THE COLLABORATIVE LEARNING SYSTEMS USED AS DECISION SUPPORT SYSTEMS

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Abstract

This paper reviews a case study in the use of COST/BENEFIT ANALYSIS in project appraisal which serves to illustrate different aspects of the practical problem (using the CBA/PC package) and the Management Game "MANAGER" that simulate all functions for three to nine companies that find in competition. The COST/BENEFIT ANALYSIS case study and The "MANAGER" game illustrate how case study and management games , that simulate competition between companies, can make an useful Collaborative Learning System and can be use into Master Courses.

Key words: Case Study, Management Games, Collaborative Learning Systems

1. e-Learning, m-Leraning as Computer-supported Collaborative Learning (CSCL)

Electronic learning (or **e-Learning** or **eLearning**) is a type of Technology supported education/learning (TSL) where the medium of instruction is computer technology, particularly involving digital technologies. E-learning has been defined as "pedagogy empowered by digital technology" [1]. In some instances, no in-person interaction takes place. *E-learning* is used interchangeably in a wide variety of contexts. In companies, it refers to the strategies that use the company network to deliver training courses to employees.

M-learning, or "mobile learning", now commonly abbreviated to "mLearning", has different meanings for different communities. Although related to e-learning and distance education, it is distinct in its focus on learning across contexts and learning with mobile devices. One definition of mobile learning is: *Learning that happens across locations, or that takes advantage of learning opportunities offered by portable technologies*. In other words, mobile learning decreases limitation of learning location with the mobility of general portable devices. (reference:http://www.grayharriman.com/mlearning.htm)

Computer-supported collaborative learning (CSCL)

"Computer-supported collaborative learning (CSCL) is one of the most promising innovations to improve teaching and learning with the help of modern information and communication technology. Collaborative or group learning refers to instructional methods whereby students are encouraged or required to work together on learning tasks. It is widely agreed to distinguish collaborative learning from the traditional 'direct transfer' model in which the instructor is assumed to be the distributor of knowledge and skills. " [Lehtinen].

2. Cost/Benefit Analysis – Case Study

2.1. Introductory remarks

The case method is often compared to other teaching methods as lectures, simulation, or role playing with respect to its ability to reach specific course objectives. Teaching with cases have been shown to be more powerful a lectures, simulations, or role playing with respect with it ability to reach specific course objectives. Teaching with cases has been shown to more powerful than lectures, for instance, in increasing students' analytical skills, decision – making skills, evaluation and judgement skills. In the case writing process we have the following steps: identifying the needs, searching for leads, data gathering case plan preparation, second interview, writing the case, case release, experimentation in the classroom, final draft and teaching notes.

The Cost/Benefits Analysis, developed by World Bank to, is a complex method for critical examination of the project profitableness by using the financial rate of return and the update techniques. The purpose of this method is to balance the cost against the benefits associated with an investment project (economic investment, research and development projects, information system, etc.). The financial cost and the time constrains involved in a risk analysis are very important elements in the decisions. The major advantage of risk analysis is that it enables us to attack more difficult problems and to make decisions we wouldn't have felt competent to make.

2.2. "The electification of a railway segment" – Case Study

The project includes the electrification of a railway segment for extension traffic and cutting down the operation and mentenance expenses. The cost of this project (new equipments (C1), materials (C2), labor(C3)), is about 12300 monetary units (m.u.) and the working time is 1 year. The actual operation expenses are 6350 m.u./year and the operation expenses of the project (when this project will be working) will be roughly 3800 m.u./year and the operation expenses of the new project in 8 years, and the last stage rate of return is 12%, we need to decide if this project is acceptable. We observe that the differences between old operation expenses and the new ones signifies the net profit of this project. The new project achivement is simultaneously with the utilization of the actual railway system. Consequently the total cost in the first year is: 6350 + 12300 = 18650 monetary units. The data of this project are presented in table 1.

2.3. Cost/Benefit Analysis Method

The purpose of any cost/benefit analysis is to balance the cost against the benefits associated with an activity. The fesability projects, like other economic projects, should be measured by its ability to provide sufficient benefits to justify its cost. The objective of cost/benefit analysis, method development by International Bank for reconstruction and Development, is to use objective economic criteria in all our judgement to select efficiently fesability studies.

2.3.1. Cost benefit indicators

a) **Benefit/Cost Ratio (BCR)** is defined as ratio expressed as a decimal fraction, between the present value of total benefits and the present vale of total costs of a project:

$$\frac{V_a}{C_a} = \frac{\sum_{i=1}^{N} \frac{\sum_{j=1}^{N_2} B_{ij}}{(1+0{,}01R)^{i-1}}}{\sum_{i=1}^{N} \frac{\sum_{I=1}^{N_1} C_{ij}}{(1+0{,}01R)^{i-1}}} \qquad (1)$$

Where:

- N1 is the number of benefit streams;
- N2 is the number of cost streams;
- R is discount rate expressed as a percentage;
- N is the lifetime of the project in years;
- Cij is the I item, in the j cost stream;
- Bij is the I item, in the j benefit stream.

b) The Present Value (PV) – is the discounting procedure which is performed over the set of current streams. The procedure is peromed as many times as discount rates are given by user.

$$VAN = \sum_{i=1}^{N} \frac{\sum_{j=1}^{N_2} B_{ij} - \sum_{j=1}^{N_1} C_{ij}}{(1+0,01R)^{i-1}} \qquad (2)$$

Where all symbols have the same meaning as in (1).

c) Rate of Ratern (RR) is the discount rate that makes the net present value of a project equal to zero. This implies solving for the discount rate R the polynomial equation:

$$RIR = \sum_{j=1}^{N} \frac{\sum_{j=1}^{N_2} B_{ij} - \sum_{j=1}^{N_1} C_{ij}}{(1+0,01R)^{i-1}} = 0 \qquad (3)$$

Equation (3) is solved by successive approximations for range -20% to 100% and where all symbols have the same meaning as in (1).

2.3.2. Cost Parametric Analysis and Risk Analysis

a).**The Cost Parametric Analysis(CPA)** explore the effect of changes in construction costs or in benefit streams on the internal rate of return and timing of the project. The analysis is performed for the changes of each benefit stream or cost stream (between -15% and +15%) or the changes of a combination of benefit and/or cost streams.

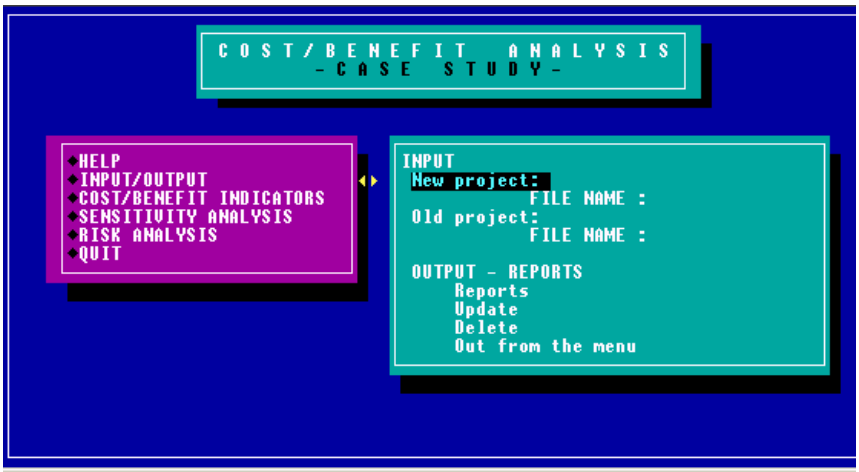
b) **Risk Analysis** can be performed over any cost of benefit streams. Every stream have a probability distribution associated (uniform, normal, beta, discrete, step rectangular, triangular). The streams affected by uncertainity are designed by the user. The generation of a randomly distributed according to a given probability density function and the perform these procedures is made by CBA package.

2.4. CBA Package

The CBA package (available on PC/AT) is designed for Cost/Benefit Analysis used in the Feasibility Projects and includes computational procedures for obtain cost/benefit indicators. The objectives of the CBA package are the following:

- To cover the complete set of computations and situations arising in the cost/benefit analysis of projects;
- To give the user full control of his analysis;
- To make program and data handling easier for the user.

The software demonstrations illustrates the type of problems that may be solved with CBA package. The case study chosen gives an idea about the potential and usefulness of the method and the CBA package for:



Specification of streams and storage data (The cost and benefit sources during the life of the project);

- Use of several Cost/Benefit Indicators (rate of return, benefit/cost ratio, first year benefit, net present value);
- Use of Shadow Rates and Sensitive Analysis (Perform a cost parametric analysis of the value of the rate of return of the project);
- Use of Risk Analysis (All costs and benefit streams have a probability distribution associated: Uniform, Step-Rectangular, Discrete, Triangular, Normal, Beta).

3. Brief description of the "MANAGER" Management Game

The "MANAGER", developed at Romanian-American University, is a management game conducted with the aid of a computer. The game outlines the main correlations existing between the various departments in a company and simulates the evolution of the company as a system. The evolution of the company is the outcome of decisions (numeric values) proposed by the managing team (the management council).

Student Teams

The students are divided into teams of 5 students, which can be grouped in a number of 3 to 9 management councils whose task is to manage the 3 to 9 companies modelled in the game for a planning period (years/quarters).

Company and starting Position

The studied system (game) models the entire activity (in a simplified way) that is unfolded in 3 to 9 enterprises in the light industry branch that have nearly identical results at the end of the base year.

Markets

The finished products are sales on four market categories, named: Home, Zone I, Zone II, Zone III

Products

There is initially one product. Students have an option to build other products.

Decisions

Students have 2 to 6 (or 8) regular decision rounds; each decision round represents a quarter a year of company operations. After the decision round time expires the computer package simulate the evolution of all competition companies. There are 110 types of decisions each decion round , spread across the functional spectrum as follows:

- Production and Plant capacity additions/upgrades;
- Research and development.
- Worker compensation and training ;
- Shipping and deliveries;

- Pricing and marketing;

Factors Responsible for Sales

The factors that are responsible for the company sales are:

- how its price compares against the prices of rival company;
- how quality compares against the quality of rival company;
- how its advertising effort compares;
- what are the stock products;

Reports Generated

After simulation, the " MANAGER" package issue the results in the form of three sets of reports:

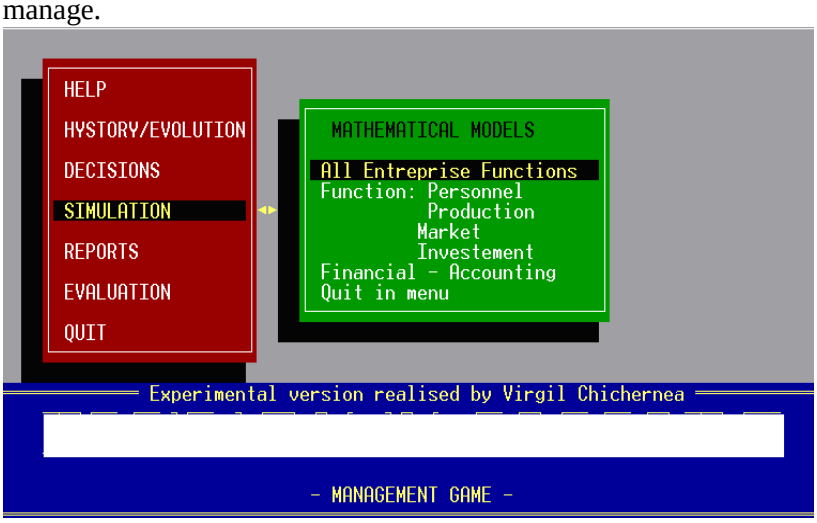
- The Industry Reports which contains : Production Reports; Personnel Reports; Semi-finished Cost; Finish Cost;
- The Commercial Reports: Market Report, Sales Reports, Inventory Reports;
- Final Performance Measures: Enterprise Reports; Quarter Evaluation Reports.

Final Perfomance Measures

In running their activities, the challenge for each management team is to craft and execute a competitive strategy that results keeps their company in competition, and produces good financial performance as measuring by sales, personnel, benefit.

3.1. The "MANAGER" package structure

The economic-mathematical models and the program package associated with it make it possible to study the evolution of the company as a system within a planning period (t+1). They simulate and quantify the effects of various decisions made within that interval. The data contained in the company data base show a normal performance to date of the respective company. The data offer information on: market potential, money assets, existing manpower, raw materials inventories, results of research and development, financial position of the modelled company the trainnees are expected to manage.



The package contains the menu for HELP(traineer's manual and samples), PARAMETERS (the number of the teams, the language used, the type of printer), HISTORY (entreprise evolution), DECISIONS, SIMULATION, REPORTS (the results of simulation), QUIT. The program package contains five mathematical models in which all the relevant data (decisions and data of data base) is integrated to evaluate the evolution of the companies as a system.

The strategic value of gaming simulation:

What is the purpose of the game? What are the risks for education? What educational value does gaming simulation acquire in the process of education when it highligts the haphazard significance of decisions? How does gaming simulation relate not only to the game theory - and therefore the probability theory - but also to the entrpreneurship theory, to the studies on learning, to the educational technologies, to virtual realities?
The management game has two attributes: co-operation and individual education. Co-operation, which stands out as the winning strategy in competition games. Individuality of education: if each person has to have a particular individuality, as it happens in the case of role playing, it means that the value of the human person and his right to self-determination must be recognized. So, not only must we have teaching imparted through gaming simulation, but also education, meant as an interactive relationship between those who know and those who have to learn.
Reports, in the form of display or listing, are produced in Romanian, English, French, German and file text can be translated in any language. The package is accompanied by a work kit consisting of: trainer's manual, managing team manual, listings on the evaluation of the companies, forms for filling in the decisions.

4.2. General description of the analysed economic setting

The studied system (game) models the entire activity (in a simplified way) that is unfolded in 2-5 enterprises in the light industry branch that have nearly identical results at the end of the base year.
The management team of an enterprise must permanently analyse both the information available in the managed enterprise and the information from the outside in order to be able to make appropriate decisions for the running of the enterprise for a plan period (one year); In a modelled enterprise one can find all its functions, namely: PRODUCTION - PERSONNEL - RESEARCH & DEVELOPMENT, COMMERCIAL, FINANCE – ACCOUNTING.
During the simulation, the program package used in the game models these functions for each analysed enterprise in the following sequence (some models are partially interactive):LABOUR TURNOVER, PRODUCTION, RESEARCH & DEVELOPMENT, RAW MATERIAL SUPPLY, PRODUCTION DELIVERY BY FOUR CATEGORIES OF MARKETS, INVESTMENT, FINANCE-ACCOUNTING. After every simulation run there are quarterly OUTPUT REPORTS.

5. *Benefits of e-Learning versus traditional classroom settings*

With virtual notes instead of paper notes and online assessments instead of paper assessments, e-Learning is a more environmentally friendly solution. In many contexts, e-Learning is self-paced and the learning sessions are available 24x7. Learners are not bound to a specific day/time to physically attend classes. They can also pause learning sessions at their convenience. All in all, in the future, more and more collaborative learning systems will arise, which can entirely change our idea of education: receiving education will become an equal collaboration between instructors and students, and the latter will be the center of education. That kind of system that we have developed has been used not only to teach and to demonstrate, but also to support students' initiative in study and collaborative exploitation. Traditional teaching means control and dominance, but collaborative learning system is based on the WWW, which combines students from all over the world. In this way everyone can share in the collective wisdom.

e-Learning m-Leraning and Collaborative Learning Systems can provide for major benefits for the organizations and individuals involved.

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