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# APPLICATION OF NEURAL TECHNOLOGY FOR PREDICTION COMPETITIVE STRATEGY OF TRADE ENTERPRISES

**Abstract.** The article is related to studying specifics of forecasting competitive strategy of business enterprises, based on neural network method. The article lays out main advantages and disadvantages of this method. Methodology of utilizing neural networks to evaluate an enterprise financial status is also addressed. Furthermore, the article reviews methods of neural network construction in order to solve various types of economic problems and assist in decision-making. It provides characteristics of quality of various types of neural networks that have been constructed. The article also develops sequence of generation and implementation of competitive strategies, which allows choosing a more rational strategy based on complex accounting for factors of variability of actions aimed at competitive positioning of a business enterprise. Model of multilevel perceptron quality analysis is also provided. The article develops classification of new cases based on neural network model. Use of this model allows to not only evaluate the financial status of an enterprise, but to prognosticate its level depending on financial and non-financial markets as well.

Main advantages of the proposed sequence are clearly visible multivariation of strategy development; existence of direct and reverse connection between stages of the process, which includes not only strategic block, but also analytical (information support), tactical (strategy

implementation) and effective (strategy adjustment) blocks, which ensure the quality of coordination between strategy development and its implementation processes.

In order to solve the problem of analytical support of business enterprise competitive strategy forecasting in short-term outlook, the article substantiates the necessity of neural network method utilization, which is a component of business enterprise activities system of methods of evaluation and forecast. Furthermore, it is proposed to develop a long-term competitive strategy of an enterprise, with its value taken into account, which is defined by a model of a sequence of values based on the balanced scoring system. This allows increasing the revenue owing to customer service improvement, demand forecast, observation of contractual discipline, logistics improvement, as well as increasing social responsibility of business, accounting for modern challenges in natural environment protection and establishing eco-friendly business activities and social responsibility of a business.

**Key words:** neural network, trading company, prognostication, financial and non-financial indicators, economic processes.

## Introduction

The perspective directions development activity of the enterprise on the basis of mathematical simulation of the forecast income commercial enterprises when assess the impact of internal factors and exogenous risks is possible on the basis of neural network systems that belong to expert model evaluation and forecasting. Today artificial neural networks have spread to solve a large class of image processing tasks, primarily for identification, simulation, intelligent control, time series forecasting of arbitrary nature in terms of structural and parametric uncertainty. Neural networks represent promising computational technologies that provide new postulates to the study of control and analytical tasks in activities of commercial enterprises. Comprehensive economic analysis

according to the method of application of neural networks is evaluated in the current state of the commercial enterprise, and at the same time being a causal analysis of changes in main indicators under the influence of factors of influence. At the same time, in analysing the economic and financial condition of the commercial enterprise taking into account the forecast for the short and long term justify the key indicators, the importance of which can lead to a change in position of commercial enterprise in a competitive environment. Due to this, it is necessary to build a dynamic management tool — artificial neural networks, with the help of which you can take into account the impact of management decisions on the profitability and cost of commercial enterprise. If necessary, the amount of input data indicators, it is possible to increase that will expand and clarify the information provision control and analytical process of management of trade enterprises not only to assess the current status, but also for the choice of competitive strategy.

Quantitative and qualitative parameterization of evidence analytical basis of strategy selection, development of indicative plans and business planning, formation of long-term strategy of business partnership, evaluation of the implementation of the strategy occurs through two processes. The first is the process of formulation. It is informative and decisive process aimed at defining the main strategic goals of the company and identification of the main obstacles in achieving them. The second is the implementation process is to develop measures which will lead to the achievement of planned strategic objectives:

- economic (high level profitability, economic potential and efficient sources of financing, the presence of solvency);
- technical-technological (the availability of advanced software control system, the low level of depreciation of fixed assets and intangible assets, high level of communication through the use of information technologies);

- organizational and administrative (high level of corporate culture, effective organizational structure, degree of motivation, professional competence of management);
- marketing (effective strategies in the promotion of products on the market, optimal pricing, advanced trading Executive network, recognized brand a positive business image);
- social and psychological (mental attitude goods consumers, the population trust);
- geographical (geographical presence of commercial enterprises in areas with developed market infrastructure and effective demand of consumers).

**Analysis of the recent research and publications**

The competitive strategy analytic substantiation is reflected in many scientific developments such domestic and foreign scientists as Gordienko, P. L., Carmine G. L, Kostina N. I., Kostyrko L. A., Kudenko N. V., Redchenko I.K., Nemtsov V. D., Sych E.M., Shkarban S. I. and others.

However, in these works is delimited by the analytical software or only in the plane of the selection and justification of the strategy activities, or with respect to operational analysis and planning of regulated activities. Out of focus diagnostics remains possible manoeuvring on strategic objectives, assessment of integration strategies and tactics of enterprise, risk analysis of tactical decisions on the criteria for achieving strategic goals, and so on. The solution to these problems will achieve the transparency, credibility strategic and tactical management and minimize risks. Therefore, the use of mathematical apparatus of theory of fuzzy sets, using in his studies of such researchers as Kruglov V. V., Matviychuk A. V., Bozic, V. S., Lebedev A. V., Schnitzer, Y. L., Zorina A. A. [1-9] etc.

Therefore, **the goal** of this article is to study the specifics of creating a competitive strategy based on the use of neural network technologies to ensure the competitiveness of commercial enterprises and increase profitability.

**Results of research**

The application of methods of forecasting of activity of the enterprises based on the use of neural networks has a number of advantages and disadvantages. The advantages is that the use of neural networks allows to investigate the dependence of the predicted values of the independent variables based on the numeric and text data subject to unknown patterns; to analyze no need to solve the problem of interdependence between the input parameters; defines the resistance to noise in the input data; analyst does not necessarily have knowledge of the high technological capabilities of neural networks. This allows you to make the assumption that sales in a future period will depend on the following parameters: sales in the last period; sales in the penultimate period; the number of working days. However, it is worth considering uncontrollable factors in the external environment, in particular: seasonal, competitors' activity in the project area, the number of buyers, the period of delivery of the goods.

The use of neural networks allows considering the factors based on which you can build short-term forecasts. Applying neural network model (perceptron with one hidden layer) and the database (retail sales and other data from external and internal environment), and you get an effective forecasting system. To take into account external parameters, you must enable the corresponding input to the neural network. This uses the algorithm for determining the importance and significance of input variables, with the exception of parameters that have little influence.

The advantage of neural networks lies in the fact that the expert does not select a mathematical model of the behaviour of the time series. The

construction of neural network model is adaptive without the participation of the expert in the learning process.

The disadvantage of this method can be considered as the need of specialized software tools; the difficulty of interpreting neural networks and is not deterministic. This refers to the so-called 'black box', where the logic decision-making by the neural network is hidden from the expert. Thus, the model is not unambiguously and transparently to determine the contribution of each indicator to the improvement or deterioration in the financial condition of the commercial enterprise. For this purpose there are algorithms 'extracting knowledge from neural networks', which formalize a list of logical rules, creating network-based expert system. However, these algorithms do not line up in the neural network packages, and the rule sets generated by these algorithms are quite voluminous.

Therefore, for the decision of problems and analytical support for the forecasting of competitive strategy of trade enterprises, we propose to use a neural network method, which is part of our proposed system, evaluation methods and forecasting activities of commercial enterprises.

The neurons linked to a specific architecture, called neural network, the type of which is determined by the task that confronts the enterprise.

An important parameter for constructing a neural network is an optimization algorithm and the learning ability. The optimization algorithm is very important for building neural networks, because it can mitigate errors in the process of formation of the training sets and to speed up the training, so the selected algorithm is the elimination of the input components (removed the data that degrade the overall score).

Neural network functioning evaluation is based on the responses of relatively simple elements of the same type, where each of the neurons contain synapses (directed input signals *x1*, ..., *xn* associated with other hidden neurons)

and an axon (the initial values *y1*, ... *ym*, associated with the hidden and input neurons).

In preparation for forecasting the data is divided into three sub-samples. The first is training, during which for the effective functioning of the networks selected set of examples, each of which contains a data pair: the input *xi* and *yj*. To train the using perceptron the data of many observations is *xi*. Each neuron of the hidden layer receives signals from neurons in the input layer. After performing operations on the signals to change weights of the neuron, which sends its output to all neurons in the following layers, ensuring the transmission of one forward (feed forward) to the output *yj*, thereby providing efferent connections.

A second sample is considered as validate, because it is designed to provide the possibility of estimating the prognosis and determining the optimal complexity of the model. Last one is used to assess the effectiveness and feasibility of the proposed model. It carries out testing the network after training. Figure 1.1 depicts a four-layer network, where first layer contains four neurons, the second three, third two and fourth three neurons.

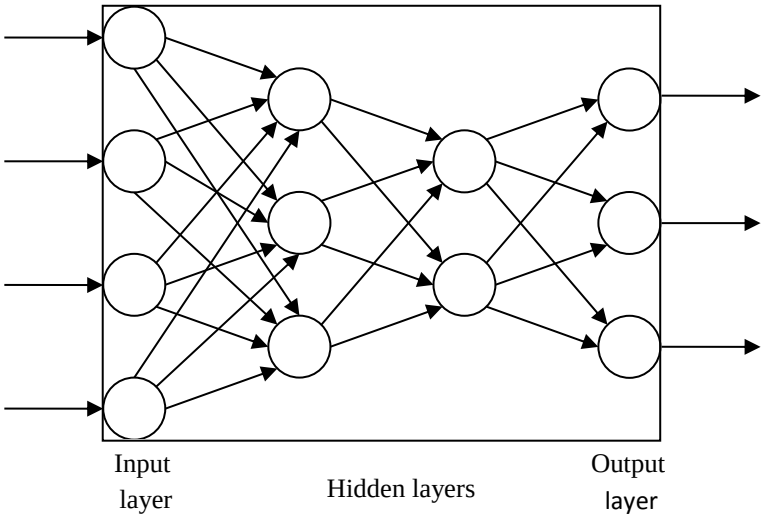


*Fig. 1.1.* **The structure of four-layer neural network**

The development and use of neural networks using NeuralTools involves four steps.

Step1. The data that you use in NeuralTools is defined in data sets for training. Data Set Manager allows you to set the data sets so that they can be repeatedly applied in the design of networks. Before the simulation of neural networks were introduced in the input data. This step has eliminated the significant scale of the data and to aligned variable ranges. As the indicators standardization was selected on the variation range.

Step 2. During training, the neural network is created based on the data set. After all, in predicting the configuration of the neural network is loaded from the database. The forecast results are presented to the user in an HTML report. After training, the network configuration is saved to the database. When the application for storing information using a database.

As noted Zorina A. A., 'the most important decision that the analyst must take when working with neural networks is the selection of a set of variables to describe the modelling process of the analysis of financial and economic activities of the company' [1]. Accordingly, data are compiled on the basis of observations for which the known values as dependent and independent variables.

According to the first level connections factors there are net income, cost of goods sold, distribution costs; the level of derivative — trading margin, speed of customer service; the second level factors are price, product range, sales organization, separate rhythm, and use of resources.

Step 3. During testing of the neural network we tested the predictive ability of the original values. The data was used for testing; there were certain sets of historical data.

The main strategic indicator, which is calculated in the prediction, should be the basis of the strategy. Therefore, we proposed the ratio of market value of the company to the value of its assets as the main strategic variable. The

indicator of enterprise value in absolute terms may be used to establish the characteristics of enterprises according to the criterion of financial stability. Among other strategic indicators we have identified profitability, gross profit amount, the amount of current assets and inventories.

Step 4. The developed neural network is used to predict the unknown initial values. Tool NeuralTools allows you to set options automatically find the best network with the appropriate strategic indicators.

According to the study, the amount of net income is characterized by a tendency to increase annually by approximately 20% and is the result of effective management of commercial enterprise, subject to the retention of competitive advantage and retains market position. Evaluation the amount of current assets and inventories shows the increase in the accounts receivable and cash, which is a Testament to balancing enterprise-level growth strategies. Regarding the correct and precise choice of strategy is quite important, because the election strategy in the short term and compliance in the long-term depends on the economic and political environment and legislative support of activity of enterprises of different forms of organization.

Therefore, based on the data we proposed the company use a corporate strategy of sustainable balanced growth on the basis of 'key success factors', which provides for the protection of market share based on the optimization of capital structure; policies of cash flow management and financial risk management policy organizational structure, modification of the product (private label); maintaining a balance between quality of services and the quality of communications; the cost leadership exercise, optimization of financial flows, valuation and transfer of certain business processes outsourcing.

The main advantages of this method is the increase in income from sales of goods by improving the level of service, accurate supply and demand forecasting; observance of contractual discipline; the reduction of cost by reducing inventory level, minimizing overhead and transaction costs in

procurement, warehousing and distribution and improving the utilization of logistics capacity; achievement of customer-oriented business processes, their openness to knowledge sharing between business partners; increase the social responsibility of business, given the current challenges of environmental protection.

**Summary**

To eliminate the identified deficiencies in models of the formation and implementation of competitive strategies of trading companies we have developed a sequence of formation and implementation of competitive strategies, which allows you to choose the more rational of them on the basis of clearly expressed through multiple routes of action; availability of direct and reverse connections between the stages of the process, including not only strategic, but also analytical (information management), tactical (implementation strategy) and efficient (adjustment strategy) blocks. But for the decision of problems and analytical support for the forecasting of competitive strategy of trade enterprises in the short term, the necessity of using the method of neural networks, which is a component of the system methods of evaluation and prediction of activity of trade enterprises.

For a long-term competitive strategy of trade enterprises, we offer you to use the model of value chain of value creation of the enterprise which must take into account the increase in income from sales of goods by improving the level of service uniformity of procurement of goods and demand forecasting; observance of contractual discipline; reducing costs by reducing stock levels and overhead and transaction costs in procurement, warehousing and distribution and improving the utilization of logistics capacity; achieve the customer-oriented business processes, their openness to knowledge sharing between business partners.

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