Відомості про автора

ГОЛОВНЯ Олена Михайлівна, доктор економічних наук, доцент кафедри менеджменту зовнішньоекономічної діяльності, готельно-ресторанної справи та туризму, Вінницький національний аграрний університет, (вул. Сонячна, 3, м. Вінниця, 21008, e-mail: ellens@meta.ua).

GOLOVNYA Elena, doctor of Economic Sciences, Associate Professor of International Management, hotel and restaurant business and tourism, Vinnytsia National Agrarian University, (21008, Vinnytsia, Soniachna str, 3, e-mail: ellens@meta.ua).

ГОЛОВНЯ Елена Михайловна, доктор экономических наук, доцент кафедры менеджмента внешнеэкономической деятельности, гостинично-ресторанного дела и туризма, Винницкий национальный аграрный университет, (ул. Солнечная, 3, г. Винница, 21008, e-mail: ellens@meta.ua).

УДК 336.6
DOI: 10.37128/2411-4413-2020-2-4

AUTOMATION OF THE FINANCIAL ANALYSIS DECISION-MAKING PROCESS ON THE INTERNET

RUZAKOVA Olga,
Phd Of Economics,
Associate Professor, Department of Computer Science
and Economic Cybernetics,
Vinnytsia National Agrarian University
(Vinnytsia)

The article proposes to use modern Internet technologies for improving the accuracy, speed and validity of financial decisions. They allow us to create a special web page where investors can conduct an assessment of potential investment objects financial status online through an appropriate decision support system. Research is based on the scientific works of domestic and foreign scientists using on the assessing the financial condition of the enterprise problems, the preparation of reporting documentation of specific enterprises, as well as taking into account the results of personal research. A detailed analysis of theoretical, scientific and practical publications, regulatory documents for assessing the financial condition of the enterprise, as well as relevant works on economic and mathematical modeling is carried out. He made it possible to identify the theoretical and applied problems in the field of study and to propose ways to solve them. The expediency of using economic and mathematical methods for estimating the financial state of the enterprise is substantiated. Formulated scientific provisions, conclusions and recommendations are based on the study of the subject area, the application of methods of economic and mathematical modeling, system analysis and methods of expert assessments. Such a system will make it possible to speed up the decision-making process, to carry out an objective and independent expert evaluation, taking into account the specifics of foreign financial management, to simplify the evaluation process through Internet technologies, and to significantly reduce the cost of such service. It is proposed to apply the theory

of fuzzy sets in the construction of DSS, which allows to take into account the different quality parameters of the object being evaluated, to stratify the evaluation process and to analyze a powerful set of evaluation parameters. As a result, it improves the quality of assessing the financial condition of the enterprise using the methodology and tools of mathematical modeling.

Keywords: Internet technology, financial condition of enterprises, fuzzy sets, desigion-making, evaluation parameters, output parameters, modeling.

Fig.: 2. Lit.: 10.

АВТОМАТИЗАЦІЯ ПРОЦЕСУ ПРИЙНЯТТЯ РІШЕННЯ ЩОДО ФІНАНСОВОГО АНАЛІЗУ В МЕРЕЖІ ІНТЕРНЕТ

РУЗАКОВА О.В.,
кандидат економічних наук, доцент кафедри комп'ютерних наук та економічної кібернетики,
Вінницький національний аграрний університет,
(м. Вінниця)

У статті запропоновано для підвищення точності, швидкості та обґрунтованості фінансових рішень використовувати сучасні Інтернет-технології. Вони дозволяють створити спеціальну web-сторінку, на якій у режимі реального часу інвестори зможуть провести інтерактивне оцінювання фінансового стану потенційних об'єктів інвестування за допомогою відповідної системи підтримки прийняття рішень. Дослідження ґрунтуються на використанні наукових праць вітчизняних та зарубіжних вчених із проблем оцінювання фінансового стану підприємства, опрацюванні звітної документації конкретних підприємств, а також врахуванні результатів особистих досліджень. Здійснено детальний аналіз науково-теоретичних та практичних публікацій, нормативних документів щодо оцінювання фінансового стану підприємства, а також відповідних праць з економіко-математичного моделювання, що дозволило виділити наявні в досліджуваній сфері теоретичні та прикладні проблеми та запропонувати шляхи їхнього розв'язання. Обґрунтовано доцільність застосування економіко-математичних методів для оцінки фінансового стану підприємства. Сформульовані наукові положення, висновки та рекомендації базуються на вивченні предметної галузі, застосуванні методів економіко-математичного моделювання, системному аналізі та методах експертних оцінок. Така система дасть можливість максимально прискорити процес прийняття рішення, здійснити об'єктивну та незалежну експертну оцінку з урахуванням специфіки закордонного фінансового менеджменту, спростити процес оцінювання завдяки Інтернет-технологіям, а також суттєво зменшити ціну такої послуги. Запропоновано застосовувати теорію нечітких множин при побудові системи прийняття рішень, що дозволяє врахувати різноякісні параметри об'єкта, який оцінюється, а також стратифікувати процес оцінювання і проаналізувати потужну множину оцінювальних параметрів. У результаті це дозволяє підвищити якість оцінювання фінансового стану підприємства з використанням методології та інструментарію математичного моделювання.

Ключові слова: інтернет-технології, фінансовий стан підприємства, нечіткі множини, прийняття рішень, оцінювальні параметри, вихідні параметри, моделювання.

Рис.: 2. Літ.: 10.

АВТОМАТИЗАЦИЯ ПРОЦЕССА ПРИНЯТИЯ РЕШЕНИЯ ПО ФИНАНСОВОМУ АНАЛИЗУ В СЕТИ ИНТЕРНЕТ

РУЗАКОВА О.В.,
кандидат экономических наук, доцент кафедры компьютерных наук и экономической кибернетики,
Винницкий национальный аграрный университет
(г. Винница)

В статье предложено использование современных Интернет-технологий для повышения точности, скорости и обоснованности финансовых решений Они позволяют создать специальную web-страницу, на которой в режиме реального времени инвесторы смогут провести интерактивное оценивание финансового состояния потенциальных объектов инвестирования с помощью соответствующей системы поддержки принятия решений. Исследования основаны на использовании научных трудов отечественных и зарубежных учёных по проблемам оценки финансового состояния предприятия, разработке отчетной документации конкретных предприятий, а также учете результатов собственных исследований. Проведенный авторами детальный анализ теоретико-научных и практических публикаций, нормативных документов в сфере оценки финансового состояния предприятия, а также соответствующих работ по экономико-математическому моделирования позволил выделить существующие в исследуемой сфере теоретические и прикладные проблемы и предложить пути их решения. Обоснована целесообразность применения экономико-математических методов для оценки финансового состояния предприятия. Сформулированные научные положения, выводы и рекомендации базируется на изучении предметной области, применении методов экономико-математического моделирования, системном анализе и методах экспертных оценок. Такая система позволит максимально ускорить процесс принятия решения, осуществить объективную и независимую экспертную оценку с учетом специфики зарубежного финансового менеджмента, упростить процесс оценки благодаря Интернет-технологиям, а также существенно уменьшить цену такой услуги. Предложено применять теорию нечетких множеств при построении СПР, что позволяет учесть разнокачественные параметры оцениваемого объекта, а также стратифицировать процесс оценивания и проанализировать множество оценочных параметров. В результате это позволяет повысить качество оценки финансового состояния предприятия с использованием методологии и инструментария математического моделирования.

Ключевые слова: Интернет-технологии, финансовое состояние предприятия, нечёткие множества, принятие решений, оценочные параметры, исходящие параметры, моделирование.

Рис.: 2. Лит.: 10.

Problem statement. Beginning in the late twentieth century the worldwide information network has become the basis of technological development of the financial services industry and one of the most important factors in the globalization of financial markets. The results of active and comprehensive use of Internet capabilities by leading financial institutions in the world indicate that with the introduction of Internet technologies a new stage of the financial transactions market development has begun, characterized by significantly high dynamics of financial flows. A characteristic feature was the active introduction into the market of high quality financial services of non-financial institutions, which leads to increased competition and redistribution of customer base.

There are many websites dedicated to financial analysis, including: minfin.gov.ua, e-finance.com.ua, finance.com.ua and more. But they all consider financial issues at the macro level, namely at the state level. An excursion to the Internet sites made it possible to find out that there was no site developed that would solve problems at the micro level, that is, at the level of a specific company, in particular, would allow to make a reasonable, quick and cheap assessment of its financial status.

The rapid development of financial Internet services is a natural result of the continued interest of financial companies in expanding and diversifying services and ensuring their attractiveness. The Internet is radically changing the traditional customer relationship model, making them more dynamic, and creating a new behavioral model for financial services consumers, providing clients with real-time access to personalized information and the ability to quickly manage resources. The increasing popularity of interactive mode is explained by its simplicity and cheapness.

The author suggests that companies that need additional financial investments to increase their production revolutions, enter the necessary open financial information in the database, which is located on a special web page, and a potential investor, using the system of decision making offered on the site in a matter of seconds evaluate different options (enterprises) of their investment scenarios and identify the most attractive investment objects. In addition, for the introduction of manufacturing innovation, such an interactive financial statement of the enterprise (FSE) is extremely effective and indispensable.

Thus, the evaluation of FSE using modern Internet technologies in real time has several advantages:

1. Promptly obtain a valid and accurate result on the evaluation of the client's FSE using a composite decision support system (DSS).
2. Ability to quickly upgrade the database of potential investment objects.
3. Access at any time convenient for the client.
4. Working with the DSS of several site users at the same time.
5. Ability to compare and rank investment firms that are attractive.
6. Cost savings.

Analysis of recent research and publications. There are numerous methods of the financial state of the enterprise estimation, considered in the works of Bernstein L., Shkolnik I., Gorodnya T., Kostyrko O., Helfert E. et al. [1-6]. However, all of them do not allow complete and qualitative analysis, since they take into account a rather limited and not always effective set of different qualitative parameters and are oriented not only to the use of modern Web-technologies, but also to the automation of the evaluation process in general.

This question is rather urgent, as reliable and objective information about the financial capacity of enterprises is necessary for investors in order to choose the best company from the many existing enterprises on the Ukrainian market in which it is expedient to invest their money. This will allow for strong foreign financial injections

into the economy, especially small and medium-sized businesses, which is the dominant lever of economic development in the country.

Goals setting. The purpose of the article is to improve the efficiency of financial analysis by applying a developed decision-making system for the evaluation of FSE by means of the Internet.

According to the stated purpose the following tasks are formulated:

1. Development of a structural model of decision support for FSE evaluation.
2. Preparation of the methodology for formalizing the proposed multilevel model of FSE estimation based on the mathematical apparatus of fuzzy sets.

Presentation of the main material of the research. Among the financial problems of the enterprise, the most researched and actual financial problems of the enterprise are analysis and evaluation of its financial condition. Such an assessment indicates the result of the enterprise activity, identifies its weaknesses and strengths and identifies ways of further development. The following user groups are required to accurately, transparently and quickly assess the financial position of an enterprise:

1. Lenders. They are interested in maintaining a sound financial position of the company, which allows you to repay the loan and interest on time. The following types of business entities are included in the creditors group: banks that issue loans of different urgency for investment projects or to replenish their working capital.

2. Business owners. They are interested in maintaining and increasing the value of their contribution to the enterprise and accruing income from owning it, which is possible only if its financial condition is stable.

3. Enterprise employees. Their interests are partly credit to earnings that have not yet been paid for hours worked. However, in addition to the firm's ability to fulfill its current obligations in a timely and full manner to payroll workers, the latter are interested in the prospects of maintaining their workplace at the enterprise, increasing pay, social benefits – all of this depends largely on the employer financial situation. Among the employees of the firm is particularly distinguished group of managers who are interested in improving the financial condition of the company in all areas of its activities. Bankruptcy of the company for them is accompanied not only by the loss of workplace, but also by the loss of professional image.

4. The state in the local and federal authorities form. Her interest is expressed in: preserving and increasing the region and the country economic potential as a whole; revenues to the budget; ensuring the required level of the population employment; production of necessary goods, works and services.

In practice, the main state interest to the entity is fiscal interest. Many companies' critical financial position does not allow them to accumulate the required amount of budget revenues, either through taxes or through dividend payments (if the state is the enterprise owner). In addition, government support for companies with critical financial status, which are of strategic importance to the region, increases budget expenditures.

In such a multi-vector problem, mathematical tools should be used to assess the financial condition of an enterprise, which will allow for a powerful set of estimation

parameters; sectoral differentiation of economic entities, specific conditions of the enterprise operation. This, in turn, will make it possible to evaluate the FSE qualitatively for both internal and external consumers of such information, in particular for potential investors [7].

It is advisable to create software in order to speed up and improve the accuracy of the enterprise financial position assessing. It will improve the efficiency and accuracy of in-depth analysis. This will allow automatically reflect the set of inputs to the set of outputs resulting from the stratification and decomposition of the estimation process using a suitable mathematical apparatus [8].

Recently, a large number of software products are being developed. They are able to analyze accounting and financial statements and to produce sufficiently accurate data on the state of affairs in the enterprise. The use of computer technology enhances the analytical work of financial experts. This is achieved by reducing the analysis timing; taking into account the cumulative impact of various factors on the economic activity results; replacement of approximate and simplified calculations for accurate calculations; formulating and solving new, semi-structured analysis problems, which are practically not done manually and by traditional methods.

Methods of economic analysis, focused on computers using, satisfies the requirements of systematic, comprehensive, prompt, accurate, progressive, dynamic. Computer technologies allow increasing the productivity of economist, accountant, planner and other specialists by decentralizing the process of automated processing of financial information, combining directly in the workplace their professional knowledge with the benefits of electronic information processing. In addition, software tools allow you to analyze the financial and economic activity of the company in dynamics over a number of periods, as well as allow employees of analytical services and business leaders independently, without the help of programmers to solve the following tasks:

- promptly obtain the necessary information from the data warehouses;
- analyze the data obtained in different sections and with the necessary degree of detail;
- output the results of this analysis in a way that is easy to perceive and make.

The basis of such programs is to bring the financial statements for a number of periods to a single comparable form that meets the requirements of the financial reporting standards. According to the data provided, the calculation of financial ratios is carried out, bankruptcy is assessed, the net assets value and the balance sheet structure are analyzed, break-even analysis is carried out.

Today there are a number of software products that allow conducting financial analysis of the enterprise, in particular:

1. INEK-Analyst is the oldest financial analysis program that allows performing financial analysis on the basis of calculated analytical tables and graphs. The system generates a brief summary of the financial position of the enterprise containing text and graphs.

2. Audit Expert is an analytical system for the diagnosis, evaluation and monitoring of FSE. The system makes it possible to re-evaluate asset and liability items and translate data into a more sustainable currency.

3. "Onvision" is a software complex that is intended for operational analysis of data obtained from accounting systems.

4. "Alt-Finance" – a software product that allows to carry out a comprehensive evaluation of the company activity, identify the main directions of its development. The Alt-Finance program uses the following basic analysis methods: horizontal, vertical, comparative and factorial.

5. "Financial Analysis" – a program for conducting vertical and horizontal financial analysis; analysis of economic potential based on the property assessment; evaluation of financial and economic performance.

6. The module "Financial analysis" of the system "Galaxy" – a program for the financial condition of the enterprise assessing and the prospects for its further development, focusing on enterprises of all forms of ownership.

7. The BEST-F system is a software product intended for the operational analysis of its own financial and economic activity, as well as for carrying out independent external expertise and analysis of the economic state of the enterprise in order to work out a strategy for its development. The analysis results are presented in the form of analytical tables and graphs [5].

A review of the comparative characteristics of the automation systems of financial analysis process, which are the most used in the market, showed that the efficiency of the results obtained for current and future management and the ability of management to respond in time to the deterioration of the financial condition of the enterprise are directly dependent on the availability of modern information technologies for analysis enterprise. Creating automated analytics jobs is the most effective organizational form of computer-aided economic analysis. But the above programs are not without many disadvantages. As a rule, it is a high price, not enough tools and built-in techniques for analysis. In addition, none of the programs considered takes into account the specifics of the enterprise functioning, the conditions of its management, the importance of financial parameters, which reduces the quality of the evaluation.

To remedy the aforementioned disadvantages, the automation system of financial analysis must satisfy the following requirements:

– to provide prompt input of real-time reporting forms, remove unnecessary data and correct them;

– to calculate the estimation parameters of the enterprise financial state;

– to provide an opportunity to choose the branch of national economy depending on the sphere of the enterprise activity (industry, agriculture, forestry, trade, transport and communication, construction, procurement, education, health care, physical culture, social security, culture and art , science);

– to calculate the FSE estimation on the basis of appropriate algorithms and mathematical apparatus;

– to make a decision for the FSE by finding the maximum value of the output parameters set;

– to provide background information about the software using (information about FSE evaluation system and input data);

– to work on a local network.

The author proposes to use DSS for the FSE evaluation, which allowing for more accurate and in-depth analysis, accelerating the decision-making process, reducing its risk and increasing the effectiveness of assessment for such a poorly structured problem under study. This will automate the process of mapping the input factors to the output FSE estimates by means of the decision-making process stratification, using the appropriate mathematical apparatus. A fuzzy logic apparatus is a common and effective apparatus for solving such problems, taking into account the different quality of the analyzed parameters.

Thus, a generalized scheme of system software module interaction is presented, as shown in Fig. 1.

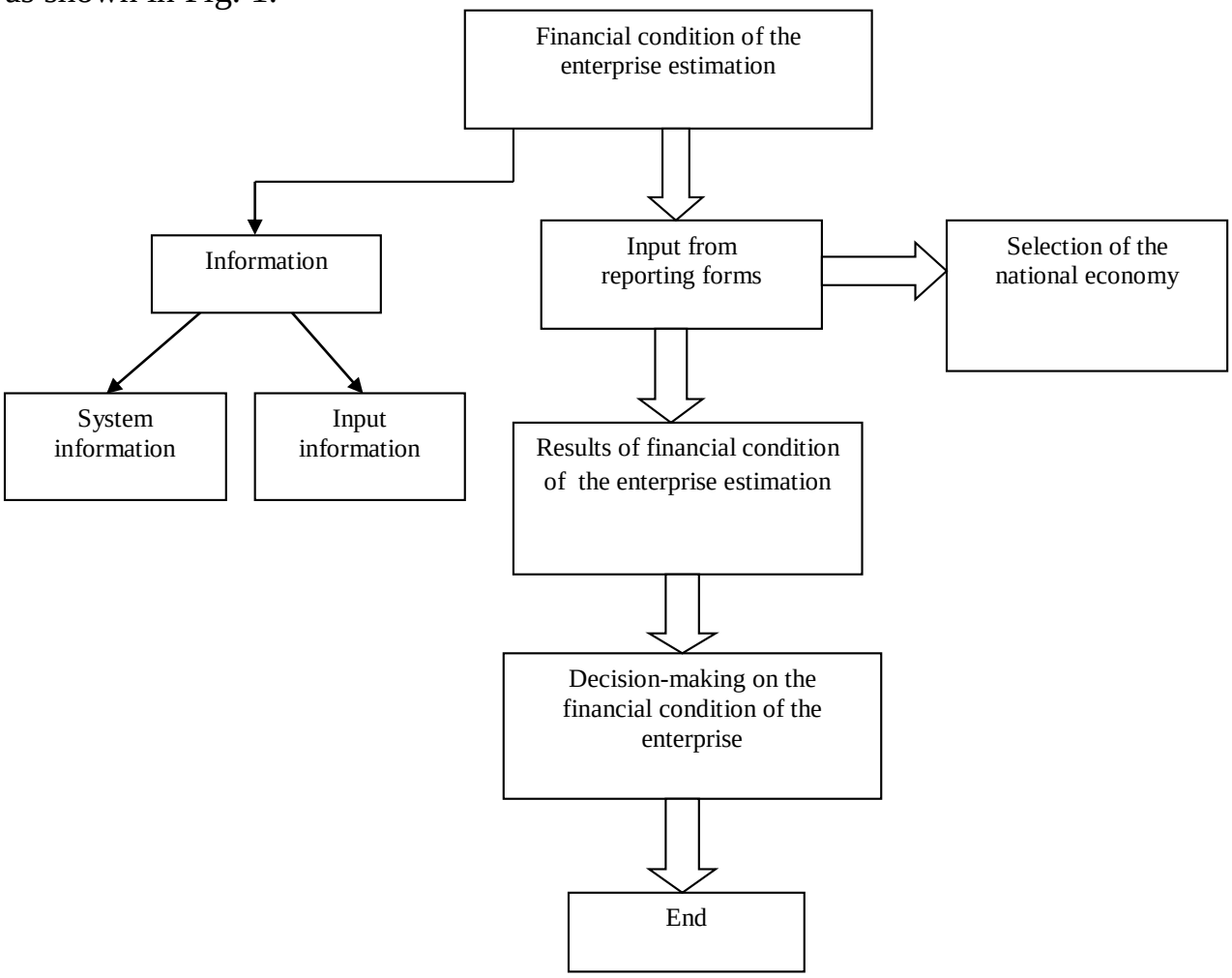

Fig. 1. **Generalized scheme of system modules software interaction**
Source: Based on data [8].

Consider the methodology of DSS formalization, which is advisable to implement on the global Internet to evaluate FSE based on fuzzy logic.

Formation of the DSS input parameters set for the evaluation of FSE. The most important indicators of financial and economic enterprise activity are taken into account in the formation of the estimation parameters x_i ($i = \overline{1,n}$) set X. The accuracy and objectivity of assessing one's financial position cannot be based on any indicators set. Therefore, the issues of selection and justification of the input / output parameters of the financial and economic activities evaluation should be carried out in accordance with the theories of enterprise finance and decision-making, in particular, taking into account the criteria of completeness, minimality, efficiency. To determine the set X, the client enters into the knowledge base, which is located on the created web page, information about the company from certain forms of reporting, including "Balance sheet", "Statement of financial results" and more.

According to systems theory, the author proposes the following criteria by which the set of evaluation parameters is formed:

1. Financial performance should be as informative and consistent as possible to provide a sound picture of the enterprise financial position.

2. They should have the same orientation (an increase in the ratio means an improvement in the financial position) (otherwise the inverse value of the analyzed indicator is taken).

3. Numerical standards for the range of change should be specified for all indicators.

4. Financial ratios should enable the enterprise valuation both in space (compared to other enterprises) and over time (over several periods).

5. Full effectiveness, minimality [9].

I. Determination of the input parameters set

An analysis of existing methods of the enterprises financial condition assessing [1-5] showed that all parameters – financial indicators – can be divided into the following groups:

- indicators of financial stability (x_1 – coefficient of independence; x_2 –coefficient of financial stability; x_3 – coefficient of financial stability; x_4 – coefficient of own funds maneuverability; x_5 – coefficient of provision with own working capital);

- indicators of liquidity and mobility (x_6 – ratio of monetary solvency; x_7 – coefficient of settlement solvency; x_8 – ratio of critical liquidity; x_9 – ratio of receivables and payables; x_{10} – asset mobility ratio);

- business activity indicators (x_{11} – asset turnover ratio; x_{12} – receivables turnover ratio; x_{13} – accounts payable turnover ratio; x_{14} – inventories turnover rate; x_{15} – fixed assets turnover ratio; x_{16} –assets turnover ratio);

- profitability indicators (x_{17} – cost return; x_{18} – sales profitability, x_{19} – return on all assets, x_{20} – return on equity).

II. Building membership functions.

For each linguistic term of parameters (low, below average, average, above average, high), we set the membership functions $(\mu(x_i))$, the appearance of which is justified by the specificity of the indicators, and the tuning is proposed by the author to be carried out using the spectral method of expert assessments (Fig. 2).

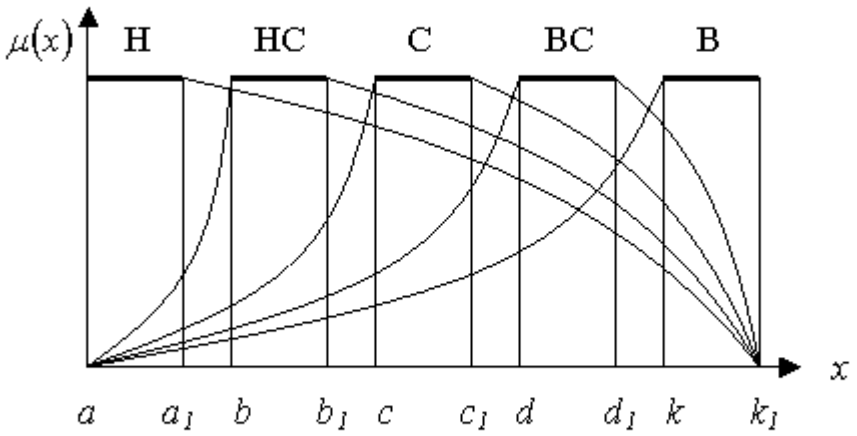

Fig. 2. **Features of five fuzzy terms for the parameters $x_1...x_n$**
Source: Based on data [7].

Therefore, in the light of the verified expert estimates by the spectral method, the following mathematical expressions were obtained describing the membership functions:

$$\mu^{н}(x)=\begin{cases}1,\ \mathrm{x}\in[\mathrm{a},\mathrm{a}_1);\\ \left(\dfrac{\mathrm{k}_1-\mathrm{x}}{\mathrm{k}_1-\mathrm{a}_1}\right)^{0,8},\ \mathrm{x}\in[\mathrm{a}_1,\mathrm{k}_1],\end{cases} \quad (1)$$

$$\mu^{нс}(x)=\begin{cases}\left(\dfrac{x-a}{b-a}\right)^{1,2},\ \mathrm{x}\in[\mathrm{a},\mathrm{b}];\\ 1,\quad \mathrm{x}\in(\mathrm{b},\mathrm{b}_1);\\ \left(\dfrac{\mathrm{k}_1-\mathrm{x}}{\mathrm{k}_1-\mathrm{b}_1}\right)^{0,8},\ \mathrm{x}\in[\mathrm{b}_1,\mathrm{k}_1].\end{cases} \quad (2)$$

$$\mu^{с}(x)=\begin{cases}\left(\dfrac{x-a}{c-a}\right)^{1,2},\ \mathrm{x}\in[\mathrm{a},\mathrm{c}];\\ 1,\quad \mathrm{x}\in(\mathrm{c},\mathrm{c}_1);\\ \left(\dfrac{\mathrm{k}_1-\mathrm{x}}{\mathrm{k}_1-\mathrm{c}_1}\right)^{0,8},\ \mathrm{x}\in[\mathrm{c}_1,\mathrm{k}_1].\end{cases} \quad (3)$$

$$\mu^{вс}(x)=\begin{cases}\left(\dfrac{x-a}{d-a}\right)^{1,2},\ \mathrm{x}\in[\mathrm{a},\mathrm{d}];\\ 1,\quad \mathrm{x}\in(\mathrm{d},\mathrm{d}_1);\\ \left(\dfrac{\mathrm{k}_1-\mathrm{x}}{\mathrm{k}_1-\mathrm{d}_1}\right)^{0,8},\ \mathrm{x}\in[\mathrm{d}_1,\mathrm{k}_1].\end{cases} \quad (4)$$

$$\mu^{в}(x)=\begin{cases}\left(\dfrac{\mathrm{x}-\mathrm{a}}{\mathrm{k}-\mathrm{a}}\right)^{1,2}, & \mathrm{x}\in[\mathrm{a},\mathrm{k}];\\ 1, & \mathrm{x}\in(\mathrm{k},\mathrm{k}_1],\end{cases} \tag{5}$$

III. Consideration of weight coefficients of parameters.

Each of the parameters has a different degree of impact on the financial position. To account for this, you must enter the weights $\alpha_1,\alpha_2,\ldots,\alpha_n$ of the parameters, where n – the number of parameters, (n = 20). According to the results of [10], these coefficients must satisfy the condition $\frac{1}{n}\sum_{i=1}^{n}\alpha_i=1,$ and their values can be determined using the method of cardinal group estimates of the alternatives significance, taking into account the competence of experts using the pairwise matrices decomposition. Therefore, the results of the studies using the above method allow to take into account the different weight of parameters by raising the corresponding functions of parameter belonging $(\mu(x_i))$ to the degree α_i .

Then we construct the logical equations that connect the membership functions.

IV. Getting the initial solution.

At the outlet, the enterprise receives an assessment of its financial condition. The set of output parameters $\mathrm{O}=\{O_1,..,O_s\}$ consists of the following solutions:

O_1 – unsatisfactory FSE;

O_2 – critical FSE;

O_3 – satisfactory FSE;

O_4 – normal FSE;

O_5 – excellent FSE.

Many of the output parameters are constructed $\mathrm{O}=\{O_1,..,O_s\}$ by the author using financial analysis methods.

Conclusions. The use of computer technology increases the efficiency of analytical work of financial experts. Software products allow to simplify the routine operations of enterprises employees in making decisions about assessing the financial condition of an enterprise, as well as to automate the process of making financial decisions. The proposed software design principles make it possible to obtain software for higher accuracy, quality and speed evaluation of FSEs, which will be easy to use, require no special knowledge in programming and computer engineering from an economist, and will not require in-depth knowledge of specifics financial work from a system programmer.

It is proposed to automate the mechanism of financial relations between an investor and a potential investing entity using Internet technologies, which allowed:

1. To make the financial decision-making process as fast as possible and streamline this process with Internet technologies.

2. To carry out an objective and independent expert evaluation, taking into account the specifics of foreign financial management.

3. Substantially to reduce the cost of FSE valuation for potential investors as well as for any business entity, since there is little charge for such interactive services. This is explained by the fact that the ratio of estimated costs for the development of a website for the evaluation of FSE and the resulting economic effect indicate a small payback period (up to 1 year).

4. To evaluate not only the current state of the enterprise at a certain date, but also to forecast its financial capabilities for changing its state in dynamics, for the future with the help of modern Internet technologies.

The advantages of the proposed DSS:

1. It is based on a comprehensive, multidimensional approach to evaluating the financial and economic performance of an enterprise.

2. A flexible computational algorithm is used to obtain the estimate.

3. The developed mathematical model allows making a quantitative assessment of the business partner reliability based on the results of its current and previous activities.

4. Modeling the financial state of the enterprise using the apparatus of fuzzy logic allows adjusting the model according to the specifics of the country, industry and time period. Such models have the properties of flexibility and adaptability to the changing conditions of a market economy. Due to the fact that the decision making in such DSS is based on the decomposition principle, the proposed mathematical model of its formalization allows it to be controlled and allows flexible adjustment of the model to the specific conditions and specificity of the analyzed object, which favorably differentiates our model from the previously developed models of FSE evaluation.

The ability to automate the process of assessing the financial condition of the enterprise allows you to integrate the software of the assessment system into local or global information environments – computer networks. The use of such software in the global environment of the Internet will allow obtaining the necessary financial resources for the development of enterprises investment capacity both domestic and foreign investors. In addition, the cost of assessing the financial position of the enterprise for both potential investors and for any business entity will be significantly reduced, because the payment for such interactive services is small. This is due to the small payback period, which is the ratio of the estimated costs of developing a website to assess the financial condition of the company and the resulting economic effect.

In the conditions of globalization of society the automated workplace of the financier with access to the Internet is a prerequisite for his productive work in the financial sphere. Therefore, interest to obtaining a quick and accurate result on the financial condition of an enterprise will grow rapidly. Thus, we propose an automated model of relations between business potential partners, where the FSE will be evaluated in an interactive mode using web-technologies, will allow to determine the result in the shortest possible time and ensure a quick exchange of information between different economic entities and potential investors.

References

1. Bernstain, L.A. (2016). *Analyz fynansovoi otchetnosty [Financial statement analysis]*. Moscow: Finansy i statystyka [in Russian].

2. Shkolnyk, I.O. (2016). *Finansovyi analiz [Financial analysis]*. Kiev: Tsentr uchbovoi literatury [in Ukrainian].

3. Horodnia, T.A., & Yavtukhovska, I.V. (2013). Diahnostyka finansovoho stanu pidpryiemstva [Diagnosis of the financial state of the enterprise]. *Naukovyi visnyk NLTU Ukrainy, 23*, 207-212 [in Ukrainian].

4. Kostyrko, O.H. (2009). Vykorystannia metodu koefitsiientiv dlia otsinky finansovoho stanu pidpryiemstva [Using the coefficient method to estimate the financial condition of an enterprise]. *Ekonomika APK*, 7, 54-56 [in Ukrainian].

5. Khelfert, E. (2015). *Tekhnika finansovogo analiza [Technique of financial analysis]*. Moscow: Audit, Yuniti [in Russian].

6. Kaletnik, G.N., & Tsikhanovska, V.M. (2010). *Finansovyi menedzhment [financial management]*. Kiev: *Khai-Tek Pres* [in Ukrainian].

7. Rusakova, O.V. (2019). Systema pidtrymky pryiniattia rishen u zadachakh finansovoho analizu [Decision support system in the tasks of financial analysis]. *Ahrosvit, 5*, 67-72 [in Ukrainian].

8. Rusakova, O.V. (2010). Pryntsypy pobudovy prohramnykh zasobiv dlya otsinky finansovoho stanu pidpryyemstva [Principles of building software for assessing the financial condition of an enterprise]. *Zbirnyk naukovykh prats' «Ekonomika ta upravlinnya APK», 4 (81),* 89-92 [in Ukrainian].

9. Matviychuk, A.V. (2010). Modeliuvannia finansovoi stiikosti pidpryiemstv iz zastosuvanniam teorii nechitkoi lohiky, neironnykh merezh i dyskryminatnoho analizu [Modeling financial sustainability of enterprises using theories of fuzzy logic, neural networks and discriminatory analysis]. *Visnyk Natsionalnoi akademii nauk Ukrainy, 9,* 24-46 [in Ukrainian].

10. Rusakova, O.V. (2014). Vykorystannya metodu parnykh porivnyan′ u finansovomu analizi [Using the method of paired comparisons in financial analysis]. *Visnyk Khmel'nyts'koho natsional'noho universytetu, 2,* 129-132 [in Ukrainian].

Список використаних джерел

1. Бернстайн Л.А. Анализ финансовой отчетности. Москва: Финансы и статистика, 2016. 624 с.

2. Фінансовий аналіз: навч. посібн. [За заг. ред. Школьник І. О.]. Київ: Центр учбової літератури, 2016. 368 с.

3. Городня Т.А., Явтуховська І.В. Діагностика фінансового стану підприємства. *Науковий вісник НЛТУ України*. 2013. Вип. 23. С. 207–212.

4. Костирко О.Г. Використання методу коефіцієнтів для оцінки фінансового стану підприємства. *Економіка АПК*. 2009. № 7. С. 54–56.

5. Хелферт Э. Техника финансового анализа. Москва: Аудит, Юнити, 2015. 663 с.

6. Калетнік Г. М., Ціхановська В. М. Фінансовий менеджмент: навч. посіб. Київ, 2010. 320 с.

7. Рузакова О.В. Система підтримки прийняття рішень у задачах фінансового аналізу. *Агросвіт*. 2019. № 5. С. 67–72.

8. Рузакова О.В. Принципи побудови програмних засобів для оцінки фінансового стану підприємства. *Збірник наукових праць «Економіка та управління АПК»*. 2010. Вип. 4 (81). С. 89–92.

9. Матвійчук А.В. Моделювання фінансової стійкості підприємств із застосуванням теорій нечіткої логіки, нейронних мереж і дискримінатного аналізу. *Вісник Національної академії наук України*. 2010. № 9. С. 24–46.

10. Рузакова О.В. Використання методу парних порівнянь у фінансовому аналізі. *Вісник Хмельницького національного університету*. 2014. № 2. С. 129–132.

Відомості про автора

RUZAKOVA OLGA – Phd Of Economics, Associate Professor, Department of Computer Science and Economic Cybernetics, Vinnytsia National Agrarian University (21008, Vinnytsia, 3, Solnyschaya St., e-mail: olgarkv81@gmail.com).

РУЗАКОВА Ольга Володимирівна – кандидат економічних наук, доцент кафедри комп'ютерних наук та економічної кібернетики, Вінницький національний аграрний університет (21008, м. Вінниця, вул. Сонячна, 3, e-mail: olgarkv81@gmail.com).

РУЗАКОВА Ольга Владимировна – кандидат экономических наук, доцент кафедры компьютерных наук и экономической кибернетики, Винницкий национальный аграрный университет (21008, г. Винница, ул. Солнечная, 3, e-mail: olgarkv81@gmail.com).