

Using Computers and Simulations in Business Education

Ph.D. ANDREEA ZAMFIR, Ph.D. ION PLUMB, Ph.D. COSMIN DOBRIN, Ph.D. ION POPA

Faculty of Management

Academy of Economic Studies Bucharest

6, Piata Romana, RO 010374, Bucharest

ROMANIA

zamfir_andreea_ileana@yahoo.com, www.ase.ro

Abstract: The use of computers and simulations in business education has gained a growing attention in most universities and has changed the educational practices. The aim of this paper is to reveal recent research focused on the use of computers and simulations in business education. The paper discloses the main rationale for applying computer simulations in business education. Moreover, PRELEM XXI managerial simulation is presented and the results of using it from the point of view of the students are revealed. The findings reported in this study may be helpful for future research in the area of using computer simulations in business education in order to produce new attractive ways of learning.

Key words: computers, business, education, managerial simulation, PRELEM XXI.

1. Introduction

Many possibilities are available for communicating and exchanging information in education using computers. One of them is computer simulation that could be successfully used in economic and managerial education. This study is the result of some years of personal experience in teaching Management for Romanian students and using PRELEM XXI managerial simulation in order to develop the skills that students need for their future professional economic and/or managerial activities.

2. Computer simulations for educational purposes

The number of computer simulations and web-based applications used in universities increases permanently. Technology is changing the way classrooms operate nowadays [1] and it is found useful by the students [2]. Thus, they are intensely using new technologies such as computers, internet, cell phones, simulations and computer games [3].

As a result, the traditional teaching methods do not match anymore with the actual student's needs and behaviour. As teachers can not change the students, the best way is to adapt their pedagogical approach to them, and to create new learning environments [1, 4, 5, 6].

Various new models of education are evolving in response to the new opportunities [7] that are becoming available by integrating computer simulations into the educational process. The new educational model is characterized by the

interdependence of communicative interaction, new technologies, the development of computer applications, the design of computer-based tasks and focused activity for learners to become critical thinkers and creators of knowledge [8, 9]. The core students' skills that should be developed are the ability of creative thinking, team-task solving, system of thinking, business decision-making, the ability of both gaining and distributing correct information in correct time and place, to make use of the advantages of computers and simulations for the exchange of information [10, 11, 12].

In today's world computer simulations and games are being implemented and integrated within several fields like military, health, research, industrial environments [13], business, education etc. In economic and managerial education it is very useful to simulate the activities of a company in order to develop students' competences and skills they need for their real activities. Since the real environments are not always available, the virtual environments can be effective alternative.

Simulation is based on the principle of "learning by doing", meaning creating a virtual environment in which to operate a model previously built. In such virtual environments, students will be forced and encouraged to behave, speak, think and write in the same way of real life [3]. In addition, a virtual environment has the advantage of experiencing different situations and learning from history, from successes and failures. Experience is a requisite resource for any company (virtual or not) to perform better in handling upcoming similar situations [14]. Simulations enhance learning

through group interaction and if this is used realistically, the experiential nature and the intensity and motivational aspects of learning should make the learning experience superior to any other learning activity. A dynamic and authentic learning environment provides a self-directed learning experience, where the teacher acts as a facilitator for learning. [6]

3. PRELEM XXI managerial simulation

PRELEM XXI managerial simulation was created and developed by a group of teachers from the Faculty of Management from the Academy of Economic Studies in Bucharest. It was designed for the students at final courses of the degree from the Faculty of Management. Therefore, PRELEM XXI integrates knowledge from various fields like production, investments, finance, accounting, human resources etc.

3.1. Features of PRELEM XXI managerial simulation

The main features of PRELEM XXI managerial simulation are the following [15]:

- It is a *general managerial game* which simulates most of the activities of a company in the wood

industry processing in order to achieve the main objectives of that business;

- It is a *team managerial simulation*, because the students work in small groups;
- It is a *computational managerial simulation* which processes information using the computer;
- It is an *interactive managerial simulation*, because the actions and decisions adopted by the participants are influencing each other to some extent;
- It is a *medium-superior managerial simulation* for the reason that it simulates management and execution processes within the company made by the medium-level and superior-level managers.

3.2. Overview of PRELEM XXI managerial simulation

Within managerial or industrial simulations such as PRELEM XXI each student is a member of a group (virtual company) and the class is split into 5 groups (virtual companies) that act like competitors on the same market. Each round of the simulation represents a virtual month and usually the students are simulating 12 months of industrial activity.

Simulated activities within PRELEM XXI simulation game are presented in figure 1.

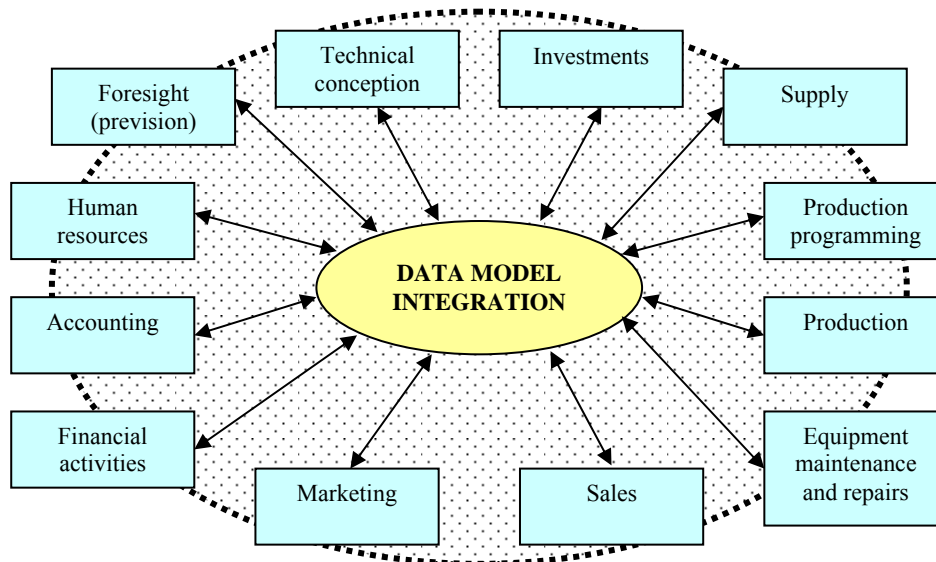


Fig. 1 PRELEM XXI data integration

The system used for the simulation includes the following components [15]: server; work stations; software for the server: Windows 2k Server, PRELEM XXI server, TCP-IP network protocol, Microsoft SQL server; software for the work stations: Windows XP, PRELEM XXI client, TCP-IP network protocol.

The main informational situations (managerial reports) provided by the system are:

1. Forecasted objectives situation (monthly and annual company plan);
2. Monthly validated decisions situation;
3. Monthly processed decisions situation;
4. Products assimilated in fabrication situation;

5. Functioning technological lines situation;
6. Research activity situation;
7. Rough (starting) material report;
8. Production report;
9. Technological equipment and human resources utilization situation;
10. Maintenance and repairs activity situation;
11. Sales and stored products situation;
12. Marketing studies situation;
13. Costs and profits situation;
14. Accounting situation;
15. Monthly balance sheet;
16. Financial activity situation;
17. Revenue and expenditure budget;

18. Forecasted objectives accomplishment situation;
19. New products portfolio.

Basically, these reports contain the results of the simulation for a simulated month and they are the subject of students' analysis when a new round of simulation starts on. The initial data are identical for each of the 5 companies and consist in the above mentioned informational situations provided by the system. However, the big number of decisions adopted by the students (around 60-65 decisions per simulated month) rapidly differentiates the performance of each virtual company.

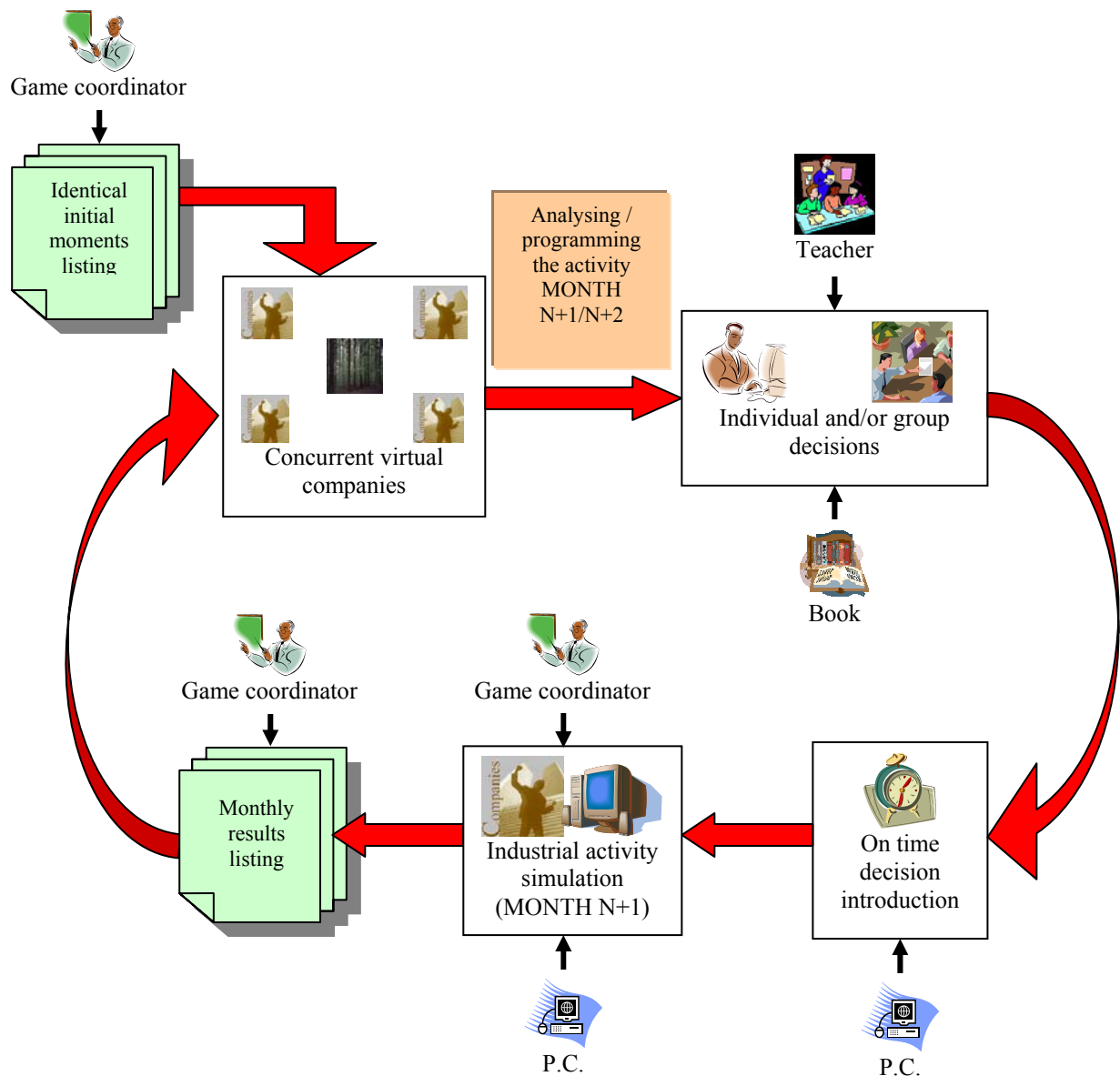


Fig. 2 Framework of PRELEM XXI managerial simulation

Figure 2 shows the general framework of PRELEM XXI managerial simulation, emphasizing the phases of the simulation and also the fact that the

simulation is an iterative process. In essence, playing the game involves three different phases:

1. *Analysis and decision making.* Within this phase students analyse the activity of their company and take on decisions based on calculations and foundations executed by each group. The students take on decisions for each simulated activity, based on the PRELEM XXI book, on their previous learning and on their managerial knowledge. They also have the support of their teacher. Basically, the students from each simulated company must adopt many decisions, such as: annual forecasting; monthly forecasting; supply decisions; scientific research decisions; new products assimilation decisions; production decisions; marketing and sales decisions; human resources decisions. The final decisions are the sum of individual decisions first and group decisions second.
2. *Decision introduction and simulation processing.* After taking on the decisions, the students must introduce the data into a computer in order to be processed and wait for the managerial reports with the results of the monthly simulation. The results of the simulation for each company are obtained through processing decisions of all virtual companies. Therefore, an important issue in this phase is that all 5 companies should introduce their decisions into computer so that the managerial simulation to work.
3. *E-mailing the managerial reports.* The managerial reports that contain the results of the simulation are E-mailed by the simulation coordinator to each company after the managerial decisions processing. In addition, the teacher receives a specially designed report in which there are synthesised the main results of the simulation for each virtual company. Based on these reports the whole process starts again with the first phase of the simulation.

In order to run the game and to facilitate communication, for PRELEM XXI managerial simulation was created a forum, where the students and other people interested could find information related to the simulation [16]. The forum is structured as follows: General Information (general rules, useful documents, the situation of decision introduction for the Faculty of Management from the Academy of Economic Studies in Bucharest), Discussions (about the simulated activities), and Varied other subjects (diverse) [16]. Besides the Forum, the students have the possibility to communicate with the game coordinator and with their teachers through E-mail.

At the end of the managerial simulation (after 12 rounds/months simulated) the evolution of the virtual companies is analysed by the teacher and a winner company is established based on several criteria (fig. 3).

Indicators	Company 1	Company 2	Company 3	Company 4	Company 5
Market value of the company	46959136	61019432	48105072	62465096	48311072
Profit	172795	3068932	1382238	5196059	2207460
Turnover	4861660	8699135	4741430	8941146	5500376
Rate of profit	3.56%	35.20%	29.16%	58.12%	40.14%
Average number of employees	85	102	86	94	85
Expenditure to 1000 euro made production	1168	785	869	623	922
Final scores	409	783	574	998	643
Final ranking	5	2	4	1	3

Fig. 3 PRELEM XXI Final Results Evaluation

Market value of the company, profit, turnover, rate of profit, average number of employees and expenditure to 1000 euros made production are the criteria used for establishing the final scores and final ranking of the virtual companies.

3.3. Results of using PRELEM XXI managerial simulation

In this subsection the results of using PRELEM XXI managerial simulation from the point of view of the students are presented. These results derived from the analysis of the empirical data collected during the class through personal observation, interviewing and questionnaire.

The questionnaire used was construed based on a five-level Likert scale. It had a scale of increasing intensity where 1 indicates strongly disagree (very badly) and 5 designates strongly agree (very good). The questions used to find out the students' opinion about the managerial simulation they have been played are listed below:

1. Is this simulation easy to use?
2. Will this simulation help you during your career?
3. Has this simulation improved your knowledge in the management field?
4. Has this simulation improved your communication skills?
5. Has this simulation improved your teamwork skills?
6. Has this simulation improved your strategic thinking and critical thinking skills?
7. Is the information regarding the simulation accessible to you?
8. Have you enjoyed this simulation?

9. To what extent the PRELEM XXI Forum helped you?
10. To what extent have you used E-mail to communicate with your teacher and/or with the game coordinator?

The average values (scores) of the responses regarding the PRELEM XXI managerial simulation for each question are presented in table 1 and compared in fig. 4.

Number of the question	Analyzed item	Average scores
1.	User-friendly	4.63
2.	Help during the future career	2.83
3.	Improving knowledge	3.28
4.	Improving communication skills	4.14
5.	Improving teamwork	3.98
6.	Improving strategic thinking and critical thinking skills	4.23
7.	Accessibility of the information	4.85
8.	Enjoying the simulation	4.78
9.	Forum assistance	4.31
10.	E-mail use	4.22

Table 1 Average scores obtained

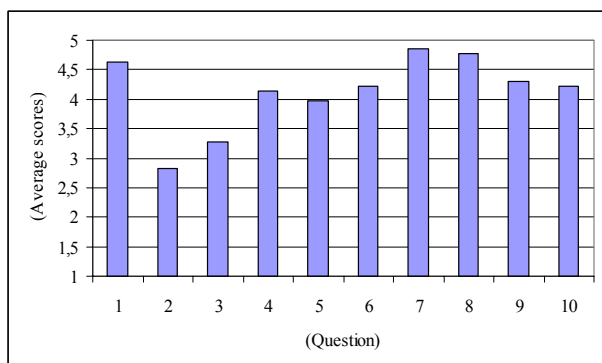


Fig. 4 Results for the questions posed

By analysing the average scores obtained we can conclude that PRELEM XXI managerial simulation has proved to bring substantial benefits, such as:

- It is to some extent uncomplicated to use, due to the advantage of not having to learn a new language. Therefore, the students could concentrate on the analysis and the decision-making;
- Students have all electronic study materials and information available altogether in one environment. The relevant information about the simulation is accessible anytime and anywhere. This way, students are able to follow the simulation even if they are not attending to class. Students seems to appreciate the accessibility to their monthly results;

- The simulation promotes competition between the virtual companies (groups of students), but in the same time, it promotes teamwork inside the companies. In business subjects, the inevitable outcome of creating common projects is teamwork. The virtual simulation environment is well-suited to this because the students can communicate with the teacher and to each other, and discussions are accessible to members of the team only;
- The forum allows discussion between students and teachers;
- PRELEM XXI managerial simulation is enhancing knowledge acquisition, retention rate and motivation for learning. It supports the development of skills like strategic thinking, critical thinking, planning, communication, collaboration, and group decisions making. Students seemed to enjoy the simulation, basically because they can put in practice their management theoretic knowledge through real process;
- The simulation becomes an aid during the teaching-learning process to reinforce the theoretical concepts;
- The students were more enthusiastic and motivated to learn Management because they felt more close to reality when the simulation was used. In addition, the students believed that participating to this computer simulation was an opportunity for them to prepare to manage a real company.

4. Conclusion

The motivation for this study was justified because business and economics involves a social dimension, meaning that people learn, work and live both as individuals and as teams, as society. Another reason is that PRELEM XXI was designed to produce real situations within the processing of wood industry. It supports multi-player interactions as well as individual thinking and learning.

PRELEM XXI managerial simulation could be used to produce rich educational materials which support collaborative learning. Thus we can see the simulation is important to assimilate the theoretical concepts in business education and to put them in practice. Moreover, the managerial simulation enhances the teaching and is more attractive for the students.

Using PRELEM XXI computer simulation for educational purposes has proved to be a successful and popular choice. It seems highly motivating and makes simulation enjoyable for students. They gained considerable experience in managing a

virtual company which for some of them will be an asset for their future professional career. The results of this study confirmed that teachers could integrate into their teaching activity technological tools like computer simulations that promote interaction and critical thinking among students. All these factors make this computer simulation a viable vehicle for the study of Management, providing tools for creating realistic economic and managerial environments. This suggests that more research should be done in the area of using computer simulations in business education in order to produce new attractive ways of learning.

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