FORMATION OF A SYSTEM APPROACH TO THE OPTIMIZATION OF MARKETING MANAGEMENT AT AN ENTERPRISE (p. 4-12)

Svitlana Kovalchuk, Dmytro Kobets, Ludmyla Dybchuk

The problem of forming a system approach to the application of marketing management to the activities of machine-building enterprises is theoretically substantiated and solved. A system of marketing management of the activities of industrial enterprises was designed. A model of the system of marketing management of an enterprise was constructed. The model contains elements of marketing research, it is based on strategic, tactical and operational management of marketing activities, implies formation of an algorithm of optimization of organizational structures of marketing, and the result of its implementation is the design of a scenario-based approach to substantiating decisions regarding increase in efficiency of marketing management at machine-building enterprises.

The process of making management decisions about the organization of marketing activities is based on economic-mathematical modeling and provides the alternativity of choice among creation, reengineering, improvement of organizational structure of marketing, a form of fulfilling marketing activities without creating rigid organizational systems and/or delegating part of marketing functions to the outsourcing by specialized consulting company. The model of optimizing a system of marketing management of an enterprise was proposed, which takes into account clusterization of enterprises by the characteristic of fulfilling marketing functions; the process of management decision making was improved regarding the choice of an optimal structure of organization of marketing management at an enterprise.

Keywords: marketing management, system approach, clustering, machine-building enterprise.

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SYSTEM EVALUATION OF ENGINEERING OBJECTS' OPERATING TAKING INTO ACCOUNT THE MARGIN OF PERMISSIBLE RISK (p. 13-19)

Nataliya Pankratova, Ljudmyla Kondratova

The result of this study is the technique for system evaluation of real CES operating taking into account the margin of permissible risk. The proposed technique is directed to timely detection and elimination of the causes for situations, connected with a possible transition of CES into an inoperable mode as a distinguishing feature. The time interval is determined to implement the coordinated margin of permissible risk, taking into account the integral informedness index and an unavoidable threshold time limit. This time interval may be used for guaranteed prevention of the specified abnormal mode in order to maintain the necessary indicators values of complex engineering system functioning in the normal mode. The proposed technique is implemented using a water supply system as an example, where the water level in the reservoir and the water pressure at the water inlet of a technological object are used as indicators; the values of these indicators characterize the state of the system at each time instance during its operation. The values for the coordinated margin of permissible risk are received in time instants, which can be used to implement the guaranteed prevention

of an abnormal situation for one indicator and an emergency situation for another.

Keywords: strategy, security, survivability, margin of permissible risk, abnormal situation, risk, uncertainty.

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DEVELOPMENT OF FUZZY STATISTICAL METHOD OF OPTIMAL RESOURCE ALLOCATION AMONG TECHNICAL DEPARTMENTS OF AN ELECTRIC UTILITY COMPANY (p. 20-27)

Mykola Kosterev, Volodymyr Litvinov

We formulated the approach to solving specific aspects of the task of strategic planning of sustainable development of an electric utility enterprise as a multi-criteria decision-making problem, which can be solved under conditions of fuzzy initial information. To solve this task, the method of constructing a set of feasible solutions was proposed, based on the specific functioning of an enterprise divisions. The set of feasible variants is compiled according to the Pareto method, when no element can be improved without worsening of at least one of the other elements, which makes it possible to define a compromise allocation of funding, at which the minimum possible value of the risk of an accident in the electric utility enterprise's networks is provided. As an optimizationl criterion, we adopted the risk of an accident occurrence in an electric utility system.To solve the task of risk evaluation at solving a linear programming problem, we applied the method, which allows evaluating the risk by analytical way without carrying out probabilistic-statistical modeling.

As a result, the developed method is efficient for practical application during an express evaluation of the risk at different variants of the allocation of funds among the units of electric utility enterprise without carrying out of cumbersome probabilistic-statistical modeling.

Keywords: electric utility enterprise, allocation, risk, the Pareto set, weighting coefficients, Saaty method.

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DEVELOPMENT OF AN ECONOMIC AND MATHEMATICAL MODEL OF LOADING A FREIGHT AND PASSENGER FERRY (p. 28-37)

Yelena Kirillova, Yekaterina Meleshenko

Ferries are an important structural element of the ferry transport technological system (TTS) and an integral part of the global navigation. Today, ferry transportation is widespread in Europe, the Baltics and the CIS countries. The most developed traffic on the maritime market is such freight and passenger ferries as ro-ro passenger and ro-pax ferries. Ferries are a linear fleet with a number of peculiarities that complicate the decision-making process on the formation of their loading. The features that do not depend on the ferry sailing region include diversified cargos, a composite cargo and passenger loading, a multitude of consignments from different shippers, a wide variety of tariffs, discounts and surcharges for transportation depending on many factors, and a set schedule of the ferry operation.

The study presents an economic and mathematical model that maximally takes into account the specific features of organizing ferry transportation as well as the technical and operational characteristics of vessels. This is achieved by incorporating into the model structure those restrictions whose left side reflects the characteristics of the ferry and the line, whereas the right side reveals the parameters of the cargo and passenger traffic. In particular, it should be specified that a composite loading of the ferry with both cargos and passengers implies restrictions that prevent the carriage of passengers without a cargo or transporting cargos without passengers accompanying them. This peculiarity of ferry loading was disregarded in previous studies devoted to optimizing the loading of vessels. Furthermore, the control parameters, which are Boolean variables, used in the model help take into account the linear and mass characteristics of each cargo unit, which is caused by a wide variety of cargos within the same nomenclature.

The specified peculiarities of the suggested economic and mathematical model make it applicable for both Ukrainian and foreign ferry operators. Furthermore, the model is open to any, if necessary, modifications depending on the requirements of individual companies due to addition or elimination of certain restrictions.

Keywords: ferry, loading, cargo, passengers, optimization, model, wagon, vehicles, cabins, company.

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DESIGNING FUZZY EXPERT METHODS OF NUMERIC EVALUATION OF AN OBJECT FOR THE PROBLEMS OF FORECASTING (p. 37-43)

Oksana Mulesa, Fedir Geche

The research is devoted to the models and methods of determining the numeric evaluation of the object. A fuzzy model of the problem was built that allows presenting the results of experts surveys as the intervals of change in the numeric evaluation including determining the degrees of the confidence of the experts in their opinions. Heuristics were proposed to determine those experts from an expert group, the degrees of confidence of who have certain features in their assessments. The application of such mechanism allows excluding the experts who are not confident in their opinions or who display equal confidence in all the values of the intervals, determined by them.

Rules of determining collective numeric evaluation of objects in the fuzzy problem of the numeric evaluation have been developed that are based on the simultaneous consideration of competence degrees of the experts as well as the degrees of their confidence in their assessments.

A forecasting model of time series was constructed, based on the fuzzy methods of determining collective numeric object assessment that provides a possibility to consider non-systematic and poor formalized external factors. The method of simultaneous usage of classic methods of forecasting and an "expert block" was designed to solve the problem of time series forecasting that provides a possibility to include the external factors to the forecasting value which have a high impact on the forecasting value but which have not systematic character or cannot be formalized.

The efficiency and expedience of application of the proposed approaches to solving the practical problems of time series forecasting were proven, on the example of the task of forecasting quantitative characteristics of HIV-infected people, registered officially in the region.

Keywords: fuzzy problem of numeric evaluation of the object, heuristics, expert, time series forecasting.

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MODEL OF START-UPS ASSESSMENT UNDER CONDITIONS OF INFORMATION UNCERTAINTY (p. 43-49)

Nikola Malyar, Volodimir Polishchuk, Marianna Sharkadi, Ihor Liakh

The study of an actual task of a start-up projects assessment on the stage of the introduction of the product to the market was carried out. The assessment of a start-up project is the evaluation of an "idea," which may bring profits in future. In this regard, the problem (poorly structured now) of assessment of efficiency of start-up projects arises, the solution to which is interested for either venture funds or the startuppers themselves.

A multi-creteria model of startups assessment under conditions of uncertainty using the apparatus of fuzzy mathematics was designed. A set of criteria was compiled for the assessment of startups, which are divided into five groups, and a gradation point scale was designed. The set-carrier of linguistic variable was proposed that meets the requests of a

decision maker when considering, evaluating and choosing startups.

A two-level mathematical model of assessment and choice of startup projects was considered. The model sets the level of the assessment of an "idea" and its linguistic value, taking into account the requests of a decision maker when considering, evaluating and choosing startups. An example of a model application is shown for the start-up "A multipurpose monitoring of a smart home" that was presented at the "Kickstarter".

The designed model will be a useful tool to increase the validity of decision making by venture funds and "investment angels" who wish to support and finance start-ups.

Keywords: start-up projects, multi-criteria assessment, group of criteria, membership function, "desired values".

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FORMING THE CLUSTERS OF LABOUR MIGRANTS BY THE DEGREE OF RISK OF HIV INFECTION (p. 50-55)

Oksana Mulesa, Vitaliy Snytyuk, Ivan Myronyuk

The research deals with the problem of dividing a group of migrant workers into subgroups according to the degree of risk of infection with the human immunodeficiency virus. Mathematical model of the problem of clustering as a problem of building up a rule was developed, by which reflection from the set of possible values of characteristics on a set of clusters is carried out and the method of evolutionary clustering of objects was adapted to the selection of groups of migrant workers by constructing a fitness function, which provides assignment of an object to the cluster, the Euclidean distance from the center of which to the object is the smallest.

Experimental verification of the developed method for the problem of defining subgroups of persons according to socio-demographic characteristics in the group of migrant workers was performed, the result of which was dividing the group of migrant workers into three groups of clusters in the ascending order by the degree of risk: a group of clusters with high risk, a group of clusters with moderate risk and a group with a relatively low risk. As a result of this division, each group of clusters is homogeneous not only by socio-demographic portraits of its representatives, but also by the degree of prevalence of practice of risky behaviors with regard to human immunodeficiency virus infection.

Comparative analysis of the results of the problem solving of clustering of the objects of the set group with high risk by the method of k–means and by the method of evolutionary clustering was carried out by the values of the function, which is the integral sum of the distances from objects to the centres of those clusters where they belong. Therefore, according to the performed calculations, the advantages of the evolutionary method in particular have been proven.

Keywords: evolutionary clustering, a group of migrant workers, the risk of infection with human immunodeficiency virus.

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STUDY OF CARRY OPTIMIZATION WHILE ADDING BINARY NUMBERS IN THE RADEMACHER NUMBER-THEORETIC BASIS (p. 56-63)

Mykhailo Solomko, Boris Krulikovskyi

The operation of addition of binary numbers in the multi-bit parallel carry adder circuit of the Rademacher NTB, the process of which uses the logarithmic summation algorithm is considered. It is found that computing of the sum and carry signals in circuits of such adders can be justified by the mathematical model in the form of the directed acyclic graph, which is a binary tree. It is revealed that the performance indicator of the directed acyclic graph in the form of a number of computing steps determines the optimum number of carries in the multi-bit parallel carry adder circuit in the Rademacher NTB.

It is found that the number of computing steps for the considered models of parallel carry adders is equal to the number of bits of binary numbers n. Thus, the complexity of the algorithm for computing the sum and carry signals of the parallel carry adder in the Rademacher NTB is O (n) and is linear – the time of the algorithm increases linearly with the number of bits of binary numbers n.

The research can be used for the design technology of electronic adder circuits, since it makes clear what is the structure of the adder, teach to operate the adder circuit at the design stage.

Keywords: adder, cascade circuit, directed acyclic graph, Rademacher NTB.

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