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CONTENT

IDENTIFICATION AND ANALYSIS OF HUMAN RESOURCES RISK ON FARMS, ENCOURAGEMENT FOR SUSTAINABLE DEVELOPMENT

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Abstract. The purpose of this study is to identify and analyze the risks associated with human resources in agricultural farms, with a focus on making sustainable development recommendations. To achieve this, a survey was conducted with 260 farmers. The dependent variable was the risk of human resources, and the independent variables were farm worker incapacity, lack of worker training, family members leaving the farm, and disasters such as illness or death of the farmer or farm members. The multiple regression analysis showed that the R2 coefficient is determined by these factors, which is valuable information for farmers and responsible bodies to develop efficient strategies and policies for managing human resources in agricultural farms.

Keywords: risk, farm, identification, analysis, management, regression, perception, human resources.

Introduction

Agricultural production relies on several resources, including the sun, water, land, capital, labour, and management (Meco et al., 2017). The sun is essential for photosynthesis, which is the primary production process in plants. Water is vital for plant growth and for carrying out biological processes. The land is an irreplaceable and indispensable resource. Capital is necessary for purchasing agricultural equipment and technologies required for production. Labour and management utilise these resources to produce as much as possible, with the highest quality and at the least cost, to earn maximum profits (Murrja, 2011). According to Meco et al. (2017), natural resources (sun, water, land) and capital are necessary but insufficient for successful agricultural production. Therefore, the entrepreneurial desire of the farmer and their family plays a crucial role in the process.

However, the entrepreneurial desire of farmers is faced with various and numerous risks. Authors and researchers classify these risks into five main groups: production risk, market risk, financial risk, legal/institutional risk and human resources risk (Drollette, 2009; Schaffnit-Chatterjee, 2010; Carne et al., 2013; Hareood et al., 1999; Hassan et al., 2023; Jankelova et al., 2017; Kahan, 2013; Komarek et al., 2020; Melyukhina, 2011; OECD, 2008a; Sciabarrasi, 2024; Schaffnit-Chatterjee, 2010; Thomas, 2018; Thompson et al., 2019; Ullah et al., 2016; USDA-ERS; Murrja et al., 2019, 2022, 2023, 2024). Entrepreneurship in agriculture is very risky (Duong et al., 2019). Risk management is very important and the study aims to increase the skills of small farmers in risk management (Abdullah et al., 2024).

The study focuses on human resource risk. The subject of the study is the vegetable farms in the "Guri i Zi" administrative unit in the region of Shkodra in Albania. This area is characterized by suitable climatic conditions and has a long tradition in vegetable production. At the moment, this area meets 42% of Shkodra's regional market needs for vegetables (Murrja, Kurtaj, Ndregjoni, Prendi, 2023; Kurtaj et al., 2024; Cerpja and Murrja, 2024).

The study is a continuation of previous studies, where production risk, financial risk and market risk were analyzed (Murrja, Kurtaj, Ndregjoni, Prendi, 2023; Kurtaj et al., 2024; Cerpja and Murrja, 2024). The results of the study will serve area farmers, field researchers, local government, and central government, as well as other countries such as Kosovo and North Macedonia, which have similar climatic conditions and possibilities of comparative advantages between them.

Agriculture is an important sector of the economy of Albania. It contributes 19.6% to the gross domestic product (INSTAT, 2023; Murrja, Kurtaj, Ndregjoni, Prendi, 2023; Kurtaj et al., 2024; Cerpja and Murrja, 2024). Despite the risks and challenges it faces, this sector has great potential for growth and development. Through detailed studies and regular risk analyses, such as our study in the Guri i Zi area, challenges can be identified and addressed to improve agricultural production and its contribution to the local economy.

Literature Review

Human resources are like two sides of a coin. They make the business successful, but they can also bankrupt it (Murrja et al., 2017). The management of human resources on the farm is not the same as the management of human resources in commercial companies (Meco et al., 2017). In commercial companies (limited liability companies and joint stock companies), the management is separated from the investing owner. While on the farm, the owner's responsibilities are greater, because he is the investor himself, the manager himself and the worker himself. Decisions are also influenced by other family members.

But of course, the question arises: "What are the sources of risk of human resources on the farm?" The authors have identified several risks, which are: the managerial incapacity of the farm owner, the premature death of the farm owner, divorce in the family, disputes or conflicts with neighbours, the departure of family members from the farm, the professional incapacity of agricultural workers, lack of communication with visitors and tourists, environmental pollution (chemicals, pesticides, waste), lack of training of employees, lack of payment of employees (Drollette, 2009; Schaffnit-Chatterjee, 2010; Carne et al., 2013; Hareood et al., 1999; Hassan et al., 2023; Jankelova et al., 2017; Kahan, 2013; Komarek et al., 2020; Melyukhina, 2011; OECD, 2008a; Sciabarrasi, 2024; Schaffnit-Chatterjee, 2010; Thomas, 2018; Thompson et al., 2019; Ullah et al., 2016; USDA-ERS; Murrja and Braha, 2021; Murrja, Meco, Maloku, 2021); Murrja, Maloku and Vuniqi, 2023).

Although human resource risk is as important as other risks, it has been overlooked by farm entrepreneurs. Komarek et al., (2020) in their study on the number of research on five risks in agriculture for the period 1974-2019 found that the largest number of studies was done on the production risk, and then the market risk, the risk legal, financial risk and finally, human resources risk.

Consequently, the following hypothesis is put forward in our study:

H1: Risk events, such as employee disability, lack of employee training, family members leaving the farm and disasters (illness/death) of the farmer or family members have serious impacts on human resource risk.

The conceptual research framework, presented in Figure 1, was formulated through a rigorous process of adapting and integrating previous studies by Murrja et al. (2022, 2023). A thorough examination of the existing literature was conducted to identify relevant knowledge and approaches that could be applied to our research. Synthesizing these findings, we were able to develop a comprehensive framework that reflects the concepts and variables under study (Murrja, Ndregjoni, Maloku, Prendi, 2022; Murrja, Ndreca, Maloku, Meço, 2023; Murrja, 2023; Murrja and Ndregjoni, 2022; Ndregjoni et al., 2023; Murrja, Maloku, Vuniqi, 2023). The resulting framework provides a clear and structured overview of the research objectives, methodology and expected results.

From previous studies, the following are recommended as human resource management techniques: practitioner good "people" skills with family members, neighbours and employees; assessment of alternative sources of work (Murrja and Braha, 2021); the training of farm members and employees, as well as the transfer and delivery of knowledge through workshops to English farmers, has been evaluated as an effective way (Heleba et al., 2009); the motivation of employees

at work, where the measurement of satisfaction is essential, since it affects the effective motivation for the success of agricultural companies (Jankelova et al., 2020); talent management, which can be considered a systematic approach to acquire the right people for the right positions at the right time (Vnouckova et al., 2016); and stress management, as well as health and life insurance for farm workers (Murrja and Braha, 2021).
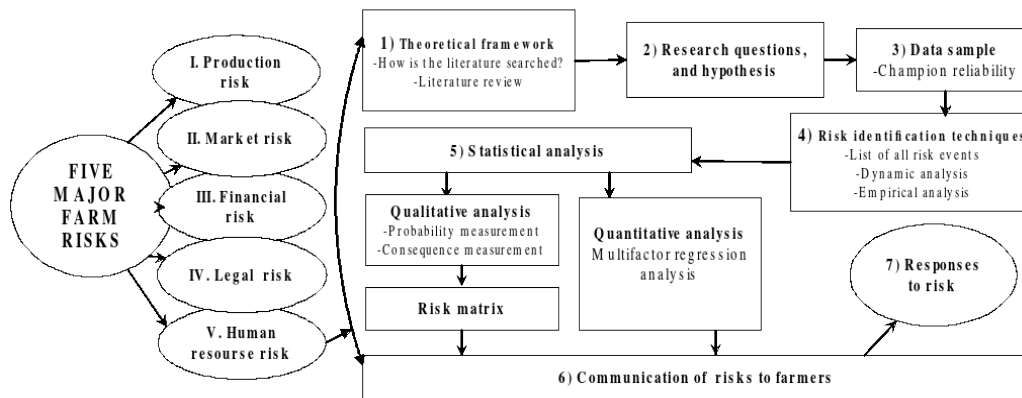
Figure 1. Conceptual framework of the study
Source: Murrja et al. (2022, 2023); Murrja (2023); Ndregjoni et al. (2023)

Methods

The study is based on primary statistical data. 260 farmers were surveyed. Their perception was measured according to the psychometric assessment of the Likert scale from 1 to 5. In the survey, farmers were asked how they perceive the suggested sources of risk. Table 1 presents the evaluation method.

Table 1. Psychometric assessment according to the Likert scale

Rating according to the Likert scale with:		Evaluation segments
Point	Fjalë	
(1)	Very little important	[1-260]
(2)	Little important	[261-520]
(3)	Moderately important	[521-780]
(4)	Important	[781-1040]
(5)	Very important	[1041-1300]

Source: Murrja et al. (2022, 2023); Murrja (2023); Ndregjoni et al. (2023)

The study involved 3500 farmers from the area. The inability to survey all farmers led to the selection of a sample as follows (Kurtaj et al., 2024; Cerpja and Murrja, 2024; Okoye et al., 2022; Israel, 1992; Cochran, 1977).

$$n_0 = \frac{Z^2 pq}{e^2} \tag{1}$$

Where Z = 1.96; p =0.5; q = 0.5 and e = 0.05, n_0 is calculated:

$$n_0 = \frac{1.96^2 * 0.5 * 0.5}{0.05^2} = 385 \, farmers \tag{2}$$

In our case, the population consists of 3,500 farmers and we can slightly reduce it (Kurtaj et al., 2024; Cerpjan and Murrja, 2024; Okoye et al., 2022; Cochran, 1977).

$$n_0 = \frac{n_0}{1 + \frac{n_0 - 1}{N}} \tag{3}$$

Where n is the sample size and N is the population size equal to 3,500.
The sample size of the study is:

$$n_0 = \frac{385}{1 + \frac{385-1}{3500}} = 260 \, farmers \tag{4}$$

Multifactorial linear regression was used to prove the relationship between the variables. This model has also been used by other researchers (Sulewski and Kloczko-Gajewska, 2014; Murrja et al., 2023; Kurtaj et al., 2024; Cerpja and Murrja, 2024). The multifactorial linear regression equation is:

$$Y = a + bx_1 + cx_2 + \ldots + nx_n \tag{5}$$

To verify the hypotheses, we tested the results through the Student's test and the Fisher test. First, we compared the P value with the coefficient α. If P < α, the hypothesis will be accepted, which means that the independent variables are important, that is, they affect the dependent variable. Then we compared the actual Fisher test with the critical Fisher where: if the actual Fisher > the critical Fisher then the hypothesis will be accepted, which means that the model as a whole is significant.

Results

3.1. Descriptive statistical analysis

First, we present the farmers' perception of the five farm risks. Table 2 and Figure 2 present the responses of farmers for production risk, market risk, financial risk, legal risk and human resources risk. Farmers feel more threatened by production risk and market risk, they feel threatened by financial risk and human resource risk, while they feel threatened by legal risk on average (Murrja et al., 2023; Kurtaj et al., 2024; Cerpja and Murrja 2024).

Table 2. Farmers' perception of the five main risks on the farm

Segment	The five main risks	Perception	
[1041-1300]	Production risk	1 220	(i) Very important
[1041-1300]	Market risk	1 080	(ii) Very important
[781-1040]	Financial risk	995	(iii) Important
[781-1040]	Human resources risk	850	(v) Important
[521-780]	Legal risk	670	(iv) Significant mean

Source: Murrja, Kurtaj, Ndregjoni, Prendi, 2023; Kurtaj et al., 2024; Cerpja and Murrja 2024
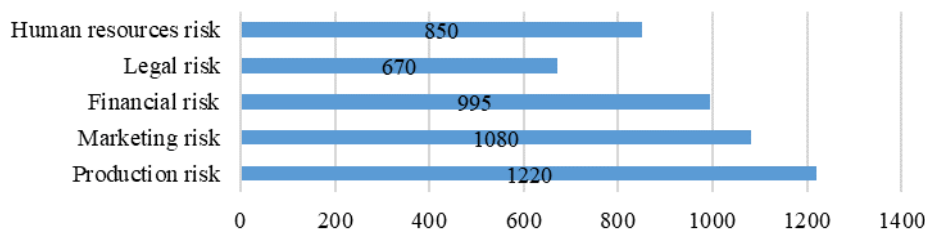
Figure 2. Farmers' perception of the five main risks
Source: Murrja, Kurtaj, Ndregjoni, Prendi, 2023; Kurtaj et al., 2024; Cerpja and Murrja 2024

Table 3. Importance of human resource risk variables

Segment	Source of market risk	Perception	
[1041-1300]	Death or illness of the farmer	1 240	(i) Very important
[1041-1300]	Professional disability of employees	1 060	(ii) Very important
[781-1040]	Lack of employee training	795	(iii) Important
[521-780]	Removal of family members	765	(iv) Moderately important

Source: Author's elaboration
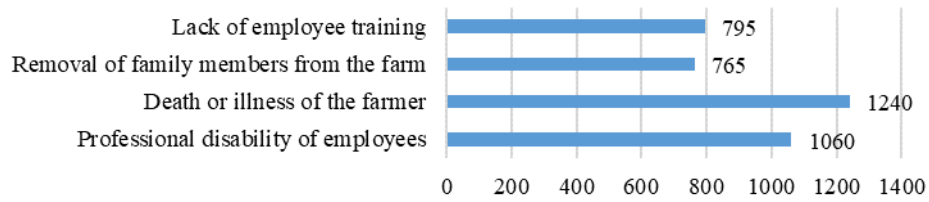
Figure 3. The importance of human resource risk variables
Source: Author's elaboration

In the study, we have included four variables to measure the risk of human resources in farming, and we present the farmers' perceptions of these variables in this section. The responses of the farmers are presented in Table 3 and Figure 3. According to the farmers, death, illness, and professional disability are very important risks that need to be addressed. Lack of training is also important, while the departure of family members from the farm is moderately important.

3.2. Multifactorial regression analysis

Often the perception of farmers does not correspond to the real trend. To prove this, we performed a multifactorial regression analysis. The dependent variable is the risk of human resources, while the independent variables are the incapacity of farm workers, the lack of employee training, the departure of family members from the farm and the misfortune (illness/death) of the farmer or members of the farm. The results of the multifactorial regression analysis are presented in Table 4.

Table 4. Results of multifactorial regression analysis

	Coefficient	Std. Error	T-ratio	P-Value
Const	-0.388161	0.988494	-0.3927	0.6979
Inability	0.360079	0.14995	2.401	0.0241**
Sampling	-0.0667174	0.213244	-0.3129	0.7570
Leaving	0.105314	0.133929	0.7863	0.4391
Disaster	0.711550	0.193899	3.670	0.0012***
R-squared	0.831234	Adjusted R-squared		0.804231
F	30.78347	P-Value		2.50e-09

Source: Author's elaboration

Discussion

From the descriptive statistical analysis of the five main risks of the farm, we found that production risk and market risk are perceived as very important by farmers. Financial risk and human resources risk are perceived as important, while legal risk is moderately important (Murrja et al., 2023; Kurtaj et al., 2024; Cerpja and Murrja, 2024).

From the statistical analysis of the four human resources variables, the farmers' perception is as follows: the death or illness of the farmer and professional disability are perceived as very important, the lack of employee training is perceived as important and the departure of family members as moderately important.

As we pointed out above, the perception does not match the real trend. This discrepancy is verified by multifactorial regression analysis. Based on the data in Table 4, we find that illness or death of the owner or family member and disability of farm workers are considered important sources. Removal of family members from the farm and lack of training are considered less important. Farmers reason that they are used to leaving their children and pursuing their personal lives, while for the training of new employees, most farmers reason that they are sufficient. In conclusion, hypothesis H1 is accepted for the variables disability, misfortune from illness or death, and rejected for the variables leaving the farm and having no training.

In addition to the importance of the variables, we also see the importance of the model as a whole. F-actual = 30.78. F-critical = F (α; k-1; n-k) = F (0.05; 4-1; 30-4) = F (0.05; 3; 26) = 2.98. So, we have: F-actual > F-critical and the hypothesis H1 is accepted, the variables disability and misfortune from illness or death. The regression model is Human resource risk = - 0.38 + 0.36 Disability + 0.71 Disaster. The relationship between these two independent variables is linear with

the dependent variable human resource risk. The coefficient R2 shows that 83% of human resource risk is determined by the above factors.

Conclusion

From previous studies, it has been established that farmers perceive production risk as a greater threat, especially in relation to floods (Murrja, Kurtaj, Ndregjoni, and Prendi, 2023). This shows that the impact of environmental conditions and climate change are the main factors that influence the perception of farmers' risks.

In terms of importance, marketing risk is ranked second. In this aspect, the greatest fear of farmers is related to price fluctuations and high competition in the market (Cerpja and Murrja, 2024). This shows that market stability and price certainty are key elements for farm success and sustainability.

One step lower in the ranking of importance is financial risk. Farmers are worried about their profits, debts and interest they have to pay (Kurtaj et al., 2024). This factor shows that financial management and financial stability are important issues for farmers.

In the detailed risk analysis of human resources, the two variables that negatively affect the most are the misfortune of illness or death and professional disability. Farmers have expressed great concern about these two aspects. On the one hand, disasters, such as the death or illness of farm or family members, are often unpredictable and can have a major impact on farm operations. On the other hand, the professional incompetence of employees increases the various risks of wrong interventions or harmful decisions, negatively affecting the performance and sustainability of the farm.

Less dangerous in the farmers' perception is the legal risk (Ndregjoni et al., 2023). This includes legal and regulatory issues that may affect the operation of the farm. This analysis shows that knowledge and enforcement of laws and regulations is an important issue for farmers and can have an impact on the success of their operations.

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IMPROVEMENT OF THE INNOVATION POLICY OF WORLD CORPORATIONS AS A FACTOR FOR SUSTAINABLE DEVELOPMENT

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Abstract. The transition to a green economy is an inevitable direction of development, requiring activation of efforts for improvement of the environmental friendliness of the economies of all countries of the world economy. The article objective resides in the study of conditions and factors, identification of the models and mechanisms of the innovation activity of the transnational corporations. The methodological foundation of the research included the historical and logical method, methods of quantitative and qualitative comparisons (when determining the cross-cultural peculiarities of the innovation activity models in different countries, and methods of expert assessment and forecasting (SPACE-analysis). The authors improved the scientific and methodological approach to the justification of the mechanism of development and introduction of the innovation policies of the world automobile corporations in conditions of a low-carbon economy by adjusting the objectives of the innovation policies of automobile corporations and eliminating problems in the process of policies implementation into the company's activity. They developed innovations management strategies at the US automobile companies based on the strategic situation analysis tool – SPACE-analysis. They also recommended the use of a strategy of aggressiveness for quick reduction of costs and increase of profits in a short time.

Keywords: innovation, transnational corporations, innovation activity models, SPACE-analysis, management strategies.

Introduction

The innovative- breakthrough character of the global economic development takes place based on the general planetary scientific and technological progress. It is provided primarily by the transnational corporations (TNC) of the world leader-countries, which thanks to the concentration of the colossal production and financial potential, efficient resources mobilization at an international scale and us of advantages of the internationalization of the markets have become the main producers of the latest products, services, and technologies.

It is TNC that form the scientific and technical component of the economic growth temps in the leading world countries, the share of which, according to the estimates of the OECD experts, increased from 38% in the middle of the XX century to 65% at the beginning of XXI century (Bhattacharya et al., 2017). That is why the acceleration of temps of innovative and technological development gained strategic significance in the global competitive struggle of all subjects of the market.

As of today, the ecologic problem moved at a global level (Carayannis et al., 2017). An increase in the popularity of the concept of low-carbon or "green economy" is largely caused by numerous crises that the world faced in recent years, in particular, climatic, ecological, food, financial, and economical crises (Coenen et al., 2015).

In general, during the last decade, the development of the world economy is influenced by techno-globalism, which is characterized by both positive and negative features (Costantini et al., 2017; Cuerva et al., 2014; Georghiou et al., 2014; Kivimaa and Kern, 2016): on one hand, one observes a dynamism of the international scientific and technological partnership at a microlevel in the aerospace and electronic industries, bio- and resources-saving technologies, mechanical engineering and instrument-making industry, pharmaceutics, chemical and petrochemical industries, production of computer equipment; a rapid increase of the labour efficiency level, quality of products and services thanks to the introduction of the breakthrough technologies and use of the innovative forms and methods of business organization; on the other hand, the level of unemployment reaches a critical point in traditional industries, deepens dehumanization and marginalization of society, one observes increased technological load on the environment during operation of carbon sources of energy.

Under such conditions, the transnational corporations face the need and try to find new approaches to innovative activity management by development and continuous introduction of the latest models and management tools, implementation of the policy of the international consolidation of the intellectual assets (Kuhlmann and Rip, 2018; Landoni et al., 2016; Mazzucato, 2016). At the same time, one also modifies the structure of the sources of the innovative ideas: alongside its own scientific and research developments, the TNC widely use the results of the perspective R&D, carried out outside the corporation, manipulate the monopoly rights on their own and purchased intellectual property objects, receiving worldwide technological rents.

When moving to high-tech development, any industry is beginning to develop innovations at an accelerated pace (Mazzucato, 2018). If the company does not develop innovations, its competitors will do that, and the company will stay behind for one technological cycle. The culture of accelerated innovative growth has common features for all technological industries, although it can change from one company to another. The future of mechanical engineering resides in the new consumer technologies and cloud computing systems. Nonetheless, the largest automobile companies do not master breakthrough solutions quickly.

Automobile construction industry remains one of the most attractive sectors of the world economy. In conditions of high competition, innovation acts as a primary factor providing competitiveness of the automobile industry products between automakers of different countries. Given the above-mentioned details, the relevance of the selected research topic is out of the question.

The article objective resides in studying conditions and factors, identification of models and mechanisms of innovation activity of transnational corporations.

Methods

The study was carried out using the methodological principle of unity of theory and practice, dialectics of general, special and singular, as well as scientific abstraction. The methodological basis of the study included the historical and logical method, methods of quantitative and qualitative comparison (when revealing the cross-cultural features of innovation models in different countries, methods of expert assessment and forecasting) (SPACE-analysis).

While forming strategic alternatives and when choosing a specific development strategy, one uses formal models (model of accumulated experience, product life cycle model, the model of the technologies life cycle, product-market, etc.) and matrix models (model BCG, GE/McKinsey, Shell/DPM, Hofer/Schendel, ADL/LC, SWOT- and SPACE-analysis).

The article will use the SPACE-analysis, grounding on two sets of criteria, for analyzing the strategic state and assessment of further actions for TNC development:

1) internal criterion – efficiency of financial and economic activity;

2) external criterion – an external condition of the enterprise.

The mentioned criteria are characterized by a range of indicators. That is why the SPACE-analysis belongs to the category of complex multi-criteria methods. It provides the possibility to assess the position of the enterprise in the market, analyze a range of parameters of the enterprise's activity and determine the optimal strategy. It should be noted that the basis of the SPACE-analysis method involves a priority modeling, grounding on expert assessments. The feasibility of the use of

the expert assessment method in this study is justified by the following: the strategic analysis in conditions of a high level of uncertainty of the external environment often includes a number of intuitive, analytically unsupported information, aimed at solving problems; the use of the most qualified specialists in the relevant field in the analysis of assessments ensures a certain level of reliability, moreover, this reliability is highly probable, quite acceptable for making decisions in situations of incomplete certainty that constantly happen in a competitive environment; the importance of collective opinions, conclusions, recommendations, and decisions is increasing in the current conditions, although the value of individual qualified estimates in economic activity is not subject to doubts.

When using the SPACE-analysis, one distinguishes four groups of criteria for the enterprise's assessment: financial condition; competitiveness of the enterprise; attractiveness of the industry; environment stability.

When determining the system of criteria, the authors considered the specifics of the enterprise and its production capacity, financial condition, level of competition, and set tasks and objectives. The formulation of the criteria, their assessment, and the definition of the recommended strategy require a thorough knowledge of both the methodology of strategic analysis and the specifics of the industry and business of the enterprise.

Results

The objectives of innovation policies of any enterprise are shaped by many factors, in particular, internal and external factors. Among all external factors, the greatest influence on the innovation of the enterprise, in particular, in terms of promoting scientific and technological progress belongs to the state policy. So, the more the state works for the improvement of the investment and innovation climate, the easier it is for the enterprise to implement innovative policies. The most significant internal factors are the resources of the enterprise and its readiness to innovate in production. It is also worth mentioning the current business trend to reduce production costs since an extremely tough competitive environment determines the need to find methods to keep the level of profit at a sufficient level. All the above-mentioned factors determine the innovative policy of automobile producers.

The automobile manufacturing companies are trying to introduce innovations and be creative to cope with new regulations. They focus on the product design, trying to improve the current characteristics of the industry, and make it more modern and progressive thanks to innovation. They try to find solutions to solving various relevant problems, which leads to the creation, design, and manufacture of hybrid vehicles, and they also combine the use of both minerals and electric energy for making electric vehicles.

To implement these strategies, many companies have decided not to do this separately. Thus, they signed agreements about cooperation with suppliers (for production), as well as with their competitors. For the latter, the main purpose that leads to the adoption of these agreements is the high cost and risk that may arise from the implementation of innovation policies. One can consider it an example of such cooperation when one company transfers knowledge to another one as it occurs between General Motors and Toyota from NUMMI, thanks to which companies were able to generate a new innovation policy.

Cooperation between car manufacturers is becoming an increasingly frequent strategy. Such unions are considered the future for the companies around the world, regardless of their size or the sector they belong to, and they become mandatory, especially when competition grows. The advantage of such transactions in recent years is mainly explained by the increase in competition, without losing autonomy and flexibility, as well as significantly reducing investment in the necessary resources compared to other parameters. Such cooperation at a global scale enables the possibility to efficiently achieve one's own objectives of the innovation policy of a particular company.

Strategic motivation as an innovation policy objective is also important, more important than other types of motivation. Cooperation is based on a strategic component, as it affects the competitive position of partners. That is why companies that previously competed in the market are joining forces in certain projects, for example, Renault and Nissan have combined to produce

cleaner cars, with lower CO2 emission levels, and, thereby, came up to the development of electric cars. There was a similar situation with PSA Peugeot Citroen and Mitsubishi Motor Corporation – they also teamed to design and manufacture electric vehicles.

Based on the experience of modern automobile corporations, it is possible to distinguish the following important factors of the enterprise innovation policy in conditions of the low-carbon economy:

- avoid activities related to over exploitation of natural resources and breaking environmental balance; carry out the necessary research and development works on standardization in the field of ecology;
- introduce, where it is possible, the principle of "he who pollutes, should pay";
- prevent activity, having harmful transboundary ecological influence at a state level;
- consider the environmental interests of the developing countries, taking into account, in particular, the environmental factors in the international trade and cooperation; take measures for the explanation of the environmental policies, attract and assist relevant international organizations with such activity;
- involve the public widely to activity, aimed at protection and saving of environment;
- properly distribute powers (local, regional, federal, national and international) and responsibilities in the fight against certain categories of pollution with consideration of the specifics of the territories that should be protected.

When forming the innovation policy, there is certainly a risk that low-carbon economic conditions will affect growth prospects in individual countries. The implementation process may result in trade restrictions due to unilaterally imposed regulations or adjustments at international prices. Developing countries may suffer more, as they may not have the capacity to enforce the world-wide brutal standards, which in turn may lead to the loss of markets. A decrease in national export capacity could lead to slower growth, lower employment and a deterioration in the foreign trade balance.

Table 1. Factors of innovation activity of the corporations

Group of factors	Restraining factors	Stimulating factors
Techno-economic	Absence of sources of funding, a weak material, technical, and scientific base; domination of the interests of existing production; high economic risk; a lack of demand for products, absence of information about markets, complications and high cost of research and development; the low scientific and innovative potential of the enterprises	Availability if a reserve of financial and material and technical measures, availability of the required economic and scientific and technical infrastructure, development of competition and reduction of a lifecycle duration of resources consuming products, preservation of scientific and technical potential and state support for innovation activity
Organizational-managerial	Sustainable organizational structures, excessive centralization, the conservatism of hierarchical principles of organizational structure, the predominance of vertical information flows; institutional closure, difficulties in intersectoral interactions; focus on established markets; focus on short-term payback; lack of scientific and innovative organizational structures, lack of international cooperation	The flexibility of organizational structures, democratic style of management, the domination of horizontal information flows, indicativeness of planning, possibility to make adjustments, decentralization, autonomy, formation of target problem groups, international scientific and technical cooperation, creation of an innovation infrastructure
Legal	The imperfection of the legal framework on innovation, protection of intellectual property	Legislative measures (benefits, laws) that encourage innovation
Socio-psychological	Resistance to changes that can cause such consequences as the change of status, need for new activities, change of stereotypes of behaviour, existing traditions, fear of uncertainty, fear of responsibility for a mistake, against everything new, an outflow of scientific personnel	Susceptibility to changes, innovation, moral reward, development of conditions of creative work, material incentives.

We think that the innovation policy should be adjusted with consideration of factors that have a direct impact on determining objectives and the definition of the overall strategy of the

enterprise in the direction of innovative development. Table 1 shows a systematized list of factors of the innovation activity, which are grouped as follows: techno-economic, organizational-managerial, legal, and socio-psychological.

Summing up, one should note that significant competition in the global market of automobile makers encourages companies to increasingly use innovative technologies and look for new ways of achieving the highest level of efficiency and profitability. As of today, resources and energy-saving technologies are the most popular areas of innovative development. This is primarily due to the global community's activation in the direction of reducing global pollution, and many countries developed strategies for transition to carbon-free economies.

Given the trends of recent years, the automobile makers should not only introduce innovations, but also effectively manage them with consideration of the environmental norms, requirements, and prospects for the development of low-carbon economies. That is why we think that automobile companies should create and implement environmental management systems as quickly as possible. The companies that already have an appropriate division in structure can apply an environmental-economic rating.

To implement long-term innovative programs, we consider it is necessary to use the following algorithm of their organization:

1) Development of the methodology and documents (regulation base) on the organization of systematic work on the identification of requests for innovation and organization of innovation activity.

2) Formation of a database for technical, production, and technological problems.

3) Formation of channels for attracting potential participants of a problem-solving process.

4) Competitions of the innovative projects.

5) Schools, programs, and courses of innovative management.

6) Organization of consultancy centres, IT-resources, and information bases.

7) Staff selection and formation of project groups for the implementation of the innovation projects in the interests of the enterprise.

8) Formation of the innovation culture at the enterprises of the corporation.

Apart from the assessment of the quantitative indicators of innovations introduction, it is advisable to determine the market position and justify the optimal strategy using SPACE-analysis for the automotive enterprises. The results of the scoring of the key criteria indicators are given in Table 2.

Table 2. Results of the scoring of the key criteria upon the method of SPACE-analysis for the US automobile companies

Criteria	Score, points	Weight	General points assessment (points*weight)
The financial strength of the enterprise (FS)			
Return on equity	6	0.4	2.4
Stability of profit	5	0.3	1.5
Level of financial firmness	4	0.3	1.2
The general assessment of the criterion	X	X	5.2
Competitive ability of the enterprise (CA)			
Share of the enterprise in the market	6	0.3	1.8
Temps of market share growth	4	0.2	0.8
Profitability of product sales	5	0.5	2.5
The general assessment of the criterion	X	X	5,1
The attractiveness of the industry (IS)			
The profitability level of the industry	7	0.5	3.5
Lifecycle stage of the industry	5	0.3	1.5
Industry's growth dependence on the conjuncture	5	0.2	1
The general assessment of the criterion	X	X	6
Stability of the industry (ES)			
Stability of profit	6	0.4	2.4
Level of innovation activity development in the industry	2	0.2	0.4
Marketing and advertising capabilities	5	0.4	2
The general assessment of the criterion	X	X	4.8

After getting general assessments of the key criteria, let us build a vector recommended to the strategy of the enterprise's development in SPACE coordinate system (Figure 1).
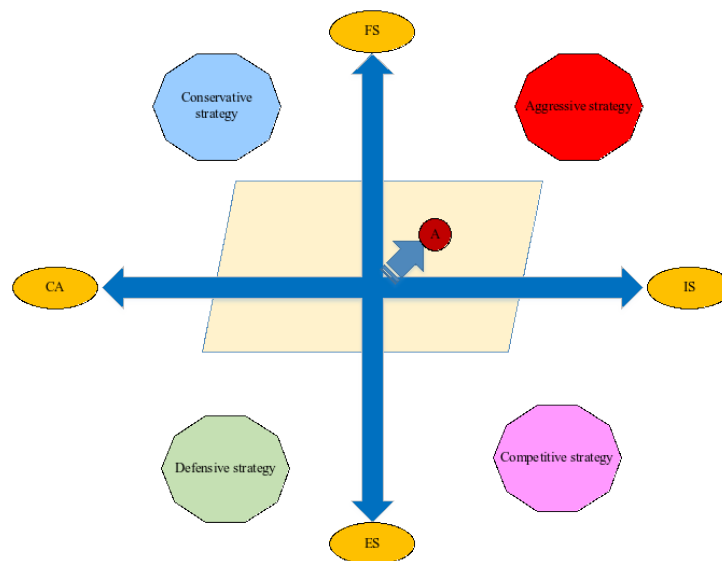

Figure 1. The SPACE matrix for automobile companies

Thus, according to the held analysis, an aggressive strategy is the optimal solution for companies (the point with coordinates A 0.9:0.4).

Active offensive strategy (strategy of leadership) stands for the setting the goal of becoming the first, leading enterprise in a certain area of activity and sales. Typically, even big and powerful enterprises do not risk using it for a wide range of products. As a rule, it is applied to one or several individual products, in the environment providing favorable conditions for holding such an innovative policy (resources, scientific and technological capacity). An active offensive strategy is extremely risky from the point of view of gaining and maintaining market positions. It is usually associated with significant spending of resources.

Discussion

Technological and market leadership grounds on the development of basic and radical innovations (Mihaela and Titan, 2014). The implementation of the strategy of leadership requires a thorough scientific and research support: a wide range of research works in related fields and constant connection with fundamental research; constant review of the most important results of R&D for their introduction in production; immediate changes in funding priorities depending on the expected marketing results. When it comes to the field of research and development, one should form a strong base, the availability of qualified personnel is especially important, as well as the establishment of permanent links between all parts within the innovation process.

When forming their innovation policy, the developed automobile companies should consider the dangers, which appear in relation to non-carbon economies. There is undoubtedly a danger that "green protectionism" will affect the growth prospects in particular countries (Quitzow, 2015). The greening of the global economy could result in imposing trade restrictions due to the imposing regulations or adjustments in international prices on a unilateral basis. There is also a risk from the application of environmental standards, which are generally important for the transition to "a green economy" but could lead to a new form of protectionism.

We think that innovation policies should be adjusted with consideration of all factors of innovation activity, which directly influence the process of objectives determination and the definition of the overall strategy of the enterprise in the direction of innovative development. Significant competition in the global market of automobile makers encourages companies to increasingly apply innovative technologies and look for new ways of achieving the highest level of efficiency and profitability (Schot and Steinmueller, 218; Tonurist, 2015). As of today, resources and energy-saving technologies are the most popular areas of innovative development. This is primarily due to the global community's activation in the direction of reducing global pollution, and many countries developed strategies for transition to carbon-free economies (Vob & Simons, 2014).

For better implementation of the innovative policies of automobile corporations, it is necessary: to strengthen the role of management in the company's administrative and economic management system; consider the consequences that may appear in the course of making management decisions; develop one's own system for assessment of the innovation activity and innovation potential of the company; strengthen control and provide the adherence to the laws of the home base country; stimulate modernization and technical re-equipment following the modern requirements and trends observed from the main competitor companies.

Conclusion

To conclude, one should mention that more effective implementation of the innovation policies of automobile corporations requires taking the following measures: strengthening of the role of management in the company's administrative and economic management system; consider the consequences that might appear during making decisions; develop one's own system for assessing the innovative activity and innovation potential of the company; strengthen control and provide compliance with the laws of the home base country; stimulate modernization and technical re-equipment following the modern requirements and trends observed from the main competitor companies.

The research suggests the use of the technological audit and holding a comprehensive analysis of the scientific and technical block of the company. The authors also offered to develop and introduce the corporate knowledge management systems at the enterprises, which will enable the possibility to introduce innovations more efficiently.

According to the analysis, held by SPACE, an aggressive strategy is an optimal choice for the USA companies, which means the setting of the goal of becoming the first, leading enterprise in a certain area of activity and sales. Typically, this strategy is used to one or several individual products, in the environment providing favourable conditions for holding such an innovative policy (resources, scientific and technological capacity). An active offensive strategy is extremely risky from the point of view of gaining and maintaining market positions. It is usually associated with significant spending of resources.

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PSYCHOLOGICAL AND LEGAL PRINCIPLES OF FORENSIC EXPERT ACTIVITY

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Abstract. Based on the analysis of the history of formation and development of forensic examinations, the author concludes that changes in the procedure for appointing and conducting examinations in criminal proceedings at certain periods of time had a significant impact on the organizational and tactical foundations of this procedure and determined its place in the system of evidence collection. The methodological basis of the study is the general dialectical method of scientific cognition of reality, on the basis of which the examination is considered as a multi-stage, complex and contradictory process of studying certain objects to establish the circumstances to be proved. It is noted that the assessment of an expert opinion is aimed at identifying and eliminating possible errors of an expert (procedural, epistemological, operational) and is a determination of the possibility of using the results of an expert study as evidence and includes the following procedures: formal (logical and procedural) assessment; substantive assessment; questioning of an expert aimed at establishing the circumstances of the expert study, and explanation of the conclusion. In conclusion, the verification of the expert's opinion is carried out after its evaluation and only if there are doubts about its reliability, aimed at obtaining new information regarding the data that was established in the course of the expert study.

Keywords: expertise, expert, source of evidence, opinion, expert error, impropriety of expert opinion.

Introduction

In criminal proceedings, issues often arise that require specialized knowledge to resolve. Therefore, in virtually every case, some kind of expertise is conducted, and this indicates a constant increase in the scientific basis of the evidence procedure. Expertise has become a relevant (and in certain situations, mandatory) means of obtaining evidence for both the prosecution and the defense.

However, in recent years, Ukraine has seen a permanent change in the procedure for appointing and conducting examinations, which has left an imprint on the organizational and tactical foundations of this procedure and led to a slowdown in pre-trial investigation and court proceedings. In this regard, it seems relevant to study the historical aspect of this issue, which will make it possible to more clearly understand how it arose, what stages it went through in its development and what it has become today. Only after that it will become clearer what role the procedure for appointing and conducting an expert examination plays now and what function it should perform in modern conditions.

The Criminal Procedure Code (hereinafter referred to as the CPC) of Ukraine of 2012 with subsequent amendments to it significantly transformed the procedure for conducting examinations and the interaction of participants in criminal proceedings with experts. The adversarial nature of the parties and equal rights to collect and submit evidence to the court were proclaimed (Article 22 of the CPC). This right also applies to the use of specialized knowledge in the form of forensic examination, the results of which play a significant role in proving.

According to Article 243(1) of the CPC of Ukraine, the defense has the right to independently engage experts on contractual terms to conduct an examination. However, the provisions of Art. 93(2) and (3) of the CPC of Ukraine, which define the list of means of collecting evidence for each party, do not provide for such a right of the defense. There is a contradiction that impedes the realization of the principle of adversarial proceedings and gives rise to theoretical discussions on this issue. In this regard, the issues of determining the legal, organizational and tactical basis for conducting examinations in the context of modern legal regulation of criminal proceedings are of particular relevance.

Literature review

The new concept of development of the theory and practice of forensic examination was fully accepted in Ukraine, which contributed to the efficiency of expert activity and was manifested, in particular, in the accreditation of laboratories of research institutions according to the international standard ISO 17025 and the introduction of the accreditation procedure according to ISO 17020.

In accordance with this new paradigm of forensic examination in Ukraine, two areas of forensic development can be distinguished today: improvement of methods of conducting traditional examinations and formation of new types of examinations.

Improving the methods of conducting traditional examinations and improving their quality through the introduction of innovative developments in expert activity is a logical direction for the development of this field of knowledge and the practice of their application in combating crime. First of all, this applies to forensic examinations, some of which deserve consideration from this point of view.

Trace evidence examination of the whole by parts (Foote et. al., 2020). The purpose of this expert study is to establish the identity of any divided object by its parts, when parts (fragments) of this object are material evidence seized during criminal proceedings. The objects of such research may be completely different objects that were divided in any way in the course of a criminal offens and are directly related to it. These can be tools, means and objects of the offens, as well as objects of the environment of the criminal offens (for example, pieces of furniture, the offender's clothing, etc.). In particular, such studies are traditionally relevant in the investigation of road accidents that have signs of a criminal offens (broken headlight diffusers, pieces of varnish and paintwork, etc.). But this applies not only to such objects, but also to narcotic drugs and psychotropic substances.

Handwriting examination (Rao et. al., 2020). Forensic document examination has come a long way in its development. Handwriting examination, as a type of forensic examination of documents, is one of the most complex and involves solving various tasks in criminal proceedings. In particular, today, the issue of examining signatures made with imitation of the signature of the person on whose behalf it is made is quite problematic. It is a question of establishing the fact of signature forgery, as well as establishing (identifying) the person who reproduced the signature of another person, having its sample (forgery "by eye", "by memory", "by sight").

It is emphasized that the study should be conducted in a certain methodological sequence, in two stages: resolving the issue of the authenticity of the signature (its validity) and identifying the executor of a non-authentic signature. Particular attention should be paid to identifying signs of imitation (Iancu, 2019). The identification of such signs is based on the fact that the usual writing process of an adult is automated and excludes conscious control over the execution of each letter or its individual elements. When imitating, however, there is a need to control the writing process when performing letters as a whole and their elements, and therefore de-automation of writing is carried out. This causes slower movements, stopping of writing, which is reflected in the signature made with imitation. Thus, each imitation signature is the result of a change in a person's usual handwriting and an attempt to reproduce the features of someone else's skill.

Ballistic examination (examination of weapons and traces and circumstances of their use) (Fovet et. al., 2020). This type of expertise is perhaps the most dynamic in the development of research methods, due to the emergence of new types of weapons (traumatic, gas, sports, pneumatic, etc.) and the number of their modifications. Their emergence and rapid proliferation in the civilian market has also led to a significant increase in the use of various types of weapons and

their modified copies in the commission of various criminal offenses, which has significantly increased the need for specific expert forensic (ballistic) research. The variety of research objects (weapon samples), in turn, required the development of appropriate expert research methods that would meet the needs of investigative and judicial practice. Therefore, ballistic examination methods are currently being developed and improved depending on the type of weapon, ammunition used and other aspects that determine the specifics of the tasks of expert ballistic research.

Portrait examination (Maloku et. al., 2021). A portrait examination is appointed in situations where the investigating authorities or the court are unable to otherwise reliably identify a person during the search for missing persons or criminals, examination and investigation of an unidentified corpse, to determine whether identity documents belong to their owner and other circumstances that are essential to criminal proceedings.

Portrait examination is one of the traditional types of forensic examinations. The methodological foundations for its performance have been sufficiently developed, and considerable experience in conducting such examinations has been accumulated. A methodological study was carried out to solve a number of complex expert situations: the study of multi-angle portraits; photographic portraits of persons photographed with a significant time gap; retouched photographs.

In recent years, new carriers of portrait information have emerged: photographs taken with the help of digital technologies, printing frames of video recordings from CCTV cameras (Goldenson et. al., 2022). Visual products based on photographs of specific individuals began to be submitted for forensic portrait research. In this regard, experts solving the task of identifying persons based on the appearance depicted on such portrait information media increasingly began to experience methodological difficulties. Obviously, such objects of forensic portrait examination require new approaches to their research and certain adjustments to the methodological support of this type of examination.

In recent years, Ukrainian scholars have paid some attention to the preparation and conduct of examinations in the context of the updated criminal procedure legislation. However, some of the formulated provisions on the legal, organizational and tactical grounds for conducting examinations are very incomplete, and some need to be clarified. In particular, the issues of using forensic examinations in adversarial criminal proceedings, independent engagement of an expert by the defense during the pre-trial investigation, preparation of forensic examination, its stages and evaluation of the expert's opinion seem to be problematic. All of this necessitates a rethinking of many provisions and recommendations regarding the moral and legal grounds and organizational and tactical foundations for conducting examinations.

Methods

The methodological basis of the study is the general dialectical method of scientific knowledge of reality, on the basis of which the examination is considered as a multi-stage, complex and contradictory process of studying certain objects to establish the circumstances to be proved. It is also used as a scientific research tool:

• Methods of logic (analysis, synthesis, induction, deduction, analogy, etc.) - when studying regulations, materials of criminal proceedings, concepts, authors' points of view on certain issues that were part of the subject matter of the study;

• Systemic and structural method - when considering the components of the preparation of the examination, its stages, evaluation of its results and place in the system of evidence;

• Historical and legal method - when analyzing the history of the formation and development of forensic examinations as a means of obtaining evidence in criminal proceedings;

• Comparative legal method - when analyzing the norms of criminal procedure legislation of Ukraine and other countries;

• Sociological methods (surveys, expert opinions) - to collect additional information on the specifics of the decision to conduct an expert evaluation.

The legal framework for this study is based on the Constitution of Ukraine, judgments of the European Court of Human Rights, criminal procedure legislation of Ukraine and other countries, resolutions of the Plenum of the Supreme Court of Ukraine, and departmental regulations.

Results

Article 92 of the Constitution of Ukraine stipulates that the principles of forensic examination are determined exclusively by the laws of Ukraine.

The main legal acts regulating the participation of an expert or specialist in criminal proceedings, as well as the procedure for conducting an expert examination, are:

◦ The Criminal Procedure Code of Ukraine (hereinafter - the CPC of Ukraine);

◦ The Law of Ukraine of February 25, 1994 "On Forensic Examination";

◦ The Law of Ukraine of February 22, 2000 "On Psychiatric Care";

◦ Order of the Ministry of Justice of Ukraine No. 53/5 of 08.10.1998 approving the "Instruction on the appointment and conduct of forensic examinations and expert studies and Scientific and Methodological Recommendations on the preparation and appointment of forensic examinations and expert studies";

◦ Order of the Ministry of Health of 08.05.2018 No. 865 "On Approval of the Procedure for Conducting Forensic Psychiatric Examination";

◦ And other departmental Rules, Instructions and applicable regulations.

An expert opinion is only one of the sources of evidence in criminal proceedings and does not have a predetermined force or any advantage over other evidence. It is not binding on the initiator of the examination and the court, but disagreement with the expert's opinion must be motivated in the relevant decision, ruling, or verdict (Article 101(10) of the CPC of Ukraine).

However, as the case law shows, the courts treat expert opinions with great confidence as a result of the use of scientific and technological progress. Therefore, during the trial, the debate between the parties to the criminal proceedings often focuses on the expert's opinion. This is especially true for the defense, which tries to find mistakes or omissions of the investigator when appointing the examination, as well as the expert when conducting it.

Expert errors. It is believed that an expert, like any other person, may make mistakes in the process of conducting an examination and preparing a conclusion based on its results, which may render this evidence void.

Of course, expert mistakes should be distinguished from deliberately false expert opinions, which are subject to criminal liability under Article 384 of the CPC of Ukraine. An expert's opinion is false if it contains a deliberate misrepresentation of facts, incorrect assessment, or conclusions not based on the materials. But there may also be an honest mistake on the part of the expert. It is this feature that distinguishes an expert error from a crime against justice committed by an expert - the deliberate presentation of false information in the opinion.

There are three classes of expert errors that can lead to the rejection of an expert opinion as a source of evidence: procedural expert errors; epistemological expert errors; operational (actionable) expert errors.

Expert errors of a procedural nature. These are errors that consist in the expert's violation of the procedural regime and the procedure for conducting the examination:

1) expert's going beyond his/her competence (resolving legal issues);

2) manifestation of expert initiative in forms not provided for by law (for example, unreasonable going beyond the scope of the research subject and questions posed;

3) substantiation of conclusions not by the results of the study, but by the materials of the criminal proceedings (the expert has the right to familiarize himself with the case file, but this right is limited to the subject of the examination);

4) independent collection of objects and materials of the examination (for example, obtaining handwriting samples of the person;

5) making unauthorized contacts with interested parties, accepting an order for an expert examination and materials from unauthorized persons;

6) non-compliance due to ignorance of procedural requirements for an expert's opinion (for example, the absence of information about the expert in the introductory part of the opinion or the absence of such statutory details as a detailed description of the objects submitted for examination).

It should be noted that procedural expert errors are often the result of investigative and judicial errors related to the preparation and appointment of forensic examinations (for example, when questions to the expert are incorrectly formulated).

Epistemological expert errors. This class of errors includes those caused by the complexity of the process of expert knowledge. They can be made in determining the essence, properties, characteristics of the objects of expertise, the relationship between them, as well as in assessing the results of cognition, the results of expert research, and their interpretation. In the literature, they are divided into logical and substantive.

Logical fallacies are associated with violations of the laws and rules of logic in the act of thinking, incorrect application of logical techniques and operations.

For example, an example of such a mistake is the confusion of causation with a simple sequence in time or the justification of a thesis with arguments from which this thesis does not logically follow. Such errors are usually associated with different logical operations and types of inferences. Thus, there are errors in the distribution of concepts, in the definition of concepts, errors in inductive inference, errors in deductive inference, errors in proof (in relation to a thesis, argument, demonstration).

Other formal and logical errors found in expert opinions are also cited in the professional literature, for example (Slack, 2020):
◦ the conclusion is not a logical consequence of the expert's research;
◦ there is no logical reasoning behind the sequence of stages of expert research;
◦ conflicting expert opinions on the same subject;
◦ the conclusion is internally contradictory;
◦ the expert's conclusions are not sufficiently motivated.

Subjective errors in expert opinions differ from logical errors in that they are caused not by a violation of the rules of logic, but by ignorance of the subject matter. Subject matter errors arise from the expert's distorted view of the relationship between objects of objective reality. Expert errors of this kind in the content of an expert opinion can be noticed only by a specialist - someone who is well versed in the subject matter of the study. In practice, there are cases of using to substantiate an expert opinion the features identified during the study of one carrier object by experts of different specialties (or by one expert with special knowledge of different specialties), which cannot form an aggregate, but must be analyzed separately for each type (genus) of expertise.

Operational expert errors. Errors of this class are related to operations performed by the expert (procedures) and may include the following:
1) in violation of a certain sequence of expert procedures;
2) in the improper use of technical means of research or the use of unsuitable means (for example, the use of equipment that has not been tested for a long;
3) in obtaining and using low-quality comparative material, etc.

In many cases, operational expert errors are accompanied by substantive errors and vice versa. Since both of these types of expert errors are related to professional competence, they can usually be detected only by persons with relevant specialized knowledge.

These provisions on the concept of expert errors and their classification are extremely important for assessing an expert's opinion, its relevance and admissibility as a source of evidence both during the pre-trial investigation and in court proceedings.

The elimination of these contradictions in the legal regulation of equality of the parties is seen in bringing the wording of Article 243 of the CPC of Ukraine regarding the right of the defense to conduct an expert examination in line with the provisions of Article 93 of the CPC of Ukraine. The defense party should be granted the right not only to initiate an expert examination, but also the right to exercise legal control over the conduct of expert examinations by the prosecution.

To eliminate the existing contradictions, the following is proposed:

1) To restate part 1 of Article 242 of the CPC of Ukraine in the following wording "The examination shall be conducted by an expert or experts engaged by the investigator, prosecutor or investigating judge at the request of the defense..." and hereinafter.

2) To restate Article 243 of the CPC of Ukraine in the following wording: "An expert shall be engaged if there are grounds for conducting an examination upon a reasoned decision of the investigator, prosecutor or upon a ruling of the investigating judge at the request of the defense. When an expert is engaged by an investigator or prosecutor, they are obliged to notify the defense and familiarize the suspect in the presence of his or her defense counsel with the decision and explain his or her rights: to challenge the expert; to file a motion to appoint an expert from among the persons specified by him or her; to file a motion to raise additional questions before the examination; to give explanations to the expert and submit additional documents; to familiarize themselves with the examination materials and the expert's opinion after the examination; to file a motion for a new examination. The investigator or prosecutor shall draw up relevant protocols on the familiarization of the suspect in the presence of his/her defense counsel with the decision to engage an expert for the examination, as well as on his/her familiarization with the expert's opinion after the examination, in compliance with the requirements of Article 104 of this Code."

3) To restate part 1 of Article 244 of the CPC of Ukraine in the following wording: "The defense has the right to apply to the investigating judge with a request for an expert examination if: an expert is required to resolve issues that are essential to the criminal proceedings, but the prosecution has not engaged an expert; the expert engaged by the prosecution has been asked questions that do not allow for a complete and proper conclusion on the issues for which an expert examination is required; there are sufficient grounds to believe that the expert engaged by the prosecution, due to lack of knowledge, bias or other reasons, will provide or has provided an incomplete or incorrect.

Conclusion

In criminal proceedings, an important element of ensuring the practical implementation of the adversarial principle is the right to use expertise to prove their vision of the situation related to a criminal offense, both for the prosecution and the defense. This is facilitated by the possibility of conducting an examination in non-governmental institutions by independent experts. Enshrining the equality of the parties in the use of specialized knowledge has led to the emergence and use of the term "competitive (alternative) examination", which is a manifestation of the principle of adversarialism in criminal proceedings.

Adversariality is studied by scholars in various aspects, namely: as a principle (basis) of criminal proceedings; as a procedure for building a process; as a set of principles of justice; as a tool (method) for investigating the circumstances of a case; as a legal method for ensuring the legality of procedural activities.

In this case, adversariality is studied in the context of determining the role of forensic examinations and their legal regulation in adversarial criminal proceedings.

It seems most productive to understand adversariality as a structure of criminal proceedings that creates optimal conditions for establishing the truth and, ultimately, fulfilling the tasks of criminal justice.

Adversariality is an integral part of the cognitive process, a method of finding evidence, examining it, a way for participants in the process to defend their position in the case, and to exercise their rights and obligations to establish the truth. At the same time, under the current legislation, the defense cannot be considered as an equal subject of pre-trial investigation with the prosecution, as it has no right to conduct investigative and search actions on its own (only to initiate them).

Drawing attention to this, Rocchio, 2020 emphasizes that the defense counsel is in an unequal position compared to the prosecution, as he is deprived of the right to perform investigative (search) actions. The author sees the elimination of this drawback in the recognition of explanations of participants in criminal proceedings, which the defense counsel has the right to receive, as sources of evidence, stating that it is too early to talk about proper competition and equality of the parties.

Obviously, it is a question of equalizing the defense with the prosecution in the right to conduct investigative and search actions, which seems to mean nothing more than the emergence of another independent subject of pre-trial investigation. However, two parallel pre-trial investigations with equal rights of the two subjects (including the right to use coercion) will inevitably lead to confusion and destruction of the entire criminal proceedings system.

Competitive (alternative) examinations are expert studies initiated by opposing parties to criminal proceedings (prosecution and defense) and conducted by both state and non-state expert institutions (experts).

In this case, each party aims to obtain, based on the use of specialized knowledge, evidence of its legal assessment of the circumstances of the criminal offense under investigation.

Such examinations are quite common in Europe and America. For example, in the United States (Texas), each of the parties (prosecution and defense) may invite an expert hired by them to court to testify as a witness for a particular party (Neal et. al., 2019). Since the services of such an expert are paid for by the party that hired him or her, the conclusions of such an expert and their objectivity may be questioned, which is the basis for court debate (discussion). In this case, the court makes a decision based on the assessment of competitive examinations and other evidence submitted by the parties.

In this case, the court evaluates expert opinions in terms of the scientific validity of the expert research, its completeness and reliability. The institute of private expertise also exists in Germany, where it competes with state expert institutions in criminal proceedings. Competition in expert activity is also used in the criminal procedure of France (Allan, 2020). However, in this country, only the court has the right to appoint two independent (from the parties) experts who are included in the relevant state register.

In other words, alternative examinations are not initiated by the parties to criminal proceedings, but only by the body conducting the proceedings. This procedure is considered to be a guarantee of obtaining objective and reliable evidence, which is an expert opinion.

Thus, the prosecution and the defense may simultaneously submit to the court two opinions prepared by different experts on the same issues. Of course, if the defense engages an expert on its own or at its request, the investigating judge may also put questions to the expert that differ from those of the prosecution. This circumstance is important for criminal proceedings, since such an opportunity ensures the completeness of the study of all material objects, phenomena and processes that contain information about the circumstances of the criminal offense.

Of course, the experience of using alternative examinations in criminal proceedings deserves to be studied and used in domestic criminal proceedings. In view of this, it is interesting to note the opinion of Otto & Heilbrun, 2019, that examinations appointed by the court can be considered "neutral" examinations, and those conducted by experts involved by the parties to the process - "not quite neutral" examinations.

It seems that this vision of the distribution of expertise reflects the experience of using expertise in the adversarial process of countries and its use in Ukraine. However, this does not mean that the experts engaged by the parties to the criminal proceedings will necessarily be biased and their expert opinions will be unfounded. However, practice shows that Ukrainian courts are more inclined to trust "neutral" experts and are willing to listen to comments on the conclusions of experts engaged by the parties.

Conclusion

Based on the analysis of the history of formation and development of forensic examinations, the author concludes that changes in the procedure for appointing and conducting examinations in criminal proceedings at certain periods of time had a significant impact on the organizational and tactical foundations of this procedure and determined its place in the system of evidence collection.

Ukrainian legislation has made significant changes to the legal regulation of expert examination, granting the defense the right to independently engage experts on contractual terms to conduct an expert examination. At the same time, the defense has the right to apply to the investigating judge with a request to conduct an expert examination at the pre-trial investigation stage.

Forensic examination plays an extremely important role in proving a case as it is perceived as an achievement of scientific and technological progress. Therefore, in the context of adversarial proceedings, all components of forensic examination (its type, stages of conduct, methodology, competence and qualifications of the forensic expert) are subject to careful analysis by the parties.

At present, a qualitatively new model of expertise is being formed in Ukraine, as well as throughout the world, characterized by the introduction of standardized terminology, development of indicators of the reliability of examination results, neutralization of expert subjectivity, improvement of existing and development of new research methods, accreditation of forensic institutes and laboratories, etc. This process is reflected in two directions - improvement of methods of conducting traditional examinations and formation of new types of examinations (molecular genetic; polygraph examination; military examination; examination of intellectual property, etc.).

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ASSESSMENT OF THE EFFICIENCY OF INVESTMENTS ATTRACTION AS A CONDITION FOR SUSTAINABLE DEVELOPMENT OF THE COMPANIES

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Abstract. The article offers a new solution to the scientific task – improvement of the already existing and development of the new provisions on economic assessment and regulation of the mechanisms on investments attraction to the company. In the course of the research, one improved the method of determining the viability of regulation of the mechanisms of the investments attraction to the enterprise; through the use of which, one can hold an analysis of the dependence of the bounding change in the volume of attracted investments for a certain mechanism on simultaneously the bounding change in duration and the cost of its use. The use of this method enables the possibility to determine whether the enterprise will be able to timely attract the planned volume of investments. The improved mathematical instrumentarium on determining the viability of regulation of the investments attraction mechanisms grounds on the formation of the power function of the dependence of the attracted investments volume on duration and cost of the investments attraction process. This function forms a figure in three-dimensional space, based on the volume change of which, it is possible to determine the dependence of the change in the volume of investments that the enterprise attracted on the cost of time and costs needed for the implementation of this process. The obtaining of power coefficients was carried out in two ways: the method of iterations and the method of achievements of Lagrange. The improved method of determining the viability of regulation of the investments attraction mechanisms can be used by employees of the analytical departments at the enterprises as well as by managers, maintaining investments activities. This method is implemented during the process of investments attraction and makes it possible, at early stages, to identify the shortcomings of the mechanisms, used by the recipient enterprise.

Keywords: investments; efficiency; sustainability; investments attraction; mechanism.

Introduction

The success of companies' functioning significantly depends on the potential capabilities of timely attraction of the necessary volume of capital for implementation of the planned projects, the achievement of the set objectives, etc. The investments for the company are one of the most significant factors of its long-term economic development. Therefore, the use of the investments attraction mechanisms is a crucial component for the successful functioning of the company. It is investments that may serve as the source of resources for the improvement of the financial and economic state of the company, increasing its market share, the introduction of innovative products, creation and use of the competitive advantages, etc.

Quite often, the company's own resources act as the main source of investments (Wang etc., 2014; Duwe & Rocque, 2017; Li etc., 2017). This is due to the instability of the economic and

political environment of their functioning, as well as the lack of effective tools for interaction with investors. Thus, there is a need for the development of the new ways of cooperation between the recipients and capital donors with consideration of modern trends.

Literature review

Successful formation and use of the investment attraction mechanisms will make it possible for the companies to timely attract the necessary volume of capital, which will increase their competitiveness in conditions of an unstable external environment (Kucharcikova etc., 2018; Huang & Pearce, 2015; Yingjian etc., 2016). This will also provide the companies with the possibility of long-term economic development, entry into the new markets, creation, and implementation of new innovative and competitive products.

The process of attracting investments to the enterprise is a complex and extensive sequence of continuous use of elementary mechanisms of different types. Different processes of investments attraction can manifest themselves as different derivative mechanisms (Junkes etc., 2015; Bardazzi & Ghezzi, 2018; Owen & Mason, 2017).

The elements, interacting within the mechanisms of investments attraction, are characterized by the subjective character of reality assessment, and, therefore, the decisions of an investor, recipient, and other intermediaries involved in the process of investments attraction, are determined by the perceptual properties of their consciousness, experience, and information they possess (Decramer & Vanormelingen, 2016; Joghee etc., 2020).

The investment attractiveness of the recipient is a significant factor, affecting the success of the investments attraction process. There are many approaches to determining the level of investment attractiveness of the enterprise in the scientific literature (Pot, 2019; Skrodzka, 2015). Nonetheless, they are all presented based on a separate, segmental analysis of factors, affecting the success of the investments attraction process. It is difficult to predict which system the investor uses for making decisions. Thus, it is almost impossible to determine the factors he will consider as well as the methods he will use to assess their influence.

The research objective resides in the improvement of existing and development of new theoretical and methodological-and-applied provisions on the economic assessment of investments attraction into the company.

Methods

To present a method for determining the viability of regulation of the mechanisms for attracting investments in a company, it is necessary to provide an equation of dependence that will be used for the analysis of the dependence of the volume of attracted investments on the cost and duration of the investments attraction process (Lai etc., 2020; Guo etc., 2016).

It is worth noting that even though the application of linear dependence is easier in practice, its use is complicated by the process of search for the linear coefficients. Of course, the introduction of these coefficients can be considered unreasonable as the determination of the inequalities of the relations between them can be carried out through the usual least-squares method for an array of log values. Nonetheless, it will make it impossible to calculate the relative change of the three-dimensional figure "volume of attracted investments (I) – duration of the investments attraction process (T) – the cost of the investments attraction process (V)," which makes it impossible to assess the bounding volume of investments, accounting for the unit of money and expenditures during the process of investments attraction. Therefore, it is advisable to consider the possibility of the use of power dependence when forming the equality of the equation (1).

Let us give the equation of power dependence in its initial form:

$$I(T,V) = b_0 T^{b_1} V^{b_2} \tag{1}$$

where b_0, b_1, b_3 – parameters of power dependence.

To obtain the parameters of power dependence, it is necessary to transform it through taking logarithms:

$$\ln(I) = \ln(b_0) + b_1 \ln(T) + b_2 \ln(V) \tag{2}$$

In practice, one will use the following equation:

$$\exp[\ln(I)]=\exp[\ln(b_0)+b_1\ln(T)+b_2\ln(V)] \tag{3}$$

$$\left. \begin{cases} I^{\frac{1}{\alpha}}=b_0 T^{\frac{b_1}{\beta}} V^{\frac{b_2}{\chi}} \Rightarrow \exp\left[\frac{1}{\alpha}\ln(I)\right]=\exp\left[\ln(b_0)+\frac{b_1}{\beta}\ln(T)+\frac{b_2}{\chi}\ln(V)\right] \\ \frac{1}{\alpha}\ln(I)=\ln(b_0)+\frac{b_1}{\beta}\ln(T)+\frac{b_2}{\chi}\ln(V) \end{cases} \right\} \Rightarrow$$

$$\Rightarrow \frac{1}{\alpha}\sum_{n=1}^{N}\ln(I_n)-\frac{b_1}{\beta}\sum_{n=1}^{N}\ln(T_n)-\frac{b_2}{\chi}\sum_{n=1}^{N}\ln(V_n)=N\ln(b_0) \tag{4}$$

where N – the number of observations over the values of volume of the attracted investments, duration, and the cost of the investments attraction process.

Thus, it is possible to form a system of linear equations, for which the sought coefficients α,β,χ will become solutions:

$$\begin{cases} y_1\frac{1}{\alpha}+y_2\frac{1}{\beta}+y_3\frac{1}{\chi}=Y \\ y_1'\frac{1}{\alpha}+y_2'\frac{1}{\beta}+y_3'\frac{1}{\chi}=Y' \\ \frac{1}{\alpha}\sum_{n=1}^{N}\ln(I_n)-\frac{b_1}{\beta}\sum_{n}^{n}\ln(T_n)-\frac{b_3}{\chi}\sum_{n}^{N}\ln(V_n)=N\ln b_0 \end{cases} \tag{5}$$

Based on the coefficients $y_1,y_2,y_3,y_1',y_2',y_3'$, one sets the initial conditions, under which one looks for one of the solutions of the equation system (5). Herewith, one also considers the values Y,Y', which are also set before solving the system of equations.

The formation of a system of equations (5) by the Lagrange achievement method is a partial case of the implementation of the above-given method of determination of the coefficients α,β,χ. Obtaining an equations system in this way starts with the selection of a certain parameter L, which is the sum of the values α,β,χ (this value is selected randomly, its choice does not affect the result as the equation obtained by implementing this sequence will be analyzed in terms of the relationship between the parameters α,β,χ).

$$\begin{cases} \alpha+\beta+\varphi+0+0=L \\ \alpha\sum_{j=1}^{N}I_j+\beta\sum_{j=1}^{N}T_j+\chi\sum_{j=1}^{N}V_j+0+0=0 \\ 2\alpha Var(I,I)+\beta 2Cov(I,T)+2\chi Cov(I,V)-l_1\sum_{j=1}^{N}I_j-l_2=0 \\ 2\alpha Var(T,I)+\beta 2Cov(T,T)+2\chi Cov(T,V)-l_1\sum_{j=1}^{N}T_j-l_2=0 \\ 2\alpha Var(V,I)+\beta 2Cov(V,T)+2\chi Cov(V,V)-l_1\sum_{j=1}^{N}V_j-l_2=0 \end{cases} \tag{6}$$

where $Var(I,I)$ - the variation of the volume of the attracted investments; $Cov(I,T),\dots,Cov(V,T)$ - paired covariance of values of the attracted investments volume, duration, and cost of the process of their attraction; l_1,l_2 - products of Lagrange.

The next stage will involve the solution of the equations system (6) and obtaining a power dependence of the volume of attracted investments on the duration and cost of the process of their attraction. After determining the equation of this dependence, one determines the relative change in

the three-dimensional figure "the volume of attracted investments – the duration of the process of investments attraction – the cost of the investments attraction process." To do this, it is necessary to calculate a certain double integral based on the obtained equation of dependence between the investigated indicators:

$$I_D = \iint I(T,V) = \iint (b_0 T^\delta V^\varepsilon) dT\, dV, D \notin T', V'$$
$$T' \in [T_1, \ldots, T_e];\ V' \in [V_1, \ldots, V_e];\ \delta = \frac{\alpha b_1}{\beta};\ \varepsilon = \frac{\alpha b_1}{\alpha} \tag{7}$$

where I_D - the volume of the sector of the figure, which is formed in three-dimensional space by the parameters under investigation.

After integrating them, we get:

$$I_D = \iint_D I(T,V) = \iint_D (T^\delta V^\varepsilon) dTdV = b_0 \int_T \left(\int_V (T^\delta V^\varepsilon) dV \right) dT =$$

$$= b_0 \int_T T^\delta \frac{V^{\varepsilon+1}}{\varepsilon+1} \Big|_{V_1}^{V_2} dT = b_0 \frac{V^{\varepsilon+1}}{\varepsilon+1} \Big|_{V_1}^{V_2} \frac{T^{\delta+1}}{\delta+1} \Big|_{T_1}^{T_2} = b_0 \left(\left[\frac{V^{\frac{\alpha b_1}{\beta}+1}}{\frac{\alpha b_1}{\beta}+1} \right]_{V_1}^{V_2} \right) \left(\left[\frac{T^{\frac{\alpha b_2}{\chi}+1}}{\frac{\alpha b_2}{\chi}+1} \right]_{T_1}^{T_2} \right) \tag{8}$$

The obtained volume values are analyzed with the use of formula 1, based on which, one determines the viability of regulation of the mechanisms for the attraction of investments in the company.

Results and Discussion

The outcome of the investments attraction mechanisms can be determined based on their economic assessment. Nonetheless, sometimes in the process of the application of the mechanisms, one faces the need for determining the appropriateness of their regulation based on the latest information. This circumstance is especially relevant when the recipient enterprise, after the launch of the investment attraction process, found out that it can take place with deviations due to the possible influence of factors, which were not considered during economic assessment.

Table 1. Natural logarithms of average values of investments volume and values of the investments attraction process cost

Duration of the investments attraction process	The cost of the investments attraction process	The volume of attracted investments
0	7.090077	6.907755
0.693147181	7.17012	7.600902
1.098612289	7.272398	8.006368
1.386294361	7.185387	8.29405
1.609437912	7.192934	8.517193
1.791759469	7.352441	8.699515
1.945910149	7.489412	8.853665
2.079441542	7.090077	8.987197
2.197224577	7.196687	9.10498
2.302585093	7.349874	9.21034
2.397895273	7.275865	9.305651
2.48490665	7.377759	9.392662
2.564949357	7.438384	9.472705
2.63905733	7.495542	9.546813

Notes: the duration of the process corresponds to the sequence numbers of the months during which one carried out the observation (01.12.2021 – 28.12.2022)

The solution to this problem is possible based on the forecasting the results of the application of the mechanisms for determining the viability of their regulation.

The choice of the starting parameters takes place until one finds a solution, which will meet the condition, specified by the third equation of the equations system (5). Let us give an example of coefficients α, β, χ calculation for the Volkswagen company, based on the data from Table 1.

Let us provide a graphical illustration of the relationship between natural investments (Figure 1).
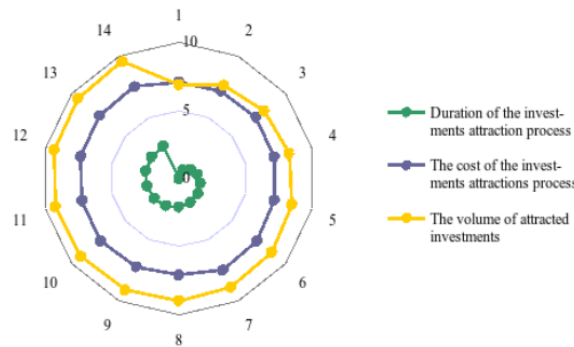

Fig. 1. The spectrogram of natural logarithms of average values of investments volume and the value of the investment attraction process cost

Let us make further calculations. Based on the method of the smallest squares, we get:

$$\ln(I) = 6.487 + 0.977 \ln(T) - 0.89 \ln(V) \tag{9}$$

The correlation takes the form:

$$\frac{131.989}{\alpha} - \frac{34.93}{\beta} - \frac{8.36}{\chi} = 97.567 \tag{10}$$

May the starting conditions be: $y_1' = 1, y_2' = 1, y_3' = 1$, with all other coefficients amounting to zero. Let us set the number Z as the one amounting to 0,22, the number Z' as the one amounting to 1.

Let us write down the equality (2) with consideration of the obtained coefficients:

$$0.22 \ln(I) = 6.487 + 0.977 \ln(T) - 0.89 \ln(V) \Rightarrow$$
$$\Rightarrow \ln(I) = 33.352 + 5.054 \ln(T) - 0.264 \ln(V)$$

Let us write the equality:

$$\exp[\ln I)] = \exp[33.352 + 5.054 \ln(T) - 0.264 \ln(V)]$$

Let us draw the equality of dependence of the investments volume on the duration and cost of the investments attraction process:

$$I = 33.352 \times T^{5.054} \times V^{-0.264}$$

The obtained power dependence reflects the nature of the relationship between the volume of attracted investments and the duration and cost of the investments attraction process. Nonetheless, the parameters set at the beginning are not the only solution for the system of equations (5). Without the change of the coefficients of the first and second equation, let us change the value of a single parameter – the number Z. In this case, we can obtain other solutions. Thus, this parameter can be selected in such a way that the resulting equation reflects the sought trend.

Let us write the equations (2) and (3) with consideration of the obtained coefficients:

$$\ln(I) = 6.82 + 0.957 \ln(T) + 0.007 \ln(V)$$

$$\exp[\ln I)] = \exp 5.82 + 0.957 \ln(T) + 0.007 \ln(V)]$$

$$I = \exp(6.82) \times T^{0.957} \times V^{0.007}$$

Thus, based on the held calculations, one can sum up that $\alpha(0.91) < \beta(0.92)$, and, therefore, the time component is revalued, the enterprise should increase the duration of the process of investments attraction, but, at the same time, consider the possibility of its cost reduction.

Thus, the sequence of implementation of the method of determining the viability of regulation of the mechanisms for investments attraction to the enterprise is as follows:

1. Obtaining the equation of the volume of attracted investments on the duration and cost of the investments attraction process.

2. Determination of volumes of sectors of the three-dimensional figure "volume of attracted investments – the duration of the investments attraction process – the cost of the investments attraction process".

3. Calculation of the relative change in the volume of sectors of the three-dimensional figure "volume of attracted investments – the duration of the investments attraction process – the cost of the investments attraction process".

4. Based on the application of the equation (1), one makes a decision about viability or unreliability of regulation of the mechanisms for investments attraction to the enterprise.

The nonlinear nature of the given dependencies is inherent to them due to various reasons. The main one is that the participants of the process of investments attraction are subjects, possessing an ability to think abstractly, namely such their features as work experience with investors, personal qualities, an ability of efficient communication, reputation in the world of business, etc.

A three-dimensional representation of the relationship between the volume of attracted investments and the cost and time, involved in the process of investments attraction determines the optimal directions for cheapening or reduction of the duration of this process. Thus, the enterprise, analyzing the process of investments attraction, determined that their volume grows faster due to an increase in the cost of this process or vice versa – due to the increase in duration. This makes it possible to plan the procedure for the implementation of mechanisms for investments attraction in such a way that it corresponds as accurately as possible to the planned tasks that the recipient enterprise sets for itself, starting with investments attraction. Therefore, it is quite possible that the change of the mechanisms list and their application will happen in the process of investments attraction, which stands for the regulation of mechanisms.

Conclusion

The main idea, based on which one formed the mathematical instrumentarium, resides in the fact that the interaction of the enterprise and the investor takes place in a non-linear form. Its result is influenced by various kinds of subjective factors, the influence of which can manifest itself, in the temporal aspect, temporarily and not predictably. Therefore, it is appropriate to analyse the functions of boundary change of the volume of attracted investments from the duration and the cost of the investments attraction process.

This is because the increase in the volume of attracted investments with each additionally used mechanism should take place faster than the increase in consumption of time and costs for the implementation of this mechanism. The article provides an analysis of the function of the change of the growth rate of attracted investments volume from the duration and the cost of the process of their attraction. This approach is not unique and can be used for the analysis of both investment cash flows at the enterprise and during the study of any other cost flows in the economic systems and structures. The article highlights a method of feasibility forecasting for regulation of the mechanisms of investments attraction to the enterprise, which is the peculiarity of this study.

The directions for further research include the development of strategies for implementation of the mechanism of the companies investments attraction, analysis of efficiency assessment of these strategies, and formation of the appropriate implementation instrumentarium.

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