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# Simulating reality for teaching strategic management

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This paper describes the development of a business simulation combining a computer application with real experts to provide university students with an immersive experience in business management. It introduces a methodology that involves students in a process of interaction with other participants as well as benefiting from valuable feedback from experts acting as economic agents. The approach has been tested, in the context of a Certificate of European Law and Economics course, at the University of Economics in Bratislava, Slovakia during the 2002/3 and 2003/4 academic years. Analysis of the experience that was gained has provided some guidelines that instructors can use to integrate simulation effectively into their teaching practices relating to strategic management.

## Introduction

Teaching methods are taking advantage of new technological advances. Nowadays, information technologies play a fundamental role in increasing the possibilities for new teaching and learning approaches (Draijer & Schenk, 2004). For strategic management studies there is a need to increase awareness about the interrelationships between strategic decisions of the different functional areas of a firm (Mankins, 2004). Theoretical approaches are limited in the way that students perceive such interrelationships only through general decisional frameworks applicable to any kind of industry. Moreover, students may perceive strategic decision-making as a static process in which only top managers have an active role (MacKay & McKiernan, 2004). In fact, most university courses related to strategic and operations management are still based on lectures and individual assignments, focusing on abstract analysis techniques and many times neglecting interpersonal aspects as well as the impact of decisions in the different firm areas. Only case studies bring students the opportunity to confront themselves with determined decisional aspects of the firm. However, the range of decisional possibilities is limited due to the static nature of the information given in the case (Mitchell, 2004).

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The fast development of computer technology, as well as the rapid improvement of versatility in programming languages, has increased dramatically the possibilities of simulation applications to emulate reality with excellent degrees of accuracy (Martin & McEvoy, 2003). In fact, many business schools and consulting companies are increasing the use of these simulation tools for personnel training and selection. In this context, simulation offers the possibility of observing the behaviour of individuals under pressure conditions with no cost-of-errors for the firm. In addition, not only personal skills can be valued but also personal attitudes in the process of collective decision-making (Curry & Moutinho, 1992).

Cadotte (1995) suggested that business schools place too much emphasis on theory and not enough on execution as well as too much on separate disciplines at the expense of integrative problem-solving and management. Ten years later still lectures, textbooks and case studies are the primary methods of teaching, at least in most European business schools. Business simulations have increased their potential with possibilities of developing large-scale simulations. However, there is still a long way to go before simulations can be considered as a widespread method of teaching.

Moreover, generalization of the use of simulation tools at universities for strategic management teaching is still far away from becoming a reality. In many cases, the lack of an applicable methodology to incorporate these simulators in the strategic management courses becomes one of the most difficult barriers to overcome for lecturers to implement these educational resources in their syllabi. On the other hand, universities and educational institutions are responding to the challenges of teaching and learning with information systems and technologies; through different philosophies regarding diverse learning environments (Masi & Winer, 2005). In this paper, we describe a methodology for putting into practice a simulation dynamic for groups of students ranging from 25 to 40 with strategic management basic knowledge. Smaller groups of participants can result in too heavy workloads for each individual while bigger groups end up disseminating the responsibilities among too many individuals, which finally turns into a lack of interest and difficulties of coordination. This methodology can be applied either in parallel with theoretical lectures or after them and was successfully tested in the context of the Certificate of European Law and Economics (CELE) course at the University of Economics in Bratislava, Slovakia in the 2002/3 and 2003/4 academic courses. This was funded by the Matra Programme of the Netherlands Ministry of Foreign Affairs.

## Simulation games

Simulation games started to be used in the 1950s when computer science started to be introduced in some American Business Schools. Initially, the simulations were developed by modelling some quantitative variables related through simple programming routines. Students handled and obtained some results from those variables after analysing a firm's case (Meyer *et al.*, 1969). Since then, simulation games have been increasingly improving as hardware and software technology improves. Nowadays, modern computer equipment allows simulations that emulate reality with accuracy levels which boost training and education potential in business management.

Basically, the decision-making process is simulated through mathematical models that analyse not only the firm's internal variables but also how they interact with the environment. Hence, the results obtained by a firm rely not only on their own decisions but also on the decisions made

by other participating firms. In addition, simulators create new knowledge for managers in a way that enhances organizational learning—as it is possible to answer the question 'what would have happened if...?' (Cohen, 1991). So, aftermath analysis of the decisions lets the students have supporting elements for reducing the risk level in decision-making in real life.

Simulators can be applied for different purposes in the internal context of a firm apart from training and education. Firms which operate in complex environments can take advantage of this technology by creating different scenarios representing most probabilistic states of nature (Stickel, 2001). Also, human resource activities, such as selection, recruiting, promotion or audit, can incorporate simulations for detecting and evaluating skills, abilities, attitudes, knowledge and/or experience of new candidates (Zulsch *et al.*, 2004). Furthermore, competitions are becoming very successful instruments to promote values related to team work, communication, personal development and organizational culture in order to improve the cohesion and organizational behaviour of the participants. This is especially relevant for firms that are in the process of assessing personnel positions or rearranging team work (Dawson, 1994). Training efforts generate higher added value by entwining theory with practice as well as letting individuals be responsible for firm decisions without taking risks, which involves a more global vision of the strategic management process. Innovation and product-launching processes are liable to be simulated as well. Risks associated with customer acceptation and fluctuation of demand can be better specified by recognizing beforehand which variables affect variability according to simulated circumstances (Sallot, 1997). In fact, simulation technologies can be employed in all kinds of firm-related activities that require improvement of skills and decision-making, practising, motivating or researching among others. In addition, these learning technologies reduce the difficulties students encounter when learning through a problem-oriented approach, by aligning the contents and assessment of the subjects with the students' learning needs and potential (Chung & Chow, 2004).

In the teaching–learning process, simulations play a twofold role. On the one hand, simulators act as a mediating technology which offers a teaching framework in the form of 'game rules'. In this way, learning is achieved in two phases. First, participants have to decide which decisions fit better with their final goal, that is, to win the competition and become the virtual firm with the highest accumulated profit. Second, they have to consider how the decisions of the other participants are going to affect their own decisions (Lainema & Nurmi, 2006). On the other hand, the simulation process reinforces learning through the feedback obtained when the decisions are processed and the results are made available to the participants. In every simulated period, participants modify and improve their decisions according to their previous experience (Arellano *et al.*, 2001). At the end of the simulation, most participants reported they would act differently if the simulation was run again according to what their acquired knowledge on the distinct management issues simulated.

Simulations can be applied to strategic management teaching using two different approaches depending on the treatment given to the exogenous variables. One approach considers exogenous variables as given, so different scenarios are simulated under a *ceteris paribus* assumption on determined states of nature (static simulations). This is the case, for instance, of applications that run simulations on balancing production lines or service environments. In this kind of simulation, students learn how endogenous variables behave under pre-established conditions. Results are based on statistical measures about efficiency and effectiveness of the system to be

optimized (Smith, 1990). Using the other approach, simulations can be developed under uncertainty conditions about the environment (dynamic simulations). In this case, most exogenous variables are unknown and depend on the decisions of different economic agents like, for instance, competitors or retailers, which also take part in the simulation (Mitchell, 2004).

Static simulation applications are based on mathematical models of optimization. Most of them are known by the students, so they could calculate by themselves at least some results of the system balancing. Simple spreadsheets can be used to simulate uncomplicated systems while more detailed or complex arrangements require more sophisticated software (Curry & Moutinho, 1992). However, dynamic simulation applications must conform to some basic requirements in order to fulfil learning objectives. As the behaviour of the environment variables is not known by the participant individually, the first requirement implies that there is no one optimum solution. Results will depend on the actions taken by the whole group of participating agents. The second requirement involves the simulator not judging the decisions made, as the concept of right and wrong decisions has to be considered according to all decisions taken by all participating agents. The third requirement assumes that the process of interrelating strategic, tactic and operational decisions are reproduced in detail as in reality. Hence, participants will be able to recognize the impact of strategic decisions on tactical and operational issues. Finally, dynamic simulators must replicate sectors and products known and preferably used by participants in order to avoid abstract environments in which there is no clear reference for students as in reality (Goodwin & Franklin, 1994).

However, the use of simulators in teaching is not exempted from some limitations. Actually, there can be some degree of disparity between simulation and reality. Though, recent development of computer technology has increased accuracy and realism in model representation. In addition, risk and responsibility for mistakes are perceived as lower than in reality, which can lead to taking more chancy decisions. Also, participants may focus on quantitative issues and ignore qualitative aspects of management such as personnel or customer satisfaction according to available information generated by the quantitative-oriented simulators (Schweiger & Sandberg, 1989). Finally, the use of simulators without a solid background knowledge of strategic management may generate for students a false consciousness of easy learning. Simulations only make sense when participants are really aware of the variables and relationships involved in all decisions. Otherwise, students would be just playing with ciphers in a nonsense game.

The main goal of this paper is to present a methodology that overcomes some of those limitations by having participants interact with real agents who play different roles in order to guide the experience towards realism and learning (Mwanza & Engeström, 2005). This methodology is designed to be implemented with an effective interactive learning application in a user-centred approach based on general human–computer interaction principles as well as educational theory (Cairncross & Manion, 2001). This methodology is derived from experience and literature review (see among others Nwana, 1990; Hutchings *et al.*, 1993; Ford, 1995; Aldrich *et al.*, 1998; Kleijnen, 2005; Olafsen & Cetindamar, 2005) and was put initially into practice as a pilot implementation in 2002 at the University of Economics at Bratislava. The Praxis Hispania MMT™ version 10.1 was the initial version of the simulation software utilized in that academic course. Updated versions have been used in later courses up to version 10.3. The experience and knowledge obtained in the initial experience helped to enrich the methodology with complementary activities to extend the experience beyond the mere process of decision-making. All students

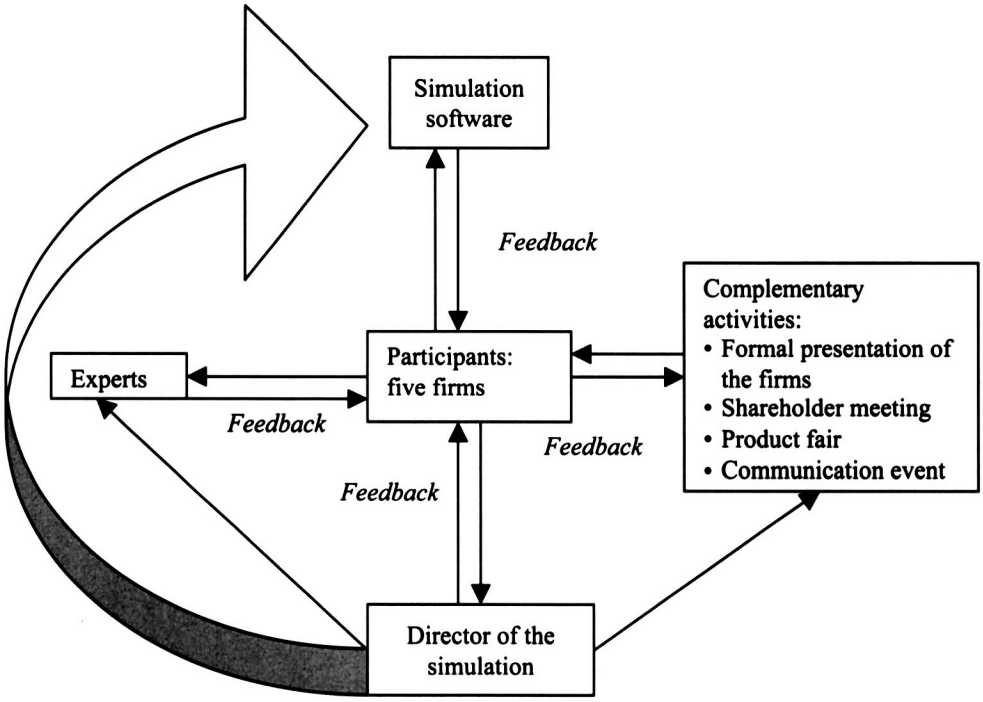


Figure 1. Elements and interrelationships of the simulation experience

took part in complementary activities to extend the experience beyond the process of decision-making (see Figure 1). Finally, the feedback of students is presented in order to review strengths and weaknesses of the methodology.

## Methodology

Seven stages were defined to implement the simulation in the strategic management course. All stages are sequential and each intends to cover different sub-objectives in the process of involving the students into a realistic experience. Scheduling was flexible so every stage could be extended or shortened in time depending on the participant requirements and training. A minimum of 30 hours was considered to be required for developing a simulation experience that covers all learning objectives. Around 30% of that time was spent in theoretical activities in the class while the remaining 70% was focused on the decision-making process and simulation dynamics. All stages are summarized in Table 1.

### *Stage 1: Review of concepts and techniques of the decision-making process*

This first stage had as the main goal that students become skilled at the practices used in the firms in the decision-making process. This process was introduced through all the phases that lead to the final decisions under a structured framework. Such a framework considered not only

Table 1. Stages involved in implementing simulation in strategic management studies

| Stage | Main objectives | Short-term goals | Long-term goals |
|---|---|---|---|
| Stage 1: Review of concepts and techniques of the decision-making process | Students become aware of the process of making strategic decisions | Increase knowledge about outcome impacts in the different areas of the firm | Use of the decision-making process in all strategic decisions |
| Stage 2: Development of role-playing activities related to decision-making in strategic management | Students put into practice all knowledge learned in the first stage | Participants become aware of how the concept of conflict influences the decision-making process | Participants' coherent presentation of ideas and positions to the rest of the group |
| Stage 3: Description of the simulation rules | Clarification of the basis and policies of the whole experience | Analysis of the simulator procedures, interfaces and use of applications | Understanding of the variables that configure the main strategic decisions in the firm |
| Stage 4: Assignation of participants to work teams (firms) randomly | Assignation of participants to work teams | Experience working as a team | Generation of long-term abilities for negotiation and resources allocation inside the team |
| Stage 5: Simulation performing and complementary activities | Involvement of the participants in the simulation | Extension of the simulation across designing and developing of new products as well as implementing marketing policies in the market | Immersion of the participants in the strategic management process |
| Stage 6: Analysis of performances and simulation aftermath | Presentation of all decisions and outputs obtained throughout the simulation periods to the audience | Discussion about evolution of the industry and firms | Interchange of information about the decisions-making process so participants can be aware of which decisions led to which results in the context of the whole industry |
| Stage 7: Evaluation of the participants and the simulation experience | Questionnaire analysis for feedback | Performance and efforts made at the complementary activities are to be also weighted in the evaluation process as well as negotiation abilities with bankers and retailers | Improvement of the whole methodology for future experiences |

the potential consequences of every single decision but also the impact of the outcomes in the different areas of the firm (Anthony, 1988). This stage was performed under a general case-study base with some role-playing applications. No specific firm cases were introduced at this stage as students may try to automatically refer to a determined case when applying the decision-making process. This could lead to confusion especially when making the first decisions in the simulation as results may not be as expected simply because the environment variables will not resemble those of the case used as reference. Students were expected to find solutions through a structured process where in many cases creativity and one-step-forward thinking are intended to be fostered at this stage.

*Stage 2: Development of role-playing activities related to decision-making in strategic management*

In this second stage, the students put into practice all knowledge learned in the first stage. It was at this stage when participants could understand how the concept of conflict influenced the decision-making process. Role playing was based on cases where groups of students had to come to a common position on different issues which could not be answered with a 'yes' or a 'no' in order to improve their ability to build solid arguments. Students had to apply the decision process under time pressure and also be able to present their ideas and personal opinions to the rest of the group in a coherent way (Schweiger *et al.*, 1986).

*Stage 3: Description of the simulation rules*

As most students did not have any experience with simulations, it was necessary to made clear what were the basis and policies of the whole experience. An analysis of the simulator procedures, interfaces and use of applications was developed in this stage regarding the Praxis-Hispania MMT™ application. All variables, outputs and decisions formats were clearly explained at this point. The number of decision periods to be simulated was four though it could be adjusted depending on the nature and length of the course. Usually, up to three decisions per week is a good approximation for a regular strategic management course. However, in the case of focusing on the decision-making procedure under time pressure conditions, the number of simulated periods per unit of time could be increased.

*Stage 4: Assigning participants to work teams (firms) randomly*

Participants were assigned to work teams (every work team represented a firm so we will refer to them as 'firms') at random. As in real life, participants did not choose the colleagues they were going to work with. This principle was applied during the whole simulation process. Different simulation software allows a diverse number of competing firms. In our case, the simulator Praxis-Hispania MMT™ (version 10) allowed infinite parallel simulations of five firms each. So, a five-firm simulation was chosen to cover all 30 students with six participants per firm. Generally, five to eight participants per firm was stated as a reasonable number for the working teams to assign tasks and responsibilities. A lower number may overload the participants with work and therefore decrease control and handling of variables in the decision process. On the other hand, a higher number of participants per firm may dilute responsibilities,

having some participants putting in most effort while others just hang around and increase organizational efforts.

*Stage 5: Simulation performing and complementary activities*

In this stage the simulation experience was performed. Four periods (years) of the firm's life were simulated so the students could fully perceive the basic issues of the decision-making process in the long term. Procedures for sending results and decisions between firms and the simulation director were clearly established. Email was the easiest and most used resource for the majority of students, a minority used floppy disks. Direct connection through the Web was not available in initial versions. However, it is due in further software versions. In any case, a clear schedule was established for all firms so time terms were generally respected. It was at this stage when students were given the opportunity to interact and negotiate with real economic agents.

The agents' staff were organized according to three different roles:

- *Negotiation*: two real banking experts acted as bankers. Students had to interact with them to ask for financial credits and/or other financial products according to their financial policy to support their firm. Also, a retailing expert was introduced into the experience so the participants had to deal with him/her to fix the process of their products to be sold by the retailer, as well as promotions and margins among other parameters.
- *Advice*: some experts acted as a delegated counsellor for the firms. Each firm had to justify its strategy and present its accountancy balance to this agent at least once for every decision period. This way, students obtained feedback not only from the output of their decisions but also from real experts.
- *Direction*: an instructor directed and supervised the whole experience. Some of his responsibilities were supervising the correct decision inputs and processing in the software, developing the scheduling and control of the different meetings with agents and also handling the different exogenous variables to modify the general economic behaviour of the simulation environment.

Some complementary activities were introduced in order to increase the identification of the students with the firm they manage and their products. These activities were a formal presentation of the firms, a communication event and a product fair. The main goal of these activities was to involve the participants in the simulation not only as a process of entering data into a computer and obtaining outputs but as an integral experience with real tangible products. This way the simulation goes beyond mere spreadsheet analysis to extend across the design and development of new products as well as the implementation of marketing policies. These activities also overcame some limitations of the simulations as participants were able to innovate, see and feel their own products. Also, all these activities were reflected in the simulating decisions or outputs through financial variables. Prize winning and inclusion of some monetary sums in the 'Other income' account worked as a suitable solution to keep these activities related to the financial aspects of the simulation, while motivating the students to make an extra effort.

The presentation of the firms was the activity that started the simulation experience. The decision-making board of each firm was presented by the participants who took a different role in the firm (chief executive officer, production, financial, human resources and marketing

management, etc.). Further, they described their company's background, mission and goals. This presentation was a starting point for the marketing strategy and was compared with the real achievements at the end of the game. The advertising campaign reflected the marketing approach of the firms. Students explained the objectives of their marketing communication according to the positioning of their products in the market. The world trade fair of dairy products was focused on for presentation of real products of the firms. It was focused on the European Union directives concerning packaging issues with regard to the information for consumers. Students prepared stands and presented their products as at the real fair, including tasting, raffles, gifts and other tools to attract visitors.

*Stage 6: Analysis of performance and simulation aftermath*

Once the simulation period came to the end, a final activity in the form of a shareholder meeting was performed. Every firm presented all decisions and outputs obtained throughout all the simulation periods to the audience including instructors and agents. The rest of the firms acted as shareholders in order to increase interactivity among all the students. The main goal was to interchange information about the decision-making process so participants could be aware of which decisions led to which results in the context of the whole industry. Evolution of the industry and firms was discussed with lecturers and the director of the simulation. A questionnaire to evaluate satisfaction of participants was given to participants to fill out at this stage. Results of this questionnaire were analysed at the next stage.

*Stage 7: Evaluation of the participants and the simulation experience*

At the time of evaluating all participants, different factors were taken into account. The position in the performance ranking of the simulation, that is, how well the firms performed in the competition regarding accumulated profit or other performance measure was one of the key factors as it was the main goal for participants during the experience. However, it was not the only criterion of evaluation. Performance and efforts made at the complementary activities were also weighted in the evaluation process as well as negotiation abilities with the agents. Finally, the students evaluated the experience as a whole by completing a questionnaire. The analysis of the data provided help to improve the evaluation criteria as determined mistakes or misunderstood variables could be identified. In any case, questionnaire analysis was the most relevant tool for feedback of the experience as a whole.

## Results

In this section, the results of the data obtained through the questionnaire on the experience at the CELE course of the University of Economics in Bratislava during the 2003 and 2004 editions will be analysed. After performing stages 1–6, a questionnaire was distributed among the students for evaluating the experience. Thirty-five and 40 students attended the Strategic Business Management course, respectively, for a total of 45 hours; 65% were students from economics and business studies while the remaining 35% were law students in the 2003 presentation. These percentages changed to 63 and 37% in 2004. All of them were in the last year of

studies (fourth course) and had some background in strategic management issues. Twenty hours of the course were theoretical in order to refresh the main concepts of the strategic management decisions process while 25 hours were devoted to the simulation experience.

The questionnaire had 20 questions. Questions 1–15 used a five-point Likert-scale while the remaining questions were open-ended. The first five questions evaluated different aspects of the simulation software Praxis MMT™. Those aspects were realism, user-friendliness, interface, number of decisions and outputs display. Questions 6–10 assessed whether the use of the simulation increased capabilities related to decision-making, theoretical knowledge application, team-working, self-scheduling and negotiation. The next five questions appraised how well the different participating agents performed during the simulation. Those agents were the director of the simulation and the retailer (questions 11 and 12). The final questions were devoted to relationships among participants: relationships inside every group (question 13), relationships with the other groups (question 14) and overall insight (question 15). Open-ended questions were as follows:

- Which were the best points of the experience in general?
- Which were the weaknesses of the experience in general?
- What would you change to improve the general organization of the experience?
- What do you think about the complementary activities?
- Anything else you want to comment on about the experience?

Table 2 shows the data obtained in the Likert-scale questions. The scale was as follows: 5 = very good; 4 = good; 3 = average; 2 = poor; 1 = very poor. Table 3 shows some selected answers to the open-ended questions according to relevance criteria.

Table 2. Results of Likert-scale questions (5 = very good; 4 = good; 3 = average; 2 = poor; 1 = very poor)

| Simulation software | Average | SD |
|---|---|---|
| Realism | 4.78 | 0.784 |
| User-friendliness | 3.95 | 0.615 |
| Quality of interface | 4.53 | 0.627 |
| Number of decisions to be made in every period | 4.79 | 0.518 |
| Display of outputs and results | 4.28 | 0.749 |
| Development of individual capabilities | | |
| Decision-making | 4.92 | 0.584 |
| Application of theoretical knowledge | 3.72 | 0.876 |
| Team-working | 4.41 | 0.683 |
| Self-scheduling | 3.35 | 0.749 |
| Negotiation | 4.49 | 0.598 |
| Performance of participant agents | | |
| Director of the simulation | 4.62 | |
| Retailer | 3.85 | |
| Relationships inside every group | 4.13 | |
| Relationships with the other groups | 2.85 | |
| Overall insight | 4.28 | |
| Total | 3.946 | 0.678 |

Table 3. Selected answers to open-ended questions

Which were the best points of the experience in general?
- Having the opportunity to apply our knowledge to firm decisions
- The competition, which was a completely new challenge for us
- Feeling that we could manage our own firm
- Everything happened very fast, every day was a surprise
- I have learned more in this simulation than in all my years of study at university

Which were the weaknesses of the experience in general?
- The experience was very time and effort demanding
- We did not have much time to make our decisions
- The simulation should have lasted longer so we would have been able to 'digest' all new experiences
- There should have been more retailers to negotiate with in order to break 'monopoly'
- We did not have enough background to make some decisions, especially those related to logistics

What would you change to improve the general organization of the experience?
- More time for everything, PLEEEEASE
- The retailer was very hard in negotiations
- We should have started before and end later
- Maybe we should have had one first 'trial' decision before starting the simulation
- You should have invited some representatives of firms in Slovakia to the final shareholder meeting so they could know how well we performed and hire us!

What do you think about the complementary activities?
- The product fair was great as we could design and develop our products in reality
- Complementary activities added more reality to the experience as we could touch and feel our products as well as present our advertising campaign to the 'world'
- The shareholder meeting helped us to understand the essence of competitiveness in our industry
- Complementary activities increased our level of stress, but they were worthwhile
- They were too much work

Anything else you want to comment on about the experience?
- There should be compulsory courses like this in the Business studies at the EUBA
- It was exhausting but we really got to learn by doing
- Now I feel empty as the simulation is over, days seem not to have much sense without getting together with the group and make decisions
- I wish the real world will be like this
- Now I feel I can do more things by myself

The results of the Likert-scale questions show a very high level of satisfaction with the experience for most participants. The simulation software scored an average score higher than 4 ('good') in all issues except user-friendliness which was valued as 3.95. Students considered, on average, that the experience increased their personal development of individual capabilities, especially those regarding decision-making, team-working and negotiation with scores higher than 4. Self-scheduling was valued at 3.35—which seems to prove that the effect of the simulation on self-scheduling capabilities is slightly higher than average. Participant agents obtained scores higher than 4 except for the retailer (3.85) and the relationships with the other groups (2.85). The retailer played a negotiation role in the simulation that kept him/her away from being 'friendly' or 'ally' which students tended to score higher. The increasing competitiveness did not help much to improve or increase the relationships with the other groups. In fact, and

especially by the end of the simulation, the atmosphere was not very affable as the firms kept all information secret and not much communication flowed among the groups of students.

Open-ended questions provided information about the perceptions of the students that were not measured through the Likert-scale questions. Five answers per question have been selected according to relevance and significance criteria as shown in Table 3. Students value knowledge application, competition and learning as the best points of the experience in general while lack of time, effort demand, need for more retailers and lack of knowledge about logistics management are the main weaknesses of the experience. Again, lack of time stands out as the main change needed to improve the general organization of the course as well as making 'trial' decisions and promotion of the experience with real economic agents in the context of Slovakia. Complementary activities were highly valued even though they involved an important load of work for students. Finally, students suggest simulation compulsory courses in their university and made comments regarding their personal satisfaction with the experience.

## Conclusions

In addressing the possibility of combining simulation applications and interaction with real agents, this paper makes two key contributions. The first arises from describing the design of the process to develop a simulation that combines software and interaction with real experts. The second arises from increasing the realism of the simulation experience through additional activities such as a product fair and a shareholder meeting to enrich the whole process by 'immersing' the participants into the new simulated reality. This experience set out to exploit the learning possibilities afforded by simulation technology. Praxis Hispania applications were chosen based on the wide range of decision possibilities offered to participants. The whole experience was designed as a sequential practice in which participants increased their knowledge about the different decision variables to be managed progressively. Rather than simply developing the simulation as a reiterative input–output cycle, participants could obtain interactive feedback not only from the performance of the firms in the competition but also from the negotiation and counselling agents. Scheduling was designed to provide students with the prospect to learn from the experience of others as well as seeing the management process from a new practical perspective.

The results of the study revealed high levels of satisfaction amongst students. The simulation methodology was put into practice under an active learning basis which motivated participants and challenged them to use their managerial skills and theoretical knowledge to score high in the competition for all the students even before graduating. Leadership, teamwork and interpersonal skills were transverse capabilities that students had to expand, especially in their internal discussions to reach the final managerial decisions. A major challenge facing the instructors was how to structure the use of applications as well as the interactions with agents and complementary activities in order to engage students in an evocative practice. This study demonstrated that all these elements of the simulation positively influenced practice learning and satisfaction as perceived by participants as well as strategic thinking in the decision-making process. This study is significant as it provides research guidelines that instructors can use to integrate simulation effectively into their teaching practices related to strategic management. We acknowledge, however, that the results cannot be generalized to a larger audience as the experience took place with students in an European university with a specific knowledge background. Additionally,

further research is needed to determine whether variables such as familiarity with simulations or a deeper knowledge of management techniques have an impact on satisfaction and learning capabilities. Even though designing simulation experiences is a challenge for educational purposes, the more fundamental challenge is to understand and use the potential power of simulations combined with real agents' expertise, having always in mind what learning, knowledge and practice are all about.

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**Notes on contributor**

Daniel Arias-Aranda is Professor of Management at the University of Granada in Spain. He has been Associate Professor at the Complutense University of Madrid where he obtained his PhD in Economics and Business Management. He has managed different research projects on implementing simulations in Business Management studies. His main lines of research are service operations management and business simulation.

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