

***Simulation-Based Learning:
Integrating ERP Systems in Business Education at Coimbra Business School***

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Abstract

Simulation-based learning (SBL), assisted by computer programs, has gained prominence in various scientific fields as an effective methodology for training qualified professionals to develop their future activities in this context. This approach was also adopted by Coimbra Business School, which a few years ago decided to introduce this teaching method into one of its business science courses. This experience has led to the creation of this article, which aims to present and discuss this active teaching method in the context of using Enterprise Resource Planning (ERP). The methodology used in this study is descriptive and exploratory, aiming to provide a detailed account of the teaching method employed at Coimbra Business School and to discuss its advantages for teaching business sciences (accounting, taxation, management, etc.). The study is based on information gathered through questionnaires from students who attended the course three years ago and are now practicing professionals in the job market. The results indicate that the use of simulations with ERP not only increased student engagement and motivation but also significantly improved their ability to apply theoretical knowledge in practical situations. These results suggest that integrating simulations into ERP teaching is an effective approach for training professionals who are better prepared for the challenges of the current job market.

Keywords: Simulation-Based Learning, Enterprise Resource Planning, Active Teaching Method, Business Education

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Introduction

Business management and modern accounting increasingly rely on reliable and timely financial information, which is essential for decision-making and the economic performance of organizations. In this context, Enterprise Resource Planning (ERP) systems have become indispensable tools, enabling the integration of processes such as sales, purchasing, treasury, and human resource management, while offering companies a holistic view of their operations (Charland et al., 2015).

Accounting, as a fundamental information system, addresses both internal and external demands and is currently supported by integration with other systems. This integration not only allows the generation of financial reports and tracking of source documents but also enables efficient resource management, enhancing market competitiveness (Zhang, 2023). Accounting education must follow this trend, preparing students for the growing use of information technologies, especially ERP systems, thus bridging the gap between education and professional reality.

Teaching in this context presents significant challenges (Léger, 2006). Many students, lacking practical experience in business environments, find it difficult to understand the benefits of ERP system parameterization and integrated usage. To overcome these challenges, active teaching methods that promote students active participation in the learning process and practical application of acquired knowledge, such as Simulation-Based Learning (SBL), emerge as effective approaches to align education with professional realities.

SBL aims to replicate the complexity of real-world environments, providing practical business experiences in a safe setting without risks to actual companies (Aldrich, 2003). This method has been applied in disciplines such as strategic management and accounting, for example, in simulating complete accounting cycles, from transaction recording to the preparation of financial statements. These activities enable students to understand the impact of business operations on decision-making (Mitchell, 2004; Sparling, 2002; Springer & Borthick, 2004).

Sidorova and colleagues (2023) highlight that, in the current context of technological evolution, higher education must adequately prepare students for the demands of the job market. In this regard, the inclusion of simulation in curricula is presented as a relevant strategy.

Léger (2006) developed a specific approach to this type of active learning, describing a simulation game designed to teach ERP concepts. His research concluded that students involved in the simulation demonstrated better assimilation of ERP concepts, underscoring the effectiveness of this pedagogical strategy for teaching enterprise systems.

Recognizing the benefits of this methodology, the objective of this article is to present the experience of Coimbra Business School | ISCAC in implementing SBL in the Business Simulation I (BSI) course unit, highlighting its advantages, challenges, and future perspectives.

Literature Review

Throughout history, education has undergone numerous transformations, reflecting changes in educational theories, societal needs, and available technologies. Traditionally, education was characterized by a knowledge transmission model, where the teacher was the sole holder of knowledge, and students were passive recipients. This model, based on lectures and memorization, placed little emphasis on the practical application of knowledge or the development of critical skills necessary for the real world.

With advances in educational psychology and cognitive sciences, learning is now understood as an active and constructive process. Active teaching methodologies have thus gained prominence, offering a student-centered approach that fosters more effective learning and the development of essential skills for professional success. When applied, these methodologies create dynamic, engaging, and effective learning environments (Duchatelet et al., 2022).

SBL, increasingly adopted in higher education, replicates real-life events or conditions, providing students with the opportunity to develop skills in a controlled environment. This is particularly useful in contexts where real situations are dangerous, rare, or complex, making them unsuitable for direct learning opportunities (Faber et al., 2023; Heitzmann et al., 2023; Vermunt, 2023).

McAlpin and colleagues (2023) define simulations as realistic environments that allow users to interact with models of situations and phenomena. Simulations provide an approximation of real-world practice, enabling students to build knowledge through real and interactive tasks (Dai & Ke, 2022). This environment fosters the development of competencies required for the parameterization and effective use of integrated systems (Bauer et al., 2022). Moreover, SBL facilitates the practice of complex or critical skills often encountered in real-world environments (Hanus et al., 2022; Vermeiren et al., 2022).

The effectiveness of SBL is widely recognized in promoting critical thinking, problem-solving, and deep learning. Studies show that well-designed simulations can significantly enhance student performance in complex tasks (Chernikova et al., 2020; Urquidi Martín & Tamarit Aznar, 2017). To maximize the effectiveness of SBL, it is crucial to create a safe and non-judgmental learning environment, where mistakes are viewed as opportunities to correct and consolidate knowledge (Madsgaard et al., 2022).

Despite its benefits, implementing SBL poses certain challenges. In the context of ERP education, the need for advanced technological resources, such as laboratories equipped with updated software, can be financially demanding for some institutions (McAlpin et al., 2023). Another challenge is the adaptation of students to a highly technical and interconnected environment, particularly for those without prior experience with integrated systems.

Additionally, the complexity of simulated business processes demands detailed and ongoing preparation from instructors to ensure that the simulations are both realistic and pedagogically effective. These challenges underscore the importance of careful planning and institutional support to maximize the benefits of SBL in educational contexts.

Methodology

This article employs two complementary methodological approaches: a case study and the use of structured questionnaires. The case study focuses on describing and analyzing the implementation of the SBL method in the curricular unit of BSI at Coimbra Business School | ISCAC. This approach allows for an exploration of the method's dynamics, from planning to execution, highlighting pedagogical and operational aspects.

Simultaneously, structured questionnaires were administered to gather data on students' perceptions and experiences during the past two academic years. The questionnaire included both closed and open-ended questions, enabling the collection of both quantitative and qualitative data. The questions addressed three main areas:

- **Learning Impact:** To understand how the SBL method influenced students' comprehension of ERP concepts and their practical application of acquired knowledge.
- **Skill Development:** To assess the development of technical and interpersonal skills relevant to the job market.
- **Satisfaction and Motivation:** To measure students' satisfaction and motivation levels compared to traditional approaches.

The collected data were analyzed descriptively to identify general trends and interpret students' qualitative perceptions. Open-ended questions in the questionnaire provided deeper insights into the methodology's relevance to their training. For instance, students were asked to describe the main challenges faced during the simulation and to highlight the skills they felt were most developed, such as financial analysis, ERP usage, and teamwork. These responses enriched the analysis, complementing the quantitative results and offering a more comprehensive understanding of the methodology's impact.

Case Study: Coimbra Business School | ISCAC

The application of the SBL methodology was integrated into the curriculum of Coimbra Business School | ISCAC with the objective of bridging academic education with the realities of the business world. This approach is particularly relevant for accounting and management courses, where the practical application of theoretical concepts is fundamental to preparing students for their professional careers.

The case study presented here describes the implementation of SBL in the course unit of Business Simulation I. This practical example illustrates the benefits and challenges associated with this teaching method, reinforcing its importance in higher education.

Implementation of Simulation at Coimbra Business School | ISCAC

The BSI course unit was introduced into the curriculum to provide students with a comprehensive practical experience, focusing on integrating the theoretical knowledge acquired throughout the course. Among the key pedagogical objectives are:

- Understanding the administrative and legal procedures necessary for company formation.
- Developing competencies in organizing and classifying accounting documents in environments close to business reality.

- Mastering the functionalities of an ERP system, exploring the coherence and articulation of data between modules such as Management, Human Resources, Assets, and Accounting.
- Interpreting financial and accounting reports generated by the ERP, with a focus on informed decision-making.
- Practically applying business concepts, promoting the development of entrepreneurial and managerial skills in a simulated environment.

This approach has been successfully assessed with students in the undergraduate programs in Accounting and Auditing and Business Management at Coimbra Business School | ISCAC, receiving broadly positive feedback, as students tend to prefer learning through practice.

The BSI methodology is divided into three phases: i) Introduction to ERP; ii) Business plan development; iii) Creation of the simulated company, business development using ERP, and data analysis.

Classes are held in labs equipped with ERP software, ensuring accessibility for all students. Each professor is responsible for 24 students, organized into six groups of four. With a workload of 3 hours of practical sessions per week, totaling 90 hours of contact time per semester, the maximum number of groups per professor is limited to six, ensuring effective guidance and quality pedagogical interaction.

In this setup, the professor acts as a consultant, guiding the working groups. This approach is based on the principle that students are responsible for developing their simulated business, while the professor acts as a facilitator with whom they share and discuss ideas. The professor adopts a pedagogical guidance role, fostering critical thinking and discussion on relevant topics and activities rather than directly executing tasks. According to students, this model has significantly contributed to forming competent professionals aligned with current market demands.

Introduction to ERP.

To enable students to use ERP software effectively in this course unit, an introductory session is necessary to familiarize them with its functionalities. This phase introduces students to ERP systems widely used in real business contexts, providing a first-hand experience with market-applied technological tools.

During the first four weeks of classes, the professor demonstrates ERP functionalities using an expository method to explain the connections facilitated by the software, including managing procurement, sales, treasury, human resources, and assets. Additionally, the integration of accounting entries within the accounting module is explained, enabling, after automatic registration, the generation of essential accounting reports for decision-making and legal compliance.

Business Plan Development.

In parallel, students select a business area for their simulated company and develop a business plan to evaluate the feasibility of their idea. To align the simulation with real business scenarios, common rules are defined, encouraging students to include typical company activities such as applying for subsidies and acquiring specific assets.

This phase includes a market analysis of the chosen business area, sales projections, and estimation of necessary expenses for the simulated company, such as materials, services, human resources, and assets.

By analyzing financial projections, students determine the initial capital required for the company, allocating it between equity and debt. The business's feasibility is assessed based on financial reporting and related economic-financial indicators, enabling them to move forward with the creation of the simulated company and guide the simulation of current operations.

Creation of the Simulated Company and Business Development.

From the fifth week onward, students use the ERP software to simulate the formation and daily operations of a company over two months. They are responsible for decisions related to investment, financing, hiring human resources, accounting records, and all activities inherent to the development of the chosen business activity.

During this period, accounting, fiscal, and management challenges are also presented, exposing students to real business scenarios within a controlled environment. Monthly, students conduct analyses of trial balances, account statements, and management support reports, evaluating the efficiency of their resource management. This process includes audits conducted with the professor's support, who also assists in closing accounts at the end of the simulation.

The final week is dedicated to the final analysis of financial and management reports, identification of potential errors, and submission of the electronic dossier documenting all the simulated company's operations.

The schedule presented in Table 1 outlines the main stages and tasks carried out during the business simulation, from week 5 to week 11.

Table 1: Schedule of Activities for Business Simulation I

Week	Task	Description
Week 5	Simulation of November operations	Introduction in ERP of inventory purchases, assets, services, and payments processes.
Week 6		Introduction in ERP of human resource elements and payroll processing. Recording of operational expenses in treasury.
Week 7		Preparation of sales and receipts processes. Integration of transactions into accounting. Organization of the generated documents in the company dossier.
Week 8	Analysis of November	Audit: Review of reporting maps and decision-making. Analysis of November trial balances.
Week 9	Simulation of December operations	Introduction in ERP of purchase and payment processes. Recording of operational expenses in treasury.
Week 10		Payroll processing and simulation of compliance with related obligations.
Week 11		Preparation of sales and receipts processes. Integration of transactions into accounting. Organization of the generated documents in the company dossier.

In Table 2 is presented the schedule outlines the main stages and tasks carried out during the business simulation, from week 12 to week 15.

Table 2: Schedule of Activities for Business Simulation I

Week	Task	Description
Week 13	Simulation of year-end operations	Calculation of the cost of goods sold and consumed, estimation of accrued expenses, processing of depreciation and amortization, and impairment testing.
Week 14		Organization of the generated documents in the company dossier.
Week 15	Business analysis and final trial balances	Students present final financial reporting maps, including the evolution of sales and expenses, as well as final trial balances. Submission of the simulated company dossier.

It is important to highlight that the goal of BSI is not solely to learn the processing of a company operational transactions but also to analyze and interpret the data generated by the ERP system to make informed management decisions. Students assume the role of managers of their own companies, where they evaluate and manage resources. Among other management tasks, they develop treasury skills by analyzing cash flows and interpreting trial balances, account statements, and journals generated by the ERP system, thus strengthening their knowledge and abilities as accountants and managers.

The described environment places the student at the center of the learning process, allowing them to apply theoretical knowledge in real-life scenarios and prepare for the challenges of the job market.

Results and Discussion

The implementation of BSI at Coimbra Business School | ISCAC has brought significant benefits to students, aligning academic education with the demands of the labor market. According to Jossberger and colleagues (2022), simulation in higher education allows students to face professional challenges without the risks associated with real-world scenarios. In the case of BSI, students take on the role of managers, making business decisions in a protected environment, which fosters a practical understanding of complex concepts. Among these concepts are inventory management, treasury, and finance, as well as the use of integrated ERP systems, which, when properly configured, enable nearly automatic accounting processes. These competencies are essential to meet current market demands.

Additionally, BSI, with the support of professors, provides a safe pedagogical environment for students to understand the consequences of errors and learn from them. This academic guidance is essential, replicating real-world business situations in the classroom and guiding students toward applying the best solutions to presented problems. This interaction not only enhances students' confidence but also allows for a more structured development of their practical skills. Although the study does not provide direct evidence regarding employers perceptions of these competencies, literature suggests that skills such as ERP system usage and the ability to interpret financial reports are highly valued in the labor market (Léger, 2006; Mitchell, 2004). This connection between practice and professional environments underscores the relevance of this method in preparing well-qualified professionals.

The benefits of this methodology have been confirmed by surveys conducted with 75 students who attended the course unit over the past two academic years. Approximately 73.6% of respondents reported feeling more motivated by this teaching method, while 86.8% highlighted that the simulation helped them understand theoretical concepts in practical scenarios. These results underline the effectiveness of BSI in providing a meaningful learning experience closely aligned with business realities.

Despite the positive results, the implementation of this method presents challenges. The lack of integration with external entities such as tax authorities and social security limits the authenticity of the experience, restricting the simulation of more realistic scenarios. Additionally, the manual preparation of supporting documents, usually received from suppliers, proved to be a labor-intensive task for students, diverting focus from more strategic and pedagogical activities within the simulation.

These challenges highlight opportunities for improvement, such as developing digital tools that automate document preparation and allow for the simulation of interactions with external entities. Implementing these solutions could enrich students' experiences, making the simulation even more effective and aligned with the corporate environment.

Conclusion

This article presented the implementation of the SBL methodology in the BSI course unit at Coimbra Business School | ISCAC. Through a combination of case study and surveys applied to 75 students, it was possible to identify clear benefits and challenges of this pedagogical approach.

The results show that SBL promotes a practical learning experience highly valued by students, aligning academic education with labor market demands. By integrating complex concepts such as management, accounting, and the use of ERP systems to support them, the methodology enables students to develop technical and interpersonal skills essential for professional environments. The high motivation and enthusiasm of students confirm the effectiveness of the method, highlighting it as an efficient tool in higher education.

However, challenges such as the lack of connection with external entities and the manual preparation of documents point to the need for additional innovations, such as the development of specific digital tools to minimize these obstacles and enhance the authenticity of the simulations. These improvements could not only enrich the learning experience but also strengthen its connection to real business practices.

Thus, we conclude that the BSI experience highlights the potential of SBL as an effective methodology for preparing students for the challenges of the labor market. We hope that the presented results encourage other institutions to adopt similar approaches, promoting the development of better-prepared professionals aligned with current market dynamics. We hope that the results presented can encourage other institutions to adopt similar approaches, promoting the training of better prepared professionals aligned with current market dynamics.

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