Journal of Engineering and Applied Sciences 12 (2): 176-182, 2017
ISSN: 1816-949X

Developing an Educational Business Simulator to Teach Management Strategy

Yoshiki Nakamura, Yukiko Kusu and Ken Takeda
Department of Business Administration, Aoyama Gakuin University, Tokyo, Japan

Abstract: In recent years, universities have witnessed a rise in demand for "active learning." In addition by using a computer-based business simulator based on the operations of a real company, students can also have experiences that include management of personnel and the flow of funds. Therefore, in this study we develop a business simulator model. The following elements of corporate strategy are used as the business simulator is to be constructed and modeled for upper-level students who have some business administration knowledge, in the stage of drawing up a management plan, the simulator must prepare the necessary information about the economy, the market and social information, the student's decision-making is to be based on the knowledge and former information, in anticipation of actually conducting a lesson using this business simulator we have considered the design of the course, themes and teaching materials. By taking these factors into account we developed this business simulator and designed the class for education as an active learning tool. We also conducted them and gave questionnaires for the university students. From the outputs we have to discuss future researchs.

Key words: Educational business simulator, business strategy, active learning, management plan, teaching materials

INTRODUCTION

In recent years, universities have witnessed a rise in demand for active learning. Active learning refers to a method of teaching that requires active participation from the learner as opposed to the lecture format where information flows directly from teacher to student. Group discussions, debate and team work are effective methods of active learning. In the field of business administration, classes that adopt active learning methods in various forms are currently being offered (Hunt *et al*., 2016). In some classes for example, an instructor provides case studies of situations that students would encounter in a real company and the students develop a response for a given case by discussing the case with one another (Chung, 2015; Wasson *et al*., 2016; Tah, 2005). In addition by using a computer-based business simulator based on the operations of a real company, students can also have experiences that include management of personnel and the flow of funds (Bertran *et al*., 2015; Pando *et al*., 2016). Therefore, in this study, we focus on how a business simulator may be used for educational purposes.

In business simulation classes, the students must use the knowledge and information they have already acquired in management classes. Consequently, a business simulator can help with the integration of knowledge and understanding about the interrelationship among various types of knowledge. In addition, a business simulator can define the object of learning because the instructor can create a story that allows the students to learn (Baker *et al*., 2005). Developed a strategic business simulator which can teach students about decision-making and management when running multiple divisions such as the withdrawal of the business new product development, financing and the purchase of a new business. However, the business simulator developed by Nakamura was not a fully "strategic" simulator as it could not respond to situations requiring the most strategy such as enforcement and resource allocation because it failed to incorporate the required analysis of outside information that management must undertake when formulating strategic plans. Therefore, in this study we develop a business simulator model that incorporates the following elements of corporate strategy:

- The business simulator is to be constructed and modeled for upper-level students who have some business administration knowledge
- Particularly in the stage of drawing up a management plan, the simulator must prepare the necessary information about the economy, the market and social information so that the student can always make an informed decision
- The student's decision-making is to be based on the knowledge that they have acquired in their business administration classes

Corresponding Auther: Yoshiki Nakamura, Department of Business Administration Aoyama Gakuin University, Tokyo, Japan

- In anticipation of actually conducting a lesson using this business simulator we have considered the design of the course, themes and teaching materials on a week-by-week basis

By taking these factors into account we developed this business simulator for education as an active learning tool that plays the role of reinforcing business administration knowledge for upper-level university students.

MATERIALS AND METHODS

Strategic business simulator model

Enforcement system and basic model: The business simulator is run on PCs and tablet devices used in classes at the university. We assume that one team consists of 3-8 students (the "learners") and an organizational chart is shown in (Fig. 1). According to Fig. 1 there is a Management division and three divisions (PC, server and Tablet divisions-the latter of which is still under development). Each division consists of purchasing, production, sales, inventory control, delivery and information management sections (Edum *et al*., 2001; Stadtler, 2005; Stewart, 1997). In the business simulator class, the learners decide on the assignment of roles within their teams such as who will serve as the president of the Management division ("management level") the head sales person in each division and the head production person in a given team. The PC and server divisions perform the role of procuring the product parts, manufacturing and sale of products from early on in the simulation. The tablet division can begin operations once research and development (R&D) expenses for this initiative are fully allocated.

Next we explain the product's parts, the finished product and the product's market for sale (Fig. 2). Each division has one factory at the start-up stage of the simulation and they can produce three kinds of products: a high-quality study, a standard article and an inexpensive study. The product is made up of a combination of parts ranging from "a1, a2, a3" and "b1, b2, b3". The price and quality of each part depends on the supplier so that the quality of the finished product varies according to the chosen combination.

The sales study focuses on the product inventory and sales to the customer. In this simulation, there are three target markets: the General Consumer market ("GCon market") which sells to general consumers through retail, the Business-to-Consumer market ("B-C market") which sells to consumers through the internet and the Business-to-Business market ("B-B market") that sells to companies. Each market has different characteristics and so the method of sale for each market will also differ.

Next we explain how the learner will engage in decision-making. There are two kinds of decision-making: strategic decision-making undertaken by the management division and tactical decision-making performed by each division (PC, server and Tablet). Strategic decision making is conducted once every term and tactical decision-making is undertaken every quarter. As for the time concept in this business simulator, the period for strategic decision-making is 1 term, (i.e., 1 year) and the tactical decision-making period is 1 quarter (i.e., 3 months).

For outside information such as sales, market conditions and economic information we use real data from 1990. The learner can use real economic data and the instructor can let the learner discover the importance of analysis, consideration and decision-making using various sources of information. In addition, the instructor can explain the reason for the sales amount that they have set because the sales amount is connected with actual economic data. In other words, analysis with strategic information shows the learner the importance of understanding decision-making based on theoretical fundamentals rather than intuition alone.

By considering the above histology and decision making timeline, the learner can experience how

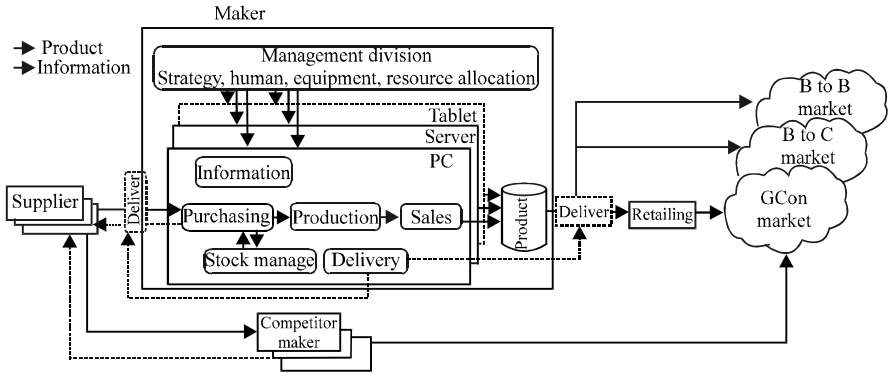

Fig. 1: Basic model of the simulation

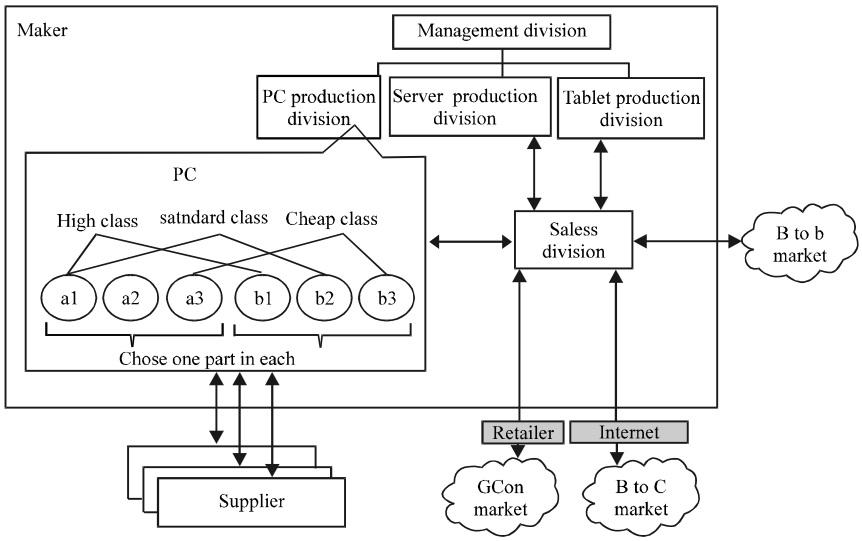

Fig. 2: Market/product/parts relationship

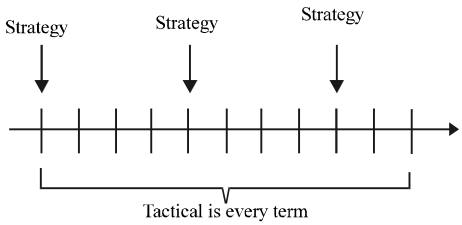

Fig. 3: Decision making timing

management competes with other teams (which represent rival companies) by obtaining the sales amount, the company image and the stock price, among other types of information. Consequently, we assume that the learner understands the responsibility, authority, allotment and the importance of discussion. We explain the learning content of management and the other divisions in the next study.

Strategic decision-making and learning content: This business simulator has been developed for a learner in the upper levels of university. In addition we assume a stage called "plan drafting" of the Management division. The flow from Plan Drafting to enforcement (PDCA) are shown in (Fig. 4).

At the Plan stage, management philosophy, policy, domain settings as well as a basic strategy (Saputri and Mulyaningsih, 2016) are determined before the simulation begins. Domain setting and the basic strategy can be modified even after the simulation begins. The basic strategy set by the management division is described to each division (PC, server and Tablet). using the text displayed on the business simulator. It is necessary for each division to make a decision using the basic strategy that the Management division has provided them. On the other hand, a plan for each term includes a profit plan, a Product Portfolio Management (PPM) plan, a human resource plan, a facilities plan (Cowling and Johansson, 2002) and R&D expenses. At first in developing the profit plan and PPM, the Management division has to predict the sales amount for every term, the cost and price of each product and expenses as part of the profit plan. To predict the above sales amount, the learner has to analyze real outside information as given by the simulator. In other words, the learner must analyze and predict the sales amount of each division using information such as the product details, the company's position, the economic climate and the social situation. That is to say, decision-making in this simulator is performed not using intuition alone but on the basis of theoretically-founded reasoning. At the start of the simulation, real outside information for a span of 15 year (from 1995-2010) is given and more information is given as the simulation progresses.

After the expected sales amount and profit have been decided, the Management division decides on the budget allocation to each division (PC, server and Tablet) using PPM. In other words, the resource allocation does not depend on intuition and perception but rather on the concepts that the learner has already studied such as product life cycle, growth potential, market share and the social situation needed in the simulation. In addition, each division must decide how to allocate the budget set by the management division. That is to say each division is given a budgetary limit that must not be surpassed during a single term.

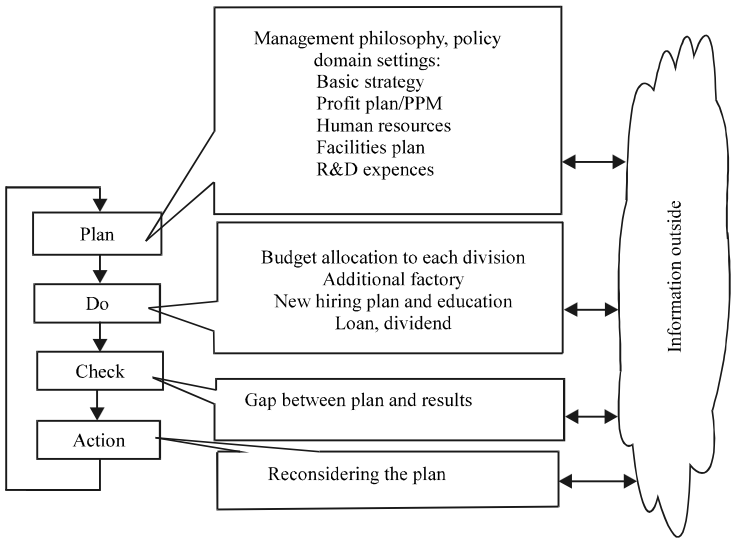

Fig. 4: PDCA cycle

Table 1: Analysi items

Sale	Operation incom	Cost of sale
Ordainary profit	Gross profit	Net incom
Volume of sales	Volume of profit	Number of new hiring

The human resource plan requires learners to decide on a new hiring plan how to address soon-to-be retired employees and employee educational expenses. Productive capacity and marketability are set as the number and the age of the employee who is leaving. Therefore, it is necessary to devise the human resource plan in terms of the retirement structure of the company, personnel expenses and growth potential. The important point for the learner to recognize is that the human resources is important for the company and that they must carry out the hiring plan while analyzing outside information such as long-term outlook, the economy and population dynamics.

The facilities and investment plan means that the purchase or sale of the factory and the expansion of the factory should increase its productive capacity. When a market and a company grows in size, demand for the product will be greater than the quantity the learner originally predicted and decided to produce, representing a loss of opportunity. To avoid this loss of opportunity, the learner may increase the size of the factory. On the other hand if products do not sell well enough and the company cannot generate a profit, the learner may consider selling the factory. By considering this situation, the learner can solidify his or her knowledge of accounting (such as cash and credit, balance sheets and profit and loss statements) and well as human resources management.

The tablet division which remains under development at the start of this simulation can be established if the associated R&D expenses are fully allocated. Therefore, it is necessary to consider outside trends, the company's situation, human resources management as well as factory management and to decide on an appropriate investment plan for the needed facilities, including the factory.

The learner can then execute this plan ("Do"). In addition, there are other decision-making considerations that the learner must address such as: dividends, the issuance of new stock, borrowing money, returning borrowed funds and investigation costs. The investigation costs represent the cost of market research, which allows the learner to obtain more detailed information to inform their decision-making, rather than relying on general data alone.

At the "Check" stage, a comparison between the planned outcome and the actual results is needed to analyze the quality of the learner's decisions. Given that this simulator has been developed for upper-level learners, the learner acting in a managerial capacity may have to ascertain and analyze his or her decision-making. To do so this business simulator will be more useful than a conventional business simulator. This is because comparing the difference between planned outcomes and actual outcomes is critical to improving the effectiveness of future decisions. The items that should be compared in order to conduct this analysis are shown in (Table 1). This business simulator changes each company's product sales amount (the sales share) according to the difference between the plan and the actual results. Analyzing why the differences may have occurred and considering how future decisions can be refined and modified are referred to as "Action". The Action stage then informs the planning stage.

Using such a decision-making model that makes use of the PDCA cycle takes the management level into consideration, allowing the learner to solidify R&D and new-product development in the intermediate term. Therefore, using this simulator for the above process can allow the learner to understand intermediate term decision making to a greater extent than a conventional business simulator can as the latter does not account for theoretical decision-making.

RESULTS AND DISCUSSION

Tactical decision-making and learning content: Tactical decision-making is carried out by each division 4 times per term, once every quarter (from 1- 4Q during 1 term). Each division must make routine business decisions such as part procurement, the production of the product and the sale of the product. This tactical decision-making includes a condition that the divisions must not exceed the budget set through PPM by the management division during any single term. Therefore, like the management division, each division must also analyze the information (such as a product's life cycle, seasonal variation and consumer indices). After conducting analysis of this data, each division should predict their future sales figures and reallocate resources quarterly. In addition, the inventory control of a given part and of the product itself is also important to decision-making in each division because it is a part of the normal course of business.

When making decisions with regard to the product's parts, the learner should use the methods that they have already learned in business administration such as ABC analysis, order quantity analysis, cost management and cost analysis. In short, the learner should develop a plan for purchase and production of necessary parts after deciding on the inventory quantities of the most suitable part and of the product. In addition, the time lag from the part's purchase order to procurement and from production instruction to the product's completion is 1Q (3 months). The learner can also consider comparing information with that of competitors by allocating resources to cover investigation costs. Next we describe the decision-making items by section. The human resource plan requires learners to decide on a new hiring plan how to address soon-to-be retired employees and employee educational expenses. Section must consider temporary workers to adopt in each 1Q (Quarter) for the production section, because productive capacity changes based on the hiring of temporary researchers. For example if the learner seeks to increase production quantity suddenly, they should hire more temporary resaerchers. The sales study decides on the sale price of the product, the planned volume, distribution costs, sales promotion costs and advertisement costs. Sales promotion costs and advertisement costs are the costs to establish the consumer's recognition of the product and the distribution costs allow the learner to consider how to most efficiently deliver the product to the end user. The production section decides on the planned amount of production, the technical repair costs and QC/IE connection costs. The technical repair costs and the QC/IE connection costs, combined are the cost for the maintenance and management of productive capacity. If the technical repair costs accumulate continuously, the effect on production is functioning effectively. The purchasing section decides on the planned procurement quantity and price. The information management section decides the JIT costs and SCM costs. The JIT costs reflect the accurate inventory information and production information on the production control. The SCM costs reflects an information sharing degree with a part company and the retailer and if the degree of information sharing is high the learner can opt instead to purchase parts and sell products as planned.

Setting by instructor: We explain the items that the teacher or administrator sets before the start of the simulation. There are some items which must be set: the number of learners on each team, the threshold of R&D expenses, basic information and market characteristics. Basic information consists of the facility items (purchase cost, service life and depreciation and amortization), the interest rate of borrowed money and forced borrowed money, the cost of materials, the unit price of temporary workers and the annual income of regular employees. Each market (GCon market, B-C market, B-B market) depend on the price, the quality, the product's performance, the design, the brand (corporate image) and the difference between the first-term plan and the results. In sum, the more suitable decision is made, the more the products have sold well in each market. In order words, because the target of the GCon market is those consumers who purchase it from retail stores we assume that the consumer of the GCon market is not knowledgeable about computers and prefers a less expensive product. On the other hand because the target of the B to C market is consumers who are knowledgeable about computers we assume that the profit rate of the B-C market is high and that sales are stable. Given that the target of the B to B market is companies, we assume that the profit rate (especially for servers) is high and that sales are stable.

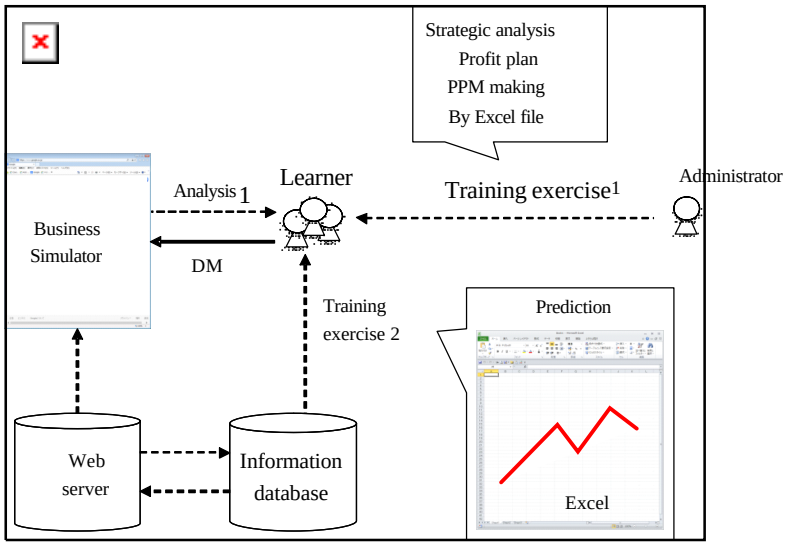

Fig. 5: Relationship between training exercise and simulator

The time setting includes the product life cycle and the market boundary line setting. We set a sales amount that increases such as the product life cycle. Only the PC product and the server product are available at the start of the simulation. Depending on the actual data, the amount of sales of the PC product decreases steadily, the sales volume of the server product increases steadily and the Tablet increases rapidly from the middle.

The relationship between the simulator, the training exercise and the theme setting: In consideration of an actual lesson we describe the relationship between the simulator and the desktop practice and explain the theme setting of every term (Fig. 5). The conventional business simulator depends on inputs based on intuition. A general business simulator addresses only "Analysis 1" in Fig. 5 and rarely includes a strategic analysis. Therefore, in this simulator, the instructor lets the learner perform the desktop practice (that is to say, an analysis of the various viewpoints) to keep the grounds of their decision making as broad as possible. First, the learner of the management division can obtain the teaching materials corresponding to "the training exercise 1." The contents of the desktop practice are as follows:

- The setting of a company name, a company idea and management visions
- The setting of a whole strategy, business strategy and the functional strategy
- Lear-the enforcement of PPM
- The profit plan
- The human resource plan and
- The facilities plan

A company name, company idea and management vision are described on an Excel spreadsheet. By inputting data onto this sheet, the learner can find and solve the problem. For example, assuming we use PPM, it is necessary to conduct an analysis using the results of previous decision-making processes and financial statements, outside information such as data from competing companies and economic information on "the training exercise 2." In other words, the learner must analyze the data using the spreadsheet as "the training exercise" so that they may use it for their own decision-making.

With regard to the theme setting, the instructor is given a theme in every term. It becomes clear that the instructor wants to teach the learner by pushing him or her forward while providing this theme.

CONCLUSION

This research has developed a model for a strategic business simulator for use by upper-level university students who already have some knowledge of business administration. This simulator can teach students about intermediate and long-term decision making such as the drafting of a plan, the guidance that must be provided to various organizational divisions and how to allocate a budget from a management-level perspective. Particularly, during plan drafting stage, the simulator will need to prepare necessary information about the economy, the market and social information so that the student can make full use of the knowledge they have already gained. In addition in anticipation of conducting an actual lesson

using this business simulator, we have also developed the class design, theme and teaching materials on a week-by-week basis.

IMPLEMENTATION

We have also implemented the simulator (particularly strategic decision-making and desktop practice) to 36 actual university students. We have collected feedback from them which includes the following: "The simulator allows us to experience real corporate management," "Sharing information and analysis methods with other team members is useful," "There is too much information," and "It takes too much time to make decisions." We will consider this feedback in determining how to make the simulator more effective.

Looking forward, the issue of text-mining in strategic guidelines, the expansion of the management method, the selecting among the information available and the application of this model to more students will need to be addressed further.

ACKNOWLEDGEMENT

This study was supported by Global Business Institute in Aoyama Gakuin University.

REFERENCES

Baker, A., E.O. Navarro and V.D.A. Hoek, 2005. An experimental card game for teaching software engineering processes. J. Syst. Software, 75: 3-16.

Bertran, F.A., L.A.B. Hernandez and E.S. Lopez, 2015. The effect of competences on learning results an educational experience with a business simulator. Comput. Hum. Behav., 51: 910-914.

Chung, C., 2015. Comparison of cross culture engineering ethics training using the simulator for engineering ethics education. Sci. Eng. Ethics, 21: 471-478.

Cowling, P. and M. Johansson, 2002. Using real time information for effective dynamic scheduling. Eur. J. Oper. Res., 139: 230-244.

Edum, F.F.T., A. Thorpe and R. McCaffer, 2001. Information procurement practices of key actors in construction supply chains. Eur. J. Purchasing Supply Manage., 7: 155-164.

Hunt, I., R.K. Taylor, A. Winter, J.J. Mackie and D. Fisher, 2016. Using the balanced scorecard to enhance undergraduate education in a first year business course: A pilot study. J. Educ. Bus., 91: 132-137.

Pando, G.J., P.I. Canadillas and J. Charterina, 2016. Business simulation games with and without supervision: An analysis based on the TAM model. J. Bus. Res., 69: 1731-1736.

Saputri, M.E. and H.D. Mulyaningsih, 2016. Blue Ocean strategy for creating value innovation: A study over kedai digital in Yogyakarta, Indonesia. J. Administrative Bus. Stud., 1: 14-20.

Stadtler, H., 2005. Supply chain management and advanced planning-basics, overview and challenges. Eur. J. Oper. Res., 163: 575-588.

Stewart, G., 1997. Supply-Chain Operations Reference Model (SCOR): The first cross-industry framework for integrated supply-chain management. Logist. Inf. Manage., 10: 62-67.

Tah, J.H., 2005. Towards an agent-based construction supply network modelling and simulation platform. Autom. Constr., 14: 353-359.

Wasson, K., K. Parsi, M. McCarthy, V.J. Siddall and M. Kuczewski, 2016. Developing an evaluation tool for assessing clinical ethics consultation skills in simulation based education: The ACES project. HEC. Forum, 28: 103-113.