

GAMES: Virtual Worlds and Reality

Selected Papers of ISAGA 2008

Eugenijus Bagdonas & Irena Patasiene (eds.)

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Web-based Business Game for multidisciplinary teaching

Eugenijus Bagdonas, Irena Patasiene, Valentina Dagiene, Vytautas Skvernys, Martynas Patasius

Abstract

The processes of integration and globalisation increase the necessity to improve competitiveness of the enterprises. In modern organisation the knowledge of narrow sphere of operations of own work is not enough, as effectiveness of the whole organisation will improve if each of the workers will understand all the main business processes and take account of them in the local decisions. In such case the improved decisions in all the workplaces will give synergetic effect to the entire organisation. Business simulations can be used to ease the understanding of main economical processes. The goal of this work is to create a Web-based tool that would simulate the business processes and help the student to understand the interdependencies of these processes. The article describes Web-based business game “Hard Nut” (“Kietas Riešutas”) made by the authors and compares it with the previous standalone version. As the opinion of the students is important in deploying and using such software in the studies, the article also gives the statistical analysis of survey of the users.

Keywords: business game; multidisciplinary teaching; internet.

Introduction

As the required study quality increases, it is important to have and use the measures that help understanding.

Analysis study program of business administration show sequence content related modules. Business game could be good tool for integrating different types of related modules.

As research in various countries show, business games are useful to improve entrepreneurship of students. The popularity of computer business games arises constantly. Many computer business games and simulation systems exist, but only a part of them has been prepared for study.

Most of businesses games offer the user to improve skills in a specific area of business (for example, marketing (Hall 2007)), some other games are dedicated to show an overview of business decisions without any deep analysis (Ichikawa et al. 2003). Most of business games have a rather limited set of student-controlled variables. Furthermore, most of the games are organised by the teacher and the students just have to fill out the decision forms, sometimes even without understanding the subject matter. It has been found that it is harder for the players to understand the games made in countries with different culture (Ichikawa et al. 2003). Some scientific works investigate the influence of national and cultural traditions for learning business and management. (Cox et al. 1997; Trim et al. 2000; Rehm et al. 2007). Analysis of business games used in Lithuania has shown that educational institutions generally use foreign games (sometimes translated to Lithuanian) and the financial statements used in those games slightly differ from the ones used in Lithuania (Skunčikienė et al. 2006). That creates a secondary problem: as Lithuania has no business game design traditions, both designing new games and studying their use in education is important.

The objective of this work is to analyze the possible methods of business process simulation and to create a tool of simulation of economic processes that would encourage the willingness of the students to understand relationships between economic processes and increase the motivation. For that it is important to adapt the architecture of the game to help its integration to various study programs for multidisciplinary use.

Model of enterprise activity used in business game

It is important to evaluate economical factors and to select those that satisfactory reflect reality and are suitable in respect of education. The complexity of business game depends on number of evaluated economical factors. For teaching purposes different economic factors usually need to be emphasized, therefore game should be flexible and universal. The other solution, when separate

games are applied to teach each factor or group of factors, is also possible. Nevertheless, surveys of students and pupils opinion have demonstrated that universal games are more reasonable with regard to education aspects.

Such considerations influence architecture of business game.

Figure 1: Enterprise and its environment



The simplest description of the market is given by P. Kotler: marketing index M_i is calculated according to the formula. In this work x_i has been modified – credit to customers added.

$$M_i = \frac{x_i}{\sum_{j=1}^m x_j}, \tag{1}$$

here:

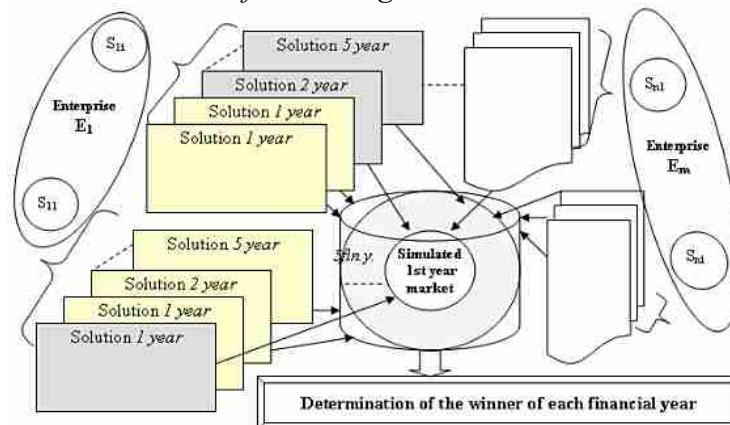
$$x_i = p_i^{-\alpha} a_i^\beta d_i^\gamma (k_i^\delta + \delta_1), \tag{2}$$

here p_i – price, a_i – advertisement expenses, d_i – distribution expenses, k_i – customer credit, α, β, γ and δ – corresponding elasticities, δ_1 – constant that decreases the influence of credit for customers.

Architectural solutions of economical processes modelling

Architecture of Business Game should be related with needs for teaching tool. Architecture of the business game is given; advantages of open access database structure are explained. The main advantage is related to the possibility of using the same game in the learning process to illustrate the structure of the enterprise information system and its possibilities. Fig 2 shows common functional schema of business game.

Figure 2: Common functional schema of business game



In the initial state of the game the main enterprise has just founded several branches (companies) E_1, E_2, \dots, E_m , that elect their boards, chose their name and work independently for several years competing with each other. The team (imitating board of the company) consists of 3-5 students of the same group, distributing the responsibilities between themselves. Every team elects a player who simulates the work of a director. Entrepreneurship tests can be used to chose the director (Bagdonas et al. 1998; Murria et al. 1994; Porte 1994; Wolfe 1994), but it is not always suitable for education.

The board has to decide the long-term goals of the company and their implementation – the strategies of the main directions of action:

- marketing strategy;
- strategy of introducing new products and increasing production;
- strategy of use of the production and selling capacity;
- motivation of personnel;
- strategy of increase of effectiveness (profit, capital, investment).

The management decisions on each financial year have to correspond to the strategy chosen.

Organisationally, the initial state of the game can be chosen by the teacher, according to the educational needs. Consequently, the business game has to be designed in the way that would allow the teacher to change the initial state of the game and the conditions that simulate external influence for each year. In this way the game becomes more complex, more interesting, and, consequently, more universal. The teacher has to understand the subject matter well, as the data should be as close to reality, as possible. For example, the data for the game described here have been chosen after analysis of a real enterprise that produced boilers.

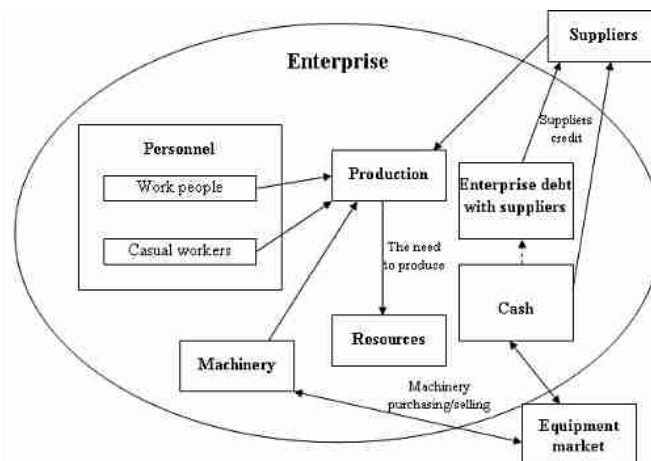
To increase the flexibility of the game, a possibility of choosing the number of student-controlled variables. The teacher can chose a subset of the whole set of variables that can be controlled by the players. Such architectural decision allows adaptation of the game to the knowledge level of the students. That is extremely useful for lab assignments or in informal studies.

Several blocks of variables in the decision sheets can be considered:

- common decisions;
- personnel decisions;
- production decisions;
- sales decisions.

The blocks of student-controlled decisions and the related economic factors can be described formally. Relationships between production decisions and related economic factors are shown in figure 3.

Figure 3: Relationships between production decisions and related economic factors



Similar description is used for explaining:

- relationships between common decisions and related economic factors;
- relationships between human resources decisions and related economic factors;
- relationships between commercial decisions and related economic factors.

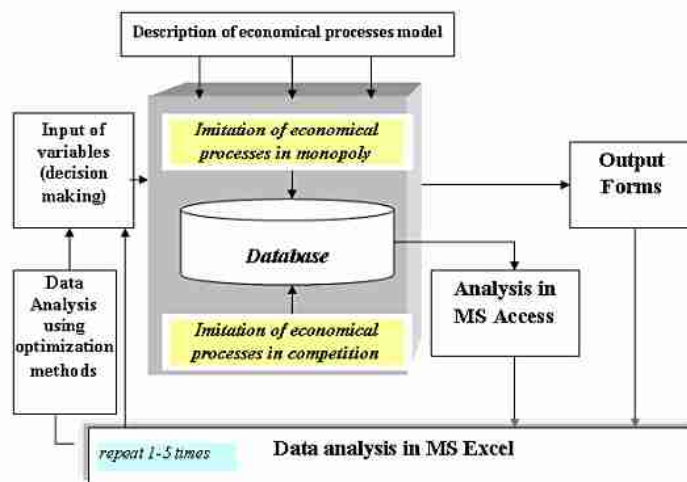
There are 10 constants that the teacher has to set once for the whole game and 40 fields that are controlled by the students.

It is useful for the students to see the results of preliminary decisions in the monopolistic market (to simulate the activities of the company with different decisions). Its usefulness is increased by the fact that results of production do not depend upon the market.

The entered data is used to calculate various results describing the economic state of enterprise.

Fig 4 shows the structure of business game that is used by the player in different modules. For example, Data Analysis, which applies optimization methods, is used in module “Decision making in business solution support systems”.

Figure 4: Structural schema of imitation of economic processes



Analysis of study process requirements has led to the creation of the computerized business game environment integrating the simulation of economical processes of industrial enterprise. This simulation includes formal market model. Computer business game control environment is adapted to stationary and Internet-based computer games. The logo of the created computer business game is „Kietas riešutas“. The architecture of computer business game “Kietas riešutas” has been proposed. It has the advantages of open database structure. The created software gets universality and dynamism because of possibility to model activity scenarios of various types of firms. “Kietas riešutas” differs from the other business games by using a single database for both individual and group work. That enables the students to analyze the decisions and results in various aspects.

The new classification of the database queries by the managerial aspect is proposed. Students use it in the decision-making. This makes an opportunity to practical use of various decision support methods (linear programming, inventory task, decision making in uncertain conditions, financial business evaluation, time series forecasting, and data mining). The possibility of implementation of the specialized packets for the rational decision making illustrates the flexibility of this model.

Described structure of BG allows us to use the business game for interdisciplinary integration. Examples of modules that may be used in the business game with additional modifications or different analysis of results are provided. The aspects of informal studies using business game as a main educational tool are also described. Examples of the business game implementation scenarios are given.

Figure 5: The usage of business game „Kietas riešutas“ in university module “Business decision support systems”

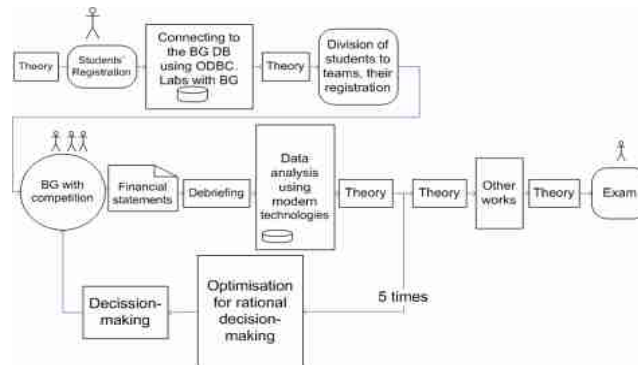
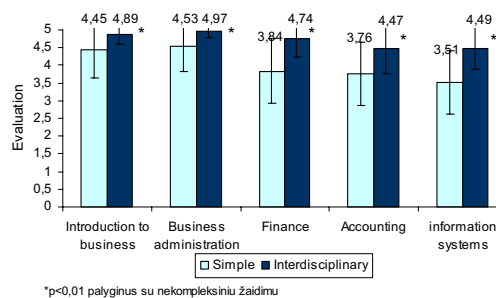


Fig 5. Use of business game „Kietas riešutas“ in university module “Business decision support systems” in the bachelor study program of business administration. Optimization methods are used for rational decision-making. For each module is used different type of scenarios. University curriculum of business administration program has been analyzed and methodology of finding a reasonable sequence of study modules by using the business game has been proposed.

Results of evaluation multidisciplinary using of BG

User survey was chosen for evaluation of the business game „Kietas riešutas“. A questionnaire was created, a survey performed and results statistically analyzed. It proved efficiency of the business game. Additional analysis was done with grades of the graduation works, decisions done during the game and game’s financial results. Fig 6 shows the distribution of users’ opinions on the complexity of the game. It illustrates the high universality of the game.

Figure 6: Results of survey of third year students illustrating the usefulness of the game for different study modules



Analysis of survey has shown the influence of the complex use of the business game for some study modules. The student had played the game, in the first year and later in the third year. 93 students of Faculty of Social sciences of Kaunas University of Technology were asked to evaluate the level of understanding of each of the study modules (“Introduction to Business”, “Business decision support systems”, “Finance”, “Computerised accounting” and “Information Systems and analysis of social data”). The analysis has shown that the complex use of the business game helps in understanding all of the modules. The differences between the groups with simple and interdisciplinary use are statistically significant (Wilkinson’s sign criteria $p < 0.01$). The increase of understanding of modules “Introduction to Business” and “Business decision support systems” with complex use of business game reaches about 0.44 points, for “Computerised accounting” – about 0.71 points, for “Finance” and “Information Systems and analysis of social data” – about 0.9 and 0.99 points.

Business game that applies the model described in this work has been implemented by using PHP. The database was implemented by using Microsoft SQL Server. This business game is accessible via URL <http://info.smf.ktu.lt/eikwin2006/>.

Conclusions

1. Long term use of business game in the educational process has shown these main educational advantages:
 - students understand the material better, since the grades for the graduation works of the students who used the business game in the learning process in a more complex way are statistically significantly higher and the difference is nearly 1 point;
 - it encourages students to seek knowledge, and to apply it in practice, since the more queries student makes to analyze the results, the better financial results he obtains.
2. The proposed management-oriented classification of queries allows user who is not an IT professional to understand principles of design, installation, and use of information systems as well as to apply them in decision-making in faster and better way.

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