

Methodological Aspects of Modeling of Economic Systems and Their Limitations

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Summary

The ongoing process of globalization is now significantly determines the need for companies and countries but increase their competitiveness over other competitors in the global market. For this reason, these market players try to the extent possible, utilize all available resources and a number of sophisticated methods for modeling economic reality that they can improve the process of drafting its strategic plans. The below we will therefore deal with selected aspects and methodological approaches in the process of modeling and simulation economic systems. The aim of this article will point out the limitations that need to be taken into account in the process of experimentation and simulation of economic systems.

Keywords

model, economic system, design, limitations

1. Introduction

At a time when globalization is growing in all sectors of human activity solves most of the companies but also countries need to increase their competitiveness over other competitors.

Therefore, these economic entities in constant demand to enhance their strategic plans, in particular through improved usability of all available information, that creativity is one of the factors for the emergence and spread of innovation (Krátka, 2013), but also sophisticated methods used for modeling economic reality. For these reasons, in our article we will discuss selected aspects and innovative approaches in the process of simulation modeling but also socio-economic systems. Since the middle of last century, modern economic discipline helps in planning and forecasting by taking advantage of the latest knowledge of mathematics, statistics, and cybernetics. Their main development is mainly ensured by using the application of technical-economic models, which supports especially the rapid growth of information and communication technologies.

2. Object of economic reality as a system

The content of this part of our article is to outline the requirements for the two-stage process of abstraction formation and subsequent modeling of the economic system to the stage where we created a model of the economic system to transform an abstract economic system. Economic system, like

any other general system (Bertalanffy, 1968) (technical and non-technical), constitute its internal elements, boundary elements with internal links - functions and vicinity system (Bertalanffy, 1974). Because the elements of the economic system, the components constituting the system already on the zoom level (resolution of a particular view of the particular economic system) are not further divisible until such time as it will increase the zoom level. It follows that by increasing the resolution by one level is also an element of superior economic system also becomes a system and is thus superior economic system subsystem. This important characteristic abstractly defined economic system displays Figure 1.

Economic system as a whole is thus (Bertalanffy, 1974) internally organized and arranged set of interrelated elements. It is such a qualitatively defined set of elements that are associated with some form of mutual respect and interaction and form a whole. Economic system in this sense is composed of its subsystems and components and that behaves like a living organism (Šimanovská, 2008), because it is composed of live elements - economic entities. The system itself can be described as an ordered triple.

$$S = \{P; V; S\}$$

P – the set of elements of the system,

V – the set of internal links of the system,

S – the set of internal states of the system.

In analyzing the economic system we are considering and exploring behavior, internal

structure and functional dependencies elements, resulting in an overall behavior of the economic system.

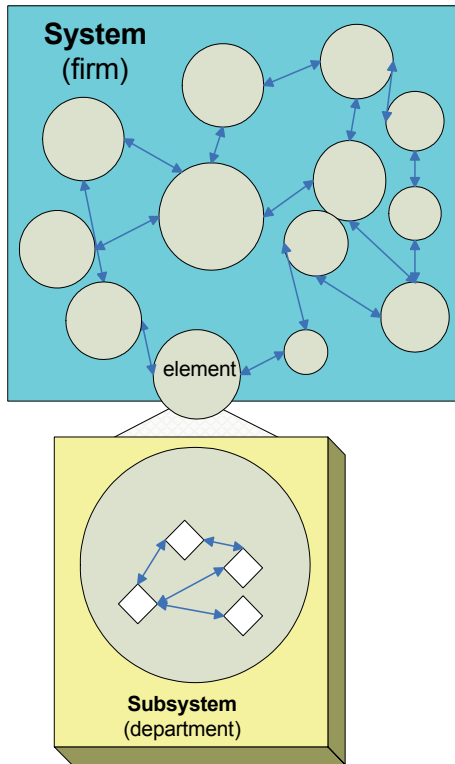


Figure 1 The relationship between the system and the element, which is also a subsystem

An important component of the economic system, which make a significant impact on its properties, it is just the internal structure intended linkages between the various elements of the economic system (Åström, Murray, 2008).

Border elements, which are located at the boundary between the system and the economic environment are actually input-output interface of the system and its surroundings, through which the medium to affect the economic system and economic system as well as much of the relevant environment.

3. Model of the economic system

In the process of analytical examination of the real economic system, therefore, seeks to examine the behavior and functional dependence characteristic of a particular object of an objective economic reality, and these features of the first phase of a two-stage modeling abstraction creation and economic systems to transform an abstract economic system. Figure 2 describes the problem domain modeling of economic processes as a result of two-stage abstraction.

In the second stage of two-stage abstraction, an abstract mathematical model of economic system that can be used in the actual analysis of the economic system using computer simulation methods is created. Created an abstract model of the economic system should reflect the most important features that characterize the studied process that is the subject of our interest in the analysis of a particular economic system (Samuelson, 1983). This means that the abstract model of the economic system corresponds to the objective economic reality at a certain level of detail.

Modern Economic Science and Management explores and applies analytical information processing tools, which include economic modeling. For example, Booch defines that (Booch, 1991) "Modeling uses the principles of decomposition, abstraction and hierarchy. Model allows to examine the shortcomings of the system in conditions that we set ourselves. We evaluate the behavior of each model in normal and abnormal situations, and then make the necessary adjustments. It is more efficient to use models to understand all the details of a complex system."

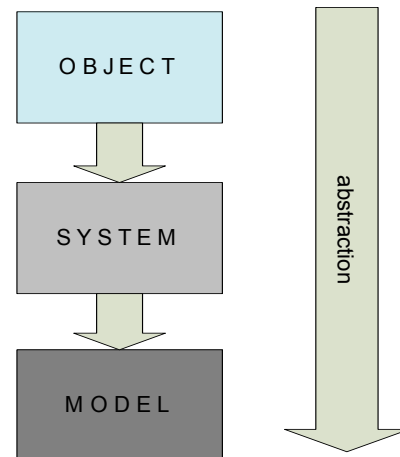


Figure 2 Relationship between objects, systems and models

It should be noted that there are many models that use a variety of methods for economic modeling (Samuelson, 1983). One of the most advanced approaches are based on the simulation of the economic environment in which the use of software agents as autonomous entities with independent decision-making. Such an approach ensures that the modeled environment replicates the real conditions, thus resulting in a more trustworthy behavior validity of economic models and simulations.

4. The process of modeling of economic systems

The process of making economic models and their subsequent transfer to the computational model in a computer can be divided into the following sub-steps:

- the attempt of the experimenter to assign an economic problem to a group of problems – categorization,
- selection of suitable modeling resources based on economic allocation problem for a class,
- subsequent formation of the very economic model with emphasis on the characteristics related to the phenomenon,
- implementation of the proposed economic model,
- discussion of the results of the implemented model.

Increased attention in the development of the economic model should be given to the first three points above mentioned division, because it is consistent identification, formulation and specification of the requirements for the modeling system facilitating faster and subsequent implementation. The above points also provide greater quality results that can be achieved in the development of the economic model.

5. Experiments and simulation of economic systems

Simulation economic systems follows the processes we have been discussing earlier in this work, ie the system processes the description of the object of our investigation and the subsequent creation of an economic model, which logically follows simulation experimentation with a particular model implemented.

Experimenting with real economic systems and with all participants socio-economic relations greatly limits the variety of factors. For example, controlled trials are carried out mainly on various marketing surveys and consumer preferences, which may not comprehensively describe the behavior and decision-making entities. Experimentation in the chosen domain area is shown in Figure 3.

Very circumscribed is also experimenting with the real economy, which is natural and it makes the following factors:

- in the actual economic system cannot examine the boundary conditions of inducing in most cases, social tensions and civil unrest,
- this point is closely connected with the former , because the border states of experimental systems frequently bring qualitatively new features that are most interesting from the perspective of the examination, however, in economy may yet unrecognized states pose a relatively high risk,
- the economy as a dynamic system has a relatively high time delay . Therefore, the results of the experiment reflected a long time after its completion , for example, the current experiments may be a dozen months and testing of strategic decisions even decades,

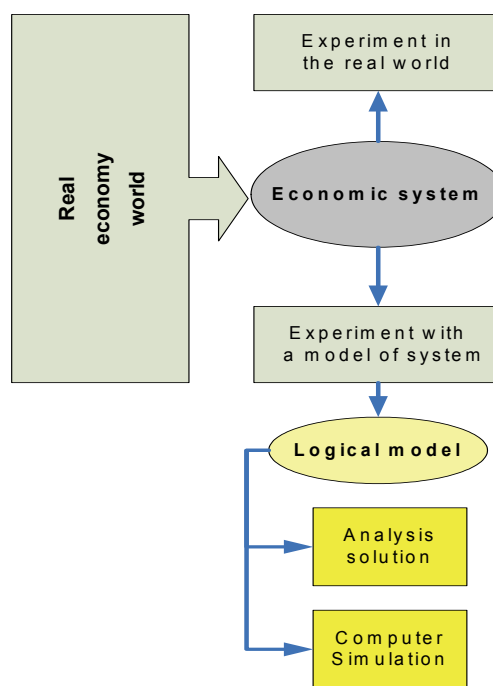


Figure 3 Experimenting with economic system

- the economic system there are a huge number of links between them, therefore, it is very difficult to implement the experiment not only for the whole system but also on the individual subsystems , because the linking of elements of the external environment is very strong and you can not just cut off or negate, in the results of the experiment, these links must inevitably occur,
- when researching and experimenting in the national economy is not always quite possible that the possible experimenter completely depersonalize and acted just cold rational.

6. Conclusion

In our contribution we would like to point out that the constant competitive pressure and increase the complexity of processes and activities that take place in the national economy, increase the quality requirements assisting optimal management systems and form a strategy and prediction not only in the corporate planning and decision making.

Therefore, in this paper we focus on some methodological aspects of simulations, particularly experimentation and constraints in the process of modeling of economic systems. And because of the limits specified in the last part of our commitment, our computer simulations and experimentation with the implemented model gives as a very effective tool to eliminate the shortcomings outlined above, which are associated with experimenting on real economic systems.

References

- Åström, K., & Murray, R. M. (2008). *Feedback Systems: An Introduction for Scientists and Engineers*. Princeton: Princeton University Press.
- Bertalanffy, L. (1968). *General System Theory: Foundations, Development, Applications*. New York: George Braziller.
- Bertalanffy, L. (1974). *Perspectives on General System Theory*. New York: George Braziller.
- Booch, G. (1991). *Object Oriented Design with Applications*. Boston: Addison-Wesley Book Express.
- Krátka, Z. (2013). Využívania metód pre stimuláciu nových myšlienok a kreativity zamestnancov podnikmi v SR. *Journal of knowledge society*, 2 (1), 1-7.
- Samuelson, P. A. (1983). *Foundations of Economic Analysis*. Cambridge: Harvard University Press.
- Šimanovská, T. (2008). Systémový prístup a simulácia ako nástroj poznávania a projektovania zložitých systémov. *Forum Statisticum Slovaca*, 3 (4), 102-106

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