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Application Of Economic And Mathematical Modeling In The Field Of Sports Services

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Abstract: *The article scientifically substantiates the features of the use of economic and mathematical modeling in the field of sports services. In modern sports economics, mathematical apparatus is widely used - various dependency graphs are analyzed, mathematical formulas are obtained, statistical data is processed mathematically, and computer modeling of economic processes is carried out. The use of economic and mathematical modeling is of great importance in the field of sports services.*

Keywords — statistics, mathematical, economic, sports services, mathematical methods, decision making, planning, forecasting.

The central problem of economics is the problem of rational choice. Mathematical support is necessary in the decision-making process to make correct and informed choices. Therefore, the role of mathematical methods in economics is constantly growing. In addition, mathematical modeling is useful for a more complete understanding of the nature of ongoing processes, their economic nature and driving forces. The use of computer modeling tools and mathematical equipment sometimes significantly reduces an enterprise's costs for planning and forecasting economic events [1, p. 116]. In this case, savings are formed as a result of model experiments and the introduction of optimization methods to solve many problems.

Let's take a closer look at the concepts of modeling and model experience. It is known that the study of economic and other systems is always based on experiments - real or model. The point of a real experiment is to study the properties of the most practical working object. For example, a real-life object is a sports facility in the form of a Winter Sports Palace. To find out the optimal price of tickets for the national hockey championship, you can conduct a series of experiments with different ticket prices depending on the number of spectators [2, p. 28]. However, such an experience will inevitably lead to a loss of income on the part of the Sports Palace, which is extremely undesirable. In such cases, it is recommended to conduct a selective experiment, that is, not on a real object, but on its virtual analogue - a model. Building models using such models and studying the properties of systems is called modeling.

Modeling is also an indispensable tool in making economic forecasts, that is, probabilistic judgments about the state of an event or system in the future. Forecasting is one of the forms of predicting the course of events and is considered the most valuable resource in the economy, since forecasting is the key to future profits [3, p.67].

Mathematical modeling is often used in studying economic systems and predicting their future state (since experience on a real object, as mentioned above, leads to unjustified costs). Mathematical modeling implies the concentration of our initial knowledge, ideas and hypotheses, recorded using mathematical relationships [3, p. 473].

The mathematical model is a simplified model of the original. This simplification reduces the dimensionality of the initial states of the system. In this case, the generated model must be the same as the original one, that is, there must be a correspondence between the original and the mathematical model. The construction of economic and mathematical models includes several stages [4, p. 223].

The formation of an economic and mathematical model begins with the formulation of a problem, which, in turn, begins with the definition of modeling goals. In addition, based on the objectives of the study, the boundaries of the system under study, the conditions of its functioning and the required level of simulated processes are determined. In addition, the problem statement includes criteria for assessing the effectiveness of possible restrictions on the original and their values. Of great importance are the description of information flows circulating between the source and external environment, the interdependence of internal elements, and the description of restrictions on allocated resources. The next stage of building a model is synthesis, that is, the formation of the structure and description of the model parameters. Structural synthesis is the creation of a certain number of alternative models that differ in the level of accuracy and take into account the initial characteristics of the problem. The role of our national customs and traditions in the family and family relationships is especially great [5, p. 279].

The model analysis stage consists of studying its characteristics and behavior under various operating conditions. At this stage, performance criteria are selected and calculated for each model built in the synthesis stage. Such criteria may be, for example, the minimum price per unit of production or the maximum quality of goods and services provided to consumers [6, p. 212].

The following types of mathematical models are distinguished:

• Analytical – models representing a set of analytical expressions and dependencies;

• Simulation models – models created on the basis of computer experiments; the description of the simulated objects is translated into machine language. These models allow you to simulate on a computer the operation of systems when measuring and processing the necessary data;

• digital – models, presented in the form of various digital methods and circuits, usually provide an approximate solution to the problem;

• Algorithmic – models represented by algorithms in the form of a certain logical sequence in a computer.

It should be noted that in the theory and practice of economic and mathematical modeling, a number of other models of different levels of complexity and different purposes are used.

In many areas of sports economics, special-purpose systems are actively used that perform routine tasks with cyclic repetition of operations [7, p. 198]. Such systems are called queuing systems. Examples of a queuing system include sports facilities (stadiums, sports complexes, skating rinks, etc.), sports organizations of all legal forms (individual enterprises, companies, joint stock companies of all types), ticket offices, retail stores and many others. other objects.

Queuing systems vary in structure and level of complexity. They are usually divided into single-channel and multi-channel.

As a rule, in economic and mathematical modeling of queuing systems and other objects, modeling elements are designated by rectangles indicated by input and output arrows (see Figure 5). If the model corresponds to the original, then the change in signal at the input and output should be the same. In this case, the internal structure of the modeled object and the processes occurring in it are not displayed in the model, that is, the model is called a "black box" [8, p. 18].

All subsequent systems are designed to generate 1 application, which randomly fall into the system input. Servicing of received applications can be carried out by the system at different intervals, since the processing time of applications depends on many random parameters. While watching a program, the channel is considered busy. At the end of the service, the channel is released and waits for a new program.

The sports industry and other sectors of the economy use a large number of queuing systems, each of which includes different service channels, has its own productivity and organizational structure. Depending on the specified characteristics, the queuing system has a certain performance (throughput). If any queuing system fails to perform its tasks over time, it will be replaced by a more efficient system that can fully satisfy the increased volume of requests. Sport plays an important role in the development of the intellectual potential of young people and the formation of a healthy lifestyle [9, p. 116-118; 10, 302 p.].

It is obvious that the random nature of the receipt of applications and the time of their servicing creates an uneven loading regime for queuing systems - in some periods the intensity of the flow of programs causes the system to work with overload, and in others the system does not work. when there are no programs. In addition, even when operating at maximum load, the queuing system allows you to create a queue that leaves some applications if the wait is delayed. In such cases, it is necessary to introduce additional service lines into the system. Such a queue system will be multi-channel.

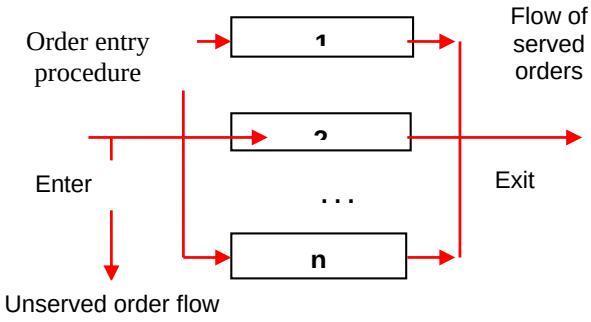

Figure 1. Multi-channel queue

As can be seen from Figure 1, each queuing system includes the following elements.

• service channels;
• input stream of programs;
• to turn;
• Output stream of served applications.

Conclusion. During the development of the investment program, the development of the sports services market and sports opportunities are determined. In this regard, in modernizing the economy, increasing the level of efficiency in the use of sports complexes, creating a competitive environment in the field of sports services, further studying the demand for sports services in the future, and solving problems in the field of further development. Innovative activities in sports organizations are considered a pressing problem.

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