e-Learning Through Business Simulation Softwares

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Abstract—The word simulation refers to any procedure that is meant to imitate a real-life system. Simulations are especially useful in examining situations that are too complex, too difficult, or too costly to explore in the real world.

The term business simulations refers to exercises that represent processes involved in the production and delivery of goods and services. These exercises may be used to study the processes themselves, to enhance their teaching, or to assess proficiency in their management.

In this article, first the concept of simulation, dimension and its various types are defined and later in particular, computerized simulation is explained. Business Simulation from the view of usage targets, importance and means of application are then studied and the practical issues are also evaluated in two simulation softwares.

Keywords—Business simulation, e-Learning, Simulation, Simulation softwares.

I. INTRODUCTION

Years have passed from creation and introduction of simulators for business simulation on international scale. After awareness of the advantageous on application in various fields such as teaching in academic institutions, organizations and evaluation of competition, these tools did draw good attention very quickly and were developed in such a way that currently they are being used by many world reputable universities and advanced organizations.

In this article, in order to get more familiar with the various dimensions of business simulation, simulation is first defined with evaluation of its various types. Then its particular type which is simulation on computer base is introduced and at the end the concept of business simulation and its types are presented. Finally, two different samples of business simulation softwares are introduced with explanation of some of their features.

II. SIMULATION

Simulations are based on a simple, but effective, learning strategy—practice. Not just any practice will do. But the practice needs to take place in context. Simulations are used to teach a specific process (the practice) within a specific environment (the context). This is the goal of simulation [1]. Simulation replicates aspects of real environments through models [2]. Many argue that simulation is not a luxury but a necessity for certain types of learning to take place [1].

They can be used for extrapolating theory, validating hypotheses, or revealing emergent behavior. Simulations can extrapolate theory into another scale or level of analysis. For instance, a theory tested with a week-long project can be simulated with a year-long project. Simulations can validate new hypotheses, similar to a controlled laboratory experiment. In some cases where it is not ethical or not possible to use human subjects, researchers set up simulation experiments instead. Moreover, simulations can generate theory when existing models or logic is insufficient to describe the phenomena. In addition, simulations can reveal properties that emerge unexpectedly from a series of interactions [2].
Although simulations aren't the answer for every situation or type of content, the use of simulations in blended learning often yields impressive results [1]. A combination of an experiential approach and lectures enables students to examine the process of business decision making in a practical manner and enhances their ability to apply concepts and tools presented in class (e.g., [3]-[12]).

In addition to usage of simulation in education, the use of simulations in evaluation of personnel in the organizations has also many applications. If correct designing is made, employment evaluation tests end to selection of better and more qualified personnel. In this way, in addition to preventing loss due to low experience of the employees whose selection were not proper and suitable for their position, it also causes reduction of expenses and increase of organization efficiency [13]. This fact and also shortage and insufficiencies of interview method and other tools which are usually used for evaluation and selection of job applicants cause the renovation of employment tests [14].

One of the other fields of usage of simulation is training and educating the specialists. In a wide research in year 2004 from a number of professors who use simulation softwares in their teachings, they were asked what targets they were aiming at by using such simulations. Approximately, half of the participants believed that providing the experience of decision making has been the most important factor. Combining and integration of theory with practice was the second factor, as said by one third of the participants. 26.5% of the participants referred to introduction of learners to planning role and 20% considered the force on the learners for team work, as the forth factor. The Table No. 1 indicates the more details of this research [15].

### III. SIMULATION ADVANTAGES

As for simulation, many advantageous have been explained which appears in various fields. Some of the major advantageous are referred to in the following.

- The closer the simulation resembles a learner's actual environment, the greater the retention.
- Simulations provide a safe environment in which to make mistakes. Some of the best learning comes from assessing one's own mistakes.
- Simulations allow learning to take place without pulling expensive equipment offline (e.g., simulation based training for F-15 aircraft—it's very expensive to pull a $40 million aircraft out of service for training purposes).
- Creating the simulation can help to streamline the processes that are being taught (i.e., improvements in process are often made when creating simulations).
- Well-designed simulations often reduce the learning time significantly. Simulations allow practice for hazardous procedures, such as shutting down a nuclear reactor.

<table>
<thead>
<tr>
<th>TABLE 1</th>
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<tr>
<td>WHAT ARE YOUR TEACHING OBJECTIVES WITH REGARD TO THE BUSINESS GAME(S) THAT YOU USE?</td>
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<tr>
<td><strong>Objective</strong></td>
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<tr>
<td>To give students decision-making experience</td>
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<td>To integrate theory with practice</td>
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<td>To introduce students to planning</td>
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<tr>
<td>To have students experience teamwork</td>
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<td>To have students engage in critical thinking</td>
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<td>To measure comprehension and understanding</td>
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<td>To have students experience business competition</td>
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<td>To interest and motivate students</td>
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<tr>
<td>To have students experience uncertainty/pressure</td>
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<tr>
<td>To have students develop writing/communication skills</td>
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<tr>
<td>No objectives</td>
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IV. SIMULATION TYPES

Simulations have various types which have their own usage depending on the various conditions and positions. Some of the general most important simulations are explained as below.

A. Situational Simulations

These include role-playing simulations and case-based scenarios. Situational simulations are typically developed to assist learners in problem solving. These programs allow learners to react to hypothetical cases. Learners are typically members of the environment in these simulations, rather than being some external force that manipulates variables at will. They typically incorporate situations in which participants react to many decision alternatives and feature a best—or optimal—sequence of right or wrong decisions. Others focus on making the best compromise possible, rather than finding the optimal sequence of best decisions. Situational simulations are most commonly used in soft skill simulations, or what some call ‘people skills.’

B. Technical Simulations

This category includes process simulators and time-based scenarios. A good example of a time-based scenario can be observed in many mortgage company Web sites, where you choose a 15- or 30-year mortgage rate, set other variables, and then observe a graph showing how those decisions change your payment schedule over the loan period. It is much easier to teach the principle of interest using this type of simulation versus explaining the concept of interest using simple examples in a paper-based exercise.

C. Procedural Simulations

Having learners sequence a list of steps in a process does not often work, although many e-learning courses use this approach. The proactive approach is to have learners perform the steps in a simulated environment. For example, consider the start-up procedure in an airplane. Instead of sequencing a list of tasks, the pilot-trainee can perform the actual steps (looking at gauges in the proper sequence, etc.). Retention and learner satisfaction are much higher when using this approach. Procedural simulations are sometimes called ‘task simulators.’ For step-by-step processes, it is hard to beat a simple procedural simulation to make the learning fast, easy, and effective.

D. Virtual Worlds

These are usually extremely complex 3-D visualizations that allow learners a wide latitude of action and movement and aim to create a landscape that can be explored, as opposed to a test that has right and wrong answers. A good example of a virtual world application is a spatial representation of several different types of 747 commercial aircraft created for Air Force base fire fighters. These fire fighters are required to be familiar enough with commercial aircraft that they can find and rescue the crew of a commercial 747 in the event of an emergency landing. This kind of simulation allows them to become acutely familiar with the smallest of details. They are very expensive to build, and thus tend to be for very specialized purposes.

E. Computer-Based Simulations

This is probably the most common type of simulation. Almost 60% of commercial e-learning courses available today deal with software application or IT topics. A computer-based simulation replicates an environment through a computer program designed to consider multiple variables, interactions, and system constraints. Computer-based simulation is used in organization studies to modeling human social systems for better understand the dynamic between individual and group behaviors. Computer-based simulation methods advance organization studies research in many ways. They can be used for extrapolating theory, validating hypotheses, or revealing emergent behavior.

Computer-based simulation adjusts values in a model by systematically changing the input to a computer program. Unlike other
forms of simulation, computer programs have the advantage of being easily adjusted. Computers can also handle a very large number of variables. To change the conditions of the simulation, the input values to the computer program are changed. Running the computer program is one of the last steps in the process of creating a simulation. First, the researcher determines the target constructs and chooses a dimension of the organization. Second, the researcher designates assumptions about the population and the system. Third, theory drives the selection of secondary or environmental constructs. Fourth, all constructs connect to a model through assumptions, interactions, descriptions, and behaviors. The model is written in a computer software language. Fifth, the computer program is run and adjustments to the model which may be made. Finally, the program is run multiple times in order to fully explore the value range decided at the outset. The results are analyzed across all simulation trials. In order to draw conclusions, the analysis is compared to expected output, another simulation, or real-world data [2].

F. Business Simulations

This kind of simulation is generally used to help people understand the dynamics behind the choices people make when running a business. Some of these can be very life-like and complex; others can be as simple as a tutorial that uses simple math to teach basic business skills (e.g., how to perform an inventory). The better ones use complex algorithms and include virtual characters with life-like back-and-forth conversation that challenge learners to understand how decisions can affect a large organization’s success or failure.

Although the history of business games has been traced to the use of board games and war games in China nearly 5,000 years ago [16], the modern business simulation game dates to 1955.

In 1956, the first widely known business game, TOP MANAGEMENT DECISION SIMULATION, was developed by the American Management Association (AMA) [17] for use in management seminars administered by the AMA. This was followed in 1957 by two pioneering events: Greene and Andlinger’s BUSINESS MANAGEMENT GAME was developed for the consulting firm of McKinsey & Company [18], and the TOP MANAGEMENT DECISION GAME was used by Schreiber in a business policy class at the University of Washington [18].

From this point, the number of business simulation games grew rapidly. By 1961, it was estimated that more than 100 business games were in existence and that more than 30,000 business executives had played at least one business game [19]. The Business Games Handbook [20], published in 1969, listed nearly 190 business games, whereas The Guide to Simulation/Games for Education and Training [21], published in 1980, described 228 business simulation games.

Since the mid-1950s, their use has grown considerably. According to Wolfe (1993), “Once a novel and cutting-edge teaching technology, this method’s use has reached the point of relative saturation in various American business course applications” (p. 446) [22]. Several studies such as Faria (1998) have in fact shown that business game usage has grown continuously [23].

V. BUSINESS SIMULATION TYPES WITH RESPECT TO THE COMPUTER’S ROLE

Many business simulations are computerized, but the computer’s role in the exercise can vary substantially. The simulation can be computer directed, computer based, computer controlled, or computer assisted, depending on the relationship among participants and between the computer and the participants. The nature of these relationships determines the resources required to develop the simulation and the settings to which it may be applied.
A. Computer-Directed Simulations

A simulation is computer-directed if the participants interact primarily with the computer, which controls the flow of events. In these simulations, a participant's actions are limited to deciding the pace, starting point, and ending point of the simulation. Often, the simulation animates a sequence of events. It may show, for example, how goods are delivered and payment received in international transactions.

B. Computer-Based Simulations

A simulation is computer-based if the participants, interacting primarily with the computer, control the flow of events. These simulations are often called discrete-event simulations. They may be implemented using either a general-purpose spreadsheet program or a specialized software package that supports animation. Typically, the participant launches the software repeatedly, to see how changes in values and algorithms affect the outcome.

C. Computer-Controlled Simulations

A simulation is computer-controlled if the participants, interacting primarily with each other rather than with the computer, must conform to a mandated flow of events that strictly constrains the number of decisions they can make and the time they have for making their decisions. These simulations are often designed to enable teams, each representing the management of a firm, to compete against each other. Accordingly, the results of the decisions made by each firm depend on the decisions made by the other competing firms. This type of simulation was introduced in the late 1950s, when mainframe computers became widely available. They are used extensively in schools of business administration, especially in the disciplines of management and marketing.

D. Computer-Assisted Simulations

A simulation is computer-assisted if the participants, interacting primarily with each other, control the flow of events. In these simulations, the computer program presents a scenario, tracks accounts, processes transactions, and facilitates interactions, generally performing the kinds of supportive tasks that computers perform in the everyday world, without strictly constraining the number or timing of participants' decisions. Thus, decisions may be entered whenever participants choose to enter them, and each decision is executed whenever the necessary conditions for its execution have been met. When this kind of simulation is played competitively, the advantageous generally goes to the player who acts first, so participants tend to be more keenly aware of the pressure of time than they would be with the formal deadlines of computer-controlled simulations.

VI. BUSINESS SIMULATION TYPES WITH RESPECT TO SCOPES

With respect to scope, business simulations may be functional, total enterprise, or total economy in scope, depending on the scenario they present and the roles they make available. Functional simulations limit themselves to the concepts of a particular business discipline, such as marketing or operations management. They put participants into discipline-specific managerial roles. Total-enterprise simulations encompass all the functional areas of business. These put participants into top-management roles. Total-economy simulations give participants multiple roles, such as consumer, investor, and company manager, which jointly support a sustainable economy.

VII. BUSINESS SIMULATION TYPES WITH RESPECT TO TECHNOLOGIES

With respect to technological sophistication, business simulations range from simple board games to software packages that track every participant and coordinate activities remotely through the Internet. The simple board games are useful for occasional events in variable settings.
They are usually amendable to shorter or longer play, depending on the circumstances. Internet-remoting software packages are ideal for distance education, as they allow participants to interact with each other even when they are not physically present at the same place and time. Between the two extremes are batch-processed setups, whereby participants enter decisions on paper or electronic forms that are sent to an administrator for processing, after which the administrator returns the results. Batch-processed setups generally are run for 4 to 12 rounds. Transmission between participants and administrator may be physical or by fax, telephone, electronic file transfer, or electronic mail [24].

VIII. ONLINE BUSINESS SIMULATION SOFTWARE: INFORMATIST

Business Simulations is made further to the result of development of Case Method. This method was figured out in 1912 in the business faculty of Harvard University and currently more than 30,000 business cases are actively being used in Harvard and other business colleges.

Informatist Business Simulation simulates the process of Harvard's Case Method with a difference that Informatist has put together thousands of participants, students, and all those interested in learning business, in an online joint and these people learn business skills and its techniques like a fun. Opposite to the Case Method which makes one to probably study tens of pages of a book, the Informatist method provides the chance for one to absorb and understand such information of probably high volume which is required for one's success in the market, without being directly aware of it.

Informatist can be accessed from the URL address http://www.Informatist.net. What Informatist provides, is a free online business simulation system.

In this virtual business world, each person is considered as a businessman and the set goal is to obtain the maximum possible INFO and to become the greatest Informatist. Raising the territory's Image and increasing the number of districts in each territory, is the main path for obtaining the INFO.

The ranking of the participants depends on the number of their INFO's savings. In this regard, it is required for a user to start a business, arrange needed real-estate for his business, employ staff, allocate work and sale forces, pricing the products and even purchase and sell shares in the stock market. The only target of Informatist is to make income and to prevent it from the competitors. In Informatist, no user has been created by computer and all competitors are real participants. The rule is the supply and demand in this game. Living in a district similar to figure 1 provides more Energy. The rate of this energy is very important when one wants to learn new skills and or employs new staffs because learning has basic role for a more successful company. A user should do anything which could lead to more income and apply this income for increase of Image or Districts of the territories so that it could be followed with obtaining more INFO. The more is the rate of obtaining INFO, the higher rank the users can reaches among the participants.

Companies active in various fields of business should always take note of active competitors in similar fields of business. It is therefore required that proper salary to be allocated to their staffs in order to keep them. For having a profitable company, suitable competitive pricing must also be done. The participants can put together their capital and establish a joint stock company because a joint stock company can have better growth as compared with Enterprises in the Informatist.

One of the duties of the person is to look for best territories for establishing business. This task is done with the support of statistics and the reports that is being provided for each territory. Employment and
firing of the staffs when it is required, allocation of suitable work force with respect to the profitability of the products, deciding the feasible and competitive price for sales of products and evaluation of tables and graphs from the statistics menu for precise and intelligent actions in future is other duties of each person [26].

**Fig.1** Inside a city with its properties. Available to user to move to this district.
IX. BUSINESS SIMULATION SOFTWARE/GAME: CAPITALISM II

Trevor Chan’s Capitalism II is the business simulation game sequel to the original Capitalism. It was created by Enlight, and published by Ubisoft Entertainment in 2001.

The player creates and controls a business empire. This in-depth strategy game covers almost every aspect of business that could be encountered in the real world; including marketing, manufacturing, purchasing, importing, and retailing. It features two new campaigns (Capitalist Campaign and Entrepreneur Campaign), plus an in-depth tutorial [27].
Capitalism provides the chance of competition of user teams with each other and or competition of the user with the already allocated computer's artificial intelligent. There is also the ability of putting the user in front of the various possible scenarios of the market and evaluate his reactions. Various tools are installed for working with the system such as user’s ability to have control on speed of the ongoing time.

Approximately most of the conditions which exist on a real business are simulated in capitalism, such as mines and fields and the possibility of using various products from them, also various firms from super markets up to car show rooms and toys shops which are in the market.

Advertisement, warehouse, purchase and sales, Research & Development units under the supervision and control of the user, do their obligations in the organization. With regard to the available raw material in the market, factories have the capacity of production and sales of various products. The possibility of quality control of the products, improvement of the product's brand, Layout formation for the units and many other challenges which exist in a actual firm are provided to the user for management and control.

The stock market is one of the active sections of this simulation which by showing the information, graphs and news relating to this market, assists the user for analysis of purchase and sales of stock. The figure Nos. 3 and 4 show two different views of this simulation [28].

Fig. 3 Capitalism II's main screen capture with different tools available for the user to control
X. CONCLUSIONS

By evaluation and study of the past operation of managers and other persons in charge of the field of business and trade in different countries, especially in the third world and developing countries, we could come to know of the weakness and various shortages in different sections. Although the causes for such operations are many but the important role and function of the quality of teaching and training for educating these people cannot be ignored. Since old time, education has been considered as one of the most essential foundations for promotion and expansion of the economy of any country.

Investment in the area of organizational training shall disclose excellent positive results in improvement of a country and can be effective in up-grading the level of operation of the managers and employees in business and trade sectors and ends with the growth and advancement of the country.

From the other side, with regard to the current difficulties in the sector of education of many countries such as shortage of facilities and allocated budgets, the universities professors are bound to teach mostly on theoretical base to the students. This has caused the students not to practically get familiar with the concepts or feel it which is followed with down grading of the quality of education and no job success of the students. As in this research, the impact of business simulation on the university education is referred to, one of these advantageous is the opportunity for experiencing the business environment, even if it is on simulation base for the user before entry to the actual business market.
Currently, the researches done in this field has ended with such a level indicating the huge improvements of the universities and educational institutes of some countries by applying the business simulations. However, non or limited applications of these softwares in the universities and other relevant centers and also nearly lack of good localized business simulation softwares, all very clearly indicates the big gap from other developed countries. To compensate this gap, we need concentration, attention and extra efforts of the interested and concerned individuals. Usage of the business simulation systems such as the given sample (Informatist), which by its potentiality engage a big number of users in its virtual market, can raise the idea of making similar local systems. Also another introduced sample (capitalism), if localized, and with regard to the artificial intelligent in its structure, can be used as an individual complete exercise for the students and those who are active in business fields.

We hope that by effective application of this tool, we could soon observe the growth and further improvement of our countries.

REFERENCES


