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ARTIFICIAL INTELLIGENCE APPLICATIONS IN FINANCIAL DIAGNOSIS AND ANALYSIS METHODS

Artificial intelligence, a relatively new phenomenon in entrepreneurial activity, allows the realization of many applications in the most diverse fields, such as medicine, accounting, auditing, and financial diagnosis. The application of artificial intelligence in economics is argued even by the characteristics and needs of the time (development of online commerce, e-governance, virtual reality, industrial robots). With the ability to learn, to understand, to know from experience, and to deal with old and new situations, artificial intelligence will collect information; examine data for the preparation of decision alternatives and decision-making.

The contemporary manager must cope with unstructured, dynamic, and stochastic tasks, must simultaneously take into account their quantitative and qualitative aspects.

Specialized dictionaries present intelligence as "the ability to learn or understand from experience, the ability to acquire and memorize knowledge, the ability to respond quickly and successfully to new problems, the use of the faculty to reason in solving problems and the management of activities effectively" [2, p.7].

The technology of intelligent systems of the "*expert systems*" type is widely implemented in the analytical practice of large enterprises. There are expert systems for a wide range of applications in all areas of the company's business, starting with the sales activity and continuing with the economic planning and forecasting of the business. The most suitable field of use of expert systems is the financial-accounting system of the enterprise. By processing the data in the financial statements, provided by the accounting software, the expert system can analyze and develop certain decisions, which will alert the management of the company in case of risky or unfavorable situations, or will confirm the correctness of the decisions taken. The intelligent systems applied for accounting provide support for managers in optimizing direct and indirect costs, which will determine the efficiency of the economic and financial activity of the company. The basic purpose of expert systems is access to information.

Facing the globalization, the spectrum of information users, such as investors, shareholders, creditors, managers, providers and other users of financial information with different interests, has increased considerably, the need for objective and timely information has increased, and the expectations of users pressure on the financial-accounting field. Expert systems can also be used in

consulting, contracting bank loans, analyzing financial indicators and evaluating the profitability of investment projects.

However, expert systems require in-depth knowledge in higher mathematics, econometrics, information systems, and high maintenance costs, which is why they have lost popularity in recent years.

Expert systems are not able to self-improve and learn from experience and find it difficult to adapt to environmental changes, which leads to incorrect data and information.

In the literature, there are many recommended analysis models for determining the risk of bankruptcy or the feasibility of a business with the application of artificial intelligence.

The management information system can be composed of several systems, which ensure the information needs of the employees. In practice, this concept began to be applied in the 90s of the century. XX, due to the increased flow of information and the impossibility of processing it without the use of "*artificial intelligence*". One of the developers of the management information system in management, Robert Antony, based on the information needs of managers, divided the management activity into three types: strategic planning, management control and operational control.

The financial diagnosis of the company is an example of the management information system. Its presence is irreplaceable in the process of monitoring the activity of the enterprise because this system solves the problem of assessing the internal situation of the enterprise based on a large number of indicators, facilitating the processing of information and decision-making on the dynamics of the enterprise.

Increasingly, contemporary Anglo-Saxon literature focuses on the use of information programs in diagnosing the company's activity. Several authors argue that the use of so-called neural networks in diagnostic analysis is more effective than the use of statistical-mathematical methods. Many managers find it difficult to use complicated econometric models in diagnosing the activity of managed enterprises. The model of "*neural networks*" is based on the principle of the functioning of the human nervous system and shows superiority over mathematical models analysis of the influence of factors on the outcome of the company's activity.

In the conditions of the information technology revolution, the diagnostic tools provided by artificial intelligence have proven to be more effective for decision making. The philosophy from which they are born is different, namely to help managers in making decisions, thus simplifying its task without involving comprehensive technological knowledge. For example, Expert Systems, the most well-known branch of Artificial Intelligence, appeared for the same purpose. However, for thirty years of study, these systems have been applied very limited due to the need for deep knowledge, high costs, and limited flexibility to change the factors of influence, etc.

Neural networks are a newer paradigm for Artificial Intelligence, being multivariate mathematical models that can be easily integrated into a decision-making system and can offer advantages for immediate application in the financial diagnosis of the enterprise. These models are widely applied in accounting, finance, and banking [6, p. 23].

The Spanish authors Serrano-Cinca and Martin-del-Brio [3, p. 198] propose another model: *Self Organizing Feature Maps* (SOFM) is a tool for financial diagnosis. A SOFM is a supervised neural model that will group and systematize data obtained from information inputs provided by the company's financial statements.

The SOFM model projects in multidimensional space data inputs, which could be, in our case, financial information, so that input models whose variables exhibit similar values approach each other on the map that is created. Each neuron learns to recognize a certain type of input pattern. Neurons will recognize similar input patterns whose images will, therefore, appear almost one on the created map.

In this way, the essential topology of the input space is preserved in the output space. To create a competitive model, SOFM uses an algorithm known as "the winner takes everything". The neural system described is, in itself, of great utility in the financial analysis of the information provided by businesses. The financial situation of a private company will determine its location on the map, but we must consider that a company can excite more than one neuron and can do so with varying degrees of intensity.

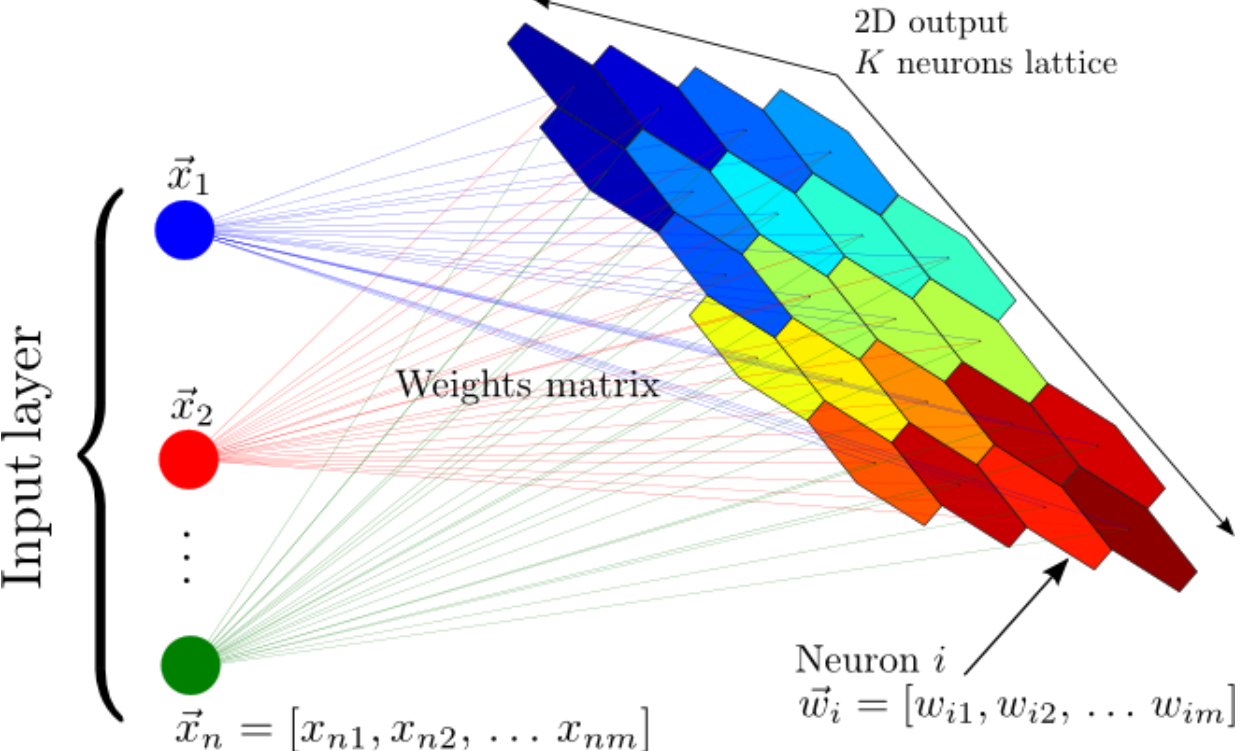


Figure 1. Visual representation of the SOFM Model

Source: [3]

Besides, this model allows us to study the evolution over time of an undertaking by entering information from different accounting periods to locate the

enterprise concerning its competitors. The neural system can be integrated into a wider range of decision-making, using various tools provided by artificial intelligence and statistics. The SOFM model can be combined with other mathematical models applied to predict corporate failure.

Another model of analysis, based on soft applications, is the diagnostic model of the economic potential of the enterprise, proposed by the author. This analysis model is organized on several levels and subsystems. Within this information system, specific connections relate to the links in both directions existing between subsystems at generalizing, intermediate and detailed levels.

The software program for diagnosing the economic potential of the company is carried out in three consecutive stages:

- stage 1 – provides for the collection and systematization of the information necessary for the diagnosis in the proposed field;
- stage 2 – provides for the determination of the dimensions of the indicators and indices determined by the diagnostic program;
- stage 3 – provides for the achievement of the results and the determination of the evolution of the indices of the indicators estimated with the delimitation of the strengths and weaknesses highlighted in the activity of the undertakings analyzed.

Financial diagnosis, under the conditions of sustainable development, determines both the level of economic efficiency achieved based on the use of material, human, financial, and informational resources, as well as increased control over the fulfillment and optimization of managerial decisions.

The virtual world has radically changed people's way of thinking and perceiving. This is why businesses need to understand the particular importance that digital technologies have for business development.

Financial diagnosis and the need to use innovative tools of information progress in the economic and financial analysis of the company to date are without due attention from managers. The American businessman and author of many business works, Gustav Berl, claims that more than 80% of American companies are bankrupt after at least two years of activity due to the lack of monitoring in the management apparatus, i.e. an efficient diagnostic system based on the application of information technologies.

Modern information systems play a decisive role in the equal development of enterprises, which depend on the availability and optimal allocation of financial resources necessary to generate competitive and revenue-producing advantages. In this context, to become compatible with the requirements of the new conditions for the development of the information society, fundamental theoretical and application changes are necessary in the methods of diagnosing the results of the activities carried out to make the management of the enterprise more efficient.

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