CONTENTS

Vol. 3, No. 1, 2016

UDC 336.16

V. Ya. Brych
Doctor of Economics, Professor,
T. Artemchuk,
Ternopil National Economic University, Researcher

MODERN APPROACHES TO IMPROVING MECHANISMS OF ELECTRIC POWER INDUSTRY DEVELOPMENT

Abstract. The paper investigates scientific foundations and practical importance of improving the mechanisms of state regulation of the electric power industry of Ukraine as a natural monopoly. The author offers a solution of the task of identifying the functional characteristics of natural monopolies as market structures, identifies key approaches to improve the mechanisms of state regulation of electric power producing industrial enterprises as natural monopolies, provides an analysis of institutional and legal framework of their management, and clarifies the main contradictions of their demonopolization. The work analyzes the essential features of natural monopolies and defines conceptual approaches to business transformation of natural monopolies.

Keywords: state regulation of natural monopolies, fuel and energy complex, demonopolization, strategic development, transformation.

Background research

The development of market economy reforms in Ukraine reinforces monopolistic tendencies resulting from the law of profit maximization. Competition that ensures dominant position of certain economic entities in the market together with concentration of production act as the driving force. The development of electric power industry in Ukraine is quite contradictory, inconsistent and is accompanied by increased risks for state governance, business and civil society. In general, electric power producing industry in Ukraine develops by inertia, and being not reinforced with the necessary investments, it retains its management and tariff principles inherited from the past. Progressive development of the industry is stifled by imperfect legislation that does not meet modern requirements.

At the same time, taking into account the European aspirations of Ukraine, its state regulation of natural monopolies (NM) and the quality of their services to population and other entities must comply with applicable European standards regarding tariff policy, service levels, safety, environmental protection and so on. All these facts call for structural changes in the electric power industry sector. Given its strategic importance, the goal of reform is to bring the industry into line to ensure sustainable development of country's economy as well as its social sector.

Features and peculiarities of reforming the electricity sector are explored by the following scientists: C. Arinin, V. Barinov, E. Volkov, D. Volfberg, V. Zolotukhin, L. Eremin, J. Keith, G. Kovalev, V. Kotler, J. McKenzie, G. Martirosyan, and in Ukraine by V. Baryakhtar, A. Biryukov, A. Bittner, A. Bondarenko, E. Borschuk, M. Virchenko, V. Kukhar, O. Kucherenko, S. Nalyvaychenko, G. Palshyn, I. Plachkov, V. Saprykin, P. Sereda, V. Shevchenko, A. Shidlovskii, A. Chemerys and others. According to the results of their research it can be asserted that the effectiveness of state regulation of electric power industry is largely determined by the structure of the industry and competition forms.

Elaboration of new approaches to the development of electric power industry has been performed by V. Alekseev, V. Brych, Ya. Hirnyak, A. Deineka, I. Diyak, L. Dmytrychenko, S. Zaitsev, S. Kiselyova, H. Liuta, N. Maystrenko, E. Perminov, M. Rustamov, A. Slobodyanyuk, I. Chukaeva; whereas O. Hudyma, O. Zolotaryova, H. Kozoriz, M. Kovalko, A. Kryvolapova, B. Kuzmenko, Yu. Shyshenin and others who have contributed to solving problems of energy security and energy efficiency.

However, there are still insufficiently developed the issues of working out the strategy of Ukrainian energy sector reforms related to the division of a single economic system into separate independent companies, followed by their privatization, introduction of competition between these enterprises and their transfer to sustainable development mode through competition, rational combination of market forces and government regulation.

The purpose and objectives of the study. The goal is scientific substantiation of effective mechanisms of enhancing competition among the electric power industry sector natural monopoly enterprises and their development on this basis.

Main material presentation

Modern electric power industry of Ukraine is mainly based on the energy sector created during the intensive industrialization of the former Soviet Union economy. Ukraine inherited such shortcomings of the economy as the excessive centralization of management, some waste of natural resources, and inability to meet the requirements of market economy [1].

Today, natural monopolies in the electric power industry sector of Ukraine function on the basis of pure monopoly and imperfect competition as recurrence of the planned and directive-based economy of the past. However, natural monopoly characteristics are typical for only one activity, it being the transmission of electricity. It is considered that this particular natural monopoly sector, namely local power grids, exists because the construction and operation of these grids that are going to duplicate the existing ones, creates an extremely high price burden due to lack of competition mechanisms and rather ineffective regulation of monopolies [2].

Natural monopolies (NMs) are economic entities (legal persons, certain groups of individuals, industries, government etc.) that have the exclusive right to manage rare production resources, including non-renewable resources, as well as the right to conduct manufacturing, trade, commerce and other activities. In this case, the economy of scale in production and distribution of products is achieved through extensive activities and provides the lowest cost per unit of output. This effect of scale, mobilization of significant resources to maintain the proper level of production, ensuring product and services quality that meet the requirements of common standards as well as the ability to reduce the costs associated with risks and uncertainty are positive characteristics of natural monopolies.

The basis of social and economic policy by which the state can assess the effect of economic growth and the development of organizations is the level of the country's population welfare. The industries that belong to NMs and other related spheres (production and distribution of electricity, gas and water supply, transport and communications) account for a significant share of Ukrainian GDP. Half of the GDP produced by NMs goes to compensation of their employees [3, 4].

So in Ukraine monopolies make a significant contribution to the country's GDP, ensuring the competitiveness of the national economy. Monopolies often use new and more advanced forms and methods of management in order not to weaken their competitive advantage. World's leading economists consider a free competition market which works effectively without state intervention to be the most efficient economic environment.

However, while investigating the theory of competition and the theory of various industrial markets, economists have concluded that there are conditions (causes) in which the competition is unable to effectively regulate certain markets and then there emerges the need for government intervention. Two situations are most often described as the ones in which the competition is unable to effectively regulate the market. In particular, the following reasons are highlighted by V. Kip Viskuzi [5], who proves that in terms of normative analysis under certain conditions unlimited competition does not work effectively enough and the two most important examples of such conditions are a natural monopoly and the work in the environment complicated by external effects.

The negative side of natural monopolies is the uncontrolled growth of tariffs, which can be limited by the state regulatory policy. The ability of natural monopolies to inflate prices for their services deprives these companies of an incentive to reduce their costs through production modernization, introduction of new technologies and rationalization, and allows inefficient expenditures to be added to the cost of services. This causes inappropriate management leading to innovation restrictions, increased depreciation of fixed assets, including networks used to provide services. The latter is the main cause of the increasing number of accidents which, in turn, lowers the quality of services provided by natural monopolies and further increases their production cost (due to increased emergency response costs, in particular).

Thus, the main reason of the tariff increase in electric energy supply industry is inefficient management, which, in turn, is caused by cumbersome management schemes, depreciated and structurally inadequate physical infrastructure and means of logistics, lack of appropriate motivation and, as a consequence, lack of economic interest in improving performance at any economic level.

These factors cause high costs together with the need to compensate them through tariffs increase. This leads to untimely and partial payment of services by the population, who are often unable to pay because of the low standards of living in the country. Household income is the basis for improving the living standard, at the same time acting as a source of investments in the improvement and development of production for further growth of living standards. The main component of the national wealth continuous growth is improvement of the population living standards that is a guarantee of business entities development and accordingly increase of their income. The solution depends on whether social or economic approach is dominant.

The industry restructuring and reforming together with reorganizing the vertically integrated complex of Ukraine began with the adoption of the Decree of the President of Ukraine 282/95 "On Restructuring of the Electrical Power Sector of Ukraine" of 04.04.95. Since then the industry has gone through such stages as corporatization of companies, creation of a competitive environment, formation of the wholesale market, and the abolition of tolling schemes and targeted supply. The creation of the wholesale electricity market made it possible to solve a number of strategic objectives for industry transition to market economy principles. However, the industry present state does not fully satisfy the growing needs of the society; there still exists the need to address such problems as the market demonopolization and improvement of the mechanism of state influence on reforming the industry.

To solve countless problems in this sphere is only possible through large-scale structural transformations using best international experience. But it requires proper adaptation to Ukrainian conditions, created mainly by its historical background. Ukraine is bound to benefit from implementation of highly successful foreign know-how and developments in the sphere of electric power industry such as non-discriminatory access to independent producers' transmission networks, the development of regional networks (US experience); organization of electricity trading exchanges, conclusion of futures and forward contracts, state priority to purchase shares from companies-owners of networks and enterprises, separation of vertically integrated electricity production and supply companies, creation of joint interstate electricity market (experience of the Nordic countries), and liberalization of electric power industry on principles of a competitive sector (Kazakhstan).

Transformation of electric power natural monopoly enterprises and creation of an effective competitive market in the electric power industry of Ukraine is an extremely difficult and complex problem that requires consolidation of efforts of central and local authorities, particularly, the Ministry of Fuel and Energy of Ukraine, the National Electricity Regulatory Commission of Ukraine, "Ukrenergo" National Energy Company and independent power producers, as well as all possible support from all those involved in performing these complex tasks. Crucially important for success is creation of a legal and regulatory framework for implementing and managing the development and functioning of the United Energy System of Ukraine within the state strategic program of transformation and demonopolization of NM enterprises. While transforming NM enterprises it is necessary to consider the following features of the energy sector companies [6]:

– availability of sophisticated engineering and technological infrastructure that is placed in a particular area and territorial specificity of relations between stakeholders;

– natural monopolies' products and services (electric power) can not be stored and maintained, thus produced but not consumed electricity causes economic losses in business activities, and underproduction in one period cannot be compensated by overproduction during the other. This makes such product (service) a specific time sensitive good, therefore production and redistribution of such goods should be stable and predictable;

– in electric power production, unlike other natural monopolies (natural gas and water supply) there exists a rigid unified system of operational, including automatic, control of modes in a united power system where there is synchronization of operating modes between parallelly working consumer power stations and plants and where the emergency conditions affect the whole territory covered by the system very quickly. Thus ensuring reliable electric power supply is a priority economic task since emergency blackouts and interruptions in electricity supply of consumers lead to significant economic losses.

These features are crucial in analyzing the specific trends of transforming natural monopoly enterprises in the energy sector of Ukraine.

The 1976 Nobel Prize laureate in Economics M. Friedman shows in his studies that there is no reasonably ideal solution to the problem of so-called "technological monopoly"; there is only a choice out of three possible imperfect cases: a private unregulated monopoly, a state-regulated private monopoly, and direct economic activity of the state. However, globalization and the development of the market environment, the constant introduction of new technologies and development of new products, which consume electricity leaves no doubt about the need to develop the energy sector.

Transformation of monopoly companies and allocation of structural units able to operate in a competitive market, should be accompanied with streamlining business terms and rules of doing business in order to eliminate the risk of replacing one monopoly with another: a public monopoly with a private one [7, 8]. It is necessary to begin with the financial recovery of the existing monopoly companies' structural units, restoring order in their financial reporting and eliminating structural units engaged in non-core activities.

Assessment of possible reactions to such measures as reforming natural monopolies leads to innovative socially oriented type of economic development. Social responsibility of the state requires to put any monopolist in rigid limits, and the consumer will be satisfied. But to be led by the consumer desires and to determine extremely low prices and harsh working conditions for a monopolist are not an economically justifiable solutions either. First, any monopoly must evolve and modernize, and this requires long-term investments, and consumers are not interested in this in current economic conditions. On the other hand, having not made these investments now, tomorrow we will feel the shortage of goods and services produced by natural monopolies or their quality will be unacceptably low. The Energy Strategy of Ukraine for the period till 2035 states that overcoming the contradictions between providing social protection and introducing market principles of management in the energy sector requires modernization of social policy [9].

Thus, there exists a conflict between a natural monopoly authorities trying to modernize their subordinate branch and get significant income and the consumers who do not want to finance the sector at their own expense, while willing to obtain goods and services of high quality which meet international standards. All this leads to the conclusion that, firstly, the regulation of natural monopolies is necessary and, secondly, the purpose of the regulator is to find a compromise between consumers and monopolies.

The primary task of transforming enterprises of energy sector should include:

– transparency of all kinds of economic activities of natural monopolies;

– preservation and development of a single electric power infrastructure, including backbone networks and supervisory control, improvement of operation sustainability, security and quality of service; development of electric power industry export potential;

– creation of the electricity market conditions, guided by the principles that preclude discrimination against any participant throughout Ukraine.

Based on the reality of existence of a two-level electricity market (wholesale and retail), it is possible to design transition stages from monopolistic to competitive market. Practice shows that competitive conditions are favorable for the spheres of production and supply. As for the areas of electricity transmission and distribution, it is expedient to preserve their monopoly and make them regulated by the state. The competitive sector of electric power requires adequate mechanisms that would combine long-term interests of the state and private business with market opportunities, its forms and rules, would ensure transparency, demonopolization of the market, freedom of business, profitability, and less bureaucratic management. The sustained position of business entities in the markets, the level of their investment attractiveness to strategic partners and the degree of customer loyalty are largely determined by the state as a guarantor of creating competitive environment and favorable conditions for business and capital investments.

Thus, the problem of electric power enterprises monopoly is a result of insufficient legal regulation of this issue in the law of Ukraine "On Natural Monopolies". Based on the above it can be stated that to ensure effective activity of natural monopolies in the electric power sector it is not enough to just form a competitive market. We consider it necessary to focus on the shift of emphasis in managing competitiveness of enterprises towards mega and macro factors, on the growing role of the state and supranational institutions in economic management, especially in terms of the global crisis expansion.

State regulation of the activities of the strategically important energy sector should be characterized by openness and accessibility of

information to the society that will make it possible to gain customers' support while establishing a sufficiently high level of prices (tariffs) to ensure profitability and, consequently, the investment development of the industry. For this purpose there must be created a national information system that would provide a common information base on financial and economic indicators of operational activities of the enterprises in the sector, the information being used for formation and implementation of decisions on regulation of natural monopolies based on actual results.

Conclusions

The research done has revealed the existence of unresolved problems in electric power industry of Ukraine and practical significance of further research into forming effective mechanism for managing development of natural monopolies. Efficiency of management depends on maturity of market economy and on consistency of state regulation, both being quite low in Ukraine. Foreign experience in electric power industry development indicates lack of common general approaches to the state governance of this natural monopoly. However, there is a certain set of different technologies, which ensure on the one hand the actual availability of goods and services provided by natural monopolies to consumers, and on the other hand efficient and profitable operation of natural monopolies.

Reforming electric power NMs is effective if there is a rational combination of market mechanisms and government regulation with the development of improved legal framework on electric power industry operation and development; there exists balance of interests of all electricity sector entities (producers and consumers, industries related to the energy sector, communities, regions, shareholders, owners and investors); geographical, economic, regional, cultural, historical and other features are considered in determining the timing and pace of their implementation at all stages of reforming the industry.

This study makes it possible to offer the improvement of mechanisms of developing electric power industry as a strategic economy sector, a natural monopoly in the market environment transforming it by separating electricity transmission enterprises from electricity supply units. The separation will provide: potential buyers' access to the monopoly product in the market; prevention from any form of collusion between a seller and a buyer or a group of buyers; guarantee of exclusive information security, which could otherwise put part of customers in a privileged position; legally strengthened safeguards system and responsibility of a monopolist for the quality of its goods or services.

For the transformation to be a success, it is necessary to perform identification of economic physical and information entropy, as well as performance indicators based on actual data to resolve disagreements on priorities.

References

1. *Yakovlev A. Areas of the Electric Power Sector Development in Ukraine / A. Yakovlev, D. Drozhzhin // Bulletin of 'Kharkiv Polytechnic Institute' National Technical University : Coll. Science. Res. – Kharkiv: NTU "HPI", 2005. – No. 34. – P. 165–168.*
2. *Rodrik D. Understanding Economic Policy Reform / D. Rodrik // Journal of Economic Literature, March 1996, Vol. 34, No. 1, P. 9–41.*
3. *On Natural Monopolies Law of Ukraine of 20.04.2000 № 1682-III. (www.rada.gov.ua)*
4. *Zielinska O. Features of the Operation and Regulation of Natural Monopolies / O. Zielinska // Bulletin of Lviv Commercial Academy. – Economic Series. – Issue 27 – Lviv: COOP Education, 2007. – P. 34–56.*
5. *Kip Viskuzi W. The Economic Theory of Regulation and Competition Policy / W. Kip Viskuzi. – K.: Salome Pavlychko "Basics" Publishers. – 2004. – P. 423–447.*
6. *Bazylevych V. Denationalization of Natural Monopolies in Ukraine / V. Bazylevych, H. Fylyuk // Economics of Ukraine. – 2002. – No. 3 – P. 35–42.*
7. *Brych B. Regulation of Natural Monopoly Enterprises in Terms of Cooperation Between Ukraine and the European Energy Community / B. Brych, M. Fedirko // Bulletin of TNEU. – 2013. – Vol. 3. – P. 23–26.*
8. *Methods of Utility Company Risk Management, Monograms. Ed. Doctor of Economics, Professor. V. Brych. – Ternopil: TNEU, 2013. – 306 p.*
9. *Energy Policy of Ukraine White Book "Security and Competitiveness" (Energy Strategy of Ukraine till 2035): [electronic resource] / National Institute for Strategic Studies under the President of Ukraine. – Kyiv. – 2014 – Access: http://www.niss.gov.ua/public/File/2014_nauk_an_rozrobku/Energy Strategy 2035.pdf*

Vol. 3, No. 1, 2016

UDC 658.12

O. S. Vysochan
Doctor of Economic Sciences, Associate Professor,
I. V. Lutsiuk
Assistant Lecturer,
Lviv Polytechnic National University

INTENSIFICATION OF INTERNAL CONTROL OVER QUALITY COSTS AS A MEANS OF IMPROVING PRODUCT COMPETITIVENESS

Abstract. The article explores the application of the active control over quality costs that gives an opportunity not only to identify existing deficiencies and deviations, but also to optimize the structure and amount of quality costs, and to forecast future changes. The extension and modification of the tasks of the control over quality costs at the transition from passive to active forms is considered. The specific features of the active control system that distinguish it from the traditional one are identified. These include the control functions, the controller's responsibility, and the controller's qualification. The model of control cycle with using the active control system is developed. It includes the following stages: preparation, implementation, subcritical stage of the controlled object modification, and an inertial stage. The essence of the control stages and the possible states of a controlled object are characterized.

Key words: internal control, quality costs, quality management, accounting information, control model.

Problem statement

Internal control is an important component of the quality management system. Its effective organization gives an opportunity to assess the actual state and to identify the deficiencies in the enterprise activities in the field of quality, to establish the reasons for deviations, and to implement measures for their elimination and prevention.

The efficient quality management system requires to depart from a pattern procedures and to enhance the intellectualization of control over quality costs. That is manifested not only in fixing the identified problems, but in providing the preconditions for their prevention in the future; not just in achieving a positive result after the implementation of all control procedures, but (and this is the main thing) in its optimization.

Analysis of recent research and publications

The issues of internal control have been explored in the research works of O. Arvinge [1], S. Briciua, A. Danescu, C. Danescu and M. Prozana [3], F. Conijn and H. Rouwelaar [4], N. Macintosh and P. Quattrone [10], K. Rae and N. Subramaniam [13] and others.

An important contribution to the investigation of the issues related to the control over quality costs was made by such scholars as S. Brad, M. Fulea, B. Mocan [2], A. Feigenbaum [6], Z. Irani and P. Love [8], R. Luther and I. Sartawi [9], H. Meier [11], P. Miguel and C. Pontel [12], S.-S. Shang and J.-X. You [14] and others.

In current competitive market conditions, not only the accuracy and reliability of economic information regarding the quality costs but also development of means for optimization of their content, structure and value are important and relevant.

As F. Conijn and H. Rouwelaar point out, "controllers must understand their changing role due to developing trends in business and social development. The controller must adapt adequately and in a timely fashion to these developments in order to keep adding value to the business and thus assuring or strengthening their position in the organization" [4].

Research objective is to develop suggestions for improving internal control over quality costs in order to increase the enterprise product competitiveness.

Research material

Development of quality management caused a necessity of transfer from the "passive" (conventional) control system, in which the cycle is completed at the stage of forming conclusions and recommendations, to the "active" (novel) where control continues until the object achieves its optimal parameters.

In the judgment of O. Arwinge, "internal control seems to be an all-encompassing process.

The wider approaches to internal control have expanded its boundaries significantly, far beyond the financial reports and the duties of the accountant. Financial reporting quality objectives have been supplemented with other internal control objectives which are related to compliance, efficiency and effectiveness" [1, p. 147].

The most representative presentations of the internal control are shaped in: COSO Model published on The Committee of Sponsoring Organizations of the Treadway Commission's initiative, COCO Model published on The Canadian Institute of Chartered Accountants' initiative, Turnbull Model published by the Institute of Chartered Accountants in England and Wales – ICAEW, the AMF Model published on L'Autorité des Marchés Financiers from France' initiative, CobiT Model published by IT Governance Committee (ITGC), Information Systems Audit and Control Association (ISACA), Basel Model enacted by Basel Committee on Banking Supervision. Some specific models are also ISA 315 Model (International Auditing and Assurance Standards Board – The Chamber of Financial Auditors of Romania, 2013), SAC Model published by the Internal Auditors Research Foundation (IIARF), the internal control model specific for the administration of state revenues in Romania (S.Briciu et all, 2011), etc. [3].

According to "Internal Control – Integrated Framework", one of the most widely practised models of internal control released by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) [5], internal control consists of five integrated components: control environment, risk assessment, control activities, information and communication, and monitoring activities.

As J. A. Hall points out [7], the internal control shield is composed of three levels of control: preventive controls, detective controls, and corrective controls. This is the Preventive-Detective-Corrective (PDC) control model. Preventive controls are passive techniques designed to reduce the frequency of occurrence of undesirable events. Detective controls are devices, techniques, and procedures designed to identify and expose undesirable events. Corrective controls are actions taken to reverse the effects of errors detected in the previous step.

In applying the conventional control, when the function of the controller is solely detecting the deviations, the submission of recommendations for their elimination, and the punishment of those responsible, the controller seeks to minimize his/her own impact on the further development of the controlled object avoiding responsibility and reducing the risk of forming wrong judgments. In this case, the controller quite often intentionally or unintentionally overlooks the information, which is essential for the future development of the economic system, hiding behind the functional responsibilities or terms of the contract. Such a system of control, despite the maximum prevalence at Ukrainian enterprises, still does not meet the requirements of time and have to be replaced by a system of active control, in which the controller functions include among other things also the formulation of the recommendations to optimize the current position of the controlled object.

When the active control instruments are used along with the classical revision techniques (such as sample inventory, monitoring, control recount, review of the decisions implementation) the methods, which have a secondary role in "passive" control, such as economic analysis, logical interpretation, forecasting, modeling etc. come to the foreground. The controller should be ready to take responsibility not only for the creation and submission of wrong judgments about the state of the inspected object, but also for the state in which the inspected object will appear after implementing all the controller's recommendations.

Generally, the aim of internal control is to guarantee efficient operational activities results, reliability of financial reports, and adherence to related rules and regulations [15].

The primary tasks of a controller in accordance with active control concept are changing (Table 1).

The application of the (novel) control system in the accounting of quality costs expands the control tasks and considerably modifies them. In spite of this, the controller is not exempted from routine procedures inherent in traditional control.

In the coordinate system "the controller – the interested person", each of them receives additional benefits from the application of active control methods. Such gains for the controllers are additional financial bonuses; the opportunity to realize their own mental capacity; intellectual development not only through the gradual gaining of greater experience, but also due to intensive generation of innovative ideas. In return, the company gets additional economic, technical, organizational, and other benefits; effective redistribution of functional responsibilities and

accountability between the managers and the controller; the opportunity to operate quality and valuable information on specific economic processes and events. By using methods of active control, a business entity gets not only extra benefits but also new knowledge that reduces the level of uncertainty concerning a particular problem.

Table 1

Transformation of the quality costs control tasks when transferring from "passive" (conventional) to "active" (novel) control system*

Tasks of "passive" control	Tasks of "active" control
1. The determination of the reliability of the information about the amount of quality costs	1. The assessment of the economic feasibility of the quality costs
2. The establishment of the completeness and timeliness of reporting information about the quality costs in primary, consolidated documents and ledgers	2. The regulation and redirection of information flows regarding the quality costs in order to maximize the completeness and reliability of the generated data and to minimize information pressure on managers at various levels
3. The establishment of correct accounting of quality costs in accordance with applicable law and approved accounting policy	3. The adjustment of the methodology of quality cost accounting within the legal framework with due consideration of the trends in the decision-makers' information needs
4. The determination of the reliability of the reflection of the quality costs in financial and management reporting of an enterprise	4. The redistribution and optimization of the functional duties of the enterprise structural divisions in order to maximize the effective formation and timely submission of reporting forms to interested parties

** Authors' development*

The system of active (novel) control has a number of features, which distinguish it from traditional control systems.

In addition to traditional control functions, which include identifying of deviations and making recommendations for their elimination, active control performs optimization of the current position of the controlled object and makes forecasting of the future opportunities and threats for the achievement of optimal parameters.

In this connection, the controller's responsibility increases because of the necessity of post-control support for the modification of the controlled object until it reaches the desired parameters.

The requirements to qualification of the controller also increase. The qualification should be high with a steady trend towards improvement (professional development, participation in scientific workshops, professional round-tables, personal involvement in field checks etc.). Additional necessary characteristics are ability to think creatively, to provide unconventional solutions, readiness to take additional responsibility, powerful logical and analytical skills, continuing self-improvement etc.

All the above considerations lead us to the need to present the control cycle model with elements of the active (novel) control system (Fig. 1).

The control cycle in Fig. 1 is divided into three main stages. During the preparation stage, primary accumulation of resources necessary for the effective implementation of control procedures occurs. It includes approval of the control plan, goals setting, determination of specific techniques and their implementers etc. At the implementation phase, all the necessary procedures to achieve the objectives defined in the previous stage are carried out. In case of applying passive control here the inspector's work is finished and he returned to preparing the following control procedures. After the control itself is completed, there begins the stage of modification of the controlled object, i.e. bringing it into the line with certain predetermined and, if necessary, adjusted reference parameters. This stage is divided into two sub-steps: subcritical and inertial. During the first of these, changes that occur with the controlled object can be reversed using additional resources (it can be initiated by management if passive control is used, or management and controllers if active control is used). During the inertial stage, the object is found in the resultant state and the changes that occurred are already irreversible.

Identification of the inertial phase is primarily connected with the existence of the factors of the environment that is external to the system "controller – management", the factors that cannot be affected by either management or the controller at all or their impact is minimal. The nature of these forces can be either global (applies to all entities in the country or industry), among them being the change of legislation, the

deterioration of market conditions etc. or local (refers to a specific entity), for example, contractors' failure to comply with contractual obligations, change of certain officials etc. At the stage of inertial modification of the controlled object, to avoid the effect of these forces is impossible though when using the active (novel) control there emerges the need in their forecasting, however, the controller has, on the one hand, full responsibility for the formation of wrong conclusions following the results of the inspection and, on the other hand, he/she bears partial responsibility for the absence of the positive result.

Characteristics of the control cycle when using active control system in the area of quality costs are shown in Table 2.

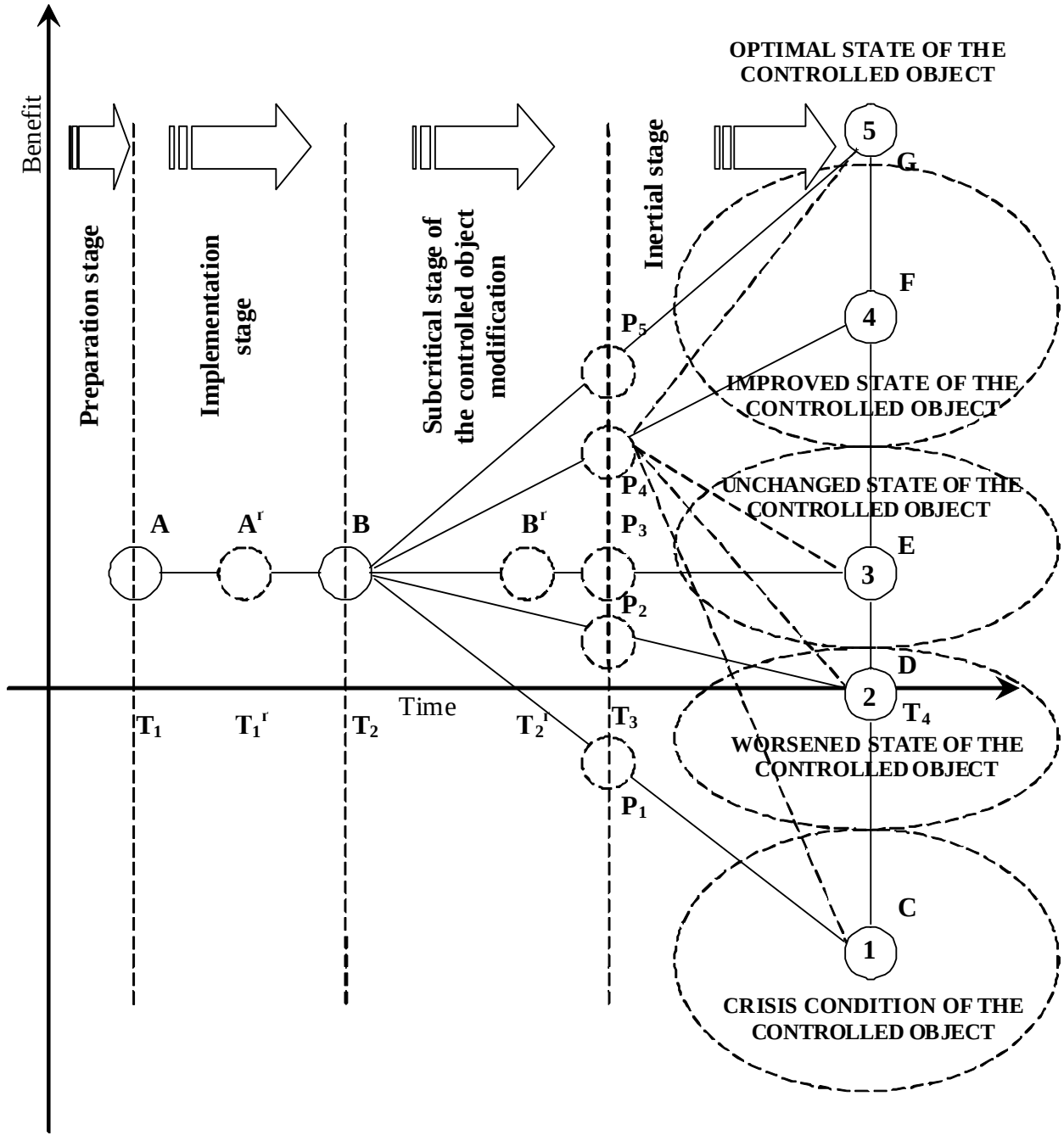


*Fig. 1. The model of control cycle with elements of the active control system**

**Authors' development*

Table 2

Characteristics of the stages of internal control over quality costs*

Stage	Characteristics
Preparation stage	Establishment of the goals and objectives of internal control over the quality costs, control planning, preparation of control program and selection of control procedures
Implementation stage	Direct implementation of the control procedures in order to establish the lawfulness and the accuracy of identification and the accounting reflection of the quality costs in terms of responsibility centres and assessment of the of quality cost management effectiveness
Subcritical stage of the controlled object modification	Adjustment of the existing management system parameters by the control instruments aimed at optimization of quality costs
Inertial stage	Minimization of negative consequences of external and internal influence on the state of the quality management system and forecasting its development in the medium and long term perspective

** Authors' development*

This leads us to the idea of existing some critical points (P1–P5) in each segment, when there is still the possibility of changing the state of the quality costs. Consequently, it is possible to change the resulting positions on the segment of enterprise usefulness (from point C to point G) in one or another direction. After passing through these points in time, to overcome the inertia of an object provided by the control means is impossible and the latter turns out to be in one of the aforementioned states. The initiator of changes in the motion path of the controlled object can be the company's management, company's particular divisions (including accounting) and the controllers themselves.

Obviously, the location of points (P1–P5) directly depends on the ratio of the subcritical and inertial phase duration. The subcritical stage is shorter in the following cases:

– the obtained control results are provided to the users without delay and within a specified time period;

– the management wants and is qualified enough to be able without the involvement of additional experts and unnecessary intermediate procedures to process the information and develop necessary decisions;

– management response to the information obtained after the control procedures is maximally quick and is communicated to the executives in the shortest possible time.

The inertial stage is shorter in the following cases:

– there is no significant influence of extraneous factors on the modification of the controlled object, which would impede its change;

– parameters of the modified object are insignificantly different from the original and do not require a significant amount of human, financial and other resources.

At the end of the trajectory of motion, the controlled object for a certain time (T4) may be in one of five possible positions:

1 – unqualified conduction of the control process has led to the condition when the company received the minimum possible benefits and the correction of which will cost significant additional resources;

2 – the controller's recommendations brought negative result due to the errors in implementation of control procedures or wrong controller's judgments;

3 – control has not brought the desired result: the errors were not identified or the controller's recommendations were not taken into account by the company's managers;

4 – during the inspection there was revealed a number of drawbacks, the removal of which brought some benefit to the company;

5 – application of active control techniques allowed not only to detect and correct mistakes, but also to optimize the state of the controlled object, which leads to maximizing the company's usefulness.

Let us characterize each of the five stages of quality costs presented in Fig. 1:

– crisis – the most dangerous situation, when due to incompetence or criminal intentions the controller makes recommendations following the results of the audit, the implementation of which not only leads to the absence of any positive effect towards improving the state of affairs on a separate piece of work but also threatens the company's business activities;

– worsened – inspection of quality costs has brought a negative result, which usually manifests itself as excessive spending of resources (financial, human etc.) in comparison with the obtained effect. This may be a result of either low qualification of the controller, his formal attitude to work, lack of basic conditions for effective inspection etc. or unwillingness of the company management to listen to the controller's recommendations and to take measures to improve the current state of affairs. Motivation can be very diverse: from the expression of distrust in the control results and lack of resources for improving the situation to the criminal actions aimed at the pursuit of private interests by governing bodies or individual responsible persons;

– unchanged – control procedures did not bring any significant positive effect. The case is typical of many large enterprises in carrying out the statutory audit to confirm reporting when its realization is dictated more by the requirements of the current legislation than the real needs of a business entity. Quite often, neither the controllers nor the company's management are interested in getting real results, therefore the audit becomes a formal procedure with a sample set of standard actions and a known outcome. Obviously, we are discussing the comparatively constant state of the controlled object, when either positive or negative changes are insignificant. Pay attention to the fact that the steady-state condition of the controlled object after carrying out the relevant procedures does not mean the absence of errors in the implementation and registration of certain business operations; on the contrary, this may often indicate deficiencies in the organization of the control system itself;

– improved – the costs of conducting control measures are less than the benefits of their results. The benefits may be demonstrated in following: the avoidance or minimization of penalties; establishment or improvement of functional relations between the various elements of the enterprise management system; identification of gaps in the existing accounting policy in some enterprise areas etc.;

– optimal – a state that is achieved only when applying the active control system, based on which the controlled object maximally approaches the "standard" formed at the stage of preparing control procedures.

The states of the quality costs after completion of the active control cycle are characterized in Table 3.

Table 3

The possible quality costs states after application of active control and their characteristics*

State of the controlled object	Characteristics
Crisis	Incompetent controller's recommendations regarding the quality costs can lead to reduced product quality, and, as a consequence, to the threat to the consumers' life and health, legal claims, damage the enterprise reputation etc.
Worsened	The costs of implementing control procedures exceed the useful effect. The amount and structure of quality costs can be both unchanged so worsened regarding their condition before control
Unchanged	The control over quality costs is not given due attention, controller only checks formal compliance of costs documentation with their reflection in reports.
Improved	There are fixed some shortcomings in the organization of the quality costs accounting, improved functional relationships between the elements of the quality management system
Optimal	The minimal costs of quality assessment and control required to ensure an adequate level of product quality. In this case, the external and internal losses caused by inadequate product quality are close to zero.

** Authors' development*

Consequently, the final aim of the active control is the achievement of the optimal state of the controlled object, i.e. the state in which the quality costs bring the maximum benefit to the business entity. The benefit can be manifested in improving the value of various indicators of economic (profit increase, cost reduction etc.), technical (increase of equipment performance, reduction of the manufacturing defects etc.), and organizational character (structuring of information flows between different enterprise departments, redistributing functional responsibilities within a specific service).

Conclusions

The implementation of active control system at the enterprise as a whole and in the area of the quality costs accounting should be the basis of forming the information base for rational mana-

gement decisions making and the tool to guide managers in the direction of the only appropriate decision. The controller becomes not only the specific data producer, but also manager assistant in understanding and working in the newly created information flows, sharing with him both the reward for success and responsibility for failure. Therefore, the controller needs not only to state the formal existence of a problem and to briefly outline the direction of its solution, but also to take direct part in the solution of this problem and propose well-founded optimal ways of its overcoming using minimal resources with the maximum effect, to generate recommendations to prevent it in the future and to implement subsequent control over the process of its solution.

References

1. *Arwinge O. (2013) Internal Control. A Study of Concept and Themes. Springer-Verlag Berlin Heidelberg.*
2. *Brad S., Fulea M. & Mocan B. (2006) Expert System for Quality Cost Planning, Monitoring and Control. 2006 IEEE International Conference on Automation, Quality and Testing, Robotics, pp. 53–58.*
3. *Briciua S., Danescu A. C., Danescu T., Prozana M. (2014) A Comparative Study of Well-Established Internal Control Models. Procedia Economics and Finance 15, pp. 1015–1020.*
4. *Conijn F. & Rouwelaar H. (2012) How Will the Control Function Look in 2020? Management accounting, pp. 243–250.*
5. *COSO, Internal Control – Integrated Framework (2013). Available at: http://www.coso.org/documents/990025p_executive_summary_final_may20_e.pdf*
6. *Feigenbaum A. (1991) Total Quality Control, 3rd ed. New York: McGraw-Hill.*
7. *Hall J. A. (2016) Accounting Information Systems, Ninth Edition. Cengage Learning.*
8. *Love P. & Irani Z. (2003) A Project Management Quality Cost Information System for the Construction Industry. Information & Management, Vol. 40, Iss. 7, pp. 649–661.*
9. *Luther R. & Sartawi I. (2011) Managerial Practices of Quality Costing: an Evidence-Based Framework. International Journal of Quality & Reliability Management, Vol. 28 Iss: 7, pp. 758–772.*
10. *Macintosh N., Quattrone P. (2010) Management Accounting and Control Systems. An Organizational and Sociological Approach. UK: John Wiley and Sons Ltd.*
11. *Meier H. H. (1991) A Control Model for Assessing Quality Cost. American Journal of Business, Vol. 6 Iss: 1, pp. 40–44.*
12. *Miguel P. A. & Pontel C. S. (2004) Assessing Quality Costs of External Failures (Warranty Claims). International Journal of Quality & Reliability Management, Vol. 21 Iss: 3, pp. 309–318.*
13. *Rae K., & Subramaniam, N. (2008). Quality of internal control procedures: Antecedents and moderating effect on organizational justice and employee fraud. Managerial Auditing Journal, 23(2), pp. 104–124.*
14. *Shang S.-S. & You J.-X. (2009) Quality cost control model based on fuzzy neural network. Industrial Engineering and Engineering Management, 16th International Conference, pp. 1112–1116.*
15. *The Establishment of an Internal Control System. Special Reports. Available at: https://www.icdf.org.tw/web_pub/20040517151210The%20Establishment....pdf*

Vol. 3, No. 1, 2016

UDC 330.11:658.011

O. V. Hlushko
PhD of Economic Sciences,
Lviv Polytechnic National University

CONTENT CHARACTERISTICS OF ECONOMICALLY STABLE EFFICIENCY OF SOCIALLY RESPONSIBLE BUSINESS

Abstract. In Europe and the United States the social responsibility of business is a clearly declared concept of business development. The economic stability of the enterprise is a prerequisite for the implementation of the principles of social responsibility of the business. The basic principles of positioning the essence of economic sustainability in the context of socially responsible enterprises are presented in the article. The typology of economic stability which is acceptable for socially responsible enterprises is improved. The components of the enterprise economic sustainability are detailed. The correlation between components of economic sustainability of the socially responsible businesses is highlighted. The article emphasizes the diversity of approaches to positioning economic sustainability and presents the differences between them. The paper takes into account the factor of social responsibility of business while correlating the components of the economic sustainability of the enterprise. The basic principles of this approach are justified. The conceptual apparatus of economic sustainability is grouped into 4 levels. This approach makes it possible to take into account the priority of categories and to structure them within the research object. Within the proposed approach there is also described and justified the essence of the economic sustainability related categories.

Key words: economic sustainability of enterprises, social responsibility of business, the typology, the components of economic sustainability, categorical apparatus.

Analysis of recent studies and publications

The theoretical principles of economic sustainability are being widely investigated by domestic scientists (O. V. Arefieva, 2011; L. R. Halko, 2010; I. Yu. Gryshova, 2015;V. L. Ivanov, 2005). Domestic authors thoroughly describe the essence of economic sustainability of enterprises in Ukrainian realities. There is also an authoritative international position on this economic category (Alan Lavine & Gail Liberman, 2007; Anand S., 2000; Bond E. W. & C. Syropoulos, 2012; Dolan P., 2004; El-Erian M. A., 2012; Fowler, S. J. & Hope, C., 2007; Gaspar J., Vasconcelos P. B. & Afonso O., 2014; Giampalmi J., 2004; Jayne V., 2004; Jones, D. R., 2000; Kerr, I. R., 2006; Lopez, M., Garcia, A., & Rodriguez, L., 2007; Oskamp, S., 2006; Relph-Knight, L., 2006; Roome, N. J., & Bergin, R., 2006; Svoboda, S., & Whalen, J., 2005; Tebo, P. V., 2005; Van Kleef, J. A. G., & Roome, N., 2007). According to these authors, the economic stability should be considered integrally with social responsibility of the enterprise. This position is not very much supported by domestic scientists, but the trend towards correlation of these two categories becomes more and more popular in the world. The issues associated with social responsibility of business are widely studied abroad (Albareda, L., Lozano, J. M., & Ysa, T., 2007; Alvord, S. H., Brown, L. D., & Letts, C. W., 2004; Bendell, J., 2005; Berkhout, T., 2005; Carroll A. B., 1999). The vast majority of researchers believe it appropriate to consider social responsibility and economic sustainability of business as a complex.

At this, the basic scientific positions of foreign researchers can be adapted to domestic economic conditions.

The purpose of the article is research into the issues of adaptation and integration of international practices in the field of economically sustainable and socially responsible business to present-day economic environment of Ukraine.

1. Typology of economic stability of socially responsible enterprises

The researchers of the enterprise economic stability determine a series of diverse classification attributes of this category (O. V. Arefieva, 2011; V. L. Ivanov, 2005). As a result, there are determined varieties of this economic category. Besides the generally accepted division of economic stability into external and internal, it is appropriate to identify other types of this complex category (Fig. 1).

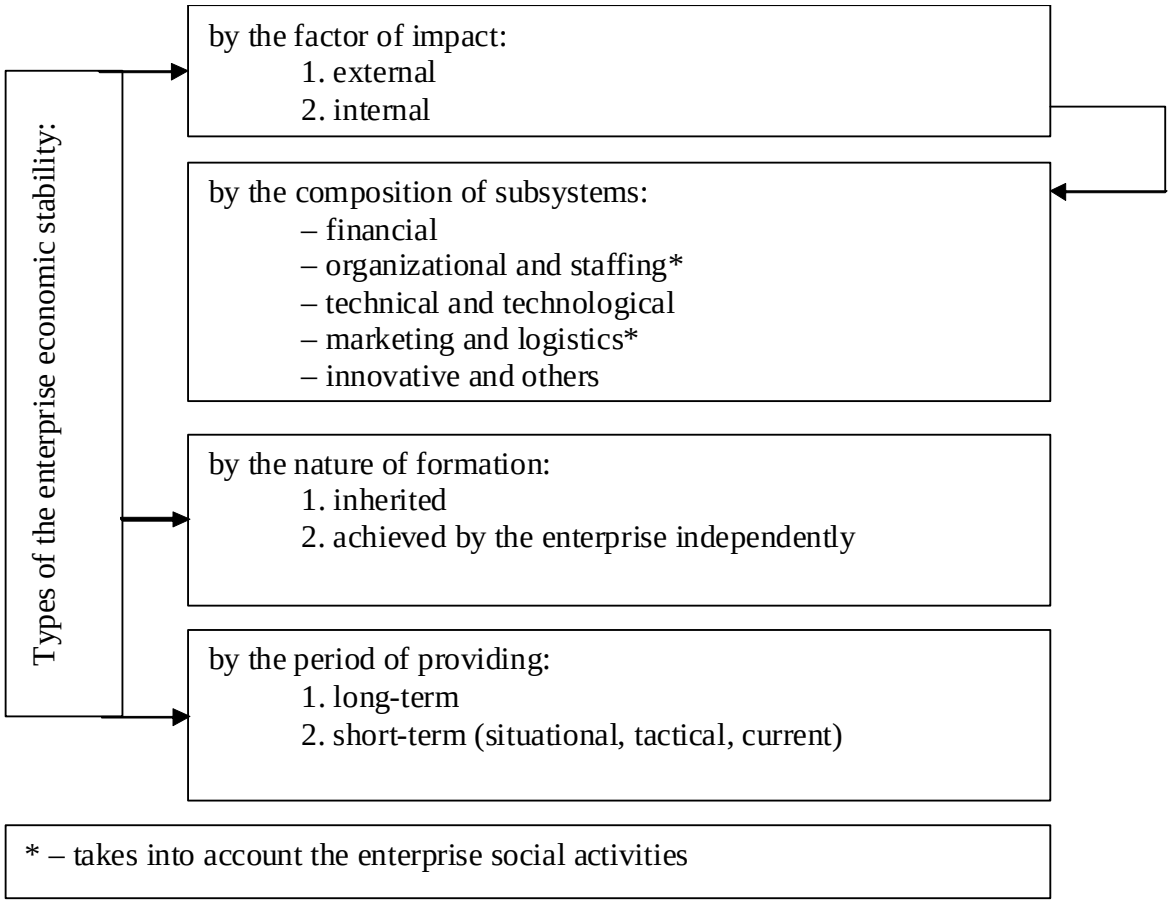


Fig. 1. Typology of economic stability as a theoretical category

** Note: Improved by the author*

Specification of the types of the investigated economic category gives us the opportunity to emphasize the conceptual peculiarities of the enterprise economic stability. Taking into account the existence of a number of endogenous and exogenous influences on the enterprise economic stability it is natural to identify internal and external stability of the enterprise. The internal economic stability is the level of the balanced use of the enterprise resource potential. The essence of this category is described through its components. Components of the internal economic stability of a particular enterprise are often different. It depends on the specifics of the enterprise activities and its business processes management as well as on the specifics of the enterprise itself.

At this, formation of the economic stability components should reflect fully all the defining resources of the enterprise. After exploring the theoretical and practical aspects of interpreting economic stability, we consider an objective correlation of 5 components (financial, organizational and staffing (managerial), technical and technological, marketing and logistics, innovation), which are shown in Fig. 1.

It is appropriate here to provide our own interpretation of the financial economic category. Financial stability of the enterprise is seen through such a level of financial performance volatility that provides opportunity to manage the development of the enterprise. Thus financial stability is interpreted as a permanent change in financial performance within certain specified norms. The results of these changes are acceptable for tactical and strategic management of the enterprise activities.

For determining an organizational and staffing (managerial) component of the enterprise economic stability the management capacity of the enterprise is taken into account. There are also determined attributive characteristics of the enterprise management system. The interpretation of this socio-economic category may have the following format. Organizational and staffing stability of the enterprise means the acceptable level of changes in the organizational structure of the company and its labor potential with the aim to

provide adaptive control of the enterprise financial and economic activities based on corporate social responsibility.

When exploring the manufacturing sector of the economy it is also necessary to specify technical and technological stability as a component of the overall economic stability of the enterprise. Interpretation of this category by economic scientists is ambiguous. The peculiarity of this category is the fact that it is estimated mostly by financial indicators though by its essence it should also take into account non-financial characteristics of the production process. The content of this component can be defined in the following way: the technical and technological stability of the enterprise is its technical potential in the context of its transition to manufacturing non-standard production units as well as the enterprise capability of providing the planned level of production profitability.

Identifying the marketing and logistics stability as one of the components of the overall enterprise economic stability is relevant for economic entities as this category reveals the efficiency of the enterprise products sales process. In modern conditions of overproduction the ability to optimize logistics costs and to find the appropriate product positioning in the market is of paramount importance. The essence of this category can be summarized in this way: the marketing and logistics stability of the enterprise is the comparability of actual sales with targets under conditions of increasing return on sales and return on marketing costs.

The innovative stability is another component of the enterprise economic stability that is worth studying. The innovative policies of the enterprise are considered to be essential for ensuring economically stable operation of enterprises in modern market conditions. This is due to the requirements of the modern post-industrial economic environment. The necessary condition for the effective functioning of a modern enterprise is the intellectual capital development and its implementation in the manufacturing process. The enterprise innovative stability is the compliance of the enterprise innovative policies with the real results of the intellectual capital implementation as well as the availability of the intellectual potential necessary for innovative development of the enterprise.

Internal economic stability is a priority in studying correlation between the available potential and its flexibility and adaptability to dynamic conditions of modern economy. It enables the enterprise to manage its advantages in market conditions. The external economic stability of the enterprise is also very important. The influence of external economic factors is relevant for the modern financial and economic system. They also determine the dynamics of the enterprise external economic stability. The external economic stability is the architectonics of exogenous factors that are actually beyond the enterprise control. But to large extent they define the basic conditions and principles of forming the internal economic stability.

For developing a comprehensive understanding of the category “economic stability”, in addition to the external and internal aspects, it is appropriate to explore the nature of forming the enterprise operation stability. The main difference between the types of economic stability, being generalized by the nature of their formation, is obvious. The inherited economic stability is the level of economic stability, shown by indicators, which has not been achieved by the enterprise itself. This economic category is closely correlated with the economic potential of the acquired enterprise. The level of inherited economic stability directly depends on the market value of the intangible assets of the enterprise, the property rights for which were acquired by the buying enterprise.

One more way of differentiating economic stability is to classify it by types according to the term of achieving. This approach allows defining long-term and short-term stability. Specifying the third type, medium-term economic stability, is not necessary within this feature. This is because economic stability is positioned as either dynamic or static. It means that considering the enterprise economic stability in dynamics, managers are oriented towards achieving long-term goals. In the analysis of static economic stability the emphasis is made on the actual level of this economic category for managers to be able to take current management decisions.

After examining the essential characteristics of economic stability in terms of the developed typology, we can formulate a number of conclusions. Economic stability as a category is a multidimensional concept. It can be viewed from different scientific positions. While characterizing in detail the complexity of this economic category, it is advisable to take into account the following:

– specifics of external and internal factors of influence on the economic situation;

– correlation of exogenous and endogenous factors in the enterprise economic stability;

– the fact that the formation of the enterprise economic stability is an evolutionary process;

– necessity to consolidate long-term goals and tactical management while forming the enterprise economic stability;

– specifics of analyzing the establishment and assessment of qualitative and quantitative indicators that characterize this category.

2. Correlation of categories: economic stability and corporate social responsibility

In the process of scientific research, economic stability of enterprise can be interpreted in different ways primarily because of the objective complexity of this economic concept. The following can be considered to be main approaches to determining the essence of the enterprise economic stability:

– approach based on the resource concept;

– approach based on institutionalism;

– systems approach;

– approach oriented to the enterprise innovation potential;

– other approaches.

Stability of an economic system is determined by its ability to recover the performance reduced by external or internal factors. The recovery potential depends on the available resources and their rational use. At the same time, economic stability is a complex of systems with distinct interrelations. Architectonics of this system is determined by formal and informal institutional effects of exogenous and endogenous nature. Consequently, adhering only to one approach complicates objective positioning of this economic category.

Economic stability as a category is not homogeneous because it consists of external components which are variously positioned by the scientific community as to the importance of their influence on the synthetic characteristic. An important aspect in defining the category of the enterprise economic stability is not only real interpretation of the economic process content but also substantiation of the reasoned statements adequacy. That is why we consider it expedient not only to offer a list of economic stability components but also to determine their interrelations (Fig. 2).

Fig. 2 illustrates interrelations between the components of the enterprise economic stability. The chart helps to see the complexity of these interrelations. It proves expediency of using the systems approach to both evaluation and management of this economic category. The proposed system is the balance of the enterprise potential possibilities, the management of which is aimed at ensuring economically sustainable operation of the enterprise.

Direct interpretation of the chart shows the availability of the managed and managing subsystems in the system of the enterprise. The interrelations between these subsystems imply reverse interdependence. The organizational and staffing (managerial) component of the economic stability is positioned as the managing subsystem that takes decisions based on corporate social responsibility. The technical and technological, marketing and logistics as well as innovative subsystems are considered to be managed subsystems. Social and financial statements are compiled in accordance with regulatory and legislative requirements (financial reporting, statistical reporting etc.), and also according to orders, instructions and other regulations issued by the enterprise management (managerial reporting, internal business reporting on production, social sphere etc.).

The proposed system of interrelations integrates the main aspects of the enterprise operation that are the components of its economic stability. Positioning of the economic stability on the basis of the chart shown in Fig. 2 provides arguments for forming the evaluative approach to determining the level of economic stability and treating it as a complex economic category. This approach also includes using management tools to ensure the declared level of the enterprise economic stability. Thus, the interpretation of the enterprise economic stability shown in Fig. 2 not only details it into components but also focuses on the procedure of fixing data in reporting forms which is the precondition of evaluation and management (also shown in the chart).

The interpretation of connections between the components of economic stability determines dependence of both direct and indirect types. The direct dependence is conceptually positioned as a sequence in which the financial and economic outcome of the enterprise operation is formed. This connection is presented with continuous lines in Fig. 2. It is visually reflected in the chart that technical and technological as well as marketing and logistics components represent product production and realization processes. Evaluation of these components is directed towards identifying the stability level of the potential involved in the enterprise operation activities. The level of the above components is fully reflected in the qualitative features of the organizational and staffing (managerial) component. Administering the processes of product production and sales is the primary task of managing the enterprise economic stability. Understanding economic stability strictly within one category cannot be considered appropriate for the well-grounded explanation of it essence.

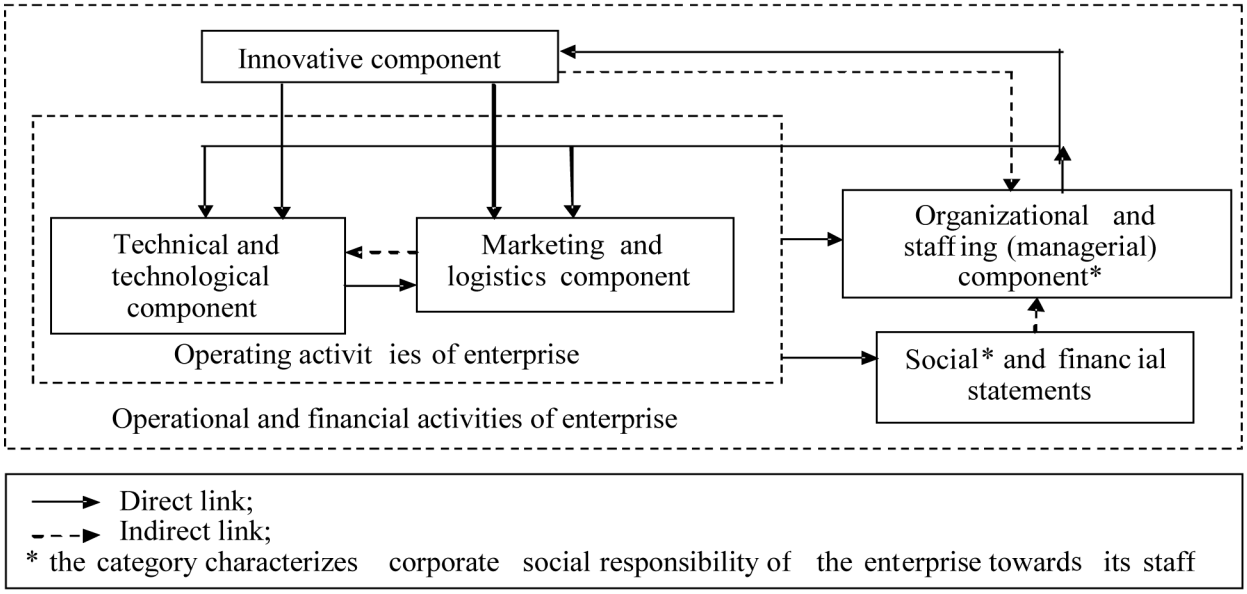


Fig. 2. The components of the enterprise economic stability and their interrelations (balancing the components of the enterprise economic stability)

** Note: improved by the author*

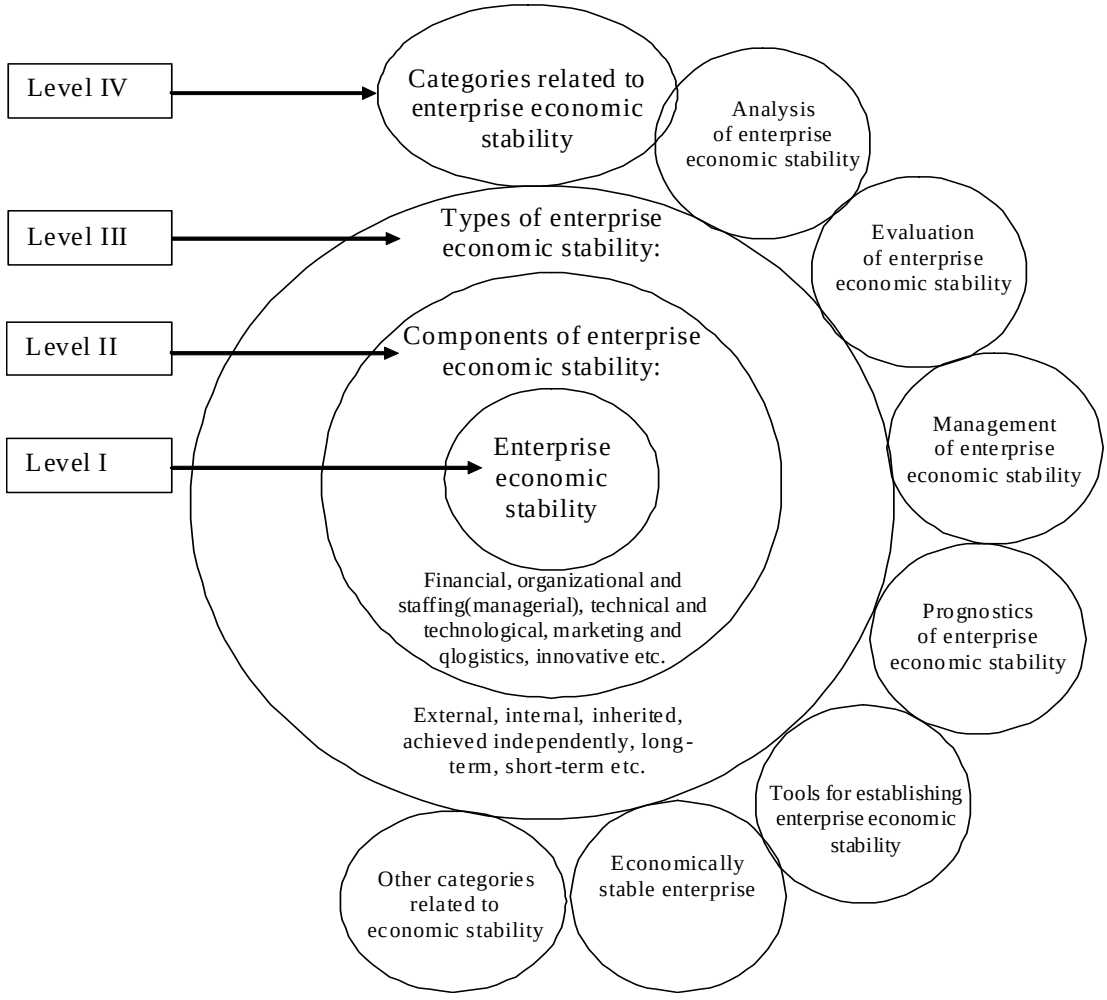


Fig. 3. Conceptual framework of enterprise economic stability

Note: elaborated by the author

The enterprise economic stability as the object of research creates additional conceptual framework, which should be considered in combination with the researched economic category. For our purpose the conceptual framework of the economic stability can be divided into several levels. The first-level categories are the immediate object of research, i.e. the enterprise internal economic stability. The second level is presented by the components of the researched object. The third level includes the types of the enterprise economic stability. The last level of the conceptual framework comprises related concepts, i.e. the economic categories which have been formed as a result of interaction between the object of research and other research spheres. Fig. 3 presents schematically the enterprise economic stability distributed by the conceptual framework levels.

The levels from first to third are described above, so they do not need any additional consideration. The fourth level of the conceptual framework of the enterprise economic stability retains its relevancy. There are the categories at this level, which have been formed as a result of the research into the enterprise economic stability. The peculiarity of this level is that the categories it contains have been formed in the result of synergy of different research spheres. Besides, the categories of this level illustrate specifics of scientific research into the enterprise economic stability.

"There are many definitions of the category of "corporate social responsibility". But understanding of this category essence in economic science literature is not always unambiguous. In western literature it is, as a rule, interpreted in the context of ensuring stable development of a company." (Bayura, 2009: 21).

The categories related to enterprise economic stability are summarized in Table 1. The Table presents modern interpretations of economic categories with the account of peculiarities of the domestic economic environment. These categories supply additional knowledge about the enterprise economic stability through detailing its fundamental aspects. Defining these categories is important because it provides complex understanding of the fact that enterprise economic stability is a multifaceted concept.

Positioning economic conceptual framework in compliance with the modern conditions of doing business is a prerequisite of the objective research into economic stability in general.

Conclusions and prospects for further research

Theoretical considerations on economic stability of socially responsible enterprises have been presented through synthesizing the experience of domestic and foreign scholars. The proposed typology of the enterprise economic stability is suitable for creating preconditions of socially responsible business. The emphasis on the social aspect of the economic sustainability of the enterprise contributes to its more effective correlation with the social responsibility.

Table 1

Modern interpretation of categories logically related to enterprise economic stability

Name of economic category	Economic category content	Notes
Analysis of enterprise economic stability	Breaking a complex economic category into components, thus identifying enterprise functional subsystems which provide the enterprise economic stability	Estimative and analytical procedure
Evaluation of enterprise economic stability	Determining the level of the enterprise economic stability on the basis of quantitative and qualitative indicators, expert method and other economic and mathematical tools	Estimative and analytical procedure
Management of enterprise economic stability	Coordinating actions of subordinate units by the enterprise managers with the purpose of effective provision of the enterprise economic stability	Management procedure
Prognostics of enterprise economic stability	Forming economic and mathematical forecasts of basic indicators of the enterprise economic stability and the general level of sustainable economic operation of an economic entity	Futuristic procedure
Tools for establishing enterprise economic stability	A set of methods or techniques for realizing a certain action which have obvious and substantial influence on enterprise economic stability by its changes (implementation of managerial decisions) or evaluation	Algorithm (approach) for implementing procedures
Economically stable enterprise	The enterprise having the stability indicators volatility level within the limits that allow to realize its strategic goals	Indicators dynamics

The architectonics of economic sustainability dealt with in the article illustrates the fundamental principles of both economically sustainable and socially responsible business. The multilevel categorical apparatus of economic stability which is expanding the understanding of this category has been formed. The proposed apparatus illustrates the complexity of this category and its potential correlation with other categories, particularly with those of social nature. The development of the concept of socially responsible business on the basis of its economic stability is the direction of further research.

References

1. *Arefieva O. V. & Prokhorova Yu. V. (2011). Anti-crisis financial management of the enterprise: [monograph]. Lviv: Ukrainian Academy of printing, 252 p.*
2. *Baiura D. (2009). Corporate social responsibility in corporate governance. Ukraine: aspects of labor, 1, pp. 21–25.*
3. *Galko L. R. (2010). Providing and Support of Economic Firmness of Industrial Enterprise: Thesis for a candidate degree in the field of Economic Sciences by speciality 08.00.04 – Economy and Management of Enterprises (After the Types of Economic Activities); Institute of market problems and economical ecological researches of the NAS of Ukraine, Odessa, 20 p.*
4. *Gryshova I. Yu. (2015). The identification of threats of economic stability of industrial enterprises. Business Navigator: scientific-production journal, 1(36), pp. 189–198.*
5. *Ivanov V. L. (2005). Management of economic stability of industrial enterprises (on the example of the enterprises of machine-building complex): [monograph]. Lugansk: East Ukrainian national University named after Volodymyr Dahl, 266 p.*
6. *Alan Lavine, Gail Liberman (2007). Quick steps to financial stability, Indianapolis, 192 p.*
7. *Albareda L., Lozano J. M. & Ysa T. (2007). Public policies on corporate social responsibility: The role of governments in Europe. Journal of Business Ethics, 74, pp. 391–407.*
8. *Anand S. (2000). Human development and economic sustainability. World Development, 28 (12). – pp. 2029–2049.*
9. *Alvord S. H., Brown L. D. & Letts C. W. (2004). Social entrepreneurship and societal transformation. Journal of Applied Behavioral Science, 40, pp. 260–282.*
10. *Bendell J. (2005). In whose name? The accountability of corporate social responsibility. Development in Practice, 15(3–4), pp. 362–374.*
11. *Berkhout T. (2005). Corporate gains: Corporate social responsibility can be the strategic engine for long-term corporate profits and responsible social development. Alternatives Journal, 31(1), pp. 15–18.*
12. *Bond E. W., Syropoulos C. (2012). Economic integration and the sustainability of multimarket collusion, Economics Letters, 117 (1), pp. 42–44.*
13. *Carroll A. B. (1999) Corporate social responsibility: Evolution of definitional construct. Business and Society, 38 (3), pp. 268–295.*
14. *Dolan P. (2004). Sustainable leadership. Leader to Leader, 33, pp. 8–12.*
15. *El-Erian M. A. (2012). Stable disequilibrium: Persistent, large payment surpluses and deficits threaten global long-term economic well-being and financial stability, Finance and Development, 49 (2), pp. 27–29.*
16. *Fowler S. J. & Hope C. (2007). Incorporating sustainable business practices into company strategy. Business Strategy and the Environment, 16, pp. 26–38.*
17. *Gaspar J., Vasconcelos P. B., Afonso O. (2014). Economic growth and multiple equilibria: A critical note, Economic Modelling, 36, pp. 157–160.*
18. *Giampalmi J. (2004). Leading chaos, paradox and dysfunctionality in sustainable development. Executive Speeches, 19(2), pp. 6–13.*
19. *Jayne V. (2004). Sustainable and responsible now a fact of management life? New Zealand Management, 51(3), pp. 26–33.*
20. *Jones D. R. (2000). Leadership strategies for sustainable development: A case study of Suma Wholefoods. Business Strategy & the Environment, 9(6), pp. 378–389.*
21. *Kerr I. R. (2006). Leadership strategies for sustainable SME operation. Business Strategy and the Environment, 15(1), pp. 30–39.*
22. *Lopez M., Garcia A. & Rodriguez L. (2007). Sustainable development and corporate performance: A study based on the Dow Jones Sustainability Index. Journal of Business Ethics, 75, pp. 285–300.*
23. *Oskamp S. & Schultz P. W. (2006). Using psychological science to achieve ecological sustainability. In S. I. Donaldson, D. E. Berger, & K. Pezdek (Eds.), Applied psychology: New frontiers and rewarding careers. London: Psychology Press.*
24. *Relph-Knight L. (2006). Sustainability is integral to top-level leadership. Design Week, 21(18), 6.*
25. *Roome N. J. & Bergin R. (2006). Sustainable development in an industrial enterprise: The case of Ontario Hydro. Business Process Management, 12(6), pp. 696–721.*
26. *Svoboda S. & Whalen J. (2005). Using experiential simulation to teach sustainability. Greener Management International, 48, pp. 57–65.*
27. *Tebo P. V. (2005). Building business value through sustainable growth. Research Technology Management, 48(5), pp. 28–32.*
28. *Van Kleef J. A. G. & Roome N. (2007). Developing capabilities and competence for sustainable business management as innovation: A research agenda. Journal of Cleaner Production, 15, pp. 38–51.*

Vol. 3, No. 1, 2016

UDC 330.341

A. G. Zahorodniy
PhD of Economic Sciences, Professor,

S. Ya. Babinska
Postgraduate student
Lviv Polytechnic National University

PARTICIPANTS OF AN INNOVATIVE PROJECT: THEIR TASKS, CONTRIBUTIONS AND INTERESTS

Abstract. The article considers the role of participants of the innovative project in its implementation, contractor relations, information, financial, and material flows that arise between them and accompany the process of the project implementation. Contributions and interests of participants in terms of the theory of groups of economic influence (stakeholders) and the conditions necessary for the successful implementation of an innovative project are investigated.

Key words: innovative project, participants of innovative project, asymmetry of information, groups of economic influence (stakeholders).

Problem statement

Under conditions of competitive economy innovation projects are an important factor in developing enterprise activities and attracting foreign investments into the country. Their essence consists in implementing measures directed towards application of innovative developments, developing new products, introducing new technologies for strengthening competitive position of the company in the market; promoting scientific and technological progress and raising the rate of economic development. In implementation of any innovation project, even the smallest ones, there take part several dozens of participants. If it is a big project, their number may reach several hundreds. So, research into the tasks set before the participants of the innovative project, their contributions and interests in the process of implementation of the project is relevant and expedient.

Analysis of the recent research and publications

The issues related to the implementation of innovative projects are dealt with in the works of the following domestic and foreign scientists: I. Blanc [1] M. Denysenko [2], P. Zavlin [3], S. Illiashenko [4], A. Kazantsev, [5], N. Krasnokutska [6], O. Kuzmin [7], H. Merkulov [8], L. Mindeli [5], P. Khariv [9], A. Yakovliev [10] and others. However, some aspects concerning participants and their tasks, contributions and interests of the groups of economic influence involved in the innovative project implementation have been studied insufficiently and need further research.

The purpose of this research is to define the tasks of the innovative project participants and their contributions into the project implementation as well as their interests in it.

Material presentation

To ensure competitive advantages of the enterprise and to improve its functioning it is necessary to create favorable conditions for the implementation of innovative projects. Participants play a significant role in the process of implementing innovative projects. Depending on the specifics, the size and type of the project a large number of organizations may participate in its implementation, each of these organizations performing certain functions and being responsible for the results of their activities. Fig. 1 shows the main participants of the innovation project.

The main participant of the innovative project is its executor, i.e. a physical or legal person which implements a project to achieve its main goal. There is a constant motion of information, cash, products, services, and works between the project executor and other participants of the project. Table 1 shows the innovative project participants and their main tasks in the process of project implementation.

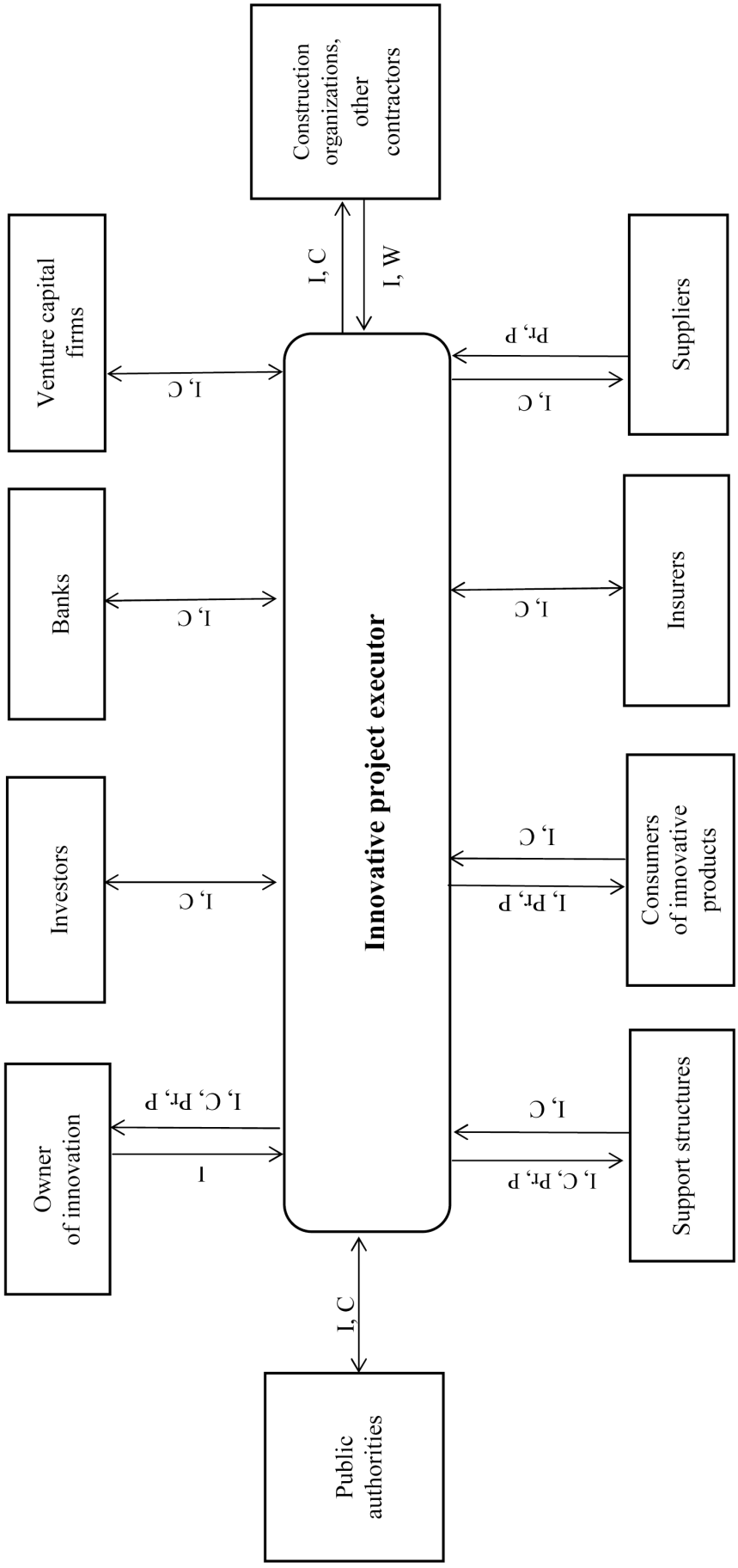


Fig. 1. Participants of innovative projects

Legend: I – information; C – cash (financial resources); Pr – products; S – services; W – work

Note: compiled by the authors

Table 1

The innovative project participants and their tasks

Types of participants	Main tasks
Innovative project executor	– implementing the main purpose of the innovation project – attracting investors for implementation of the innovative project
Owner of innovation	– providing the project executor with the information on the innovative project that defines the basic requirements and characteristics of innovation
Investors	– investing their own (borrowed) property and intellectual assets in the innovative project for getting profit
Banks	– opening and keeping current accounts of the project participants – making settlements between the project participants – providing loans to the project participants – operating on investments – being intermediaries in carrying on leasing operations – – consulting on banking and other financial services
Venture capital firms	– creating and implementing new types of products, new techniques and technologies, using a venture capital (venture financing is provided without any pledges unlike the bank crediting) – attracting resources for implementation of innovation activity – realizing results of the applied research
Construction organizations, other contractors	– developing the project estimate – building new facilities, reconstructing, overhauling or expanding the existing ones, and installing equipment under the contract concluded with the innovative project executor – engaging subcontractors to perform certain types of work
Suppliers	– providing material and technical support necessary for implementation of the innovative project
Insurers (insurance company)	– providing the project participants property interests protection – being obligated, for a certain fee, to compensate to the policyholders and other participants of insurance market the loss inflicted by the insured event or to pay the insured amount during the period identified by the contract
Consumers of innovative products	– purchasing the products and services that are the result of implementing innovative projects
Support structures	– facilitating the innovative project implementation by providing the project executor with the information, money, products or services that are needed.
Public authorities (Verkhovna Rada of Ukraine, the Cabinet of Ministers of Ukraine, central executive power bodies, authorities of local government (village, town and city councils))	– determining the legal, economic and organizational foundations of state regulation of innovation activity in Ukraine – establishing forms of stimulating innovation processes – providing the project executor with the information and funding some innovative projects

Note: compiled by the authors

As to innovative projects funding, it should be noted that according to [11], the amount of funds directed towards their financing should not exceed 70 % of the project cost. This provision also says that the enterprise own funds should constitute not less that 30 % of the innovation project financing. The amount of funds from the State budget that are allocated for financing one innovative project may not be less than 200 thousand UAH. The innovative projects that are supposed to get financial support from the state budget are selected by Credit Council of Ukrainian State Innovation Company.

Information is an important resource being exchanged between the project executor and all its participants. It plays an important role in the process of designing and implementing innovative projects because the process directly requires the availability of complete, accurate, timely and relevant information about the market, demand for products, market conditions, competitors etc. However, for the information to be usable it should be, first of all, gathered and made available to users.

However, a significant disadvantage, which may arise in the process of the innovative project

implementation and be related to the information and its movement is asymmetry of information. According to the definition provided by "Financial and economic dictionary" [12], asymmetry of information is "the situation, in which some market participants possess the information, which is not available to other interested parties". This phenomenon covers various areas of activities, including innovation activities of enterprises. Asymmetry of information results in reducing the effectiveness of the decisions made by the innovative projects participants and increasing the innovative projects implementation risks. In fact, the users of information have different goals, and therefore, each innovative project participant has different material interests.

Thus, for example, B. Eichengreen [13], the famous economist, Professor at University of California, considers that due to the information environment asymmetry investors are faced with difficult task of choosing the direction of investments, because when reliable and accurate information is not available it is difficult for them to determine when and how the information asymmetry will affect their business.

These are the disadvantages of the information asymmetry [14]:

– the market equilibrium (both favorable and unfavorable), being the balanced state of the market, is changing under the influence of the information asymmetry;

– the information asymmetry leads to the emergence of defects in market participants interactions, thus undermining the optimal allocation of resources. In commodity markets the information asymmetry results in developing negative trends;

– the effect of information asymmetry reduces the efficiency of the economy as a whole and affects its security. The most skillful and conscientious participants of market relations are advantageous therefore the benefits of society from the effects of information asymmetry largely exceed its losses, otherwise the losses from the effects of asymmetry information are very considerable for society. The fact that the economy is characterized by the low level of information capacity has the negative impact on the economic security of the state.

Asymmetry of information has the following effects: consumers of innovative products purchase lower quality products at higher prices; sellers of better quality goods experience reduced sales. If such a situation lasts for quite a long time, it will lead to bankruptcy of best sellers, so the asymmetry of information is dangerous for the market.

Each group of participants (the owner of innovation, investors, banks, venture capital firms, construction organizations and other contractors, suppliers, insurers, consumers, support structures, public authorities and other participants) affects the implementation of innovative projects so they can be considered the groups of economic influence (stakeholders). E. Freeman [15, p. 46] provided the following definition of the groups of economic influence (*Engl.* stakeholders): these are groups of people or organizations (economic entities) that can either resist or contribute to the goals or activities of an organization.

By the environment to which stakeholders belong, they are usually divided into internal (the owner of innovation) and external (investors, banks, venture capital firms, construction organizations other contractors, suppliers, insurers, consumers, support structures, public authorities). Groups of economic influence can have both financial and non-financial impact on the implementation of innovative projects.

Each group of economic influence has some relation to and interest in the innovative project that is demonstrated in financial, material and technical, insurance or other forms. Accordingly, to implement the project successfully the innovative project executor should pay due attention to the contributions and interests of each group of economic influence and coordinate them. However, in Ukraine accounting the interests of groups of economic influence in most cases is done intuitively because of the lack of effective tools for their considering.

Contributions of stakeholders in the implementation of innovative projects and their interests in their implementation are shown in fig. 2 and fig. 3, respectively.

As seen from fig. 2 and fig. 3, each group of stakeholders makes certain contribution to the innovative project implementation, and also has an interest in its implementation. It is apparent that each of the groups is interested in successful implementation of the innovative project. Therefore, to avoid possible negative consequences that may arise in the process of implementing the

innovative project it is necessary to adhere to the following conditions:

– to reduce the risk of the information asymmetry occurrence;

– to involve highly qualified specialists to the project implementation;

– to organize interaction, in particular, exchange of information, among the innovative project participants and to coordinate their interests;

– to create the situation when the participants' interests coincide with the project goal;

– to create the database containing information on innovative projects and to timely update it. An important element of this base is its connection with information centers, databases (including foreign) and its ability to provide the interested parties and individuals or organizations interested in financing the innovative projects etc. with the access to the necessary information.

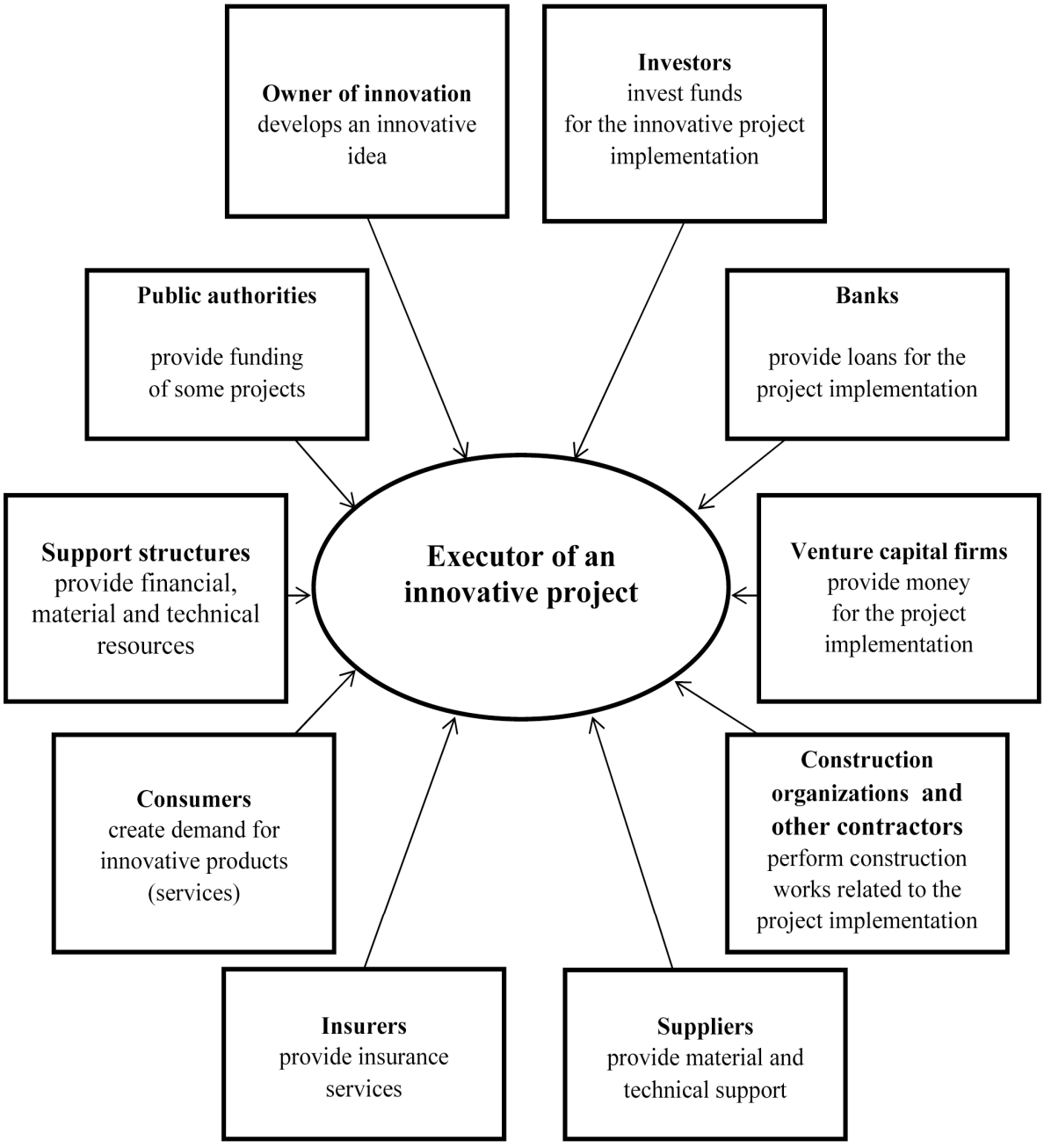


Fig. 2. Contributions of the groups of economic influence (stakeholders) into the innovative project implementation

Note: compiled by the authors

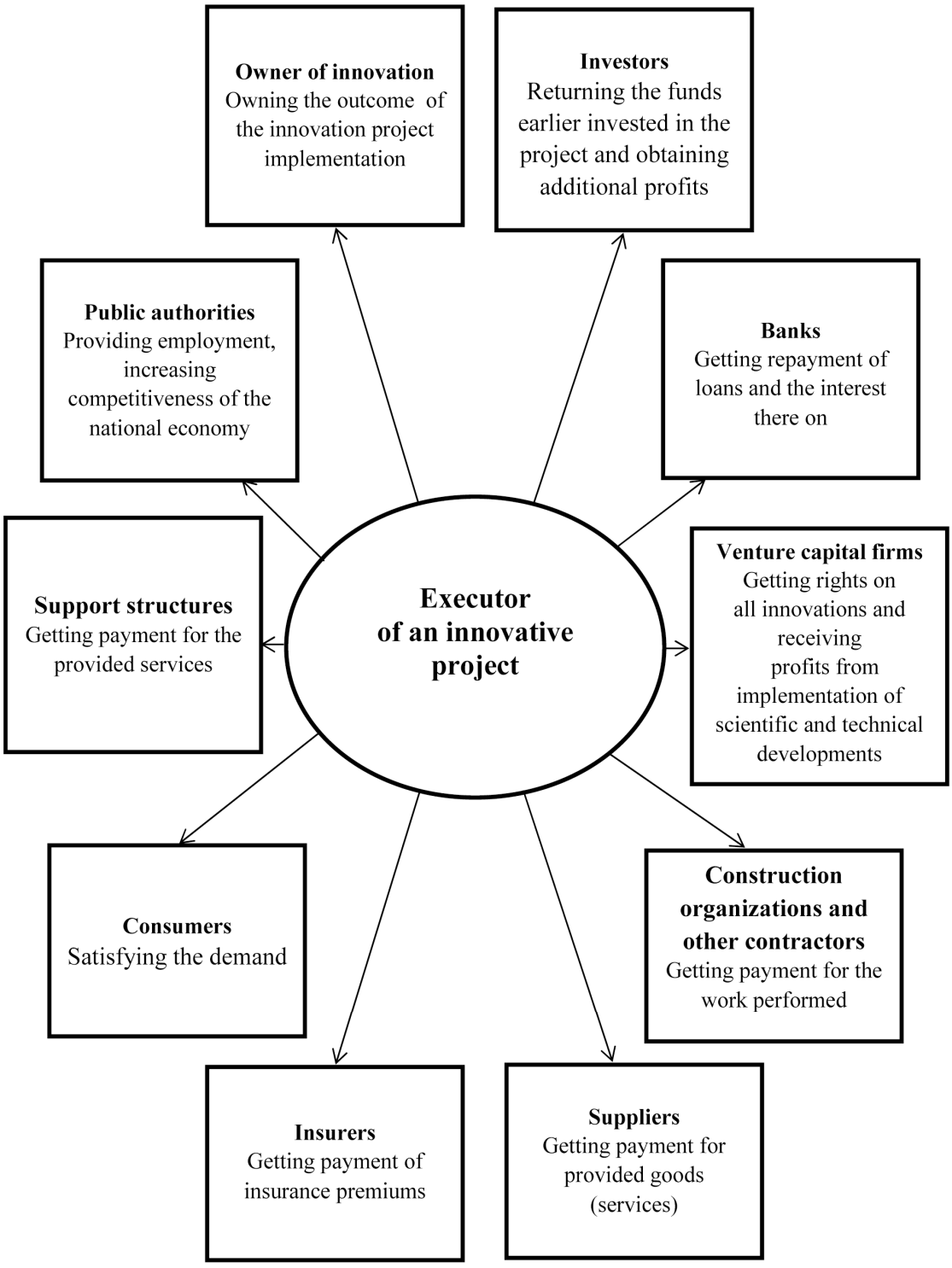


Fig. 3. Interests of groups of economic influence (stakeholders) in the innovative project implementation

Note: compiled by the authors

Conclusions

The innovative projects development and implementation take an important place in scientific and technological progress of the country. In fact, implementation of innovative projects grants any company the status of being flexibile and innovative thus strengthening its competitive position and increasing the rate of economic development of the enterprise. However, for the successful implementation of the project it

is necessary to ensure coordination of work (planning, organization, control) of the project participants, adjustment of their contributions and interests within the innovative project, taking into account the tasks of each participant and providing them with all necessary and sufficient information to avoid information asymmetry. All this is necessary for the successful innovative project implementation that, to a large extent, depends upon the project participants and the information they possess.

References

1. *Blanc I. A. (1999) Fundamentals of Financial Management. – K.: Nika Tsentr.*
2. *Denysenko M. P., Holubieva T. S., Kolos I. V. (2009) Information provision of innovative investment activities of company. Management and enterprise in Ukraine: stages establishment of and problems development, pp. 43–49.*
3. *Zavlin P. N. (2000) Foundations of innovation management: theory and practice. – M.: OAO "NPO "Izdatelstvo "Ekonomika".*
4. *Illiashenko S. M. (2003) Management of innovation development: problems, concepts, methods. Sumy: VTD "Universytetska knyha".*
5. *Kazantsev A. K., Mindeli L. E. (2004) Fundamentals of innovation management. – M.: Zao "Izdatelstvo "Ekonomika".*
6. *Krasnokutska N. V. (2003) Innovation management. – K.: KNEU.*
7. *Kuzmin O. Ye., Kniaz S. V., Vivchar O. Y., Melnyk L. I. (2005) Activation of investment and innovation activities of enterprises. – Stryi: TzOV "Ukrpol".*
8. *Merkulov N. N. (2007) Scientific technological activity: innovative aspects. Odessa.*
9. *Khariv P. S. (2003) Innovation activity of enterprise and economic evaluation of innovative processes. – Ternopil: Ekonomichna dumka.*
10. *Yakovliev A. I. (2010) Project analysis of innovative investment activities. – Kharkiv: NTU "KhPI".*
11. *"About approval of procedure using the special fund of the state budget of Ukraine directed to the financial support of innovation activities of business entities", [Electronic resource]/ – Access mode: http://zakon5.rada.gov.ua/laws/show/1316-2004-p*
12. *Zahorodniy A. G., Vozniuk G. L. (2011) Financial and economic dictionary. – Lviv: Vydavnytstvo Lvivskoi politekhniky.*
13. *Eichengreen B. (2003). Capital flows and crises. – Cambridge: MIT Press, Massachusetts. – 385 p.*
14. *Yevdokymov V. V. The asymmetry of accounting information and ways of her minimize. International collection of scientific papers, Vol. 3, No. 21, pp. 135–146.*
15. *Freeman R. E. (1984). Strategic Management: A Stakeholder Approach. Boston et al.: Pitman. – 315 p.*

Vol. 3, No. 1, 2016

UDC 330.11:338.54

H. M. Zakharchyn
Doctor of Economics , Professor,

N. P. Lyubomudrova
PhD of Economic Sciences,

I. B. Sobol,
Postgraduate student,
Lviv Polytechnic National University

MOTIVATION AND EVALUATION OF PERSONNEL IN MODERN CHALLENGING ENVIRONMENT

Abstract. Relationship between motivation and evaluation of the personnel in the enterprise management system as a purposeful influence on employees' performance is substantiated; the new tasks set before employees in modern challenging conditions are outlined. There are defined today's new challenges that are becoming a reality and are determining the new tasks set for national management. The basic essential components of personnel motivation and evaluation are presented; the content analysis of the personnel assessment tasks depending on manifestation of specific trends in society is made. Relevant principles of motivation and evaluation of personnel are indicated, the need for the formation of innovative mechanism for managing the personnel efficiency and work is emphasized. The mechanism is supposed to combine motivation and evaluation contexts and harmonize relations between employers, managers and employees.

Key words: motivation, personnel evaluation, motivators, motivational policy, personnel management.

Formulation of the problem

Today we are witnessing the emergence of new trends being of qualitatively different nature which are the laws of another dimension and which require new scientific and applied approaches to personnel management. In this context managers are challenged not only by the rational use of human resources but also by effective capitalization of the personnel's competences, skills and experience into the company's assets. Among all the aspects of the personnel management system employees' motivation and evaluation are most sensitive to changes. However, practices of personnel motivation and evaluation being intrinsic for foreign companies cannot always be adequately adopted by domestic enterprises. Besides, there is no systematic approach to the evaluation and motivation as a harmonious mechanism for managing both labor and enterprise. Managers do not bother looking for innovative tools of personnel motivation and evaluation, which exacerbates the problems associated with effective human capital management at domestic enterprises.

Analysis of recent research and publications

Personnel motivation and evaluation play a prominent role in the management of personnel, so this topic is covered in quite a lot of scientific papers by both domestic and foreign researchers. Scientists are exploring this topic in different directions, approaches, focusing on various aspects. Theoretical aspects of motivation, motivational techniques, value orientations of people, the basics of motivation are covered in publications of Ukrainian scientists [1, 5, 7, 8, 13]. Motivation and its relationship with organizational culture are dealt with in the author's monograph [2] and the article by O. V. Kharchyshyn [12]. The issues of evaluating personnel are explored by scientists who describe methods of personnel evaluation, current approaches to evaluating personnel, constituents of personnel evaluation [3, 5, 9, 14]. The issues are dealt with either in the light of the company's efficiency [11, 15] or in the system of motivation itself [10]. Systematic scientific work by A. M. Kolot is also noteworthy [4]. The author integrally combines personnel motivation, promotion and evaluation into a single management mechanism. Undoubtedly estimating positively and appreciating the contribution of scientists to the development of these important theoretical and applied problems, we note that some aspects require further research. In particular, it is advisable that at present scientific

ideas be looked at in terms of new trends, new challenges that will inevitably determine not only the theoretical and methodological approaches to economic processes and phenomena but will also change the instrumental component in the practical implementation of theoretical considerations. So a comprehensive statement of the scientific problem of finding an effective mechanism for improving the management of personnel is required, and in that approach staff motivation and evaluation should be an integral part and one whole.

The purpose of the article is to highlight the relationship of motivation and evaluation of personnel and to define new tasks in modern challenging conditions.

Presentation of the main material

Today it is necessary to track the current challenges in society, their influence on the structure of personal incentive systems to be able to form timely measures aimed at increasing motivation policies and methods of personnel evaluation.

The main modern challenges are:

– construction of civil society and the desire for greater freedom and responsibility;

– socialization and humanization of labor as a result of spreading socio-humanistic trends in management;

– promotion of cultural component in management that creates new value orientation of people, it being the basis of motivation;

– informatization of society and formation of virtual economy;

– transition processes occurring in our society that require not just adaptation to change but continuous human development, which should form the basis of motivational policies at enterprises;

– quality as a new essence in the evolutionary development of society, with its new content and meaning, requiring innovative approaches to instrumental component of personnel motivation and evaluation;

– time dimension as a factor of accelerating all processes and radical changes in technology, organization of work, which also stimulate development of other evaluation technologies and motivational tools.

These challenges have become reality and, accordingly, set new challenges for national management. Managers at various levels begin to practice new technologies of personnel management, seek new forms of personnel motivation and evaluation, and check their effectiveness and adequacy.

Relationship between personnel motivation and evaluation is clear as far as these are not only interrelated management functions, but also meaningful impacts on the activities of every person in the organization reflecting causal relationships. Usually motivation is considered to be a result of evaluating employee's performance. This relationship can also be reversed. In the system of motivation among other elements and features there is the evaluation function that allows comparing performance and reward, thus identifying the power of the motivational tool. In evaluating personnel three functions are also performed – administrative, informational and motivational. Thus, on the basis of evaluation there are taken important management decisions related to the system of motivation. Motivational objective of personnel evaluation is to choose adequate methods of motivation. At the same time, the motivational component of personnel evaluation allows to identify the timely feedback between managers and subordinates in terms of the results of their work. Personnel evaluation should not have a punitive character, making people psychologically tense. It should encourage and motivate development and improvement of their professional abilities. In this context, motivation is expected to be fundamental in the system of evaluation. Since these functions are interrelated and dependent the aim of top management should be to synthesize motivation and evaluation to obtain synergy effect. The relationship of the main components of motivation and evaluation is presented in Table 1.

Analyzing the main components of personnel motivation and evaluation, we note that in the process of motivation a personal incentive is important as a fundamental component while for evaluation the fundamental element is a set of parameters by which an employee's performance and effectiveness in the organization are judged. In this context, enterprise managers should pay attention to the use of special motives, which would provide opportunities to increase efficiency, responsibility and satisfaction from work, i.e. motivators. A motivator "is the most optimized motive, which provides a relatively stable expression of the appropriate response to stimulus" [8, p. 504]. Based on the fundamental component there is formed an incentive to action, the internal one for motivating an employee and the external one for evaluating employee's performance, and there taken

actions based on the results, such as promotion, compensation or taking an appropriate management decision based on evaluation. Parametric-essential component can also be interpreted in different ways. Motivating personnel is more related to the aspects of quality, it especially concerns creative work where the material component may give way to the immaterial one, where the emotional and status factor as well as recognition weigh more than even wages. For the evaluation it is important to operate quantitative indicators which are necessary for determining the employee's labor cost and then, as a complementary element, for stimulating the employee.

Table 1

The main components of personnel motivation and evaluation

Basic essential components	Motivation	Evaluation
Fundamental element	Motive	A set of evaluation parameters
Incentive	Internal	External
Goal	Improving the efficiency of personnel and enterprise	Determining the cost of labor and the cost of personnel
Result	Reward (individual or collective)	Stating the fact of evaluation, confirming job relevance and level of professional competence, taking an appropriate personnel decision etc.
Dominant indicators	Quantitative, qualitative	Quantitative
– Essential manifestation	– Time and space forms – Objective and subjective states – Economic and psychological nature	– Time and space forms – Real and potential states – Individual contribution to performance – Necessary employees traits

Source: developed by authors

New challenges put new tasks on the agenda of motivational policies and personnel evaluation systems, they require integrated efforts in search of innovative methods and technologies, review of personnel and work evaluation criteria. Table 2 shows the major challenges of our century and new personnel evaluation tasks.

Table 2

New tasks of personnel evaluation in modern challenging conditions

New challenges	New tasks of personnel evaluation systems
Democratization of social processes, which gives freedom of choice	Comparative evaluation of success and failure during a certain career stage
Intellectualization of society	Review of competencies and criteria for evaluating labor effectiveness
Informatization and virtualization of ecomony	Reorientation of evaluation policies and evaluation procedure
Socialization and humanization of labor	Strengthening the social dimension in the scale of personnel and performance evaluation
Introduction of cultural component in the management system	Relations between evaluation system and the type of organizational culture
Reconsideration of the category of quality as the universal value of evolutional development	Evaluation of the development potential of a multidimensional person and his/her career progression

Source: developed by authors

The growing tendencies specified in Table 2 in all spheres of society will definitely bring changes into the content of evaluation, will cause the review of the evaluation structure with different accents on the evaluation of personal qualities, quality of work and performance. The time factor today demonstrates the dynamic acceleration of all processes, dissemination of information, emergence of new professions, reduced product life cycles, request for new professional skills and competences, which also require simplification of evaluation procedures. Informatization of society will promote the use of information technologies (time management, for example, to study the intensity of labor) during the period of personnel evaluation. Social and humanistic tendencies facilitate the movement of evaluation technologies towards increasing the value of labor social efficiency. This applies not only to those companies that are already recognized as socially active but also to those that understand that social responsibility is a sign of the strong civil society. Quality, as an essentially different level of development, focuses on the quality values and parameter, this, in turn, changes the approach to motivating and evaluating personnel. All these challenges initiate changes in approaches to

motivation of personnel and tasks of motivational policies as they reinforce such core categories as “complexity”, “tension”, “intensity”, “importance” of work, which are the components of motivation.

Both motivation and evaluation of personnel is based on the principles of objectivity, accuracy, comprehensiveness, accessibility, timeliness, flexibility, which remain relevant today.

Conclusions and perspectives of further research

In today's challenging conditions an innovative mechanism for managing the efficiency of personnel performance and labor should be formed. It has to integrally combine evaluation and motivation contexts and harmonize relations between employers, managers and workers. Personnel motivation and personnel evaluation are autonomous areas of working with people, but they have many common components, so with the appropriate and holistic approach to the selection of innovative mechanisms for their implementation it is possible to get the effect of synergy in using human potential and achieving success in the market. New challenges dictate new approaches but do not deny the use of those traditional methods of personnel motivation or evaluation that still preserve their relevance and effectiveness even in the face of change. Consequently, the task of HR-managers is to be able to combine innovation with tradition in the correct proportions.

Research into this direction of personnel management should continue but it should account innovative trends in economic development, management, society as a whole. Further research should be directed towards building a model of system-based assessment of latest impact factors influencing the formation of innovative motivational and evaluation policies at enterprises. Another research direction might be reviewing professional standards, and expanding the field of motivation and personnel evaluation criteria.

References

1. *Vievska M. Motivation of Professional Self-realization in Order of the of Forming Managerial Competencies Strategy // M. Vievska, L. KrasoVska // High School. – 2010. – No. 3–4. – P. 89–103.*
2. *Zaharchyn G. Formation and Evaluation of Managerial Staff of Enterprises And Organizations Motivation: monograph // G. Zaharchyn, N. Lyubomudrova. – Lviv, Lviv Polytechnic National University Publishing House, 2015. – 188 p.*
3. *Yeskov O. Staff Evaluation as an Important Factor for the Personnel Certification // O. Yeskov, M. Pashuta // Formation of Market Relations in Ukraine, 2007. – No. 3 (70). – 157 p.*
4. *Kolot A. Motivation, Promotion and Staff Assessment / A. Kolot. – K.: KNEU, 2003. – 224 p.*
5. *Labenska T. Development of Methods for Personnel Evaluation // T. Labenska // The State And The Regions. Series: Economics and Business, 2007. – No. 4. – 160 p.*
6. *Libanova E. Values and Social Reality of Ukrainian Society / E. Libanova // Economics of Ukraine. – K., 2008. – No. 10 (563). – P. 120–136.*
7. *Lipych L. The Genesis of Labour Motivation Theories / L. Lipych, L. Pustyulha // Science and Economics. – 2010. – No. 1. – P. 114–117.*
8. *Prytula O. Motivational Mechanisms and Their Using in Business / O. Prytula. – Lviv. – Lviv: IRD NAS of Ukraine, 2003. – 216 p.*
9. *Sivashenko T. Modern Approaches to Staff Assessment / T. Sivashenko // Economic Analysis, 2011. – Issue 8, Part 2 – P. 315–317.*
10. *Sytnik O. Personnel Assessment in the System of Motivation / A. Sytnik, O. Kovalchuk // Actual Problems of Economy. – 2007. – No. 11. – P. 84–87.*
11. *Turchina V. The Main Directions of Work Efficiency Improving in Crisis Period / V. Turchina // Formation of Market Economy: zb. nauk. pr. – K.: KNEU, 2010. – Vol. 2. – P.427–436.*
12. *Harchishina O. Personnel Motivation Based on the Theory of Organizational Culture (Electronic Resource) / O. Harchishina // Economy. Management. Innovations. – 2014. – No. 1.*
13. *Chernenko V. Innovative Work and Motivational Bases Of Its Development / V. Chernenko // Ukraine: Aspects of Labor. – 2007. – No. 6. – P. 30–34.*
14. *Tsurcan S. Labour Productivity as a Part of Integrated Assessment Indicator of the Efficiency of Industrial Enterprise’s Staff: Problems of Definition and Using / S. Tsurcan // Visnyk of Khmelnytsky National University. – 2011. – No. 4, Vol. 2. – P. 216–219.*
15. *Shumakova I. Human Resources Potencial and its Impact on the Organizations Efficiency / I. Shumakova // Visnyk NTU “KPI”. – 2010. – No. 22. – P. 12–20.*

Vol. 3, No. 1, 2016

UDC 338.24:658.152:621

Z. O. Koval
PhD, Associate Professor,
Lviv Polytechnic National University

EVALUATION INDICATORS OF THE MARKETING STRATEGIES EFFICIENCY OF VALUE-BASED ENTERPRISES

Abstract. The article presents indicators used for evaluating the enterprise marketing strategy efficiency with current approaches. Trends in evaluating marketing strategy of value-based enterprises are analyzed and specified. There are selected and grounded evaluation indicators of marketing strategies efficiency of value-based enterprises. The system of indicators corresponding to the selected principles and demands of value-based management as well as to the suggested efficiency evaluation criteria is developed. The aim of this research is to analyze advantages and disadvantages of current evaluation indicators of marketing strategies efficiency in the process of their application as well as develop new indicators to meet the requirements of value-based enterprises. As a result of the research a system of indicators to carry out an objective and overall evaluation of the marketing strategy according to the integral efficiency indicator and in compliance with the requirements of value-based enterprise management is proposed. The research results can be applied in the evaluation model of the marketing strategy options at the value-based enterprises with the aim of choosing the best option.

Key words: indicators of efficiency evaluation, marketing strategy, marketing strategy efficiency, strategy options, system of indicators, value-based enterprise.

Problem statement

Planning enterprise activities involves forming strategies of its development, the general strategy, in particularly, which determines the enterprise business line, its strategic goal, the tasks to be performed to achieve it as well as its functional strategies. Marketing strategy is a detailed elaboration of the enterprise development directions in the field of marketing. Efficient marketing strategy enables an enterprise to offer its customers products that maximally meet the demand, are sold at favorable prices, at their earliest convenience, and in the convenient place, thus guaranteeing the possibility for the enterprises to compete in the market efficiently.

In case of value-based management, extremely important is availability of the relevant indicators that make it possible to evaluate not only the efficiency of the enterprise marketing strategy but also its impact on the enterprise value. However, when making a selection of indicators for such efficiency evaluation, it is essential to answer three major questions: for what purposes these indicators will be used; what benefit the results of their analysis will bring; and who needs them.

A review of recent research and publications

The analysis of recent research and publications in which the solution to the given problem is presented, shows the variety of approaches to the enterprise marketing strategy formation. The related research works reveal a number of trends in evaluating the marketing strategy efficiency, one of the trends being its evaluation by means of summing up the results of production and sales activities improvement with the account of the maximum use of market opportunities, the increase in the forecasts reliability, identification of the market segment for certain products etc. Other trends concern evaluation of marketing strategies efficiency according to such factors as the number of customers, marketing integration, adequacy of information etc., though there is no algorithm for their calculation. Several trends are based on the assumption that marketing performance consists in sales growth and increase in profits. However, these are final results, and they are influenced not only by marketing but also by other enterprise performance factors, such as personnel qualification and financial potential. Consequently, such assessment is too simplified and not very objective. It has also been proposed to evaluate marketing strategy efficiency as a total of expenses on marketing, though in this case it is evaluated marketing cost-effectiveness rather than marketing strategy efficiency.

In the majority of international publications [3–5, 8, 11–15] marketing expenses are being treated as an investment into enterprise efficiency. The research into the barriers hindering the

objective evaluation of marketing performance efficiently conducted by the auditing and consulting firm "Deloitte" is an important contribution to the issue of evaluating marketing performance efficiency. One of the major latest research is a global evaluation system of marketing investments called the "optimal marketing" [13] based on analyzing the data on customers' performance evaluation obtained through CRM (Customer Relationship Management) system. The research conducted by J. Lenskold [14], who not only interprets expenses on marketing as investment but also suggests evaluating efficiency using ROI (Return on Investment) metric, is notable in this field. M. McDonald and P. Mouncey consider investments into marketing taking into account their ROI time [15]. As far as Ukrainian researchers are concerned, they still, for various objective and subjective reasons, look at investments into marketing as expenses. One of the principal reasons for this is the necessity to take time factor into account. Some time is needed to feel the effects of applying a certain marketing strategy. The absence of a common viewpoint on determining basic indicators for evaluating the efficiency of marketing strategies as well as the absence of an evaluation technique, in particular, for value-based enterprises, makes these issues particularly topical.

Objectives of the article

The article aims at justifying the expediency of selecting adequate indicators of marketing strategy efficiency of value-based enterprises. The following tasks are set:

– to analyze the approaches being used for evaluating the efficiency of enterprise marketing strategy;

– to study the trends of marketing strategy evaluation and to adapt them for being used by value-based enterprises;

– to justify the expediency of selecting indicators of marketing strategy efficiency for value-based enterprises.

Results and discussion

Given the fact that any activity leads to some results manifested in its outcomes that may be evaluated, the results of selecting and applying the marketing strategy are visible in the achievement of economic, managerial, social, communicative, competitive and other effects. Such diversity of results as well as increase in the role of marketing strategies in the enterprise activities have given rise to a considerable number of trends in evaluating the enterprise marketing strategy efficiency.

Generally speaking, efficiency may be defined as the correlation between the outcomes of any activity (or measure) and the expenses on their high-quality achievement. Thus, efficiency characterizes processes and activities of managerial nature, reflecting the level of achieving the goal, and may imply: a clearly stated specific outcome; correspondence of the achieved result to the most possible, ideal or planned outcome; costs and benefits correlation; quantitative characteristics of enterprise performance; the level of achieving the goal.

Evaluation of efficiency of the enterprise marketing strategies involves selection of the following evaluation criteria: effectiveness, expediency, costs, ethicality, rationality, adaptability, reliability, dynamics. Such criteria will enable comprehensive efficiency evaluation of marketing strategies. In particular, effectiveness describes the expected, planned or actually achieved result of marketing strategy implementation by an enterprise. Expediency criterion marks correspondence of marketing strategy and effects of its implementation to the goal set by the enterprise. Costs criterion characterizes the level of expected or obtained business expenditures as a result of the selected strategy implementation. Ethicality criterion characterizes correspondence of the selected strategy to ethical, social and ecological standards. Rationality characterizes correspondence of the marketing strategy to the core principles of enterprise development and its marketing activities. Adaptability criterion marks the level of marketing strategy adjustment to the conditions of external and internal environment, its flexibility depending on the impact of these conditions. Reliability characterizes the ability of the marketing strategy to preserve with time the value of all parameters within certain limits, indicating that it can be applied in specified environments and conditions. Dynamics characterizes timeframe of marketing strategy implementation as well as possibility of its development.

Application of the aforementioned criteria for the evaluation of the enterprise marketing strategy will make it possible to analyze not only the efficiency of a certain strategy but also to compare variants of strategies in order to select the best one. In particular, one may use the model of advantages of the enterprise marketing strategies (Fig. 1), that has been created by analogy with the polygon of competitiveness, and reflects correlation of various indicators on the plane. To display the level of significance of each criterion under

study, a certain scale of measurement is used, for example level evaluation. Thus, by means of polygons of advantages for the enterprise strategies depicted on one plane, it is possible to analyze their efficiency level according to various criteria.

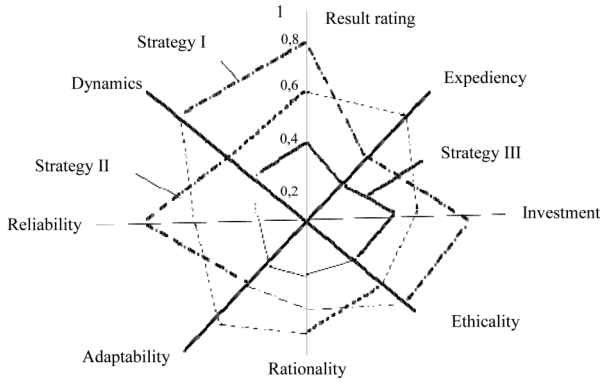


Fig. 1. The model of comparison of the enterprise marketing strategy variants (criteria values are determined according to the level scale from 0 to 1)

The application of the suggested marketing strategy evaluation technique on the basis of the suggested criteria will make it possible to visualize and evaluate advantages and disadvantages of each strategy being evaluated, and, as a result, select the most efficient one.

Quantitative estimation of a marketing strategy may be obtained applying economic and mathematical methods. In particular, the marketing strategy efficiency in general terms may be presented through these three basic indicators: the period of time for strategy implementation (T), costs of strategy implementation and possibilities of cost reduction (C), expected or obtained result (effect) from the application of the strategy (R).

Having defined the enterprise marketing strategy efficiency as E, we can present this indicator as a function of three variables (T, C, and R):

$$E = f(T, C, R) \to \max . \qquad (1)$$

Therefore, we obtain the evaluation model of enterprise marketing strategy efficiency according to certain variants. Let function $P(x)$ denote expected (or achieved) outcome of strategy application, where the variable x characterizes the number of strategy variants. Then, efficiency of their implementation may be presented by $E(x)$ function, which is the derivative of the amount of $P(x)$, that is, $E(x) = dP(x)/dx$. Thus, the speed of achieving the intended effect $P(x)$ as well as the rate of strategy efficiency change may be determined by the following equations:

$$R(x) = \frac{dE(x)}{dx} = \frac{d^2P(x)}{dx^2}, \qquad (2)$$

$$Z(x) = \frac{\frac{dE(x)}{dx}}{E(x)} = \frac{d[\ln(E(x))]}{dx}. \qquad (3)$$

The proposed technique will make it possible to evaluate the efficiency of the enterprise marketing strategies in terms of the speed of achieving the intended effect and the rate of the strategy efficiency change.

Therefore, we suggest grouping indicators that should be used at various stages of marketing strategy life cycle (Table 1).

Table 1

Peculiarities of applying marketing strategy efficiency evaluation indicators of at various stages of its life cycle

Stages	The essence of the stage	Evaluation indicators of marketing strategy efficiency
Development	Determination of goals and missions, tasks and objectives of the activity; Analysis of strengths and weaknesses, opportunities and threats; Determination and development of alternative courses of action and directions.	Evaluation of various strategy alternatives in terms of: – feasibility; – validity; – competitiveness.
Selection	Analysis of developed strategies; Comparison of alternative strategies; Selection of optimal strategy.	Comparison of alternative strategies by the following indicators: effectiveness, expediency, costs, ethicality, rationality, adaptability, reliability, and dynamics.
Implementation	Determination and substantiation of marketing behavior; Arrangement of conditions for efficient strategy application; Coordination of various directions for strategy implementation.	Evaluation of opportunities and threats for a strategy implementation according to the following indicators: – creative approach, – tactics of marketing activity implementation, – marketing management.
Evaluation	Analysis of the strategy implementation results; Analysis of time and resources expenditures; Analysis of the level of the goal achievement.	Strategy efficiency evaluation by changes in effectiveness, costs, ethicality, rationality, adaptability, reliability, dynamics, and expediency.

As a marketing strategy efficiency characterizes the efficiency of its development and implementation processes, its evaluation should include analysis of the following:

– validity and feasibility of plans;

– general purpose and objectives of marketing strategy;

– correctness of choosing the strategy type;

– strategy components (concept, measures and actions, indicators and criteria etc.);

– degree of achieving the goal, results, expenditures, competitiveness and flexibility of the strategy etc.

The purpose of the marketing strategy efficiency analysis consists in obtaining an objective evaluation of the effect received from implementation of certain marketing activities, and its comparison with expenditures and the goal set. However, in the context of value-based management this purpose is accompanied with assessment of the enterprise value change due to implementing these marketing activities.

Consequently, value orientation of management makes certain adjustments in the marketing strategy efficiency evaluation. Taking this into consideration, the analysis of marketing strategy efficiency will also include assessment of the enterprise value increase and the contribution of marketing activities into it; analysis of the marketing activities efficiency and the costs of marketing measures taken; profitability analysis of investments into marketing activities; assessment of the effects obtained and the influence of factors on the efficiency of marketing strategies as well as the reserves for its increase.

The essence of efficiency evaluation of marketing strategies at value-based enterprises lies in analyzing the strategy development and the results of its implementation, their correlation with the goals set and the costs incurred. The analysis of validity and feasibility of plans involves the comparison of strategic indicators of the enterprise performance with the indicators of the current and/or previous periods. A considerable difference in these indicators should be substantiated either by additional attraction of resources (financial, human, material etc.) into the enterprise activities or their withdrawal.

The analysis of the integrated index formation will make it possible to reveal the reserves, i.e. unused opportunities for the enterprise marketing strategy efficiency enhancement that should be considered while developing the enterprise marketing strategy in future.

Conclusions and prospects for future research

The choice of indicators for evaluating the marketing strategies efficiency of value-based enterprises should imply getting an objective evaluation of the effect these strategies have on increasing the value of the enterprise assets. As there is the need in creating the appropriate image of the enterprise and increasing the enterprise value, such evaluation is of key importance in making an assessment of the general effect of marketing strategies implementation in case of value-based management. Application of the suggested indicators for the evaluation of the enterprise marketing strategies will make it possible to obtain objective assessment of their efficiency, being the background for their further considerable competitive advantages. The selection of principles and directions of evaluation may be substantiated by the significance of marketing strategies in the enterprise value formation. The further research will involve the development of methodological basis of assessment of marketing strategies efficiency at value-based enterprises.

References

1. *Upravlinnia innovatsiinymy protsesamy v mezhakh ekosystemy: Monohrafiia / N. I. Chukhrai, R. Patora, A. H. Zahorodnii, H. M. Zakharchyn ta in., za nauk. redaktsiieiu N. I. Chukhrai. – Lviv: Vydavnytstvo Lvivskoi politekhniky, 2012. – 216 s.*
2. *Tsyhankova T. M. Suchasni modeli ta tendentsii rozvytku stratehichnoho marketynhu / T. M. Tsyhankova // Marketynh v Ukraini. – 2004. – No. 2(24). – S. 31–36.*
3. *Porter M. Konkurentnaia stratehyia: Metodyka analyza otraslei y konkurentov / M. Porter, per. s anhl. Y. Mynervyna. – M.: Alpyna Pablysher, 2011. – 454 s.*
4. *Tompson A. Stratehycheskyi menedzhment. Kontseptsyy y sytuatsyy dlia analyza / A. Tompson, A. Stryklend, per. s anhl., 12-e yzd. – M.: Yzd. dom "Vyliams", 2006. – 928 s.*
5. *Krevens D. Stratehycheskyi marketynh / D. Krevens, per. s anhl. – M.: Yzd. dom "Vyliams", 2008. – 512 s.*
6. *Marketynhovi stratehii rozvytku ta konkurentospromozhnosti sotsialno–ekonomichnykh system v umovakh hlobalizatsii : monohrafiia / [I. V. Taranenko, O. V. Dashevska, D. Iu. Liashko ta in.]. – Dnipropetrovsk: DUEP, 2010. – 304 s.*
7. *Balabanyts A. V. Obgruntuvannia mekhanizmu vymiriuvannia rezultatyvnosti marketynhovoi vzaiemodii pidpryiemstva iz tsilovym rynkom / A. V. Balabanyts [Elektronnyi resurs] // Torhivlia i rynok Ukrainy. – 2009. – No. 28. – Vol. 3. – S. 8. –*

Rezhym dostupu do zhurn.: http: // www. nbuv.gov. ua/portal/Soc_Gum/Tiru/2009_28_3/index.htm.

8. *Marketynhovi pokaznyky: Bilshe 50 pokaznykiv, yaki vazhlyvo znaty kozhnomu kerivnyku / [U. Pol Ferris, T. Neil Bendl, I. Filipp Pfaifer, Devid Dzh. Reibshtein]; per. z anhl.; za zah. red. I. V. Taranenko. – Dnipropetrovsk: Balans Biznes Buks, 2009. – 480 s.*
9. *Marketynhovi stratehii rozvytku ta konkurentospromozhnosti sotsialno–ekonomichnykh system v umovakh hlobalizatsii : monohrafiia / [I. V. Taranenko, O. V. Dashevska, D. Iu. Liashko ta in.]. – Dnipropetrovsk : DUEP, 2010. – 304 s.*
10. *Marketynhovi pokaznyky: Bilshe 50 pokaznykiv, yaki vazhlyvo znaty kozhnomu kerivnyku / [U. Pol Ferris, T. Neil Bendl, I. Filipp Pfaifer, Devid Dzh. Reibshtein] ; per. z anhl.; za zah. red. I. V. Taranenko. – Dnipropetrovsk : Balans Biznes Buks, 2009. – 480 s.*
11. *Marketing in 3D // Deloitte report, London, 2007.*
12. *Kumar V. Customer Relationship Management : Concept, Strategy and Tools / V. Kumar, W. Reinartz. – John Wiley & Sons, Inc., 2nd ed., 2012. – 379 p.*
13. *Lenskold J. D. Marketing ROI : the path to campaign, customer, and corporate profitability / J. D. Lenskold. – New York : McGraw-Hill, 2003. – 271 p.*
14. *McDonald M. Marketing accountability : how to measure marketing effectiveness / M. McDonald, P. Mouncey. – London and Philadelphia: Kogan Page, 2009. – 294 p.*

Vol. 3, No. 1, 2016

UDC 658.012.16

O. V. Pyrog,

Doctor of Economics, Professor

K. P. Stelmakh
Assistant Lecturer,
Lviv Polytechnic National University

OPERATION AND MODERNISATION OF FIXED ASSETS AT MACHINE-BUILDING ENTERPRISES

Abstract. The article presents the research into the issues of operation and modernisation of fixed assets that is of particular importance in conditions of investment development by machine-building enterprises at the modern stage of the economic development of Ukraine. Investments targeting particular facilities (buildings, transportation means, and equipment) stress the relations between investments and fixed assets. Modernisation seen as improvement of functional features of equipment, taking into account the stimulating factors, helps increase the production quality indicators.

Key words: modernisation, fixed assets, fixed assets operation, life cycle of fixed assets, factors of modernisation, improvement of fixed assets, machine-building enterprises, depreciating of fixed assets.

Problem statement

The importance of material factors of production – the fixed assets – has increased during the past years. The increase of production volume occurs due to the effective use of productive fixed assets. Economic efficiency of machine-building enterprises depends on certain indexes. One of the basic indicators is production capacity of fixed assets. The basic problem of fixed assets operation is their maintenance, renovation and successful exploitation for further work at the enterprise. The solution of this problem can be facilitated through extensive study and research into modernisation as renovation of the active (productive) part of fixed assets and improvement of production quality indicators (labour productivity, quality of products, operating lifetime). Considering that repair works can fully renew primary properties and prevent premature wear one can state that there is possibility to maintain successful operation of fixed assets. Today management of machine-building enterprises of Ukraine practically does not use the system of preventive maintenance, that negatively affects maintenance, modernisation and use of fixed assets. So the issue of fixed assets operation efficiency comes to the forefront in studying and researching the enterprise activirties.

Analysis of the recent research and publications

Home and foreign scholars do research into the issues related to effective enterprise activities by improving fixed assets operation. On the one hand, this can be done through modernisation, and on the other hand, through improvement of professional qualities of maintenance personnel engaged in production. The issues related to effective activities of enterprises, successful operation and modernisation of fixed assets have been studied by many scientists, among them being: Melnyk S., Mochernyi S., Kravchenko O., Kuzmin O., Osypov V., Horngren C. T., Foster G., Datar S. M., Dubinin S. and others. The enterprises that are operating fixed assets that do not meet modern technological requirements, must modernize and use them most effectively. It is especially relevant in modern social and economic environment characterized by lack of financing and investments.

Research objective

The aim is research into the aspects of successful operation and modernisation of fixed productive assets at machine-building enterprises.

Research materials

The modern stage of socio-economic development of our country needs implementation of the necessary investment policies that are responsible for the state of production, technical level of fixed assets resulting in the increase of the enterprise competitiveness and profitability. Research into the aspects of successful operation and modernisation of productive fixed assets is especially relevant at the modern stage of development of economic thought in our country.

Development of national economy is directly related to the recreation of fixed assets, being drivers of production, as meeting social demands requires renovation and technical reequipment of the existing fixed assets or introduction of new ones that is dictated by rapid development of science and technology. Achievement of this goal needs investments. Investments are the basis for the development of enterprises and all types of economic activities. Buildings, constructions, transport vehicles, equipment are often objects of investments and that is why there is interrelation between investments and fixed assets. It explains interdependence between the investment process and the fixed assets operation at machine-building enterprises.

S. Melnyk [1, p. 162] characterizes the concept "operation of fixed assets" as the process of useful use of fixed assets in productive activities of the enterprise during a certain period of time and expenditures on their repair, modernisation, completion of construction, replacement of separate parts and maintenance.

A. Kravchenko [2, p. 29] considers that economic nature of fixed assets is determined by those specific conditions in which they are exploited, and also by how they came to an enterprise: whether they have been produced, acquired, obtained free, leased or rented.

Modernisation is improvement of operating machines and equipment and bringing them into the state corresponding to the requirements of modern technical and economic level by structural changes, replacements, strengthening of units and parts, setting adaptations and devices for mechanization and computer-aided production. Modernisation is taking place in case of improving production quality indicators (lowering production costs, improving working conditions, increasing products quality) [3, p. 196].

S. Mochernyi [4] interprets the essence of the concept of modernisation as a process of the partial upgrading, replacement of obsolete equipment (machines, mechanisms, equipment, devices etc.), technology of production, technical and technological reequipment of industrial and agricultural enterprises.

Modernisation, as a result of partial moral obsolescence, deals with equipment (machines, facilities, machine-tools) while reconstruction concerns the enterprise as a whole or its production units (work shops, areas), and the repair process refers to every separate object or its component. There is interrelation between the types of the productive fixed assets depreciation and the forms of their removal. Graphically this interrelation between the types of fixed assets depreciation and the methods of their removal is presented in Fig. 1.

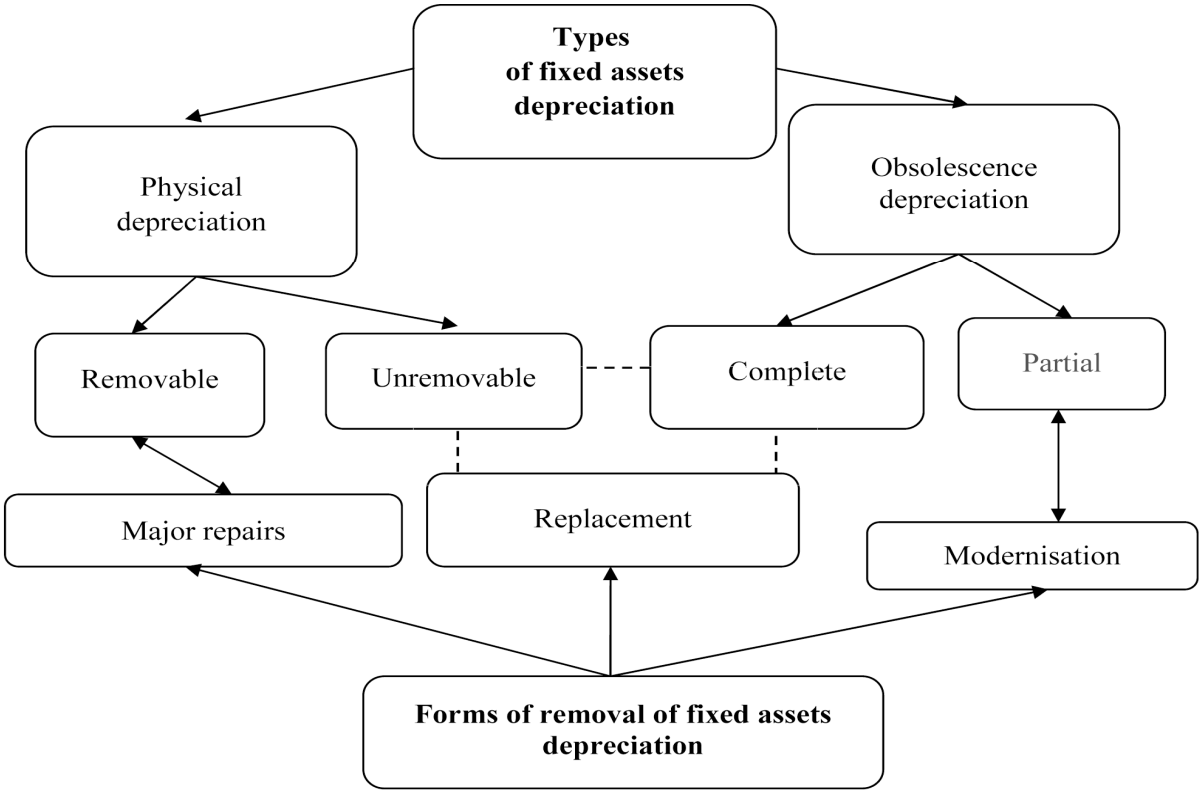


Fig. 1. Types of fixed assets depreciation and forms of their removal

The moral depreciation is caused by creating new and more advanced equipment but to improve the operation of the existing fixed asset is possible by upgrading the relevant construction elements (of equipment, machinery, machine-tool). Modernisation embraces the quality changes of the active part of fixed assets, as it concerns the productive fixed assets. The improvement of fixed assets is not only repair, reconstruction (further construction) and modernisation (reequipment). In fact, as a result of changing functional features there must be felt a positive economic effect.

However, Dubinin S. [5] notes that modernization never means only technological upgrade, it always implies a choice of certain changes in social relations initiated by the country's elite. Should modernization be considered as the direction of structural changes in economic policy at the national level or just as a technological upgrade? We believe that technological basis of modernization is the key to the term interpretation. Technological upgrading consolidated with the investment strategy of a machine-building enterprise will contribute to both ensuring successful fixed assets operation and getting socio-economic effects.

Operation of machines, equipment and machine-tools is effective in case an enterprise carries on successful politicies (has a system of planned preventive repairs) on removal of depreciated fixed assets and improvement of existing fixed assets. To improve operation of fixed assets and production capacities at enterprises is possible due to their increased exploitation in intensity and their increased loading in extensity [6], the observance of proportionality and shiftness in the fixed assets (equipment) operation, the active process of controlling, repair works, modernisation and technical maintenance of the operating fixed assets.

While determining composition of expenditures by types of improvements it is necessary to follow applicable state regulations. The ways of improve functioning of fixed assets are presented in Fig. 2.

Further construction (extension), replacement of separate parts of fixed assets, modernisation, modification, introduction of effective technological process mean expansion of certain buildings and constructions, technical re-equipment of other objects, implementation of new technique and technology, mechanization and automation of production that individually or in combination increase the initial value of a piece of fixed assets. To perform these works it is obligatory to have project specifications and estimates as well as appropriate permits from the state control and supervision authorities.

The accounting of costs related to repair and improvement of fixed assets is regulated by the Order "On approval of guidance on accounting of fixed assets" [7], Regulation (Standard) of Accounting 7 "Fixed Assets" [8] and by the Tax Code of Ukraine (TCU) [9].

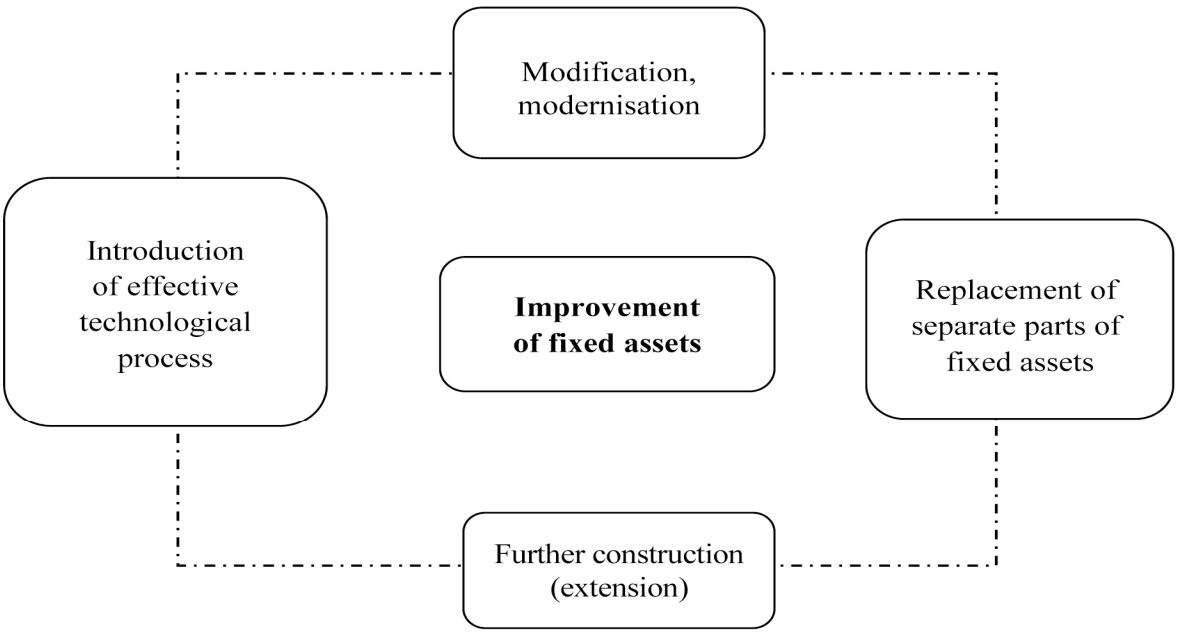


Fig. 2. Methods of improving fixed assets functioning

Note: compiled by the authors [7]

There is the difference between modernisation and repair: repair results in improvement (enhancement) of the initially accepted normative performance indicators (useful life, capacity, quality etc.) of fixed assets objects while expenditures on modernization are referred to the increase of the value of fixed assets (i.e. they cannot be referred to the production costs). An important difference between repair and other types of the fixed assets rehabilitation consists in that expenditures on all types of repairs refer to current costs, and expenditures on reconstruction and modernisation refer to capital costs.

Legislation contains no clear definition of such concepts as modernization, repair and other types of fixed assets operation improvements. However, some normative documents provide the definition of such concepts. Accounting Policy Regulation 7 "Fixed Assets" and Section 6 of "Methodical recommendations on fixed assets accounting" define the concept of modernisation as the improvement of technical parameters of equipment with the aim of increase its useful life or production capacity [7, 8].

In tax legislation improvement is presented by permanent and capital repairs, reconstruction, modernization, technical upgrading and other types of works that contribute to successful operation of fixed assets.

According to Tax Code of Ukraine the original value of fixed assets is increased by the amount of costs related to repair and improvement of fixed assets (modernization, modification, completion, additional equipment, reconstruction), which leads to an increase in future economic benefits originally expected from the use of the fixed assets objects in an amount exceeding 10 per cent of the aggregate book value of all groups of fixed assets subject to depreciation at the beginning of the fiscal year, with referring the amount of improvement to the fixed assets object that has been subjected to repair and improvement. Accordingly, costs of repair and improvement of fixed assets in the specified amount are subject to depreciation in accordance with paragraph 144.1 of Article 144 of Tax Code of Ukraine. At the same time, the amount of costs associated with repair and improvement of fixed assets, including leased or received in concession or created (built) by the concessionaire not exceeding 10 per cent of the aggregate book value of all groups of fixed assets at the beginning of fiscal year is referred to by the taxpayer as part of expenditures. At this, the tax accounting of expenses made for the repair and improvement of facilities depends on the use of fixed assets:

– they are included in the cost of sold goods, works, and services, if the fixed asset is used in operating activities (subparagraph 138.8.5, paragraph 138.5, Article 138 of Tax Code of Ukraine);

– they are included in other expenses (paragraph 138.12, Article 138 of Tax Code of Ukraine) [9].

Provision 102, which contains the definition of concepts referring to repair of automotive vehicles as a complex of operations on restoring proper operation or functioning of products and recovering resources of products or their components, provides interpretation of other concepts. In particular, current repair is the repair that is executed for ensuring or restoring operation of a product and consists in replacement and (or) restoration of particular parts.

The major repair is the repair that is executed for restoring proper operation and complete or close-to-complete renewal of a product resource with replacement or restoration of any of its parts, including basic ones. Technical maintenance is a complex of operations or an operation to support functioning or proper condition of a product when it is used as intended, stored and transported. The concepts of repair and modernization should be distinguished from the concept of technical maintenance of the fixed assets objects. After technical maintenance the state of the object does not improve in comparison with the previous one. These measures are aimed only at preventing abnormal aging or deterioration of the object for further use (storage, moving etc.) [10].

The cost of upgrading, modification, renovation, retrofit, completion can be either capitalized, i.e. increase the value of fixed assets or written off as the costs of the reporting period. The principles of capitalization or reference to the current costs associated with fixed assets primarily depend on when those costs were incurred [11].

Thus, the law regulates that the amount of the costs associated with repair and improvement of fixed assets in the amount not exceeding 10 per cent of the aggregate book value of all groups of fixed assets at the beginning of the financial year is referred to the expenditures while the expenses exceeding 10 percent are referred to a specific item of fixed assets, which was subjected to repairs and improvements.

In case a taxpayer has no fixed assets at the beginning of a financial year, a 10-percent repair limit is zero. Accordingly, if after January 1 of the same year the same taxpayer aquires fixed assets and then repairs or improves them during the year, the expenses on these measures are not included in the composition of costs (are considered above-limit costs), however, the original cost of fixed assets subjected to repair and improvement will increase by the amount of these expenses. It is necessary to note that the taxpayer has the right to allocate the total amount spent on repair and improvement to the fixed assets object that underwent repair and improvement come true, even if the amount of 10-percent limit has not expired [12].

Repair costs may be considered capital investment, if the purchase price of an asset already reflects the commitment (necessity) of the company to spend in future on bringing the asset (fixed asset) to a state in which it can be used (operated successfully).

For example, in case of acquisition of a building that needs repair, repair costs are allocated to the increase of the original cost of this building to the amount that can be recovered from the use of the building in future. In particular, as a result of the executed works on improving the fixed assets the expected useful life of the asset and the quality of products (works, services) produced (provided) by this object increased. Modernization of the fixed asset is conducted to prolong its useful life, separate parts of equipment are replaced to increase the quality of products (works, services). Replacement of such a component in this case is reflected by capital investments into acquisition of a new fixed assets object and writing off the replaced object.

In record-keeping repair costs are reflected by the debit of account 23 “Production”, or by class 9 “Expenses on activity” and by the credit of account 63 “Settlements with suppliers and contractors” (if works are performed by a contractor). The improvements of a fixed assets object as they are implemented are written off by the debit of account 15 “Capital investments” and by the credit of accounts 13 “Depreciation (amortization) of fixed assets”; 20 “Inventories”; 22 “Low-value fast-deprecating items”, 65 “Payments for insurance”; 66 “Payments to employees” (if works are performed by economic method). In case the improvement is done by a contractor, the expenses are allocated to the credit of account 63 “Settlements with suppliers and contractors” [13, p. 10–13].

Thus, modernization is upgrading of the active part of fixed assets with the further increase of the efficiency of their use, increase of production capacity and prolongation of their useful life in accordance with the modern technological requirements. Modernisation consists in comparatively minor design changes, in relatively insignificant change of materials and methods of treatment, however, followed by the improvement of production quality indicators and improvement of working mechanisms, machines and other equipment.

Deterioration of equipment is one of the reasons of modernisation, and it is demonstrated through excessive operating costs and increased expenses on technical maintenance. However, it is found that foreign enterprises (probably, their majority) are accustomed to keeping old equipment in operation, even if its functioning is unsuccessful. Technical maintenance costs in general in many ways exceed the value of investments [14].

Thus, competition between enterprises requires permanent investments in assets, that makes it necessary to create differentials that will guarantee competitiveness. Some authors state that many enterprises using resources search for the ways to improve their operating efficiency, among them being gaining the confidence of investors, customer loyalty, and obtaining more competitive position willing to invest in high-tech and available equipment, to ensure maximum use of tangible and intangible resources [15].

The technical upgrading of a machine-building enterprise means taking a complex of measures, in accordance with the enterprise operation and development (without expansion of existing floor spaces), that envisage raising separate areas of production to the modern technical level due to introduction of new technologies, mechanization and automation of productive processes, modernisation and replacement of the worn physically and technically obsolete equipment that can be presented as the implementation of investment strategies. During technical upgrading it is worth taking into account the life cycle of fixed productive assets, as a set of stages (with upgrading and without upgrading) demonstrates the ability of machines and equipment to be further operated.

O. Makeyeva [16, p. 229–232] characterizes the life cycle of fixed assets as a period from the

beginning of capital investments in an object to the object liquidation and presents the following life cycle stages:

– capital investments into a fixed asset;

– productive use of the fixed asset;

– restoration and improvement of the fixed asset's quality characteristics;

– disposal of the fixed asset.

At the same time, in our opinion, the stage of "Restoration and improvement of of the fixed asset's quality characteristics" needs wider study with specification of stages. The life cycle of the fixed productive assets is presented on Fig. 3.

The stage of "Restoration of fixed productive assets" consists of the following phases: scientific and engineering development, designing, upgrading of the fixed productive asset (modernisations) and exploring. Considering that the restoration of the fixed productive assets contributes to their further operation, modernisation as an improvement of functional features of equipment gives an opportunity to get significant results in production.

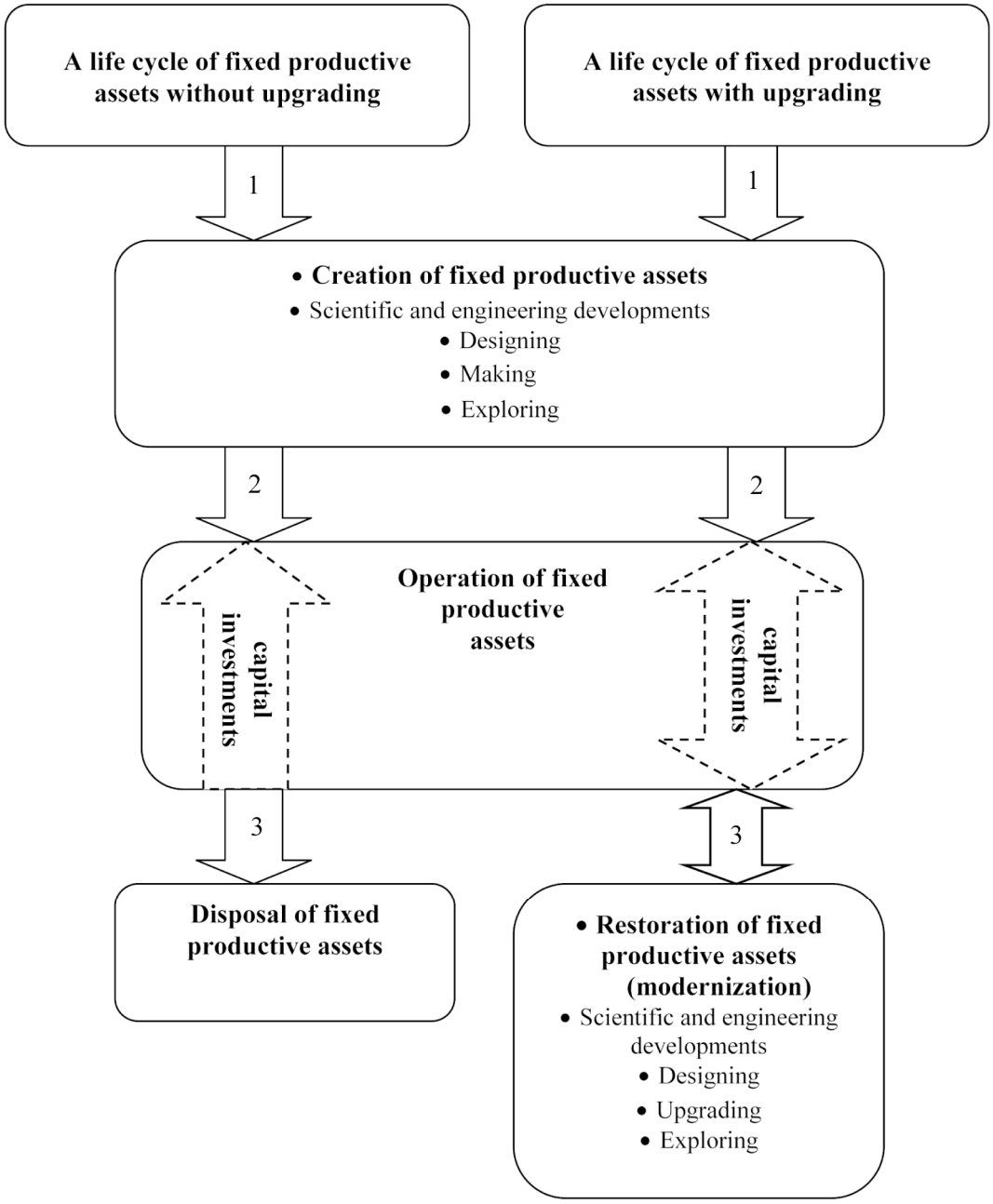


Fig. 3. Life cycle of fixed productive assets

Note: compiled by the authors [16]

Taking into account external and internal factors that influence the machine-building enterprise it is possible to distinguish factors that contribute to modernisation of fixed productive assets (machines, equipment, machine-tools).

The factors that stimulate modernisation of machine-building enterprises are presented in Fig. 4.

The factors that contribute to modernisation of fixed productive assets are of different character. In particular, the enterprise management, at their discretion, trying to make fixed assets operate successfully and to further exploit them introduce the system of technological inspections, repairs and modernisation that meets current needs of post-industrialized development.

A factor of economic globalization is all-embracing in relation to intellectually-informative resources, innovations, competition, that acquire importance today. O. Bilorus, D. Lukyanenko [17] characterize the quality features of economic globalization as the features that reflect the processes of transnationalization, regionalization and global institualization, where the driving forces are fundamental scientific and technological changes on the basis of all-embracing informatization.

Development of economy depends on limited raw material resources while intellectual and information resources have no quantitative limitations and are able to multiply, replicate and self-develop. Investment strategy implementation is related to diversification of production and creation of fund for upgrading fixed assets.

The results of the research [18, p. 262] into the influence of diversification of production at "Company VEEM-Metalavtoprom" LLC, specializing in manufacturing bus components, passenger seats for public transport, in particular, show that for implementing "A102 "Karpaty"" investment project the company modernized and bought a large portion of equipment for manufacturing basic products.

The company's management has an opportunity to launch manufacturing of new types of products using both upgraded and purchased high-accuracy equipment.

In particular, Humeniuk A. [19, p. 137] states the necessity of creating fund for upgrading fixed assets that can be used for improvement, upgrading, and restoration of fixed assets with the aim of improving technological aspect of production.

It is worth noting that, apart from the available factors, a number of internal production factors can also stimulate modernisation of fixed productive assets. Internal production reasons (factors) can be different (increase of profitability, energy efficiency, materials efficiency, capital productivity and upgrading of fixed assets) for every separate enterprise.

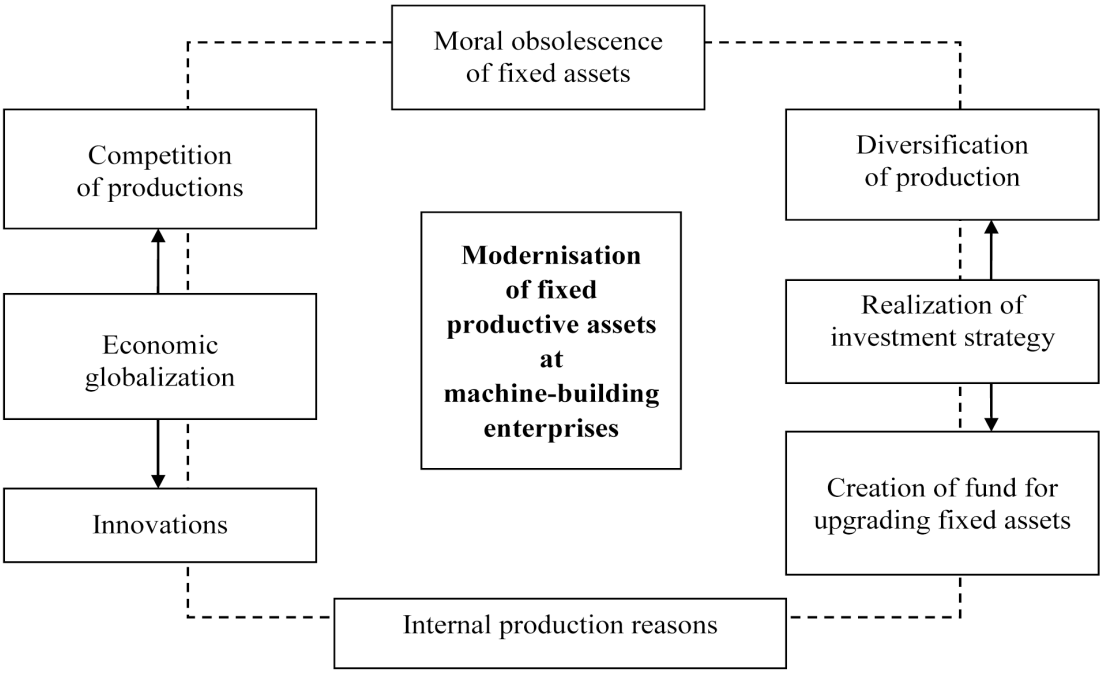


Fig. 4. The factors that stimulate modernisation of machine-building enterprises

Note: compiled by the authors [17–19]

Thus, it is expedient to calculate the integral index of modernisation investment efficiency at "Company VEEM-Metalavtoprom" LLC that is formed on the basis of internal production factors :

$$I = \sqrt{\frac{\Delta FFA}{\Delta FA} \cdot \frac{\Delta PFA}{\Delta FA} \cdot \frac{\Delta EFA}{\Delta FA} \cdot \frac{\Delta MFA}{\Delta FA} \cdot \frac{\Delta KFA}{\Delta FA} \cdot \frac{\Delta RFA}{\Delta FA}}, \quad (1)$$

where *I* is an integral index of investment efficiency of modernisation; ΔFFA is an increase of capital productivity; ΔPFA is an increase of labour productivity; ΔEFA is an increase of energy efficiency; ΔMFA is an increase of materials efficiency; ΔKFA is an increase of investments; ΔRFA is an increase of profitability; ΔFA is an increase of fixed assets upgrading.

Table 1 presents summary calculations of the integral index of investment efficiency of modernization at "Company VEEM-Metalavtoprom" LLC in 2013–2015.

Table 1

Summary calculations of the integral index of modernization investment efficiency at "Company VEEM-Metalavtoprom" LLC in 2013–2015

Indexes	Marking	2013	2014	2015
Increase of profitability	ΔRFA	0,036	0,04	0,045
Increase of energy efficiency	ΔEFA	0,008	0,0095	0,01
Increase of capital productivity	ΔFFA	0,017	0,019	0,02
Increase of materials efficiency	ΔMFA	0,013	0,015	0,018
Increase the labour productivity	ΔPFA	0,02	0,03	0,04
Increase of investments	ΔKFA	0,12	0,14	0,16
Increase of fixed assets upgrading	ΔFA	0,035	0,04	0,05
Integral index of modernisation investment efficiency	I	0,66	0,69	0,74

Source: formed by the authors on the basis of the company's reports

The low value of even one of the partial estimations substantially reduces an integral estimation. It is possible to state that the integral index of investment efficiency of modernisation at "Company VEEM-Metalavtoprom" LLC in 2015 is 0,74 and is within the limits [0–1]. When profits increase, when there is increase of internal production factors, fixed assets upgrading grows, the value of integral investment efficiency of modernisation also increases.

Accordingly, having obtained a general integral index for a certain enterprise for every year, it is possible to analyse the dynamics of investment efficiency of modernisation and identify factors that have the greatest influence on it and stimulate it, taking into account the aspects of operation and modernisation of fixed assets.

Conclusions

Analysing aspects of operation and modernisation of fixed assets at machine-building enterprises special attention should be given to legislative interpretation of the concepts of repair and improvement of fixed assets, stages of life cycle of fixed assets restoration and factors that contribute to modernisation of equipment, machines and machine-tools. One of the main factors that stimulate modernisation is a moral obsolescence, economic globalization and investment strategy. Modernisation touches only the active part of fixed assets.

Modernisation of fixed productive assets improves the quality indexes of enterprise operation (labour productivity, lifetime of fixed assets, quality of products) and stimulates successful fixed assets operation, taking into account the modern technological needs of machine-building industry.

References

1. *Record-keeping of improvement and repair of fixed assets : materials of X International scientific conference ["Ecological and social reference-points of record-keeping, control, economic analysis : civilization challenges"], (Zhytomyr, October 13–15, 2011). Zhytomyr: 2011. – 464 p.*
2. *Kravchenko A. A. The Registration-analytical providing of management the fixed assets of agricultural organizations : of dissertation of candidate of economic sciences : 08.00.12 / Alain Andreevna Kravchenko. Stavropol, 2011. – 214 p.*
3. *Osypov V. I. Economy of enterprise: train aid / V. I Osypov it is Odesa: "Lighthouse", 2005. are 724 p. s.*
4. *Mochernyj S. V. Economic encyclopaedia / of S. V. Mochernyj – K: The Publishing center "Academy", 2001. are 848 p. s.*
5. *Dubinin S. Alternatives of modernisation // Free thought. – 2010. – No. 2 (1609). – p. 5.*
6. *Khariva P. S. Economy of enterprises: train aid / P. S. Khariva. – Ternopil: Economic thought, 2000. – 500 p. s.*
7. *Order "On approval of guidance on accounting of fixed assets" No. 561 of 30.09.2003. [Electronic resource] – Access mode:: http://www.zakon.rada.gov.ua.*

8. *Regulation (Standard) Accounting 7 "Fixed Assets": of 27. 04. 2000 No. 92 [Electronic resource]. – Access mode: http://www.zakon.rada.gov.ua.*
9. *Tax Code of Ukraine: of 02.12.2010 № 2755-VI [Electronic resource]. – Access mode: http://www.zakon.rada.gov.ua.*
10. *Regulations on maintenance and repair of road vehicles road transport No. 102 of 30.03.98 p. [Electronic resource]. – Access mode:: http://www.zakon.rada.gov.ua.*
11. *Horngren C. T., Foster G., Datar S. M. Cost Accounting: A Managerial Emphasis. – 10-th Edition, Prentice Hall, Inc., 2000. – 360 p.*
12. *Bulletin of the Ministry of income and fees Ukraine [Electronic resource]. – Access mode: http://www. zakon.rada.gov.ua.: http://www.visnuk.com.ua.*
13. *Ghranov R. Reconstruction, modernization and repair of fixed assets / R. Ghranov // Debit – Credit. – 2004. – No. 17–18. – P. 10–13.*
14. *Casarotto Filho N. and Pires L. H., Networks of small and medium enterprises and local development:strategies for achieving global competitiveness based on the Italian experience. (São Paulo, SP: Atlas, 2001).*
15. *Buiar D. R. and Hatakeyama K., Information technology as competitive leverage in Paraná new industrial hub. Revista Educação e Tecnologia, 7, 2011, 39–52.*
16. *Makeeva O. V. The life cycle of fixed assets – issues of accounting and control / O. V. Makeieva // Journal of Social and Economic Research. – 2002. – No. 12. – S. 229–232.*
17. *Bilorus O. Global transformation and development strategy: monograph / A. G. Bilorus, D. G. Lukyanenko and others. – K.: VIPOL, 1998. – 416 p.*
18. *Kuzmin O., Drymalovska Kh., Stelmakh Kh. Diversification as a strategy of investment and innovation development of enterprises materials IV International Scientific Conference ["Modern challenges of the global economy"], (Kyiv, 19–20 lyst. 2015). – K.: Taras Shevchenko National University of Kyiv, 2015. – 292 p.*
19. *Ghumenjuk A. F. Theoretical and practical problems and methods of forming the fund upgrades of investment property in lease terms / A. F. Ghumenjuk // Herald of Khmelnytsky National University. Scientific journal. – 2009. – No. 6. – Vol. 1. – P. 137–140.*

Vol. 3, No. 1, 2016

UDC 339.5:330.23

O. V. Pyrog
Doctor of Economic Science, Professor,

A. I. Horyachka,
Bachelor of International Economics,
Lviv Polytechnic National University

THE DEVELOPMENT OF E-COMMERCE IN TERMS OF VIRTUALIZATION INDUSTRY

Abstract. The article focuses on the analysis of the virtual economy, global trends in e-commerce, market size of e-commerce and the prospects of their development. Innovations in e-commerce, industry 4.0, which is a profitable platform for investments from around the world, are presented.

Key words: e-commerce, virtual economy, real economy, Internet, Internet sector, online stores, virtualization industry, industry 4.0, Ukraine.

Problem statement

E-commerce is developing rapidly, but there are several issues of e-business. Firstly, intense competition dooms to failure many start ups in the field of e-business. Secondly, because some online sellers deceive customers the demand for virtual goods is reduced. Today the key issues are the protection of buyers' rights on the Internet and the constant improvement of Internet relationship regulation. The most urgent issue in Ukraine is the introduction and popularization of Internet wallets. As there are only some sites that provide the option of paying with electronic purse, most goods are still being sent by post with overhead payment increasing the cost of online product and therefore reducing demand for online purchasing.

Analysis of recent research and publications

The important contribution to defining e-commerce was made by such scholars of western schools as B. Busto, E. Vilkas, K. Kendall E. McCarthy, B. Marshall, E. Melz, K. Rihelsford, P. Steynbart, I. Sharp and others. Ukrainian and Russian scientists also investigated some issues of electronic commerce, among them are: O. Bilyachenko, N. Buzak, H. Litvak, G. Negoda, L. Timchenko, V. Rudnytsky, N. Chebanov, L. Yanchev. The current state and trends of e-commerce in Ukraine have been investigated in research works of A. Kudinov and A. Kredenets.

N. Chuchko [4] and G. Lozikova have been researching the development of electronic commerce in international economic relations. The article of M. Vozny [5] identified the importance of international e-commerce in the global economy, the basic trends of its development, the analysis and dissemination of international electronic commerce in Ukraine. However, the given data in the publications are already out-of-date, therefore there is a need for researching new trends in this area as the development of the information economy is growing rapidly.

Research objective is to study the current state of e-commerce market and identify the main trends of development in the world and specific regions.

Research material

The real sector of economy is an integral part of modern economic systems, which plays a major role in ensuring sustainable economic development and social welfare state. At present it holds key positions in economies of many industrialized countries. Thus, for example, it accounts for 54,5 % of GDP in the UK, 57,1 % in Japan, 40 % in the USA and 68 % in China. The essence of the virtual model is that instead of administrative methods by which the cost was transferred from the first to the second sector, in modern pseudo-market systems there are various successfully operating non-market forms of payments: promissory notes, barter, debt trading. The above model is based on current numbers and facts of Ukraine. At present barter and other forms of non-cash payments exceed 40 % of payments for industrial products. Tax debt payment of entities is 10 billion, wage, pension and other budget transfers account for 8,5 billion. A comparison of virtual and real economies is presented in Table 1.

Table 1

Comparison of virtual and real economies

The virtual economy, economy online	Real economy, economy offline
Fields of activity: trade, services;	Fields of activity: agriculture, industry, building, transport, trade, services;
mainly unavailable control and licensing system, without paying bribes corruptionists;	continuous problems with licensing and controlling systems; tax and other state control bodies require regular bribes, or close down the real business;
you do not need to rent or buy office space, work is in online mode (modern office – is no office);	you need to spend money on offices and have additional problems with bribes, firefighters, sanitary stations; hire and provide security; face with the risks of raiding and racket;
faster calculations;	slower calculations;
faster customer services;	slower customer services;
employees work in comfortable environment, at home or resort with access to the Internet;	employees work at the office;
chief is not tied to the workplace, manages company online;	chief must be at the office;
level of the company is the global economy, the planet.	the level of the company is the local economy, town.

Subjects of interactive economy are businesses, consumers and a state. Virtual economy as a market economy is characterized by tough competition. First of all image and competitiveness of the economy is provided by reputation and rankings of entities. Market signals, entity's image and various sureties and guarantees are mechanisms of interactive economy.

The main trends of e-commerce in the world are:

– the future of e-commerce is forecast for mobile e-commerce implementation and payment transactions using smartphones, tablets and other mobile devices, as a share of Internet users using mobile devices is growing;

– a key success factor of e-commerce businesses in modern conditions is personalization, individualization. In recent years customers of e-commerce businesses are increasingly interested in unique products designed in sites by themselves or other consumers. In case of rapid growth of such orders, problems with satisfying all users' desires may occur;

– more and more retailers are trying to enable their customers to order products via the Internet, besides offer favorable terms of same-day delivery products, free exchange and return of goods that undoubtedly is their competitive advantage. Although at present the share of online retail turnover in the total volume of retail trade in Ukraine is low – 1.5–2 %, there is a great growth potential of this figure, as in developed countries the figure is not less than 7,8 %;

– widespread use of electronic money and other new means of payment, putting into circulation own currency by e-commerce companies. A good representative of e-commerce businesses is Amazon that has been using its own currency Amazon Coins since 2013. This type of virtual currency is used to purchase mobile apps and make purchases with their use;

– the use of new technologies to promote products online. The introduction of 3D technology for simulating in kind products in the network in order to provide them with more complete description attractive for new customers; the introduction of technology with the ability to view video switching in one click from video viewing to the Internet-shop to purchase a particular product;

– the active development of e-commerce through social networks. E-commerce businesses use social networking as a marketing platform for promoting their online stores, increasing the number of customers, examining their preferences, developing personalized offers on the received data basis, offering consumers to generate wish-lists or to become familiar with goods and services recommended by friends. For example, eBay is working on product recommendations based on Facebook data, Walmart has 22 million fans in Facebook and constantly surveys to determine the range of products offered on the site;

– among the population of developed countries a new life style "on-line" is spreading, ordinary citizens are turning to the network not only for information but also for purchasing goods, banking operations and other activities;

– the form of interaction between enterprises as e-commerce B2B is actively developing;

– business to business, e-commerce opportunities are widely implemented not only in retail practice for customers;

– continuous updating and development of new information technology and computer technology that facilitate access to the users' network and establish closer cooperation.

As a country-innovator the USA made a great leap in the implementation of virtual economy. E-business has become a powerful industry there. Experts predict that e-business will have reached the level of 20 trillion dollars by 2020 that exceeds twice GDP of the United States in 2005.

Europe, being involved in the World Wide Web later, today demonstrates the intense growth trends. The highest Internet penetration over 80 % is typical for the Netherlands, Germany, Britain, France, that's why these countries have the highest percentage of consumers who deal with e-commerce businesses (Fig. 1). According to the Center for Retail Research, e-commerce share in total retail trade is the largest in the UK – 13,5 %, second place is taken by the USA with 11,6 %, the third is Germany – 9,7 %. Next in the list are the countries with approximate share of e-commerce 7 % of the total retail turnover – Sweden, France, the European Union. For Italy, Russia, Poland and Spain the figure was at 2,3 %. The average cost of one purchase online in 2013–2014 was the highest in the USA – 119 dollars, while the average number of acquisitions during a year was 15.6 times, while in the UK these indicators were: 99 dollars and 18 times, respectively, in Germany – 89 dollars and 18,1 times, in Italy – 72 dollars and 10.4 times, respectively. In the USA the most popular products include digital content, digital appliances, toys, hobbies, books and magazines. The average cost of purchases accomplished depended on the level of prices for goods and services and the solvency of the population, so the figure is highest in the countries with higher levels of economic development.

One of the trends in the field of e-business is the massive use of mobile devices to perform business transactions online (Fig. 2). Turnover within the mobile segment of e-commerce in the USA in 2013 reached 41 billion dollars or 8 %, moreover, its growth is predicted to be 100 bln. dollars by 2017, followed by the UK with 10 %, Australia – 8 % and the USA – 8 %. The share of mobile customers is significantly lower in Germany – 6 %, Italy – 4 %, the Netherlands – 4 %, and in France only 2 %. It should be noted that only 17 % of French Internet users use their mobile devices to research products while in most European countries the figure is over 30 %. In addition, only 4 % of respondents in France said they downloaded and used mobile application retailers (compared to 13 % in Germany and 20 % in the UK). According to eMarketer research, most e-commerce consumers still prefer to use tablets for purchasing rather than smartphones.

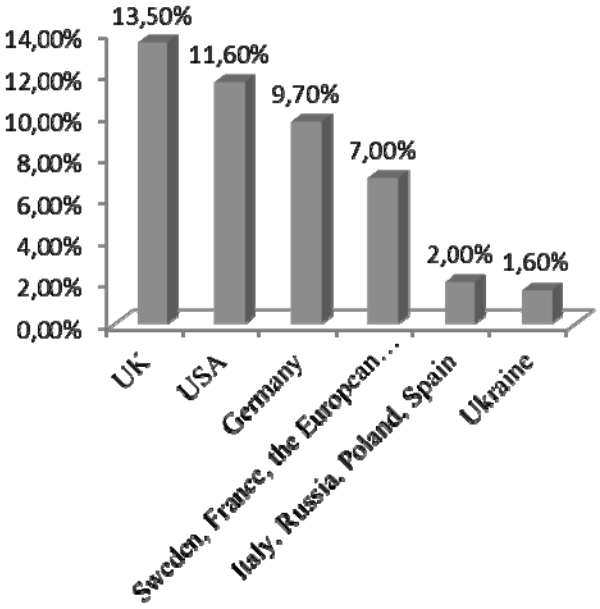


Fig. 1. Internet penetration in the retail world

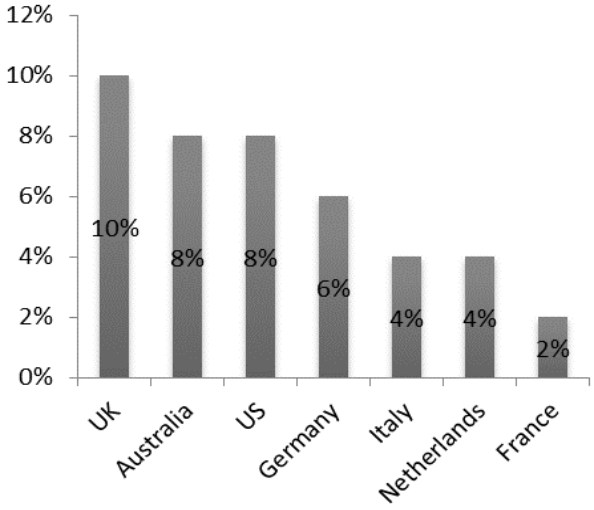


Fig. 2. The share of "mobile" transactions in e-commerce in 2015

According to eMarketer research, the first in the rating of the countries with the developed e-commerce is the United States, the second is China. We note that the Chinese e-commerce market has great potential. It is expected to become the world leader by 2016. Dynamically growing e-commerce markets in China, India and Indonesia will have allowed the Asia-Pacific region to be ahead of other regions at the pace of e-business development by 2017. Compared to the US and European e-commerce market, e-business market in India was insignificant in 2012 and amounted to 1.6 bln. dollars, but experts predict that its volume may already be 15 bln. dollars by 2017. According to

ASSOCHAM report & KPMG Report, in June 2014 the number of online shoppers in India amounted to more than 240 mln. people. Indian online market is a combination of individual e-commerce sites and 80 well-known retailers with annual sales of about 100 million dollars. It is forecast that in this region mobile segment is the future of e-commerce, namely smartphones, but not more expensive laptops and tablets. Among the clients of Indian e-commerce companies there are 90 % of people aged 18–35 years. In Asian countries the rapid pace of online business is related to the fact that many consumers have only recently gained access to the network, and therefore actively began to perform the first e-commerce operations while Internet penetration was only about 17 %.

Asian countries along with Argentina, Mexico, Brazil, Russia, India and Canada will encourage the growth of e-commerce worldwide. According to forecasts of Forrester Research, the total turnover of e-commerce in Argentina, Brazil and Mexico in 2018 will grow by 135 % and will amount to 47 billion. dollars. Brazil is a leader among countries of the South American region. Its e-commerce market (B2C + C2C) will have grown for 5 years to more than 2 times from 15 bln. to 35 bln. dollars. The number of online shoppers during the same period will have increased by 79,3 %, from 30.9 million people to 55.4 million.

It is expected that China will have become the world largest retail market by 2018. In particular, for 2015–2016 the growth of retail volume in China will be 8,7 %. In the future, the share of mobile payment transactions in total retail trade in the country will increase from 8 % to 20–30 %.

The number of online shoppers is rapidly growing (Fig. 3). In 2010 there were 140 million people involved in e-commerce in China, in 2012–220 million people and by 2015 their number is expected to increase to 520 million. In the USA the number of online shoppers will have increased from 140 million to 200 million people by 2015.

In Ukraine the volume of e-commerce in 2013 was estimated at 2 billion dollars that was by 1 billion dollars more compared to the previous year. Ukrainian market has the rapid pace of development and future prospects. However, due to the general decline of the Ukrainian economy against a difficult social and political situation development of e-business significantly reduced its pace. Because of the annexation of the Crimea and the war in the east in 2014 volumes of e-commerce decreased to 1.6 billion dollars according to preliminary estimates, besides population's solvency was reduced. The average order value in Internet-shops decreased in proportion to the fall of the national currency to 60 %, consumers of category "luxe" instead of buying exclusive products started buying their cheaper counterparts. Due to fluctuations in exchange rates, domestic participants of e-commerce market suffer from reducing returns and losses. So one of the trends of domestic e-commerce is a rapid reorientation to new types of goods and services, flexible pricing depending on exchange rate.

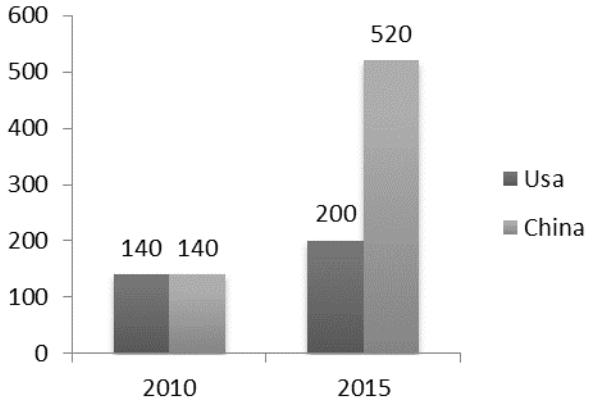


Fig. 3. Dynamics of the number of online shoppers in the USA and China

The Internet is undoubtedly the most massive technology and hence the most promising one in terms of investment and business.

Now there is the fourth industrial revolution based on computerization of production. It involves implementing cyber physical systems (CPS) in production and logistics, as well as using the Internet in industrial processes.

By combining machines, storage systems and equipment in a network, we get the "intellectual production", in which machines independently exchange information and are constantly adapted to the urgent production needs. As a result, experts expect to receive rapid productivity growth as well as significant savings in materials and electricity.

German Management Academy of Lower Saxony supports specialists and managers through its training program Related Industry 4.0. Foreign countries show a great interest in this strategy that gives German industry outstanding opportunities for optimal placement in world production.

In practice-oriented DMAN seminars, which include informational visits to German companies, managers from Central and Eastern Europe, Asia and the Middle East become more familiar with the strategy of Idustry 4.0 and learn best practices in place.

In recent years the developed countries of the world have defined strategy and tactics of their information development and adopted documents (including concepts) in this field of public life. For example, the United States has a program "Action Plan of the US Administration in the National Information Infrastructure". The European Union has developed the program "European Way to the Information Society." At the end of June 2000 the Action Plan "e-Europe" was adopted. At the level of the Member States of the European Community the legal regulation was introduced. In particular, Germany introduced the program "Germany's path to the information society". In the Nordic countries there is also a legal regulation on the issues of establishment and development of the information society. For example, in Norway there is a program of formation and transition to an information society "Better use of information technology in Norway" and the "eNorge". The formation of Norwegian appropriate strategies and tactics in the field of information and communication technologies were due to the initiative of the European Union "eEurope". The "eNorge" was implemented within the above Action Plan of the European Community with adaptation to the conditions of Norway, which was primarily provided by the program. In the program "eNorge" government planned intention to achieve the goal of an information society and knowledge society in three main requirements that must be guaranteed "access – competence – confidence" [3]. There is a program of Denmark "State program of transition to an information society", and in Sweden there was adopted National strategy for the information society and the Swedish program "Information Society Sweden". Finland has introduced two programs: Program "Finnish way to the information society" and, accordingly, Information Society Development Program and Strategy of Information Society by 2015.

Nowadays the main trends of e-commerce market in the world are:

– steady flow of retail trade to the Internet (now in Ukraine the share of Internet sales is 1,6 %, in the UK – 13 %);

– increase in the share of active customers among Internet users;

– habit to use the network as a way of searching information about the product (typical for Ukraine, because 56–60 % Ukrainians use search engines to gather information, 33–41 % of Europeans and 28 % of Americans);

– trend aimed at developing ways to pay online (today over 85 % of purchases are made in cash);

– development of advertising on the Internet.

Conclusions

E-business is a profitable area for investment because it is developing rapidly. The most promising market is China, it has the highest growth rate of e-commerce indicators in the world. Now we are observing a revolution – Industry 4.0, which will allow to develop information technology to the level of intellectual production. The virtual economy will eventually replace the real economy.

References

1. *Patramanska L. Yu. (2014) Research current trends in the world market for e-commerce / L. Yu. Patramanska// Technology audit and production reserves. – 2014. – No. 5/3 (19). – p. 111.*
2. *Kudinov O. (2011) ecommerce development in conditions of global information space / O. Kudinov // Bulletin of the International Nobel Economic Forum. – 2011. – No. 1(4). – P. 196–202.*
3. *Kredenets A. (2011) Status and trends in the development of e-retail sector in the Ukrainian network Internet / E. V. Kredenets // Bulletin of Lviv Commercial Academy. – 2011. – No. 34. – P. 268–272.*
4. *Chuchko N. A. (2011) Ecommerce system of global economic relations / N. A. Chuchko, G. M. Lozikova // Industrial economics. – 2011. – No. 4. – P. 153–158.*
5. *Voznyy M. I. (2011) International e-commerce. Problems and prospects of development in Ukraine / M. I. Voznyy // Proceedings of Bukovina University. Economic science. – 2011. – No. 7. – P. 243–252.*
6. *Summer A. (1999) E-Commerce / A. Summer, Gr. Dunkan. – NYH Publishing, 1999. – 263 p.*
7. *Hubaev G. N. (2005) Information marketing of products / G. N. Hubaev. – Rostov-on-Don: "RYNH", 2005. – 224 p.*
8. *Tardaskina T. N. (2011) Commerce / T. N. Tardaskina, E. M. Strelchuk, V. Tereshko. – Odessa: ONAT. Popov, 2011. – 244 p.*
9. *Global Retail E-Commerce Index [Electronic resource]. – Access mode: www/URL:http://www.atkearney.com/consumerproducts-retail/e-commerce-index.*
10. *Worldwide Ecommerce Sales to Increase Nearly 20% in 2014 [Electronic resource]. – Access mode:*

http://www.emarketer.com/Article/Worldwide-Ecommerce- Sales-Increase-Nearly-20-2014 / 1011039

11. *E-Commerce Europe. European B2C E-commerce Report 2014 [Electronic resource]. – Access mode: www.ecommerce-europe.eu/facts-figures*
12. *IT market in Ukraine 2014 – Current situation and short term outlook [Electronic resource]. – Access mode: www.ewdn.com/category/data-reports*
13. *Morgan Stanley Blue Papers [Electronic resource]. – Access mode: www.morganstanley. com/views/ perspectives*
14. *Ovchinnikov B. A. (2014) Marketplace e-commerce in Russia. 9 months in 2014: Manuscript, Question and Answer [Electronic resource] / B. Ovchinnikov. – Access mode: www.datainsight.ru/eretailforum 2014*
15. *KPMG-ASSOCHAM India Luxury summit in 2014 [Electronic resource]. – Access mode: www. kpmg. com/IN/en/IssuesAndInsights/ArticlesPublications/ Documents/KPMG-ASSOCHAM-India-Luxury-Summit-2014.pdf*
16. *Wigder Z. D. (2014) The Evolution Of eCommerce In Brazil [Electronic resource] / Z.D. Wigder. – Access mode: www.forrester.com/The+ Evolution + Of + eCommerce + In + Brazil / fulltext / – / E-RES117444*

Vol. 3, No. 1, 2016

UDC 330.341.1

N. S. Stanasyuk
Ph.D. in Economics, Associate Professor
Lviv Polytechnic National University

STRUCTURAL DEVELOPMENT OF INDUSTRIAL POTENTIAL OF UKRAINE

Abstract. The methodical aspects of analyzing of structural changes impact on the development of basic components of industrial potential of Ukraine are disclosed in this article. In the context of the offered methodology, the results of calculation of structural changes impact on the efficiency of fixed assets, labour potential, innovative and investment development of the industrial potential are shown in the fields of employment, capital investments, innovations and production of industrial goods. Conclusions as to the received analytical results are made determining the content of structural transformations of the industrial potential of Ukraine

Key words: structural changes, structural transformation and industrial potential.

Formulation of the problem

Emergence of structural crisis in the national economy stimulates to maintain effective government regulation of structural changes that appeared in a certain sector of the economy. Ukraine's decision to take on the modernization of industry makes it find out objective ways aimed at effective structural transformation of the industrial potential. The reason of this process is structural changes that took place in the world caused by the evolutional growth of the economy and the necessity of the industrial potential development as cause-and-effect process determined by the impact of the objective factors (innovations, investments, labour potential, capital etc.).

Factor analysis is a classical methodological instrument of determining the influence of certain factors on the of industrial potential development that allows to set cause-and-effect relations between structural changes and effective indicators of the industrial potential development. Though, primary indicators without tendentiousness of their changes are often used at calculations. This, in its turn, gives partial meaning of the received results and does not assist to provide complex evaluation of the existing situation. Analysis of interrelation between the structural changes of certain factors and certain indicators of the efficiency does not provide understanding of structural changes tendentiousness and reduces efficiency of the state regulation of structural transformation of the industrial potential.

Analysis of recent researches and publications

Taking into account the importance of the mentioned theme, the theory of structural transformations throughout the evolutional development of the economy is widely disclosed by foreign as well as native scientists. Among foreign researchers it is worth to mention J. Keynes [1], the founder of the new system of views on the development of the economy. The innovation of Keynes' theory implies the introduction of macroeconomic analysis into scientific environment and setting up of macroeconomic dependences between factors and processes as well as formation of the effective economic policy of state regulation of the market economy on this basis with the purpose to remove the discovered drawbacks. His the most famous follower was R. Harrod [2] who is considered to be the founder of the theory of economic growth. His model of economy contains factors which determine potential possibilities of national income growth in a long-run perspective. E. Domar [3] shared the same views, he considered investments to be a strategic factor of the economy growth.

Transition from administrative-command economy to the market one in the 90th years of the last century caused the development of the native theory of structural transformations, and choice of changes towards Euro integration became a new incentive for modern researchers. A. Galchynskyi points out that Ukraine today is not yet ready to conduct postindustrial transformations [4]. Such conclusion is reasonable and determined by the considerable economic underdevelopment of the state in comparison with the leading European countries. Therefore, it's extremely important now

to form powerful industrial potential within the context of innovative-investment development of the national economy.

A lot of native and foreign researchers connect structural changes with separation of certain cycles of economic development. Y. M. Chaika offers to distinguish small (4–6 years), medium (7–11 years) and long-run cycles (40–60 years) [5]. To our mind, it makes sense to separate six basic stages of structural economy development cycle offered by I. I. Pasinovych: structural crisis, structural changes, structural shifts, structural reforms, structural adjustment and structural transformation [6]. These stages are characteristic for structural development of the industrial potential as well, that, on one hand, is the result caused by internal structural crisis, and on the other hand, is the result from structural shifts in the economy of the country in whole.

At the same time, represented scientific achievements of native and foreign researchers as to the development of the theory of structural transformations do not solve the problem of structural development of the industrial potential as an inseparable part of national economy taking into account peculiarities of structural changes in the mentioned sector, that requires working out of appropriate methodical tools, due to their application it would be possible to get complex analytical picture of their influence.

The objective of the article

The objective of the article is to work out methodological bases of the analysis of structural shifts impact on the industrial potential development with the aim to assess tendentiousness of changes.

The presentation of the material of the research

Structure of the industrial potential is a dynamic value that constantly changes under the influence of objective factors, thus modifying and adapting itself to certain economic conditions. Structural development is a logical reaction on structural changes, that in the long run will result in creating of more improved and adequate to modern economic realities structure of the industrial potential. Development of the national industrial potential takes place under the influence of structural changes of its basic components, that is social and labour, industrial and economic, finance and investment and innovative potentials.

To determine the impact of structural shifts on the industrial potential development we suggest to use data of an average number of regular workers, gross added value, capital investments and volume of the innovative products sold (table1).

Table 1

Structural transformations of the basic indicators of the industrial potential development by types of industrial activity, share, %

Types of industrial activity		Mining industry and quarries development	Processing industry	Electric power, gas steam and condensate air supply	Water supply: sewage, wastes utilization
Gross added value	2010	25,98	58,44	12,41	3,17
	2014	24,33	59,66	13,79	2,22
Capital investments	2010	27,73	53,91	17,06	1,30
	2014	23,20	49,25	26,55	1,00
Average number of regular workers	2010	15,24	64,97	14,37	5,42
	2014	13,45	65,78	15,15	5,62
Volume of the innovative products sold	2010	0,75	99,25	0,00	0,00
	2014	0,04	99,51	0,42	0,03

From source: [7].

A tendency to increase of the share of capital investments, number of workers and gross added value is observed during the investigated period in the sphere of electric power, gas steam and condensate air supply (average annual rates of growth were 109,2 %, 101,0% and 102,1 % accordingly). At the same time, absolutely opposite dynamics is observed in mining industry and quarries development, where negative tendencies are found in all indicators of the industrial potential development. Such situation is mainly caused by unsatisfactory economic situation in the eastern regions of Ukraine that are the basic centers of the development of the mentioned industry.

The increase of share in the structure of employment, gross added value and volumes of realization of innovative products in processing industry (average annual rates of increase were 100,2 %, 100,4 % and 100,1 % accordingly) took

place regardless of capital investments share reduction, that indicates the perspectives of the industrial potential development of this industry. At the same time, reduction of capital investment share and gross added value in the field of a water-supply (average annual rates of recession were 94,89 % and 93,12 % accordingly) and increase of regular workers share proves ineffective development of the industrial potential and existence of structural deformations.

Research of interrelation between the structural changes of basic indicators of industrial potential development is conducted by coefficients of sensitiveness, that are calculated by the following formulas (1) in table 2:

$$Ч_i^1 = \Delta V_i / \Delta_{Ii}\ ;\ Ч_i^2 = \Delta P_i / \Delta_{Ii}\ ;$$
$$Ч_i^3 = \Delta V_i / \Delta_{P_i}\ ;\ Ч_i^4 = \Delta R_i / \Delta_{Ii}\ , \qquad (1)$$

where $Ч_i^1$, $Ч_i^2$, $Ч_i^3$, $Ч_i^4$ – are coefficients of sensitiveness of change rates of one indicator towards another in i-type of industrial activity during 2010–2014; ΔV_i, ΔI_i, ΔP_i, ΔR_i – are average annual rates of share changes of gross added value, capital investments, average number of regular workers and volume of the innovative products sold of i-type of industrial activity during the analyzed period.

Table 2

Coefficients of sensitiveness of structural transformations of the basic indicators of national industrial potential development by types of industrial activities

Type of industrial activity	Coefficients of sensitiveness			
	$Ч_i^1$	$Ч_i^2$	$Ч_i^3$	$Ч_i^4$
Mining industry and quarries development	1,01	1,01	1,01	0,58
Processing industry	1,02	1,02	1,00	1,02
Electric power, gas steam and condensate air supply	0,93	0,93	0,92	x
Water supply: sewage, wastes utilization	0,98	1,06	0,92	x

From source: [7].

As we can see, the most effective structural changes of capital investments are in the processing industry, where the change of structure of capital investments on 1 r.p. (relative point) correspond to the change of 1,02 r.p. of structural transformations by volumes of gross added value, volume of the innovative products sold, average annual number of regular workers. The structural changes of capital investments in mining industry and quarries development provide changes in 1,01 r.p. in the structure of gross added value and average number of workers. At the same time, the change of structure of an average number of regular workers on 1 r.p. into structural changes by volumes of gross added value also correspond to the change of 1,01 r.p.

In most types of industries, that is in mining and quarries development, processing and water supply, structural changes of capital investments determine positive changes of other indicators. These results are logical and scientifically grounded. In fact, as early as in the 50th of the last century Khansen E., a famous supporter of Keynesianism, grounded dependence of technical progress on capital investments [8].

We agree with E. V. Prushkivska's statement, that structural transformations are orientated on the criteria of economic development efficiency [9]. Taking it into account, impact of structural changes on the industrial potential development will be analyzed by the selection of efficiency indicators of the components, that is by the capital investments efficiency, fixed assets, labour and innovations on the basis of methodology suggested in the study [10, p. 136–140] (table 3).

Reduction of general efficiency of capital investments is the result of inefficiency of structural changes by the amount of capital investments in mining industry and quarries development (-4,53 r.p.), processing industry (-4,66 r.p.) and in the field of a water-supply (-0,30 r.p.). The most positive results were received in electric power, gas steam and condensate air supply where the growth of the capital investments efficiency was 65,75 %. The most effective structural changes occurred in the processing industry and electric power, gas steam and condensate air supply by the indicator of an average number of workers where the growth of the capital investments efficiency was 9,50 % and 5,40 % correspondingly. The same tendencies are observed as for the development of social and

labour component of the industrial potential. The reason of negative joint impact is negative tendencies of structural changes in mining industry and quarries development (-78,14 % and -28,46 % accordingly). Structural changes in the field of employment, capital investments and gross added value had the most positive influence on the efficiency of productive component growth of the industrial potential because positive results are received in most types of industries.

Nowadays, the development of industrial potential is not possible without implementing of innovations. Y. V. Vertakova and V. A. Plotnikov underline in their work the interrelation between innovative and industrial development and necessity of taking it into account with the aim of effective government regulation of the economy development of the country [11]. Impact of structural changes on innovations efficiency is mostly observed in the processing industry (table 4).

Table 3

Impact of structural shifts in the fields of employment, capital investments and gross added value on the efficiency of industrial potential development by types of industries

Type of industrial activity	Impact of structural shifts on efficiency						
	investment s in the field of		fixed asset in the field of			labour potential in the field of	
	employ-ment	invest-ments	employ-ment i	investments	gross added value	employ-ment	gross added value
Mining industry and quarries development	-14,07	-35,59	0,46	1,16	0,42	-78,14	-28,46
Processing industry	9,50	-54,63	0,10	-0,55	0,14	23,07	-6,04
Electric power, gas steam and condensate air supply	5,40	65,75	0,03	0,32	0,05	27,62	4,02
Water supply: sewage, wastes utilization	-5,30	7,95	0,02	-0,03	-0,10	4,56	14,44
Compound growth rate	-4,47	-16,53	0,60	0,90	0,52	-22,90	-16,05

From source: [7].

Table 4

Impact of structural changes in the fields of employment and capital investments on the efficiency of innovative development of the processing industry

Type of activity	Impact on innovation efficiency of structural changes in the field of	
	employment	investments
Production of food products, beverages and tobacco goods	-12,87	-61,79
Textile production, production of clothing, skin, goods from skin and other materials	0,61	0,40
Production of goods from wood, paper production and printing activity	-10,99	-5,36
Production of coke, products of oil processing	-94,93	-543,81
Production of chemicals and chemical products	2,51	47,51
Production of basic pharmaceutical products and pharmaceutical drugs	-8,94	-24,05
Production of rubber and plastic goods; other non-metal mineral products	5,47	51,78
Metallurgical production, production of metal complete goods, except machines and equipment	10,23	-57,37
Production of computers, electronic and optical products	8,81	3,78
Production of electric equipment	1,37	-1,76
Production of machines and equipment, which don't belong to other categories	9,91	7,44
Production of vehicles, trailers and semitrailers and other transport vehicles	-29,54	-6,02
Production of furniture, other products, repair and assembly of machines and equipment	20,53	2,84
Compound growth rate	-97,83	-586,40

From source: [6].

Obtaining of negative growth by the given indicator is connected, first of all, with the decrease of innovative activity level of industrial enterprises. The conducted analysis showed that structural changes were the most effective in the production of rubber and plastic goods; other non-metal mineral products (efficiency growth of the fixed assets was 5,47 % and 51,78 % accordingly), chemicals and chemical products, furniture, machines and equipment.

Conclusions and perspectives for further researches

Analysis of structural changes impact on the development of industrial potential is done on the basis of setting up cause-and effect relations between primary indicators that characterize the development of the potential components and the criteria of the development efficiency taking into account the dynamics of their changes. Tendencies of the development of the main components of the industrial potential have been defined on the basis of the analysis results of structural changes of primary indicators. Interrelation between structural changes in the field of capital investments, employment, production and innovations is set with the help of the coefficients of sensitiveness. Conducted calculations showed mainly negative tendencies as to the structural development of the industrial potential. Regardless of positive results received on the industrial and economic component, efficiency of the industry fixed assets is extremely low. Obtained results prove the necessity to conduct effective government regulation of structural development of the industrial potential, taking into account distinguished cause-and effect relations as its basis. Establishing of competitive structure of industrial potential under the conditions of economic transformation of the country will become a direction of further scientific researches as it will promote the accumulation of one's own financial resources, attraction of investments into the development of industry and introduction of innovations. Industrial potential must become the basis of establishing of innovative-directed economy in Ukraine.

Reference

1. *Keyns Dzh. M. Obshchaya teoryya zanyatosty, protsentov y deneh / Dzh. M. Keyns // Antolohyya ékonomycheskoy klassyky. – M., Helyos ARV, 2002. – 458 s.*
2. *Harrod R. Economic Essays / R. Harrod. – L., 1952. – 265 p.*
3. *Domar E. Essay in the Theory of Economics Growth / E. Domar. – N. Y. – 1957. – 8 p.*
4. *Halchynskyy A. Lohika samorozvytku ekonomiky zavzhdy rozumna / A. Halchynskyy // FORBES vid 25 hrudnya 2015 r.*
5. *Chayka Yu. Mekhanizmy strukturnoho rozvytku natsionalnoyi ekonomiky / Yu. Chayka // Visnyk KNTEU. – 2011. – No. 3. – S. 30–41.*
6. *Pasinovych I. I. Strukturnyy rozvytok ekonomiky ta suchasni vyklyky strukturnoyi transformatsiyi v Ukrayini / I. I. Pasinovych // Sotsialno-ekonomichni problemy suchasnoho periodu Ukrayiny: zb. nauk. pr. – 2016. – No. 117 (1). – S. 82–87.*
7. *Vidkryta statystychna baza Derzhavnoyi sluzhby statystyky Ukrayiny. – Elektronnyy resurs. – Rezhym dostupu: http:// www.ukrstat.gov.ua.*
8. *Khansen É. Ékonomycheskyy tsykl y natsyonalnyy dokhod / É. Khansen. – M., 1959. – 602 s.*
9. *Prushkivska E. V. Evolyutsiya kontseptsiy strukturuvannya natsionalnoyi ekonomiky / E. V. Prushkivska // Problemy ekonomiky. – 2013. – No. 2. – S. 87–94.*
10. *Melnyk M. I. Formuvannya biznes-seredovyshcha Ukrayiny v umovakh instytutsiynykh transformatsiy: monohrafiya / M. I. Melnyk. – Lviv: IRD NAN Ukrayiny, 2012. – 568 s.*
11. *Vertakova Y. Innovative and industrial development: specifics of interrelation / Y. Vertakova, V. Plotnikov // Economic Annals-XXI. – 2016. – No. 156 (1–2). – P. 37–40.*

Vol. 3, No. 1, 2016

UDC 378.332

V. V. Voytsekhovska
PhD of Economic Sciences, Associate Professor
Lviv Polytechnic National University

O. Butzbach
Doctor of Economics , Professor
Seconda Università degli studi di Napoli

THE ENVIRONMENTAL SUSTAINABILITY – ASSESSMENT OF REGIONAL PRIORITIES FOR AIR POLLUTION REDUCTION

Abstract. The problem of reducing air pollution as key element of environmental sustainability by regional criteria was considered. The basic study approach is taken, according to which the quantitative analysis methods were used to define the relation between air pollution reduction and the relative reduction volume of its negative impact on the region's inhabitants. The result proved that the product of two indicators – the concentration of air pollution and population density in the territory determines the priority of reducing pollution and as a result the implementation of regional eco investments. Conducted interpretation proposed approach using statistical data on air pollution for the largest cities in Italy and dust pollution areas for Polish Voivodships. Corresponding conclusions of practical significance and prospects of the proposed approach to the definition of regional priorities of reducing air pollution were made.

Key words: environmental sustainability, regional development, air pollution reduction.

Problem statement

The problem of sustainability can be seen in global terms, in relation to the continents, regions, countries, localities, sectors of the economy, human settlements, a separate business entities. However in its entirety, this category is only correlated with the entire human civilization. Sustainable development of each country is possible only in the context of sustainable development of the entire human civilization. The same applies to all industries and the settlement of the territorial subsystems of each country. They can only grow steadily as the structural units (branch, territorial, settlement) steadily developing country. One of the major challenges of today's World is to ensure that countries build on the momentum created by the Sustainable Development Summit of the United Nations and truly undertake to adapt the 2030 Agenda to their national situations by reviewing policies, plans and institutions. The countries acknowledged that the Agenda extends beyond development cooperation and are considering relevant reforms in their domestic policies to address its provisions.

The analysis of recent researches and publications

Different authors put different values in this concept, but its genesis in relation to social development as a whole, of course, related to the problem of environmental degradation [4, 6, 10]. The Sustainable development is interpreted as "development that meets the needs of the present, but does not compromise the ability of future generations to meet their own needs". Daly H. E. elaborates on this definition, directly linking the satisfaction of human needs with the use of the biosphere. Leitmann J., Bartone C., define sustainable development as development "where the impact on the environment remains within the economic capacity of the biosphere, so it does not break the natural basis for the reproduction of human life" [10]. This specification is of great practical importance, since hypothetically people can meet their needs, living in tech world.

During the UN General Assembly the importance of environmental component of Sustainable Development was stressed, that economic growth must be decoupled from environmental degradation and combat climate change to protect future generations. The Global Sustainable Development Report by United Nations highlights the importance that no one is left behind is a fundamental guiding principle for the implementation of the 2030 Agenda for Sustainable Development. Science can inform decision-making on three broad questions. First, who are those being or at risk of

being left behind? Second, how can strategies and policies reach them in practice? And third, what types of strategies and policies would be appropriate in order to leave no one behind? [1].

Research objective

The aim of the study was to determine the priorities of reducing air pollution in some areas. At the same time to put forward the idea that in addition to pollution concentration, the significant role played also the population density living in that area. To realize the goal of the task was to identify and use quantitative methods to describe the relation of pollution to the impact on people with incomplete information regarding this relation. To interpret the results the statistical information available was used for the cities of Italy and Poland Voivodships.

The main results of the research

The one of the important issues is to assess the negative impact of pollution on the person, such as urban and suburban air. The result may be negative impacts on well-being, health, the number of unproductive days, life expectancy and more. In general, to obtain relevant quantitative relations in this area is very challenging. At the same time focus on some of the features of these peculiarities makes it possible to obtain results that are of practical importance. Thus, air pollution is both an environmental and a social problem, as it leads to a multitude of adverse effects on human health, ecosystems, the built environment and the climate.

Alternatively, in a quantitative form we offer parabolic dependence of the second order, which connects the effect of concentration of harmful components in the air with the effect for humans. By such dependence the relation, that defines pollution emission and its effect is determined:

$$\Delta E = cdv\Delta Z, \qquad (1)$$

where ΔE – the change (increase) of effect; ΔZ – the change (increase) of polluting emissions; d – concentration of harmful components at the time of pollution's variation; v – population density, which is constant; c – constant.

From the given dependence follows that the effectiveness of reducing pollution is caused by two parameters – the concentration of harmful component and density of inhabitants in the territory contaminated. At the same level of pollution, its reduction is more important for areas with higher population density. Also unavoidable conclusion that in the absence of pollution or in deserted areas to reduce pollution brings effect within defined criteria. This product determines the priority of measures to reduce pollution [15].

For example, the replacement of vehicles that use liquid fuel to electric is advisable to carry out first in densely populated cities with high air pollution. The same applies to restrictions on the movement of vehicles above-gas emissions [3].

It should be noted that the relation (1) can be used in two ways. The first area – the definition of priority areas to reduce pollution. The second direction – determination or distribution of the funds that would ensure overall maximum benefit from environmental investments.

In this direction, we conducted the relevant calculations involving some statistics from Italy and Poland. It should be noted that the relation (1) can be used for a wide range of objects – continents, countries, regions, cities and more. The corresponding analysis was conducted for the largest cities in Italy. In addition to publicly available information on the city's area and the number of residents we used data on air pollution are taken from the report of EEA [5]. Over the last few decades, evidence has been established about a broad range of air pollution's adverse effects on health. These effects are associated with short- and long-term exposure to levels usually experienced by urban populations throughout the world.

The present analysis indicates that air quality policies have delivered many improvements. However, the high amount of population in Europe is still exposed to exceedance of European environmental standards. Average levels of particulate matter of 10 μm^3 or less (PM10) in Italian cities in 2002–2004 ranged from 26,3 to 61,1 mg/m^3, with benchmark set by WHO 50 mg/m^3. The health impact of air pollution is large: 8220 deaths a year, on average, are attributable to PM10 concentrations above 20 mg/m^3. This corresponds to 9 % of the mortality for all causes (excluding accidents) in the population over 30 years of age. The impact on short-term mortality is 1372 deaths, or 1,5 % of the total mortality in the whole population. Hospital admissions attributable to PM10 are of a similar magnitude [7, 14].

The primary data concerning the territory, largest Italian cities population shown in Table 1.

Table 1

The statistical data concerning population parameters and area of biggest Italian cities, 2014 [2]

Nr	City	Population, th., ppl.	Area, km^2	Population density, th/ km^2
1	Turin	870,7	130,2	6,6
2	Genoa	586,7	240,3	2,4
3	Milan	1337,0	181,7	7,35
4	Bologna	375,9	140,7	2,7
5	Florence	361,6	102,4	3,5
6	Rome	2627,0	1285,0	2,1
7	Naples	960,0	35,5	8,2

Elaborated on data of Annuario statistic italiano, Istat 2015

From these data it follows that the population density is the smallest in Rome and largest in Naples and has a nearly 4 times difference. Such fluctuations significantly influence the effect of changing in pollution, including when it is decreasing. It should be noted that in Rome except permanent residents the tourists should be considered also. But since their stay is temporary, the damage from pollution should be considered with the regard to permanent residents only.

For the priority in air pollution reduction the following data will be used, concerning PM10 [5].

Table 2

The definition of City's rating for reducing dust pollution

Nr	City	PM 10 $\mu g/m^3$	Population density, th/ km^2	Indicator, dv	Ranking of Pollution influence
1	Turin	81,0	6,6	534,6	2
2	Genoa	44,6	2,4	107,0	7
3	Milan	66,7	7,35	490,4	3
4	Bologna	57,0	2,7	153,9	5
5	Florence	52,0	3,5	182,0	4
6	Rome	58,0	2,1	121,8	6
7	Naples	75,6	8,2	619,9	1

Elaborated on data of European Environmental Agency, 2015

As seen from the table data the most polluted air is in Turin and the least in Genoa and at least 1.8 times differ. Since, as noted, the population density is significantly different, therefore we note the fluctuating rate criterion – the product of the concentration of pollution on population density. The highest priority according to our research is to reduce pollution in Naples where population density is greatest. On the second place is Turin, where the population density is average but most concentrated is air pollution. The main conclusion, according to the proposed approach is to give the priority for pollution reduction is that the population density in the territory, which is also one of the key parameters that can change the option setting priorities as for air pollution.

It should be noted, that we used the statistical results developed by studies of WHO (World Health Organization) and EEA (European Environmental Agency) on the largest cities in Italy. According to these studies the particular matter pollutant (PM 10) is one of the most harmful and leads to many deaths from respiratory and cardiovascular diseases caused by this factor [5, 8].

Table 3

The statistical data concerning population parameters, area and amount of dust pollutants emission, Polish Voivodships, 2014 [13]

Nr	Voivodships	Population, mln., ppl.	Area, in thousand, km^2	Particulate dust pollutants emission, in th. ton.
1	Lower Silesian	2,9	19,9	4,0
2	Kuyavian-Pomeranian	2,1	18,0	3,9
3	Lublin	2,2	25,1	2,1
4	Lubusz	1,0	14,0	1,2
5	Łódź	2,5	18,2	3,4
6	Lesser Poland	3,3	15,2	3,9
7	Masovian	5,3	35,5	4,6
8	Opole	1,0	9,4	2,1
9	Subcarpa-thian	2,1	17,8	1,7
10	Podlaskie	1,2	20,2	0,9
11	Pomeranian	2,3	18,3	2,8
12	Silesian	4,6	12,3	10,6
13	Święto-krzyskie	1,3	11,7	2,7
14	Warmian-Masurian	1,4	24,2	1,2
15	Greater Poland	3,5	29,8	4,6
16	West Pomeranian	1,7	22,9	2,6

Elaborated on data of Statistical Yearbook of Republic of Poland, 2014

For Voivodships of Poland the atmospheric dust pollution was analyzed. The peculiarity of information support of the study was that instead of the value of contamination by volume of the atmosphere considered as analogue ratio reductions in tonnes to fit in Voivodship areas.

Lets take a regional interpretation of equation as an example the emission of dust pollution on the territory of Poland's Voivodships. Relevant primary statistics are given below in Table 1 [13].

Primary data on the absolute area, population, Voivodships pollution are further used to determine the desired relative parameters (Table 4). The results of the corresponding calculations are presented in Table 4 [13].

Table 4

The definition of Voivodeship's rating for reducing dust pollution

Nr	Voivodships	Population density, mln., ppl./ th. km^2, v	Pollution concentration, th. ton/ th.km^2, v	100dv, indicator	Ranking of pollution influence
1	Lower Silesian	0,15	0,20	3,0	3
2	Kuyavian-Pomeranian	0,12	0,22	2,6	5
3	Lublin	0,09	0,08	0,7	13
4	Lubusz	0,07	0,09	0,6	14
5	Łódź	0,14	0,19	2,7	4
6	Lesser Poland	0,22	0,26	5,7	2
7	Masovian	0,15	0,13	2,0	7
8	Opole	0,11	0,13	1,4	10
9	Subcarpathian	0,12	0,10	1,2	11
10	Podlaskie	0,06	0,04	0,2	16
11	Pomeranian	0,13	0,15	1,9	8
12	Silesian	0,37	0,86	11,8	1
13	Świętokrzyskie	0,11	0,23	2,5	6
14	Warmian-Masurian	0,06	0,05	0,3	15
15	Greater Poland	0,12	0,13	1,6	9
16	West Pomeranian	0,07	0,11	0,8	12

Elaborated on data of Statistical Yearbook of Republic of Poland and own calculations, 2014

Out of the data it follows that the maximum level of dust pollution is 20 times greater than its minimum value and a maximum density of population than the minimum of 4 times. According grade ranges 40 times.

If we compare the ratings we shall observe, that the top three priority on reducing pollution include the following Voivodships: Silesian, Lesser Poland, Lower Silesian. The results are conditioned by the fact that in these Voivodships have the largest concentration of pollution and population density living in these areas.

The reason for it should be considered as the presence of large scale industrial production, which requires the involvement of a significant number of employees and activities which are based on industry specifics, that are related to pollution.

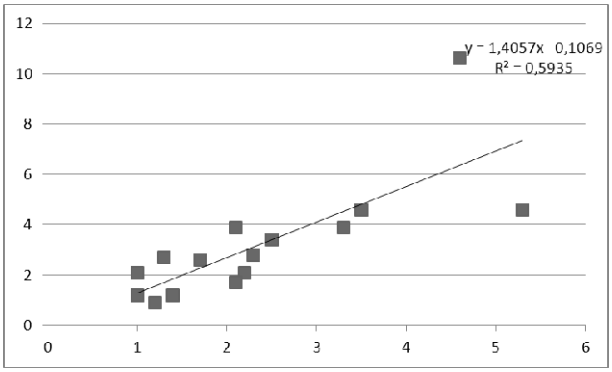
Priority means that first of all shall be implemented the environmental initiatives in these areas. But the choices of eco-investments significantly affects the readiness of technical and technological solutions. Also important factors include absolute and specific costs, including such factors as capital intensity reduction of pollution [12–14].

As was previously analyzed from the two areas of air quality improvement for dust pollution better results are achieved, which decreased more rapidly.

The statistical data are further used to determine for each of the Voivodship concentration of gas emissions and population density in the area. The result of this analysis can serve as a measure of efficiency (rate) of pollution reduction. At the same time, the analysis shows a statistical relation, that illustrates a dependency of the correlation. In quantitative form, it has the following linear interpretation:

$$Z = -0{,}106 + 1{,}05N, \qquad (2)$$

The graphic interpretation of given correlation can be observed in figure.



The correlation between dust pollutants (y) and population (x)

The coefficient of correlation is equal tor = 0,77. Thus,distresscommunicationis significant.

By dividing the left and right side of the equation on the size of the surface S, we obtain the dependence of the concentration of impurities on the density of the population living in the territory:

$$\frac{Z}{S} = -\frac{0{,}106}{S} + 1{,}405N / S. \qquad (3)$$

General conclusion is that in real business practices the developed pollution type is closely linked to population density in the area. The reason for this phenomenon may be the concentration of production and consequently attract a large number of employees. Concentration in turn leads to an intensification of contamination. Normally the pollution depends on other factors. Selected primary statistics allow to access the problem of prioritization, that reduces pollution by individual region.

Table 5

The calculation's results of the effect of air pollution reduction for the period 2012–2014

Nr	Voivodships	Particulate dust pollutants emission, in th. ton. (2014)	The emission change: 2012–2014, th. ton. ΔZ	The effect from the pollution reduction $\Delta E'=dv\ \Delta Z$
1	Lower Silesian	3,7	0,3	0,9
2	Kuyavian-Pomeranian	3,4	0,5	1,30
3	Lublin	2,1	0,0	0,00
4	Lubusz	1,1	0,1	0,06
5	Łódź	3,2	0,2	0,54
6	Lesser Poland	3,6	0,3	1,71
7	Masovian	4,5	0,1	0,20
8	Opole	1,9	0,2	0,48
9	Subcarpathian	1,7	0,0	0,00
10	Podlaskie	0,9	0,0	0,00
11	Pomeranian	2,4	0,4	0,76
12	Silesian	10,6	0,0	0,00
13	Świętokrzyskie	2,7	0,0	0,00
14	Warmian-Masurian	1,1	0,1	0,03
15	Greater Poland	4,5	0,1	0,18
16	West Pomeranian	2,6	0,0	0,00

Elaborated on data of Statistical Yearbook of Republic of Poland

The effect of the priority principle implementation can be determined if we use the equation(1) involving data from two time periods – 2012 and 2014 the relevant data and calculations are listed below [12, 13].

According to the statistics the total emission of dust pollution in 2012 amounted to 52,3 th. ton and in 2014 50 th. ton, which decreased by 2,3 th. tons (by 4,4 %). The total effect was 6.16 (in relative units). If for example, the money spent on air pollution reduction in the amount of 2,3 th. tons were realized in Silesia, which has the highest priority according to our ranking, the effect would have been an amount equal to 27, 1 (in relative units), therefore more than 4.4 times than actually achieved level. If contamination is reduced to the same extent in Silesia and Malopolska Voivodships, the result would be 3,3 times larger. It can be concluded that prioritizing pollution reduction allows a more rational approach to the allocation costs for that purpose in the general funds in certain areas.

A priori, this can be explained by the fact that there are appropriate technical solutions that do not require for their implementation major capital expenditures. At the same time, the chemical nature of air pollution may require more complex development projects and significant capital investment. Do not forget about the diversification aspects of environmental activities. In the majority of casses, the environmental measures of regions are carried out independently at their own expense and opportunities. A compromise between the interests of the community as a whole and the community in some areas can be achieved through the introduction of appropriate criteria and constraints.

To reduce air pollution it is needed to perform certain research, develop special measures and to invest in ecological projects.

Conclusions

The developed work have shown, that the choice of parameters, that quantify environmental sustainability should take into consideration the pollution's negative impact at first on the life quality of one man, and then summarize the number of residents living in a particular area.

Taking into consideration air pollution, the output parameters for the performed research, should be considered a harmful gas in the air, the component that is correlated with the amount of gas emissions per unit of area. For residents of the entire territory

the overall pollution impact is considered additive, which will be proportional to the population.

The statistical analysis of largest Italian cities and Polish Voivodship demonstrates, that these indicators and their product significantly differ for different areas – different regions of one country, on given example of Poland and Italy. Therefore, the main dependence can be used to identify priority areas for the implementation of measures in order to reduce air pollution. In order to select appropriate investment projects, we require further assessment of the eco-costs effectiveness, which is largely dependent on the innovation degree of new technology. The strategy to reduce air pollution at the country level should consist the eco-activities for every city, territory, region considering the pollution's degree, the industrial specifics as well as general and local resource capacity allocation, formation and implementation of eco-investment projects.

References

1. *Transforming our world: the 2030 Agenda for Sustainable Development, United Nations Resolution, General Assembly, 25 september 2015.*
2. *Annuario statistic italiano, Istat, 2015.*
3. *Benessere equo e sostenibile 2015: principali risultati, Istat, 2015.*
4. *Daly H. E., 1990. Towards some operational principles of sustainable development. Ecological Economics 2:1–6.*
5. *European Environment Agency. Air pollutant concentrations at station level (statistics)/November 30, 2015.*
6. *Jeffrey D. Sachs. The age of sustainable Development/Columbia University Press New York, March 2015, 544 p.*
7. *Health impact of PM10 and ozone in 13 Italian cities (2006), WHO-Europe.*
8. *Health risk assessment of air pollution. General principles . WHO, 2016.*
9. *Istat, Ambiente ed energia, Archivio dei comunicati stampa -[http://www.istat.it/it/ambiente-ed-energia]*
10. *Leitmann J., Bartone C. et al. (1992). "Environmental management and urban development: issues and options for third world cities." Environment and Urbanization 4(2): 131–140.*
11. *Rockström, Johan, Jerey D. Sachs, Marcus C. Öhman, and Guido Schmidt-Traub. "Sustainable Development and Planetary Boundaries." Background Paper for the High-Level Panel of Eminent Persons on the Post-Development Agenda. New York: Sustainable Development Solutions Network, 2015.*
12. *Statistical yearbook, Republic of Poland, Voivodships, 2012.*
13. *Statistical regional yearbook, Republic of Poland, Voivodship Nr: 1–16, 2014.*
14. *The 2050 vision is set out in the EU's 7th Environment Action Programme (EU, 2013).*
15. *Voytsekhovskyy V., Voytsekhovska V. Metodological aspects of quantitative assessment of the pollution reduction status and trend // MEST Journal Vol. 3, No. 1, pp. 163–169.*