

# *The use of bussines simulators in teaching logistics*

## *Looking for new ways of teaching logistics*

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**Abstract**—Traditional training offered by universities in the area of logistics usually involves a set of techniques that are applied specifically within the different topics that make up this science, which has resulted in a set of decisions and activities that optimize results in different areas, but they ignore the operation of the system as a whole. The use of simulators games and other fun tools that emphasize the interaction of the different departments of a company is important to reinforce the conviction that the decisions made in logistics are only valuable when the system is viewed in its entirety. In order to help students in undergraduate and continuing education professionals understand the importance of the interaction of different decisions, we have designed a simulator logistics decisions incorporating elements of Gamification. In this research the characteristics of the simulator and some preliminary conclusions of our work are presented.

**Keywords**—*bussines simulators; gamification; blended learning; logistic teaching.*

### I. INTRODUCTION (*Heading 1*)

The ideal way to develop logistics concepts is show to people the consequences of each decision they make in terms of efficiency, productivity, inventory levels, supplier selection, etc., and to indicate how a decision in one area of the company affect the performance of the overall system. Logistic Simulator (LOST) is a video game that allows to students to develop logistical concepts and understand its interfaces as if it were a game.

### II. DEVELOPING

#### *A. Theoretical framework*

The globalization of markets and the emphasis on cost reduction has caused a huge interest in the logistics activities throughout the world, and has induced the development of technical knowledge and skills of people dedicated to make decisions in areas such as production, inventory management, transport and other areas associated with the various logistics activities [1].

Many authors [2], [3], [4] and [5] suggest that the borders of the different departments (both, inside and outside of corporations) are fading and the points of interaction between these functional entities are increasingly important if you want

to achieve greater efficiency in cost reduction and customer satisfaction.

The need for competitive personnel who can get an overview of the interactions generated by each of his decisions has resulted in the development of courses and seminars in the field of logistics, mainly in areas associated with information systems, warehouse management, transportation and strategic customer service [6]. However, employers indicate that the development of these skills remains a challenge for educational institutions because there are many differences between the offered content and applicability and tools that the industry considers relevant. One of the most severe criticism is related to the development of a knowledge that has fragmented and does not allow a comprehensive view of organizations [7], [8], [9] [10] and [11].

In order to solve these problems, this proposal contemplates the use of a simulator business whose difficulty increases gradually, and allows students:

- 1) To acquire logistics concepts quickly and fun
- 2) To observe the consequences of each decision in different areas of a company
- 3) To identify the main variables that must be observed when making every decision.
- 4) To develop an intrinsic motivation that leads them to investigate, understand and experiment new strategies to reach the solution of a problem.

#### *B. The method*

LOST is a simulator game based on Gamification.

Through an initial presentation we explain to the participants the objectives of the game and how the program works. In addition, a trial version is made available for them to operate the simulator and ask any questions.

When this phase is over, each of them receives a file with a set of randomly generated data but containing a homogeneous degree of difficulty.

Before students begin the game they must to define a set of strategies. Each of the decisions made by students can be transferred and stored in a database, so the teacher can see the consistency between the decisions taken and the defined strategy.

On the other hand, within the simulator there is a "trophy room" where we indicate to students the challenges of the scenario. There is also a "leaderboard" that allows them to identify their performance against other group members.

Each scenario assumes a minimum score to be reached by the participants. When a student has achieved the objectives successfully, it is given a new scenario that contains new variables or more complex situations where he/she should take a greater number of decisions.

The teacher can continually check the database to observe the progress of students. When a student is far from the goals, there is the option of discussing a change of strategy or suggest adjustments on the operationalization of decisions.

All scenarios contain logistical problems related to topics such as forecasts, inventory, transportation, quality, production management, vendor selection, scheduling activities, etc., but the complexity of the situation faced by the student and the goals achieve are increasingly high.

Regularly a deadline in which students must pass each stage is established. During this time students have the opportunity to play the game up to three times.

If students exceed the minimum score in either of the first two occasions, they have the option to register again and try to improve their results (and get a better place in the standings, for a large majority of students is very rewarding to see his/her name appearing at the top of the leaderboard).

If any of the students do not reach the minimum score at the deadline, then those who have achieved the highest scores have the option of becoming "the advisors" to ensure that the key concepts of the game have been understood by their peers and develop together these strategies to help them improve their performance.

For example, suppose that three of the students do not reach the minimum score; then, the first three places in the table have the opportunity to be the adviser of these students, and this extra work allows them to get some specific benefits along the course.

### C. Results

The game was first used in the semester from August to December 2013, with a group of 20 students of industrial engineering at the Tecnológico de Monterrey -Campus Ciudad de Mexico. Currently is used in courses for undergraduate students in business and engineering, the MBA program and courses of continuing professional education (at Ciudad de Mexico, Guadalajara, Puebla and Toluca, the number of students exceeds 400 scholars).

One of the most remarkable results is that even when 70% of the students achieved the minimum score to pass the stage at the first time playing the simulator: 85% of them returned to play the same scenario just to try to improve their scores!!!!

At the end of the game, students have been asked to fill out a survey to gather statistics to help us determine which actions were effective in implementing the simulator. The scale used is 1 = strongly agree, 2 = agree, 3 = disagree, 4 = strongly disagree.

Some of the most significant statistics are as follows:

- The game helps me to learn: 48% strongly agree, 39% agree.
- The game helps me to develop interest in the subject: 61% strongly agree, 28% agree.
- The game prompts me to push myself: 64% strongly agree, 27% agree.
- The game helps me to build confidence in the mastery of the subject: 43% strongly agree, 42% agree.
- The game develops my persistence to solve a challenge: 55% strongly agree, 36% agree.
- The game helps me to demand more from myself: 60% strongly agree, 30% agree.
- The game does not bring me any benefit: 61% strongly disagree, 31% disagree.
- The game seems to me like a waste of time: 60% strongly disagree, 31% disagree.

Based on this data and the change in attitude of the students to these courses, we believe the results are encouraging.

### III. DISCUSSION

Until now, LOST has been used in undergraduate classes only like a support to motivate students, but the program have been respected. By contrast, in continuing education courses, the simulator has been used as the basis for generating discussions and motivate at the group to investigate and generate content that will be cover during the sessions. We believe that this practice is correct.

Similar to undergraduate courses, in continuing education modules there is also a content that should be covered. However, instead of presenting a fragmented knowledge, the use of LOST in the first module has generated an interesting discussion on different topics such as forecasts, transportation, inventory, service levels, etc. Moreover, the simulator helps students to quickly understand the logistical relations between different departments of a company, has generated in students the motivation to investigate different issues, and has enabled them to visualize the relationships that occur when we make decisions in different areas of the company.

When all topics related with the first scenario have been identified, we create a program and generate the content that will be discussed in the following sessions. When the issues have been covered, then we ask participants to play again the same version of the simulator and compared the results to see if they are better (97% of them improved their results).

In addition, we present the second version of the simulator, we explain the new variables that are incorporated and the possible interactions that will be generated. We ask to students to play this new version and to establish new strategies to incorporate the changes. Based on the new version back to generate a discussion on decision-making, content, strategies, etc.

In the continuing education courses we have only considered using the first three stages of this tool, as the time planned to cover this content does not allow us to go deeper into the issues. However, the observed results are gratifying: the participants form teams, investigate, discuss strategies, compete with each other, have a better understanding of phenomena and logistics are highly motivated to engage in discussions in relation to issues which are incorporated in the simulator. We believe this is the correct use of the tool and this should be replicated in the undergraduate courses.

Based on this experience we suggest modifying the use of this tool in undergraduate courses. The aim is to modify the curriculum so that rather than establishing a set of materials with fragmented content, consider incorporating a teaching model based on this tool that allows us to negotiate with participants the content in each courses in this area; discuss with them the issues in each class and incorporate research models and techniques that allow them to overcome the scenarios presented. That is, to make that the students show a greater commitment to their own learning.

This is not simple, because it is very possible that instead of a single teacher to explain to students all content, be necessary to consider teaching teams that can review and discuss specific models involving different areas of knowledge. But we suppose that this could cause it a different dynamic and generate greater understanding of the issues and logistical interfaces in the minds of students.

#### IV. CONCLUSIONS AND NEXT STEPS

LOST is a business game designed to teach logistics and provides students with a concrete experience; which leads them to observation and reflection; which allows the generation of abstract knowledge; accelerating the understanding of concepts; allowing them to view and experience the interplay that develops between different areas of a company; which it provides participants an intrinsic motivation for the search for new solutions and strategies that lead them to optimize their performance.

The instrument created possesses the quality that is proposing the challenges participants whose level of difficulty increases gradually, so that allows the incorporation of new concepts based on previous experience.

The tool has been used both in undergraduate and continuing education courses, but instructional design used is different. The tool gets most useful when incorporated into a more open curriculum, a teaching model that allows participants to define those elements that want to incorporate the discussion in the classroom.

By other hand, although we have designed twelve different scenarios for the game, there are currently only eight programmed scenarios. In addition, the project wants to incorporate experts in the areas of finance, marketing and supply chain to help us think and design new challenges.

Moreover, the game is set on a platform with Excel VBA programming. We want to rebuild it in a more robust computer language that allows students to operate it from mobile devices (tablets and phones).

Likewise, we want to build a largely enough data base that allows us to observe what are the main mistakes that students make when playing the simulator; what variables they consider important; what variables pass them unnoticed; what are the more successful strategies; how they apply the previous knowledge; etc. Based on these results, one objective is to design a series of didactic supports (exercises, videos, readings) that offer useful advices that may strengthen their weaker skills.

In Mexico, small and medium enterprises (SMEs) generate 72% of employment and 52% of gross domestic product (GDP). We believe that putting the game on the network to develop logistics concepts in this type of business becomes an essential task that will contribute to the development of our country.

In addition to the survey applied to students at the end of each scenario, there is also another survey that allows us to identify general student characteristics (gender, career, semester, age, etc.). Through this type of survey we are able to develop a deeper research that allows us to explore the usefulness of the simulator on different types of students.

Finally, we want to put at least the first two scenarios on the network in order to allow the project to be available for both, students and teachers to use.

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