences and research on management due to offering a comprehensive view based on various techniques of data collection, including interviews and observations. According to Guzmán Barquet and Alejo Machado (2017), a *case study* is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between the phenomenon and context are not clearly evident. The methodology allows for a holistic understanding of phenomena within their real-life contexts, making it particularly valuable for practitioners exploring complex areas of research (Shishkov 2020; Stake and Visse 2022).

In the past forty years, case study research has evolved substantially and resulted in a pragmatic, flexible research approach that provides a comprehensive understanding of diverse issues across various disciplines (Harrison et al. 2017). Indeed, the applicability of the case study methodology spans numerous fields, including business, education, political science, and social work (Shishkov 2020). In practice, it allows an in-depth exploration and analysis of both successful and unsuccessful contexts in order to understand, for example, effective management strategies.

The suitability of case studies for testing theory, however, continues to be a subject of debate. Although some scholars have highlighted the weaknesses of the research design, its strengths, including providing detailed and contextual insights, are equally significant. The methodology has also demonstrated its capacity to yield rich, qualitative data—data that are crucial for developing theories in various domains of research (Løkke and Sørensen 2014). After all, theories emerge from empirical observations, which highlights the foundational role of case studies in research (Varela, Lopes and Rodrigues, 2020). In our study, to investigate decision-making

within the context of business simulation games, we performed a case study to analyze feedback derived from the coursework of postgraduate students.

Budapest University of Economics and Business (BUEB) launched the Sales and Operations Management course in Autumn 2023 as mandatory module of two master's programs: the MSc in International Business and Economy and the MSc in Marketing (BUEB 2024). Although both for full-time students, the former program was delivered in English, whereas the latter was delivered in Hungarian. The Sales and Operations Management course focused on sustainable business development related to managing sales and business operations in both languages.

The course was divided into two sections, with the first half of the semester focusing on organizational and strategic issues in sales and highlighting the key elements of the sales process. The second half transitioned to supply chain management and covered topics such as creating an effective supply chain, inventory management, related digital solutions, and agile innovation.

After an introductory overview on the expectations of businesses to act ethically, responsibly, and sustainably and of managers to prioritize generating stakeholder value, the course explored recent practices in managing sales and business operations. Lectures in the first half of the semester discussed the role of sales in the value chain while examining strategic issues such as market segmentation, targeting, and positioning. Students explored organizational structures that support effective sales processes and strategies for managing sales teams, and emphasis was placed on value-based selling and ethical sales practices that contribute to long-term customer satisfaction and loyalty. Lectures in the second half of the semester, by contrast, covered the design and management of supply chains that are both efficient and sustainable. Topics included supplier selection, logistics, and the integration of supply chain activities to optimize performance. Students learned about inventory management techniques that balance cost-efficiency with the need for responsiveness to market demands. The role of digital solutions in enhancing supply chain visibility and agility was also explored, especially while highlighting tools such as enterprise resource planning systems. The course concluded with a focus on agile innovation in operations management, which involved adopting flexible, iterative approaches to developing new products and services, thereby ensuring that businesses can quickly adapt to changes in the market environment.

During the seminars running in parallel with the lectures, students engaged in groupwork within the framework of an online simulation game. To bridge theory and practice, the teaching team employed the game Values-Based Management hosted by the platform EDUardo (EDUardo 2024) in competition mode, which allowed students to apply lecture content while confronting the complexities of value-based management in sales and business operations. The groups focused on the game and participated in the so-called decision rounds during weekly seminars, which were facilitated by the seminar leader faculty member. Although the assessment for the course included the game, grades were not related to the results achieved during the competition. The students worked in groups of three or four, made the decisions needed for the game together—the semester had 12 decision rounds total—and reflected on their groupwork and the connections between the

lectures and the game in writing at the end of the semester. The group reflection paper drew from individual input from each student, including feedback on the groupwork and on the individual contributions to decisions made during the game. The paper concluded with a group evaluation of the connections between the lectures and the game.

In total, 19 group reflection reports were submitted at the end of the semester: 13 groups completed the tasks in English and six groups completed the tasks in Hungarian. The students in the English-language groups studied in the International Business and Economy program in English and were from a variety of countries. The students in the Hungarian-language groups, by contrast, studied within the Marketing program in Hungarian and were from Hungary only. All students completing the online simulation game had previous academic experience in business and management, and the majority had professional experience as well.

We, the authors, two of whom were also involved in managing the online simulation game, analyzed the group reflection papers to scrutinize the students' decision-making processes, along with the outputs and charts generated during the game. Added to that, a semistructured interview was conducted with Péter Szlávik, founder and CEO of EDUardo, to inform our analysis even further. Ultimately, we aimed to answer two research questions:

1. How can an online business simulation game support the development of decision-making skills among business students?
2. How do postgraduate students evaluate their learning experience regarding how an online business simulation game supports the development of their decision-making skills?

4. Results

In Hungary, simulations have been available since the early 1990s and played an important role not only in higher education but also in entrepreneurial training. A semistructured online interview conducted with Péter Szlávik, founder and CEO of EDUardo, in March 2024 revealed that the company currently focuses on international markets and operates in many countries. EDUardo's business simulation games offer both single-player and multiplayer modes, including group options, and are designed to respond to unexpected events and assist participants in making entrepreneurial decisions and deriving lessons from them. Simulations model the effects of economic decisions and consider bankruptcy situations based on factors such as cash flow and asset availability. They also provide feedback to participants on the effects of their decisions, thereby offering opportunities to practice and learn from economic situations, including the opportunity to make mistakes freely, which is crucial for learning and development. They additionally provide information about the result of participants' decisions to the instructor via various charts, each displaying an important indicator of the group's performance over time.

For instance, the chart in Figure 1 indicates earnings before interest, taxes, depreciation, and amortization.

EBITDA

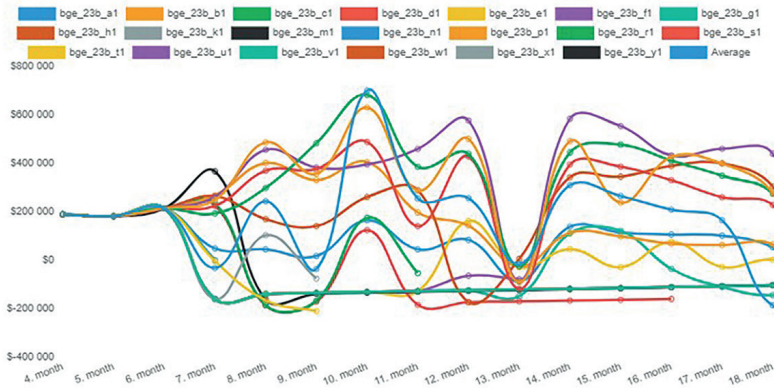


Figure 1. Results of earnings before interest, taxes, depreciation, and amortization (EBITDA) of master’s student groups in the English-language Sales and Operations Management course at Budapest University of Economics and Business, Autumn 2023 (Source: EDUardo)

The instructors were provided with such charts after each decision round that covered a month in the simulation game. The chart showed whether a group went bankrupt due to their decisions (e.g., the green line falling flat in month 7), as well as the in-built market shock unexpected by the students (e.g., the sharp drop in each group’s performance in month 13). The students received immediate feedback from the game after each decision round on various elements of their decisions, along with a sales summary (Figure 2).

Sales summary

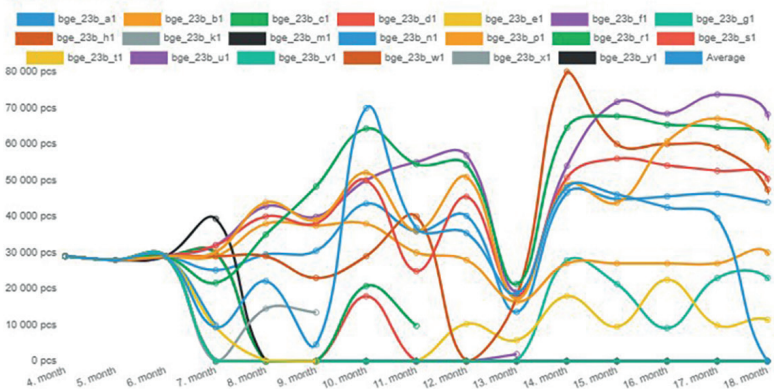


Figure 2. Sales summary of master’s student groups in the English-language Sales and Operations Management course at Budapest University of Economics and Business, Autumn 2023 (Source: EDUardo)

The simulation game differentiated four types of customers and showed the total number of products sold in each segment by the companies. The relevant results of the decision rounds were also shown to students and instructors (Figure 3).

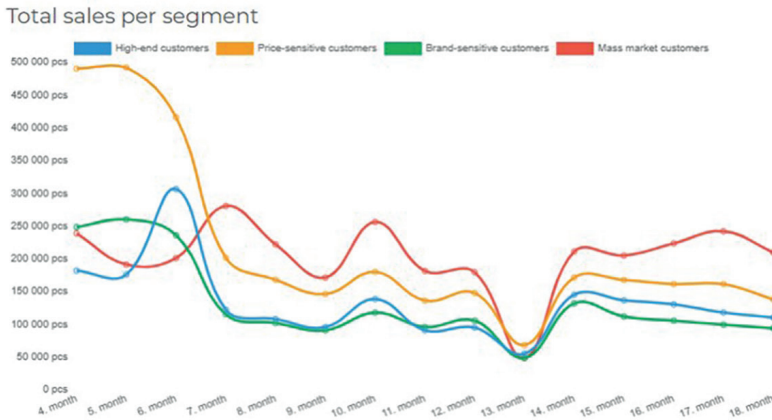


Figure 3. Total number of products sold in each segment by the companies (Source: EDUardo)

Although the charts continually informed the instructors about the results of the decisions made by students, the details of the decision-making process, including individual contributions and reasons for actions, were not displayed by the game. The group reflection papers were analyzed to clarify those elements.

Students studying in English held regular team meetings to exchange ideas and clarify roles. Those meetings were held both before and after decision rounds with the aim to identify business scenarios and make educated, timely decisions. The meetings were enhanced by the simulation's feedback mechanism, which enabled teams to adjust strategies quickly based on performance metrics and market information provided by the simulation software. The students emphasized the importance of handling unforeseen challenges, considering various risks, and adapting to changing market conditions. They also mentioned flexibility and the need to take a holistic approach to decision-making that considers multiple business aspects, from sales and marketing to production and human resources.

The decisions made by students studying the course in Hungarian were also grounded in thorough market analysis while taking into account both competitors' actions and their own market position. For instance, one student chose to keep prices below competitors' levels while allocating more funds to marketing. Another participant chose to respond to market fluctuations by enhancing the perception of products while reducing production losses. Several students also highlighted the critical importance of workforce management. For example, one student emphasized the necessity of maintaining adequate staffing levels to meet production goals; in one instance, excessive layoffs led to insufficient product output, which resulted in a shortage of demand in the market. The students also actively managed

finances, including revenue, costs, investments, and profits. One student referred to a challenge faced when loan repayments could not be met due to a failure to achieve planned sales quantities, which caused financial difficulties for the company. Others highlighted sales strategies aimed at increasing product awareness and catering to various market segments, including efforts to focus marketing on premium and brand-sensitive consumers.

Throughout their reflections, students examined various aspects of decision-making strategies, evaluated options, and responded to changes in the simulation environment. Examples from the simulation game illustrate their collaborative decision-making processes, strategic analyses based on competitor actions, and consideration of long-term impacts in their strategies. When faced with outcomes that did not meet expectations, they engaged in strategic re-evaluation and adjustments, including by revising pricing strategies and introducing alternative marketing approaches.

5. Discussion

The group reflection papers and the experiences of the instructors confirmed several issues in the academic literature that we reviewed. Overall, the students enjoyed the simulation game, appreciated its gamefulness, and found it engaging and relevant to the course. The situations in the game that mimicked real-life moments in the business world helped the students to learn more about competitive markets and associated periods of uncertainty and stress when significant decisions have to be made. Successful groups tended to avoid impulsive decision-making by instead relying on putting the strategies learned during lectures into practice. Some students emphasized that even though it was just a game, the stress caused by bankruptcy was indeed a shocking learning experience that they would not like to have in their careers.

Another common element that the participants all mentioned was the game's built-in market shock. Such a critical incident, as the literature also highlights, was a truly eye-opening experience for many students. Just when they had just gotten used to the complexity of decision-making involving the consideration of competitors, marketing activities, financial implications, and workforce issues, the market shock forced them out of their comfort zones and routine decision-making. It also helped them to connect the lectures with real-life practice.

The instructors took the risk of incorporating such a complex simulation game into their course knowing that the game immediately demanded consideration of various topics that would not be discussed until later in the semester. Nevertheless, due to their previous studies and work experiences, the master's students were able to grasp the gist of the complexity of the strategic decision-making process from the very beginning and accepted that certain issues would be clarified weeks later when the respective topic was discussed during a lecture. The instructors also considered the recommendation of researchers and excluded the simulation game's results from assessment. In that way, the stress related to the game did not exacerbate the

usual anxiety about assessment, and participation in the game was a very positive learning experience for the students, as the end-of-semester student satisfaction survey confirmed.

6. Limitations

Because we conducted a case study, the results need to be primarily interpreted in the context of the Sales and Operations Management course, as a mandatory module of two full-time postgraduate programs at BUEB: the MSc International Business and Economy program in English and the MSc Marketing program in Hungarian. It was the first time that the course ran with a 60-student cohort. As mentioned, the students in the International Business and Economy program were from a variety of countries. All students completing the online simulation game had previous academic experience in business and management, and the majority had work experience as well. Another important limitation to note is that our qualitative research did not focus on any specific decision-making skill, nor did it aim to measure changes in the students' performance related to the course objectives. The role of instructors in aligning the course with any simulation game incorporated, including detailed and constant communication with their students, was also an important factor to be considered. Last, an important caveat is the online simulation game played by the participants; although EDUardo's Values-Based Management online simulation game exhibits all the positive characteristics described by researchers, it is not necessarily appropriate for every postgraduate business and management course.

7. Conclusion

Today's business environment demands that companies operate ethically, responsibly, and sustainably. Managers are expected to generate value for stakeholders while maintaining a balance between profitability and social responsibility. The Sales and Operations Management course at BUEB addresses those expectations by providing students in the MSc International Business and Economy and the MSc Marketing programs with a comprehensive understanding of contemporary practices in sales and business operations.

Our qualitative research, based on a case study, aimed to explore how an online business simulation game can support the development of business students' decision-making skills and how postgraduate participants evaluate their learning experience in that context. In line with relevant academic literature, the selected online simulation game facilitated an engaging learning experience in which the alignment of course goals, the game's complexity and gamefulness, and the exclusion of the game's results from assessment were all important factors. The group reflection papers submitted by the participating students at the end of the semester confirmed that an online simulation game can be instrumental for practicing quick, complex decision-making and thus for preparing students for success in the global business

arena. Another academic paper examining the students' experiences and how the business simulation game contributed to the development of their teamwork skills is planned for future publication.

Ethics statement

The publication of the study's results has been done responsibly and without violating personal rights, honor, or reputation. Participation in the study by students at BUEB was voluntary; their informed consent was collected, and their personal data were protected. Compliance with scientific ethics standards was ensured by following the Hungarian Academy of Sciences' Code of Scientific Ethics, while the protection of personal rights and the handling of personal data were done in accordance with the regulations laid out in the "General Rules and Certain Personal Rights" of Act V of 2013, the Civil Code, as well as BUEB's policy related to data management.

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