DOI: 10.6084/m9.figshare.9783122
UDC 005.8

Li Ming
PhD student Department of Information Systems and Technology, *orcid.org/0000-0002-9396-2852*
Taras Shevchenko National University of Kyiv, Kyiv

MANAGEMENT OF COMPETITIVENESS OF FOREIGN UNIVERSITY IN CHINESE FIELD OF EDUCATION

Abstract. *Optimization of educational establishment exchange dealings with rival establishments is the key task of efficient management. This makes it necessary to use the predicting and simulation dynamics of competitiveness pointers in demand to examine alternative approaches for the growth of educational establishments and the selection of optimum situations of its market demeanor. The conception of competitiveness is nevertheless not obviously defined by experts, and differs on the subject zone: enterprise, educational establishments, industry, region, companies, etc. Educational establishments management competitiveness needs the adoption of prudent and scientifically built managerial resolutions. It is essential to take into account a lot of issues that have a important impact on the management progression, the excellence of decisions and outcomes. Multipurpose criteria were used in the simulation model study and the scenarios development for calibration experiments. This makes it possible to solve the inverse problem taking into account several limitations. The obtained results show that the higher educational institution market share can not only not decrease, but it can also double by an increase in the cost of education if the adopted management decisions will be aimed at improving the quality of the provided educational services.*

Keywords: education system; promotion; international experience; knowledge management; simulation; managerial cognition; system dynamic modelling

Problem definition

The problem of rising competitiveness is one of the main tasks for improving the management of educational establishments, working in environments of the crisis and market. Optimization of educational establishment exchange dealings with rival establishments is the key task of efficient management. This makes it necessary to use the predicting and simulation dynamics of competitiveness pointers in demand to examine alternative approaches for the growth of educational establishments and the selection of optimum situations of its market demeanor. The conception of competitiveness is nevertheless not obviously defined by experts, and differs on the subject zone: enterprise, educational establishments, industry, region, companies, etc.

There are additionally a quantity of unsettled problems: lack of universal mathematical model for competitiveness evaluating and predicting, a frail veiled regularities reason of the competition practice in prevailing models, complexity of computerization and insufficient decision speed, lack of dedicated competitiveness management software and gears in the market. Simulation dynamic modeling lets forecasting the undercurrents of competitiveness and decision making on the range of measures for their growth [1].

Recent publications analysis

Educational establishments management competitiveness needs the adoption of prudent and scientifically built managerial resolutions. It is essential to take into account a lot of issues that have a important impact on the management progression, the excellence of decisions and outcomes. The decision-maker can practice different methods in the emerging practice and making executive decisions: information examine, data mining, databases values exploration, reasoning based on examples, imitation modeling, evolutionary calculation and genetic systems, neural networks, situation analysis, cooperative modeling, artificial intelligence systems [9]. The genetic algorithm accomplishes a random exploration method, based on environmental selection – the main instrument of evolution, allowing discovery problems answers that are close to optimum [10].

The foundation of the decision-making process throughout the use of the simulation method is the model of the research objective that can be a composite of unified simulation and optimization models with a assembly of dynamic and information relations amid all stages models [11]. Expert particulars the problem and model, makes alternatives, preparation of a directed computational experimentation on the simulation model and choice and ranking standards. Simulation modeling expertise allows in view of the expert subjective partialities and his knowledge in the decision-making process.

Semi structured are systems that are considered by a multidimensional class of the occurring progressions in them and their interconnectedness, the absence of adequate quantifiable information about the dynamics of

 © Li Ming

progressions, as well as the progressions nature flexibility in time.

Cognitive modeling gears are used to research weakly semistructured systems. Info about the system in the cognitive model is signified in the form of a set of notions and the causal-investigatory net (cognitive map) connecting them. It reflects the expert's personal representation on the rules and patterns that are characteristic in the modeled system. Analytical methods concentrated on the study of the system structure and obtaining forecasts of its performance during various control actions are applied to the cognitive map with the determination of effective management approaches synthesis [12].

The solution examination based on examples is to determine the likeness measure of the present situation to example situations from the rule database (RD). The parameters weights stated by the expert for the setting from the RD are taken into reason in this case. The similarity measure differs on the familiarity of the current situation to the example situation [13].

The neural network device [14] is easy to use and it lets reproducing complex dependences. It is used to resolve problems of predicting, classification or management.

The choice of technique varies on the set of assignments that need to be committed to make effective management choices.

The simulation methodology allows performing effective analysis and structure management that simultaneously contains elements of continuous and discrete action and is influenced by numerous random factors. It is described by cumbersome relationships [2]. Various combinations of the principles of imitation [4], cognitive modeling [5], and Petri nets [3] are used in the development of models. Using the method of system dynamics as the main tool is due to the complexity of the strategic alternatives selection in a dynamically developing situation, under conditions of external and internal uncertainty [6].

The use of different modeling methods by the decision maker enables:

– use multi-criteria in the model development and study;

– conduct a comprehensive analysis of a large number of alternatives and choose an option that matches the selected criteria;

– explore dynamic situations, when the system and environment parameters change in the implementing projects process;

– to study the influence of structural organization features and feedback loops on the behavior;

– interpret system flow diagrams. This makes it possible to make concerted decisions;

– use simulation models as a tool for conducting a large number of experiments of a "what-if" set;

– to conduct scenario research on simulation models.

AnyLogic system [7] is used for developing the model of mutual influence of university competitiveness factors.

Results of the main study material

The parameter values are given in Table 1 for experiments with a model. The market share data and the number of potential students of the Petro Mohyla Black Sea National University (PMBSNU) in Zhoushan, Wuxi and Wuhan (China) data are presented in the table.

For example, it is possible to estimate the educational services market share of the Petro Mohyla Black Sea National University in Zhoushan, Wuxi and Wuhan (China) with increasing cost of education per student.

The decision-maker has the strategy choice depending on internal and external factors during the analysis of alternative scenarios.

Let us carry out experiments on Zhoushan (Fig. 1), Wuxi (Fig. 2) and Wuhan (Fig. 3) data, the result of which will be the all variables values of the input parameter vector.

Table 1 – ***The market share data***

	Model parameter	Parameter value		
		Zhoushan, China	Wuxi, China	Wuhan, China
Input parameters	Capacity_of_the_market_segment (per.) – MCP	2 500	1 200	5 000
	Cost_of_education (RMB/year) – CE	3 200	3 100	2 400
	University_rating (points) – RU	0,5	0,6	0,6
	Qualifications_of_teachers (points) – QL	4	4,5	5,5
	Number_of_the_group (per.) – NS	15	15	15
	Students_academic_performance (points) – SM	0,2	0,2	0,2
	Evaluation_of_teachers (points) – RLS	0,2	0,2	0,2
Dependent parameters	Rating_of_teachers (points) – RL	0,25	0,25	0,25
	Quality (points) – Q	0,45	0,4	0,6
Output parameters	Market_share (%) – CP	0,01	0,05	0,02
	Number_of_potential_students (per.) – PS	25	60	100

Perform the calibration experiment of the Zhoushan data model in order to determine at what input parameters values of the PMBSNU market share will be 0,15%.

The "Qualifications_of_teachers_» parameter values can vary within the limits of [1 – 10], "Cost_of_education_" – [2 000 – 4 000], "Number_of_the_group_" – [5 – 20], "University_rating_" – [0 – 1].

The experimental results analysis shows, that the decision on insignificant cost of training increase can be accepted at a sufficiently substantial advanced training of teachers

Perform the calibration model of the Wuxi data at a given "Market_share" parameter value = 0.1.

The "Qualifications_of_teachers_» parameter values can vary within the limits of [1 – 10], "Cost_of_education_" parameter–[3 000 – 3 500], and the "Number_of_the_group_" parameter – [5 – 20], "University_rating_" – [0 – 1].

The cost of training for students of Wuxi can be 3 265 RMB / year and the number of students in the academic group, in contrast to the Zhoushan city is 12 people, as can be seen from the model calibration experiment.

Perform an experiment with several restrictions for the Wuhan data. What should be the input parameters values to ensure that the educational services market share doubles with the cost of training = 3 000 RMB / year?

The following values ranges for the input parameters:

"Qualifications_of_teachers_" – [1 – 10];

"Students_academic_performance_"– [0 – 1];

"Evaluation_of_teachers_"– [0 – 1];

"Number_of_the_group_ "– [5 – 25];

"University_rating_"– [0 – 1].

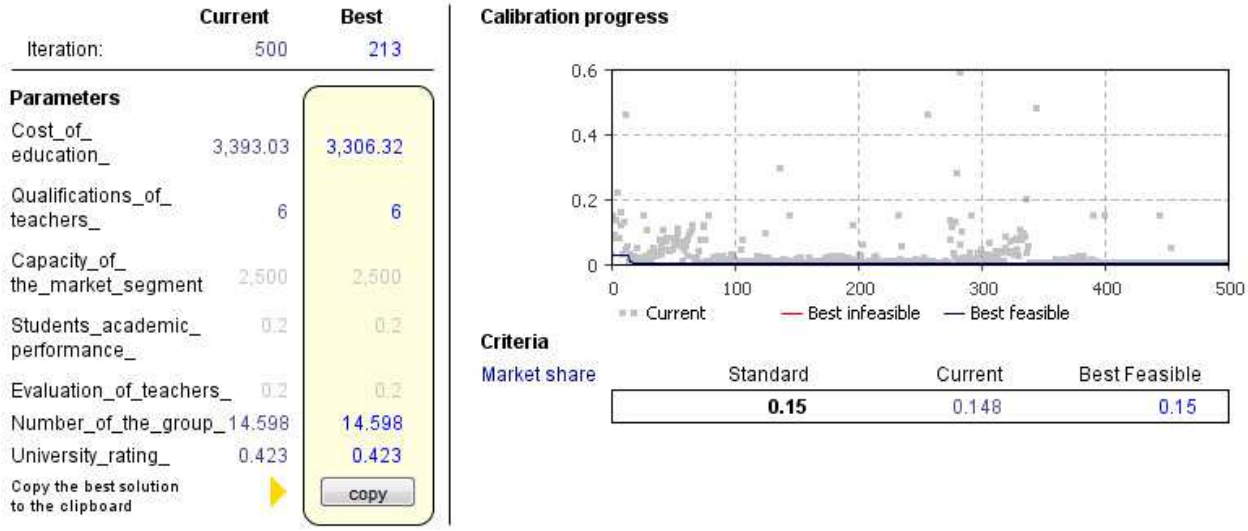

Figure 1 – Results of the Calibration experiment for Zhoushan

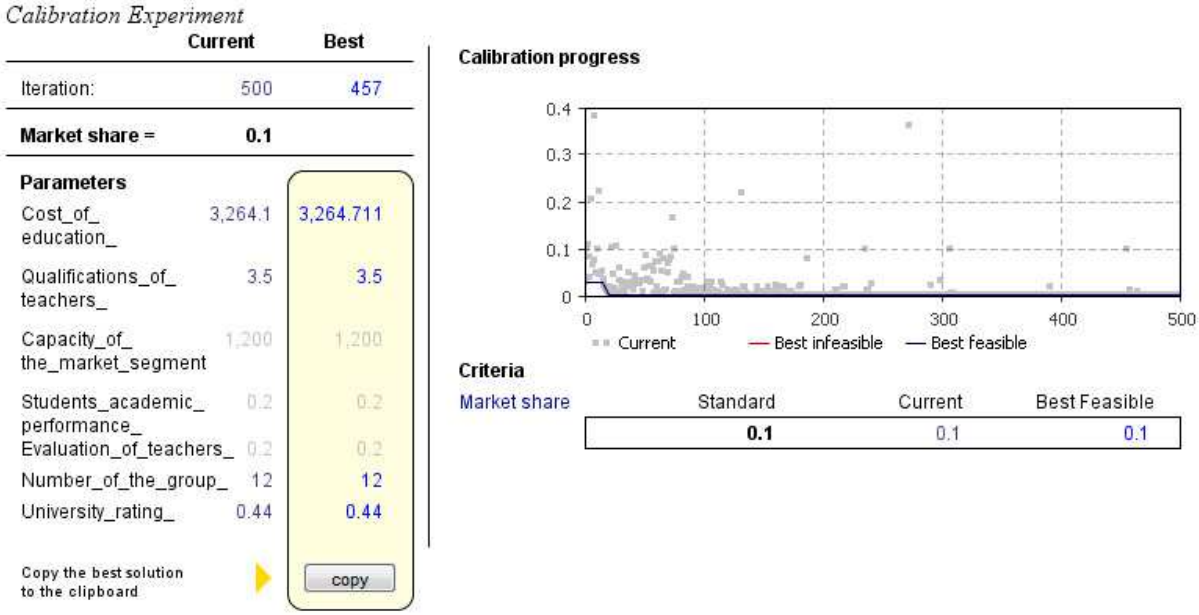

Figure 2 – Results of the Calibration experiment for Wuxi

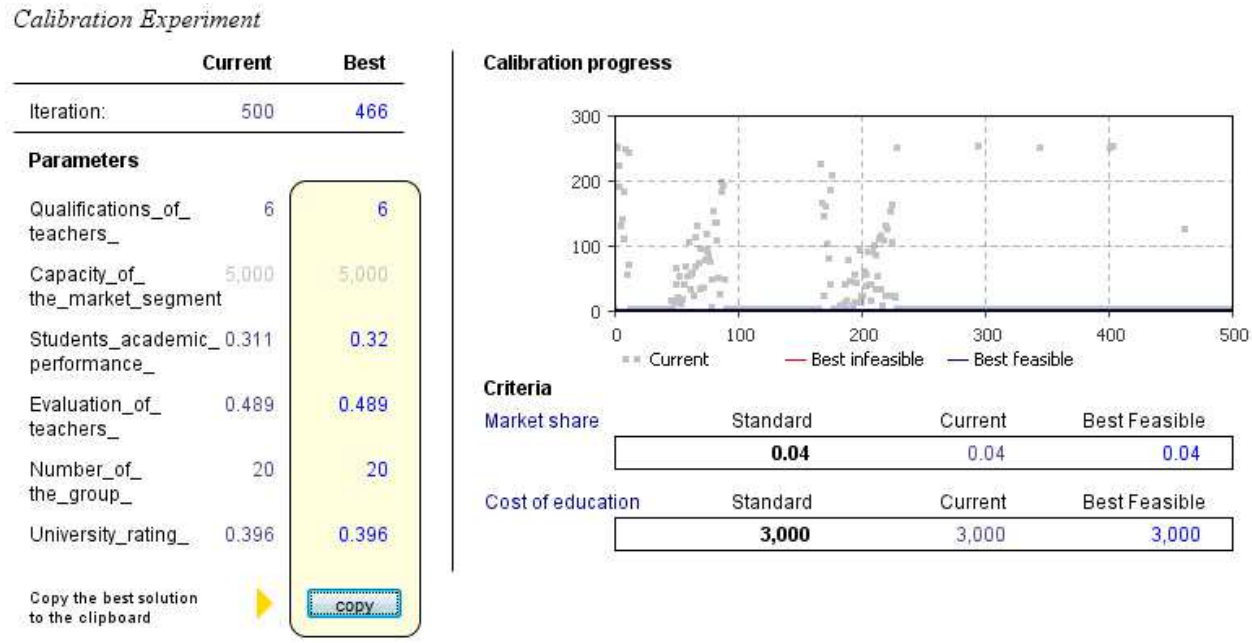

Figure 3 – Results of the Calibration experiment for Wuhan

The obtained results show that the higher educational institution market share can not only not decrease, but it can also double by an increase in the cost of education if the adopted management decisions will be aimed at improving the quality of the provided educational services.

Conclusions

1. An analysis of the experiments results with model shows that in the case of an increase in the cost of education, the values of the output values "Market_share", "Number_of_potential_students" are reduced. To increase the competitiveness of an educational institution, increase the market share, and, consequently, the number of potential students, a decision can be made either to significantly improve the qualifications of teachers or reduce the number of students in academic groups, since these factors affect the quality of education. Increasing the "Quality" parameter value will compensate for the negative impact of the increase "Cost_of_education" parameter. The upgrade of the university's rating is another option to avoid a decrease in market share and the number of potential students. The decision-maker determines the best strategy, taking into account external and internal factors of the educational institution activity, which follows from the experimentally obtained alternatives.

2. Multipurpose criteria were used in the simulation model study and the scenarios development for calibration experiments. This makes it possible to solve the inverse problem taking into account several limitations.

3. The obtained results of experiments, during which the inverse modeling problem is solved, allow evaluating (within the limits imposed by some criterion or set of criteria) various strategies ensuring the functioning of this system.

References

1. *Koshkin, K., Knyrik, N. & Voznyy, A. (2016). Decision-making in the implementation of IT projects based on simulation. Journal of NTU "HPI", 12-16.*

2. *Hamilton, J. (2004). Time Series Analysis. New Jersey: Princeton University Press.*

3. *Kotov, V.E. (1984). Petri nets. Moscow: Nauka.*

4. *Lychkina, N. (2005). Simulation of economic processes. Moscow: Akademiya IT.*

5. *Bai, S., Blintsov, V., Bushuev, D., Voznyy, A., Gayda, A., Zaporozhets, I. et al. (2013). The management of the organization of the organization of the organization of the sea and sea complex. Mykolaiv: Torubara Publishing.*

6. *Lychkina, N.N. (2007). Simulation models in procedures and systems for supporting strategic decision-making for enterprises (T. 1). Business-Informatics.*

7. *AnyLogic. Multi-approach simulation simulation. Retrieved from: AnyLogic: http://www.anylogic.ru/.*

8. *Ryzhkov, A. (2017). Assessment of the quality of teaching as an element of the management of a joint international educational project. Science Rise, 3, 51-59.*

9. *Logunova, E. (2012). Physics and mathematics and information technologies: problems and development trends. MATHEMATICAL MODELS OF DECISION SUPPORT SYSTEMS. IV. Novosibirsk: SybAK.*

10. Rutkovskaya, D., Pipinskiy, M. & Rytkovskiy, P. (2008). Neural networks, genetic algorithms and fuzzy systems. Moscow: Gorachaya Linia – Telecom.

11. Lychkina, N. (2007). Modern technologies of simulation and their application in information business systems and decision support systems. http://it-claim.ru/Library/Books/SC/articles/sovremennye_tehnologii_immitacionnogo/sovremennye_tehnologii_immitacionnogo.html .

12. Avdeev, Z., Kovriga, S. & Makarenko, D. (2007). Cognitive modeling and solving the problems of managing weakly structured systems (situations). Moscow: ИПУ РАН.

13. Borisov, V., Kruglov, V. & Fedulov, A. (2007). Fuzzy models and networks. Moscow: Goriachaya Linia – Telecom.

14. Varshavskiy, P. (2008). 1th National Conference KII-2008. Mechanisms of plausible reasoning on the basis of precedents (accumulated experience) for expert diagnosis systems. 2, pp. 321-329. Moscow: Lenand.

Стаття надійшла до редколегії 05.02.2019

Лі Мін
Аспірант кафедри інформаційних систем і технологій, *orcid.org/0000-0002-9396-2852*
Київський національний університет імені Тараса Шевченка, Київ

УПРАВЛІННЯ КОНКУРЕНТОСПРОМОЖНІСТЮ ІНОЗЕМНОГО УНІВЕРСИТЕТУ У КИТАЙСЬКІЙ ОСВІТНІЙ ГАЛУЗІ

Анотація. *Оптимізація процесів, які відбуваються в навчальних закладах з урахуванням впливів конкуруючих закладів, є ключовим завданням ефективного управління. Це обумовлює необхідність використання прогнозуючої і імітаційної динамічної моделі показників конкурентоспроможності для вивчення альтернативних підходів до розвитку освітніх установ і вибору оптимальних ситуацій їх ринкової поведінки. Проте концепція конкурентоспроможності уніфіковано не затверджена експертами і варіюється щодо предметної області: підприємство, навчальні заклади, промисловість, регіон, компанії і т.д. Конкурентоспроможність менеджменту освітніх установ вимагає прийняття зважених і науково вивірених управлінських рішень. Необхідно брати до уваги безліч питань, які мають важливий вплив на прогрес управління, досконаліть рішень і результатів. Багатофункціональні критерії використовувалися при дослідженні імітаційної моделі і розробці сценаріїв для калібрувальних експериментів. Це допомагає вирішити зворотну задачу з урахуванням кількох обмежень. Отримані результати показують, що частина ринку закладів вищої освіти може не тільки не зменшитися, а й подвоїтися за рахунок збільшення вартості навчання, якщо прийняті управлінські рішення будуть спрямовані на підвищення якості наданих освітніх послуг. Отримані результати експериментів, під час яких вирішується проблема зворотного моделювання, дають змогу оцінити (в межах, встановлених деяким критерієм або набором критеріїв) різні стратегії, що забезпечують функціонування цієї системи.*

Ключові слова: система освіти; просування; міжнародний досвід; управління знаннями; моделювання; управлінське пізнання; системне динамічне моделювання

Link to publication

APA *Li Ming. (2019). Management of competitiveness of foreign university in chinese field of education. Management of development of complex systems, 37, 116 – 120, dx.doi.org\10.6084/m9.figshare.9783122.*

ДСТУ *Лі Мін. Управління конкурентоспроможністю іноземного університету у китайській освітній галузі [Текст] / Лі Мін // Управління розвитком складних систем. – № 37. – 2019. – С. 116 – 120, dx.doi.org\10.6084/m9.figshare.9783122.*