MATHEMATICAL MODEL OF THE MANAGEMENT OF DEVELOPMENT OF INTEGRATED BUSINESS STRUCTURES

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BACKGROUND AND OBJECTIVES. In modern economic conditions the formation of financial and economic factors to enhance the development of integrated business structures cannot take place without the active use of mathematical modeling methods. One of the main directions of improving the financial and economic mechanism is the use of these methods as an effective modern tool for strategic management of the development of integrated business structures.

METHODS. The methodology of scientific research are general scientific and special research methods: All scientific research carried out within the framework of established integrated business structures, use general scientific methods, such as the method of scientific abstraction, the method of analysis and synthesis, the method of unity of historical and logical, positive and normative methods, as well as specific research methods. To the specific methods of research can be attributed modeling, which is presented in the study

as the basis for effective management of the development of integrated business structures.

FINDINGS. The hypothesis of the scientific study is to model the process of development of integrated business structures as a given condition for managing the available combined potential. The aim of the study is to substantiate theoretically the use of mathematical modeling in the management of the development of integrated business structures.

CONCLUSION. It was determined that in modern conditions, under the specifics of the formation and development of integrated management structures, which includes many structural units, to improve the management mechanism can be achieved by using as an effective tool of computer technology, allowing a flexible and responsive to changing economic conditions.

KEYWORDS: integration potential; mathematical modeling; integrated business structures; integrative-innovative development; business entities; factors of external and internal environment.

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
10	1	0

МАТЕМАТИЧНА МОДЕЛЬ УПРАВЛІННЯ РОЗВИТКОМ ІНТЕГРОВАНИХ БІЗНЕС СТРУКТУР

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Вступ. У сучасних умовах господарювання формування фінансово-економічних чинників для активізації розвитку інтегрованих структур бізнесу не може відбуватися без активного використання математичних методів моделювання. Одним з основних напрямів вдосконалення фінансово-економічного механізму є застосування цих методів як ефективного сучасного інструменту стратегічного управління розвитком інтегрованих структур бізнесу.

Гіпотеза наукового дослідження полягає у моделюванні процесу розвитку інтегрованих структур бізнесу, як заданої умови управління наявним об'єднаним потенціалом.

Метою дослідження є обгрунтування на теоретичному рівні використання математичного моделювання в управлінні розвитком інтегрованих структур бізнесу .

Методологією наукового дослідження є загальнонаукові та спеціальні методи дослідження: Усі наукові дослідження, що проводяться в межах сформованих інтегрованих структур бізнесу, використовують загальнонаукові методи, такі як метод наукової абстракції, метод аналізу і синтезу, метод єдності історичної і логічної, позитивний і нормативний методи, а так само специфічні методи дослідження. До специфічних методів дослідження можна віднести моделювання, який представлено в дослідженні як основу для ефективного управління розвитком інтегрованих структур бізнесу.

Висновки. Визначено, що в сучасних умовах, згідно із специфікою формування та розвитку інтегрованих структур управління, до складу якого входить багато структурних підрозділів, удосконалювати механізм управління можна з використанням як ефективного інструменту комп'ютерні технології, що дозволяють гнучко і оперативно реагувати на зміни економічних умов.

Ключові слова: інтеграційний потенціал; математичне моделювання; інтегровані структури бізнесу; інтегративно-інноваційний розвиток; суб'єкти бізнесу; чинники зовнішнього і внутрішнього середовища.

Statement of the problem. The task of mathematical modeling of economic systems is the use of mathematical methods for the most effective solution of problems arising in the development of integrated business structures.

Analysis of recent research. The implementation of building models in practice is very diverse. A large number of scientists are interested in this problem in the context of the study of economic systems. The analysis of literature sources showed that there is no universal tool for modeling financial and economic indicators of integrated business structures, everyone chooses his own way to solve the problem.

The experience of creating some has shown that each of the models well describes the economic system for this particular situation and has no universality. For example, multifactor models of economic growth developed by P. Douglas, R. Solow, J. Tinbergen and J. Mead, interpreting development as a derivative of economic growth, reveal the dependence of the dynamics of national production on labor costs, capital and time, from the level of technology and the integrated coefficient of proportionality. According to these models, the way to solve the problem of achieving sustainable development is to overcome obstacles to the growth of gross domestic product by eliminating the negative effects of declines in production and related unemployment, inflation and rising social tensions (Ansoff, 2004; Burgelman and Maidigue, 2004; Yermoshenko and Hanushchak-Iefimenko, 2010; Hanushchak-Iefimenko, 2013, 2014; Hurzhii, Karakai, Petrenko et al., 2006).

The purpose of the study substantiation at the theoretical level of the use of mathematical modeling in the management of the development of integrated business structures.

Presentation of the main material. For the development of integrated business structures it is advisable to solve economic problems in several stages:

Stage of meaningful task statement. It includes qualitative and quantitative analysis of objects and situations. Thus difficult objects are broken into parts, communications of these elements, their properties, quantitative and qualitative values of properties, quantitative and logical relations between them which are expressed in the form of equations, inequalities and so forth are defined. That is, the object is represented as a system. The next stage is the mathematical formulation of the problem, in the process of which the construction of a mathematical model of the object and the definition of methods for solving the problem. This stage can be defined as a stage of systematic synthesis of tasks in the field of development of integrated business structures. If the conducted system analysis has led to such a set of elements, properties and relations for which there is no acceptable method of solving the problem, it is necessary to return to the stage of system analysis (Burgelman and Maidigue, 2004).

However, to solve economic problems, system analysis must take into account a lot of features, so it is difficult to rely on a known mathematical model and algorithm for its solution.

This is followed by the stage of developing a program for solving the problem. For complex objects, consisting of a large number of elements with a large number of properties, you need to compile a database and tools for working with it, methods of data retrieval required for calculations. For integrated business structures, the use of standard software packages and database management systems, in our opinion, is unacceptable because of the limited choice of methods, and there is no choice of the best option from the alternative. At the final stage, the model is operated and the results are obtained.

Consistent use of methods of research of operations and their realization allows to overcome subjectivism, to exclude the volitional decisions based not on the strict and exact account of objective circumstances, and on casual emotions and personal interest of heads.

System analysis allows you to take into account and use in the management of all available information about the managed object, to coordinate the decisions made in terms of objective rather than subjective criteria of efficiency. The use of computer technology allows the manager to receive only the necessary information, by processing huge amounts of data. And the use of a systematic approach in the formation of management decisions shows how to effectively apply previously open economic laws (Yermoshenko and Hanushchak-Iefimenko, 2010).

In their activities they use various models as a simplified reflection of an economic phenomenon or object or a simplified description of reality. The model can be described in the form of equations, diagrams, graphs, diagrams. In economic analysis, the assumption of the variability of one parameter with the invariability of all others is usually used.

To model the economic processes of development of integrated business structures use aggregate quantities, ie a set of specific economic units as a whole. For the purpose of the qualitative and more effective economic analysis, it is expedient to define, with what type of model it is necessary to carry out researches, namely:

- theoretical models explore the general properties of economics, using deductive methods and formal assumptions;

- applied models analyze the functioning of a particular economic object and use the results of research in practice. Applied ones include econometric and economic-mathematical models;

- macroeconomic models describe the economy as a whole, using aggregate quantities;

- microeconomic models are the main components of economic and mathematical modeling;

- in trend models, the development of the economic modeled system is reflected by the trend of its main indicators;

- optimization models are designed to choose the best option from a certain number;

- simulation models are intended for use in the process of machine simulation of the studied processes;

- static models reflect the economic process at the beginning and end of a certain period and do not consider the transition process itself;

- dynamic models depict economic processes taking into account the time factor;

- in deterministic models use rigid functional connections between variables;

- in stochastic models there is a factor of randomness. In the study of these models using probability theory and mathematical statistics (Hanushchak-Iefimenko, 2014).

For integrated business structures, only complex models are used, for example, micro- or macroeconomic dynamic models, which, in our opinion, most adequately describe this economic system.

The modeling process is cyclical, and in each cycle there are several stages. To conduct qualitative research, it is necessary to follow this sequence of economic and mathematical modeling (Fig. 1).

According to the proposed block diagram, the economic task is formulated step by step, preconditions and assumptions are accepted, the properties of the modeled object, its structure are distinguished, hypotheses explaining the behavior and development of the object are formulated. At the stage of building a mathematical model is the expression of the studied problem in the form of specific mathematical dependencies. The construction of models is divided, in turn, into several stages. First, the type of economic-mathematical model is determined, the possibilities of its application in this task are studied, a specific list of variables, parameters and forms of relations is specified. For some complex objects, it is advisable to build several multifaceted models, with each model highlighting only some properties of the object, and other properties are taken into account approximately. The desire to build a model that belongs to a well-studied class of mathematical problems is justified, which may require some simplification of the initial assumptions of the model, which does not distort the main features of the modeled object. However, it is possible that the formalization of the problem leads to a previously unknown mathematical structure.
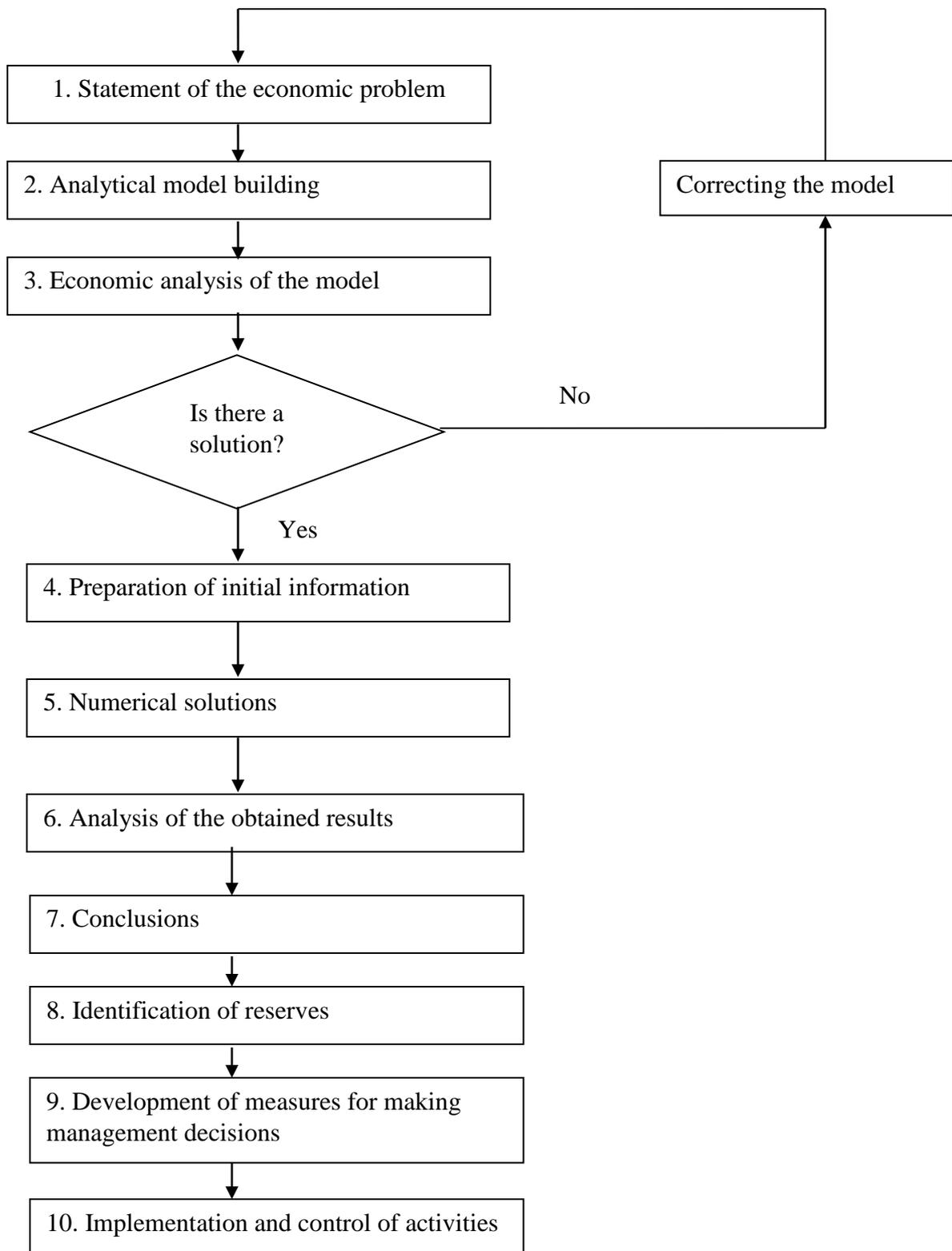
Source: (Yermoshenko and Hanushchak-Iefimenko, 2010).

Fig. 1. **Block diagram of the modeling process for the development**
of integrated business structures

At the stage of mathematical analysis of the model, the general properties of the model and its solution are revealed by mathematical methods of research. An important point is the proof of the existence of a solution to the formulated problem. Analytical research finds out whether the only solution is which variables can be included in the solution, to what extent they change, what are the trends of their change and so on. However, models of complex economic objects are difficult to analyze, in such cases, move to numerical research methods. In economic problems, the process of preparing initial information is the most time-consuming stage of modeling, because it is not reduced to passive data collection.

Mathematical modeling has strict requirements for the information system, it is necessary to take into account not only the fundamental possibility of preparing information of the required quality, but also the cost of preparing information arrays. In the process of preparing information, methods of probability theory, theoretical and mathematical statistics are used to organize sample surveys, assess the reliability of data and so on. In systematic economic and mathematical modeling, the results of the operation of some models serve as initial information for others. At the stage of execution of numerical solutions of the problem, algorithms are developed, programs are prepared and calculations are performed directly, and significant difficulties arise due to the large dimensionality of economic data. Usually calculations based on the economic-mathematical model are multivariate. Numerous model experiments, the study of model behavior under different conditions are carried out due to the high speed of modern computer technology (Hanushchak-Iefimenko, 2013). The numerical solution significantly complements the results of the analytical study, and for many models it is the only possible one. At the final stage there is an analysis of numerical results and their application. The question of correctness and calculation of modeling results and their applicability both in practical activity and for the purpose of model improvement is solved. Therefore, first of all, the adequacy of the model is checked for those properties that are selected as essential.

Conclusions and prospects for development. For integrated business structures from the analysis of the obtained results it is possible to draw conclusions and identify reserves, then develop measures for management decisions and complete this flowchart of implementation and control of measures.

These stages of economic and mathematical modeling are closely interrelated, in particular, there may be reversals of stages. Thus, at the stage of building a model it may become clear that the statement of the problem is either contradictory or leads to too complex a mathematical model; in this case, the initial statement of the task must be adjusted. Most often, the need to return to

the previous stages of modeling arises at the stage of preparation of initial information.

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