CHARACTERIZING BUSINESS GAMES USED IN DISTANCE EDUCATION

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ABSTRACT

The Internet created new opportunities for business simulation applications in general and business gaming applications in particular. Two approaches are currently in use for the latter. The First approach comprises devising web-based simulators, both new and converted ones. The second approach encompasses all conversion types of existing simulators. This paper is twofold. First, it proposes a taxonomy to the different types of business games used in distance education, presenting their characterizations, advantages and disadvantages. Second, it presents an example of an Advanced Hybrid Model with applications both in distance education and traditional courses.

KEYWORDS: Simulation, business games, distance education, e-learning.

INTRODUCTION

Business games are profiting from the advances in information technology. The first models were spreadsheet based and they were handled without any computer assistance. Andlinger (1958) shows an example of this type. Such models were quite simple and they were very susceptible to processing errors. In the next generation, business games were converted, or devised, to mainframes. Therefore, more complex models were created and the errors were drastically reduced. However, the portability problem arose; i. e., the models could only be played when a mainframe computer was available. The personal computer (PC) eliminated the problem of portability by permitting to emergence of a next generation of business games. Consequently, its use was widespread.

The Internet extended the question of portability by giving the possibility to eliminate the traditional face-to-face interactions. Actually, the participants of a business game course can have access to the simulation when they want and where they are. Internet brought new possibilities not only to management simulation, but also to the business education field in general. Fritzsche and Cotter (1992) were the first authors to highlight the benefits of the Internet for simulation and experiential exercise in the ABSEL conferences. Twelve years later (2004), ABSEL recognized its importance by creating a new research track to examine online education.

However, the Internet has also created a dilemma for developers, especially for those that have already well established implemented models: what to do with existent models considering that the future lies in running simulations based on the Internet? One option is rewriting the existing algorithms using Internet programming languages. The Java language has been the natural choice because of its capabilities (Kuljis and Paul, 2003; Pillutla, 2003). If this option is made, developers have to be conscious that high funding will be necessary, time has to be considered, and software stability will be lost, at least in a first moment. In other words, a new software cycle life has to be started. Considering the problems to recreate a business game based on an existing one, an affordable option is to adapt existing models to the Internet. In both options, it is important to highlight that in additional to language programming, designers should also be concerned with other required skills such as graphical user interface, visualization, media features, and other functionalities (e.g., include a help option) considering that the face-to-face contacts are supposed to be reduced, or eliminated, and made in an asynchronous way.

Teach (1997), Peach and Platt (1998) and Palia *et al.* (2000) were some of the first authors to discuss how to adapt current simulation to online environment. Nowadays, many business games are still running without any adaptation to the Internet. For example, ABSEL website has 28 business simulation game packages listed. Seventy percent of them are DOS-based or Windows based (Mak and Palia, 2005).

This paper will addresses two issues related to business games used in distance education. First, general characteristics of business games used in distance education are discussed and a taxonomy is proposed showing advantages and disadvantages of each model proposed. Second, an example of an Advanced Hybrid model is presented and some applications to both distance education and traditional courses are discussed.

BUSINESS GAMES USED IN DISTANCE EDUCATION

A first attempt to classify business games used in distance education courses was presented by Pillutla (2003), who classified simulation games according to how distributed they are distributed. The categories are *Client-Server Based*, *Internet Based* and *Web Based*. Client-Server Based model runs on a *Local Area Network* (LAN), it is limited to a building or campus and it requires installation of the client software on users' computers. Internet Based Model uses components such as *File Transfer Protocol* (FTP) and e-mail other than the *World Wild Web* (WWW). It can be global, but it can also require client software to be

Category	Software Characteristic	Advantage	Disadvantage
Stand-Alone Based Model	No changes made in the existent business game	No necessary funding and no technical expertise required to convert the simulator	No new features available
Basic Hybrid Model	Computerized process to input data and to visualize / print out reports No web site available to integrate with the business game	Low necessary funding Low technical expertise required	Few new features expected to be available
Advanced Hybrid Model (Emulated Web Model)	Business game is directly linked to a web site Some additional tools of distance education also integrated	The model can have all features present in a true Web-Based Model	High demand of funding and technical expertise to conversion
Converted Web-Based Model (True Web Model)	Business game algorithm implemented with a traditional programming language, but running in a web server	Stability of existent business game not lost because its algorithm is not modified	Possible low performance if compared to an Original Web-Based Model
Original Web-Based Model (True Web Model)	Brand new business games using only Internet programming tools	Highest performance when compared with all other business games used to distance education	Highest cost and time involved

Table 1 – Different types of business games used for distance education

installed on users' computers. Finally, Web Based model uses solely Web browser as interface. It can be global; it makes use of user friendly interface, it has an easy deployment and a powerful functionality (Pillutla, 2003, p. 114).

This paper extends Pillutla's taxonomy by considering business games prepared to be used exclusively in the Internet, and by separating the Internet Based and the Web Based models in five distinct categories. Actually, the Internet is classified as "…a computer system that allows millions of computer users around the world to exchange information" (Longman, 2001). In this sense, the Web Based category could be considered as a special case of Internet Based model because FTP, e-mail and WWW are all tools conceived to be used in the Internet.

The Internet provides two environments to management simulation courses. In the first environment, the Internet is used only as an interface device, i. e., to transmit and receive information or to enter decisions and to access reports generated by the simulator. In this case, the core program, i. e., the unit which makes the processing needed to generate the outputs, still continues to run in a local computer or in a Local Area Network (LAN). Types of business games used in this environment are Stand-Alone Based model, Basic Hybrid model and Advanced Hybrid model.

The second environment uses a Web-based simulator, where the core program is located in a Web server. Conversely, Pillutla (2003, p. 113) defines the Web-based simulation game as an environment that "… uses a Web-browser as the sole interface for game participants and administrators in running and administrating a simulation game". This way, the notion of "anytime" and "anywhere" is applicable not only to participants, but also to instructors as well. Types of business games used in this environment are the Converted Web-Based model and the Original Web-

Category	Anytime and Anywhere Notion		Time involved to prepare and to use the game
	Instructor	Participant	
Stand-Alone Based Model	No	No	High
Basic Hybrid Model	No	No	Moderately High
Advanced Hybrid Model	No	Yes	Moderately Low
Converted Web-Based Model	Yes	Yes	Low
Original Web-Based Model	Yes	Yes	Low

Table 2 – Perceived characteristics of different business games used for distance education

Based model. They can be characterized as true web-based models.

Table 1 presents the different types of business games used in distance education based on developers perspective; that is, software identification, advantage and disadvantage from a technical viewpoint. Table 2 shows some characteristics of the each type business game from an application perspective. Both tables are discussed next.

Stand-Alone Based Model - All business games can be used in distance education even though no adjustments are made in their software. For example, the instructor can ask participants to send their decisions by e-mail. In a next step, the instructor enters the data sent by participants into the business game. After all data are entered, the instructor processes the period, prints out the reports, and scans them. Finally, he sends the scanned reports to participants by e-mail.

The main characteristic of this category is that it has no automated link between the business game and any Internet tool. Its advantages are that it is cost free to adaptation to a web site and that no programming technical skills are required, thus, permitting everyone to apply a business game in distance education. Its main disadvantages are the highest demanding time required to run a simulation and no new features are available. Because Internet tools are very user-friendly, this category of business games is not supposed to be used in distance education. At least a minimal adaptation in the business game is advisable to ease its usability; otherwise the instructor will be work loaded.

Basic Hybrid Model – The main characteristic of this model is that it is used only when only data entry and released reports processes are automated, i.e., a device is used to execute these processes. Usually, e-mail or FTP components are used to transmit information. An alternative option is having auxiliary software running in a stand-alone PC to make the input and output communication with the business simulator. No specific web site is used to data entry, reports visualization, and print out.

The main advantages of the Basic Hybrid Model are the low necessary funding to perform the changes, and the low

technical expertise required. As to the disadvantage, it main one is the limited exploration of the Internet resources.

Advanced Hybrid Model – The Advanced Hybrid Model uses a web platform linked to the business game based on stand-alone PC. It is heavily dependent on web programming language. Communication is made directly between the business game and a website environment devised specifically for this purpose. Additionally, some tools of distance education are also integrated in the web site, such as announcements, space to download material, etc.

This model has two main advantages: It can have all features present in a Web-Based Model and participants playing the game are not able to differentiate between this type and one true Web-Based Model. Its main disadvantages are the high cost involved to convert the model and the strong technical expertise in programming language to the Internet that is required. The instructor is still dependent of a stand-alone PC business game to process the simulation. The notion of "anytime" and "anywhere" is not applicable to the instructor, only to participants. In other words, the Advanced Hybrid Model only emulates a true Web-Based Model. The business games used by Bernard (2004) are hybrid models.

Converted Web-Based Model – This model is a natural extension of an Advanced Hybrid model. The basic difference between the Converted Web-Based model and the Advanced Hybrid model is that the latter still runs the simulation on a stand-alone PC. Converted Web-Based model is a true web model, that is, the developers have to make the core program of the business simulator run in a web server. In other words, the algorithm implemented in a traditional programming language (e.g. Fortran, Pascal, Delphi) is maintained, but units of conversions are implemented.

This model did not lose the stability achieved by the existent business games because the algorithm implemented remains the same. A disadvantage to be pointed out is the probability of having low performance, when compared with an Original Web-Based Model. Pillutla (2003) presents a good example of how to convert a stand-alone based
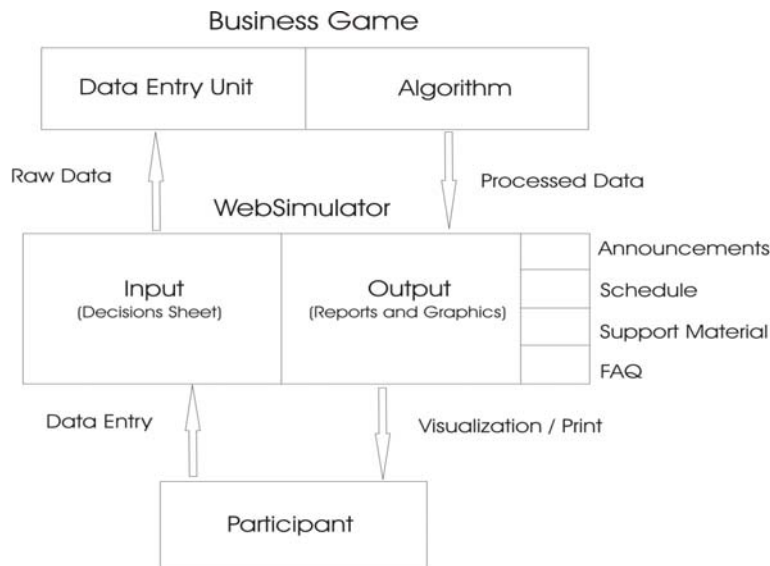
Figure 1 – A structure of an Advanced Hybrid Model of a business game

business game into a Web-Based model. He also shows all technologies used.

Original Web-Based Model - This category can be considered the state-of-the-art business games, not only for distance education, but also for face-to-face interaction courses. The conception process is made to use all Internet capabilities. It can be based on an existent algorithm or it can create an entirely new one. If an existent algorithm is used, there is a possibility to improve it, aggregating new functionalities to the business game.

Nowadays, the Original Web-Based Model is still an exception in the business gaming field, but as long as Internet programming languages popularize, this category is supposed to be the default. Once it was conceived to run directly in the Internet, it is expected to have the highest performance when compared with the previous analyzed models. The main disadvantages associated with this model are the cost and time involved. However, they are not real disadvantages if a new business game is to be created. If so, the Original Web-Based Model is the best option to run business games in distance education.

EXAMPLE OF AN ADVANCED HYBRID MODEL

The business games to be exemplified in this item had this author as one of the designers. They were originally programmed in the Pascal programming language to run in the DOS platform in the latter 1980s. In the 1990s these business games were upgraded using the Delphi orientated programming language to run in the Windows platform. Finally, in this decade, the business games are being converted to a Web Based category. Nowadays, all participant interfaces are running through a Web site specifically devised to be used in management simulation

courses. Many features of distance education web site were already incorporated using the Java and the PHP programming languages. However, the core program units are still running in the stand-alone PC. Therefore, these business games are characterized as Advanced Hybrid Models (SIMCO, 2005; SIND, 2005; SISERV, 2005).

The Advanced Hybrid Models encompass the web site, called Web Simulator (www.websimulador.com) and the business games integrated to it. Communication between the Web Simulator and the business games is carried out by using the technical *eXtensible Markup Language* (XML). Figure 1 presents a diagram of communication between the business games and the Web Simulator.

The Web Simulator architecture is composed of three layers, as represented in Figure 2. The first layer is dedicated to the administrator in order to manage the web site. The administrator's main attributions consist of managing institutions and instructors' profiles, and releasing simulations to be used. The release process involves defining who will use the simulation (institution and instructor), which simulation will be used (manufacturing, retailing, or service); for how long, and if additional softwares will be used, such as the Decisions Supporting Systems – DSS and the Individual Assessment Tool (options in implementation phase).

The second layer is instructor orientated. Each instructor can navigate in all simulations he is associated with. In each simulation the instructor can manage not only the simulation, but also the web site tools. The available tools are access control (by participant or team), announcements, schedule, and an area to download files. The communication between web site and simulator occurs in this layer. There are options to download decisions taken by participants and to upload XML files to be used by the Web Simulator so as to construct reports and graphics.
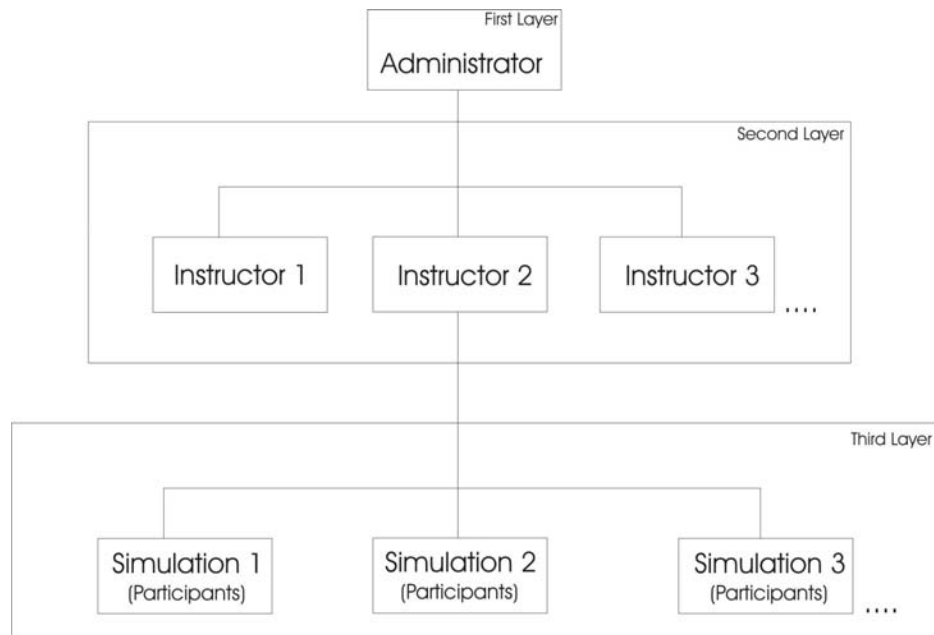
Figure 2 – Layers of a web site devised to support business simulations

Figure 3 presents the interface of the Web Simulator showing its functionalities.

The third layer is accessed by participants to enter their decisions and visualize / print out reports and graphics. As the main characteristic of an Advanced Hybrid Model, the participants will not perceive any differences in comparison with a true Web Based Model because all the information they need is accessed directly in the web browser; in other words, the access can be made by any browser connected to the Internet. Thus, the notion of "anytime" and "anywhere" access is presented to the participants.

ADVANCED HYBRID MODEL APPLICATIONS

The Advanced Hybrid Model exemplified has been used by this author to both distance education and traditional courses. The latter applications are performed in capstone courses to undergraduate levels at Federal University of Santa Catarina (Universidade Federal de Santa Catarina – UFSC), and in many other Brazilian universities. The course is performed using face-to-face interaction sessions. Students deliver their decisions at the end of class. The professor processes the decisions in the business simulator and uploads an XML file to the Web Simulator. Students access reports and graphics of the simulation in a security environment by using login and password.

The use of distance education technologies enriched the traditional business simulation course in many aspects: (i) the access to reports is made by students anytime and anywhere; (ii) performance graphics are also available; (iii) students are pleased with the technology; (iv) the professor's time to release outcomes is reduced because no reports print out is necessary; (v) new Internet features were added, such as space for announcements and area to download files. In addition, two other benefits were also observed: first, the access to the Web Simulator can be made, either by a team or individually. In both cases, the site monitors the navigation, showing which web site areas were accessed. An access report is also available. The professor uses the individual access to include an additional criterion to assess students, thus reducing the dependency of team criteria assessment; a common limitation of business simulations. Second, the use of Internet tools enhanced the image of the course as technologically advanced.

The distance education applications have been used to business educations and to contest gaming. Both kinds of applications use similar asynchronous technologies, i.e., there is no timing requirement for transmission of information. As a result, this environment does not allow for instant communication between participant and instructor (Duck, 2005). So far, the asynchronous environment was not considered an important limitation to the applications performed because the simulated companies were composed of a single person or of a team that had constant face-to-face interactions. Consequently, the only desired moment to a synchronous environment; that is, instantaneous communication between participants is the debriefing session. It is in this session that participants have the single opportunity to share the lived experiences and enhance their achieved learning. The debriefing session, as well as other sessions such as the briefing one, can be performed by using a chat room or other more advanced technologies such as teleconferencing and videoconferencing.

Contest simulations are applied in both open and private formats. The open contest occurs once a year, having a pre-defined schedule (www.torneiogerencial.com.br), and there is no limit to participants. In a first round, simulated

Figure 3 – Web site devised to integrate business games with the Internet

companies compete in groups of eight companies, thus forming an industry. The number of industries depends on the number of participants. All industries are of the same kind and there are no interactions between them. The company with the highest stock share value in each industry group after five simulated periods passes to the next contest round. At this point, there are two possibilities: the first one consists in repeating the methodology used in the first round and in performing additional rounds until the winners are known. In the second one, considering that the number of participants can achieve thousands, the winners can be determined in the second round. In order to do that, the Web Simulator is prepared to rank the stock shares of all companies together, despite which industry they are in. Also, no confidential business reports can be assessed by all companies. By so doing, it is possible to observe companies with the highest stock shares, period to period, and to analyse business strategies used by the best performed companies.

Private contests usually are run in a single round of 6 to 10 periods. Audiences are generally formed by universities aiming at integrating all students and trade associations so as to stimulate the managerial learning among their associates. In both kinds of contests (open or private) the role played by the instructor is not so hard because he prepares a single scenario, no matter whether the contest will have 8, 100 or 1,000 simulated companies. The Web Simulator replicates this scenario to all industries. Additionally, all data entry process is automated.

CONCLUSIONS

Business games using the Internet capabilities are a reality and they are expected to be the default in the future. However, many existent business games are supposed to be adapted so as to be run in the Internet. The question then lies in "how to adapt the existent business games to the Internet environment" This paper proposed a taxonomy to help both developers of business games and instructors to have the same terminology when discussing the use of business simulations through the Internet.

Additionally, an example of advanced hybrid business game was shown and some applications discussed. It was observed that the Hybrid Business Games Model can be successfully used in both distance business education and traditional courses as well. This author is convinced that the Internet is a powerful tool to facilitate the managerial learning through business simulation applications. However, new pieces of research have to be conducted in order to analyse whether the combination of business games with the Internet is also an enabler of additional learning, as stressed by Smith (2005). Moreover, new researches can also extend this paper by including not only developer and instructor's perspective, but also participant perceptions about the use of business games for distance education.

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