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Oksana Nesterenko,
Doctor of Economics, Associate Professor,
Kharkiv State University of Food Technology and Trade, Ukraine
ORCID: https://orcid.org/0000-0002-9516-0917

Angelika Krutova,
Doctor of Economics, Professor,
Kharkiv State University of Food Technology and Trade, Ukraine
ORCID: https://orcid.org/0000-0002-7154-6233

Oksana Blyzniuk,
PhD (Economics), Associate Professor
Kharkiv State University of Food Technology and Trade, Ukraine
ORCID: https://orcid.org/0000-0003-1321-1563

Olena Zhyliakova,
PhD in Economics, Associate Professor
Kharkiv State University of Food Technology and Trade, Ukraine
ORCID: https://orcid.org/0000-0003-4580-1752

Iryna Andriushchenko,
PhD in Economics, Associate Professor
Kharkiv State University of Food Technology and Trade, Ukraine
ORCID: https://orcid.org/0000-0002-4028-6782

MANAGEMENT ACCOUNTING OF COSTS FOR HUMAN CAPITAL OF THE SERVICE ENTERPRISE

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Abstract. *The systematic study, critical assessment of theoretical provisions and current practice of accounting organization of costs for human capital of the service enterprise, improvement of accounting mechanisms for the use of personal human assets and human capital of the enterprise are provided in the article. It is proved that the need to reflect human capital in accounting is due to the following factors: human capital is considered an integral part of national wealth; determining the main role of human knowledge, abilities, qualifications, and education in the process of social production; change of attitude to a person that is the appreciation of its creative potential and intellectual abilities. Characteristic definitions of human capital in aspects of different spheres of its functioning are analyzed. Peculiarities of normative and legal regulation of human capital as an intangible asset under SSAP and IFRS and identification of contradictions in accounting of personnel costs under the current accounting system are considered. The peculiarities of the organization of primary accounting of human capital at the enterprises of the service sphere are considered. It has been proposed to record information on the costs for human capital in terms of the processes of its formation, use, and development in the Employee Data Card (standard form P-2) by introducing an additional Section VI "Costs per employee." The financial statements of analytics have been improved to Form No.1 of the Balance Sheet (Statement of Financial Condition) by introducing analytics in the first section of liabilities in the item*

"Additional capital" of information on human capital of the enterprise, which will generate financial statements for full disclosure to stakeholders, especially investors. Suggestions are given for the prospects of further development: research of accounting of costs for personnel of the enterprise depending on the life cycles of personnel and the enterprise, development of theoretical and methodological bases of corporate social reports on human capital, improvement of personnel value assessment methods (especially residual and liquidation value).

Keywords: *human capital, accounting organization, additional capital, intangible asset, personal human asset.*

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Introduction

A person in a consumer society strives to consume in such a way that, on the one hand, he (she) is no worse than others, and, on the other, he (she) does not merge with the crowd. Individual consumption reflects not only the social characteristics of the consumer (as a demonstration of social status) but also the characteristics of the individual lifestyle. All these features change the personnel of enterprises, while the characteristics (properties) of the personnel themselves change, and specific ones appear depending on the economic activity.

All this requires a change in the worldview of the company to personnel as a special and priority resource – the transformation of the entire resource management system of the enterprise, its components (accounting, analysis, planning, organization, control, etc). Manifestation of the concept of human capital in the theory of economic thought necessitates the creation of effective information support, which became a prerequisite for the creation of the concept of accounting for human resources (human capital, personnel).

Literature Review

Modern "theory of human capital" as a field of economics, in which the human component of economic systems of different scales is considered in terms of value and price and differs in definition by three levels:

– at the level of personality (nanolevel) human capital is a system of knowledge and abilities that a person has acquired through education, training, practical experience (using their natural abilities) and through which it can provide valuable production services to other people - personal (private) human capital (Cleary, P. et. al. (2016); Cuozzo, B. et. al. (2017); Dumay J. (2016));

– at the enterprise level (microeconomic level) human capital is the total qualification and professional abilities of all employees of the enterprise, as well as the achievements of the enterprise in the effective organization of labor and personnel development - the intellectual capital of the enterprise (Goldin, C. (2016));

– at the state (macroeconomic level) human capital is the accumulated investment in areas such as education, vocational training and retraining, career guidance and employment, health improvement, etc. National human capital is an essential part of the national wealth of the country (Guthrie J., Parker L. D. (2016); Secundo G., et.al. (2016)).

In our opinion, to identify the types of human capital and to form appropriate definitions, it would be more appropriate to use an approach that would take into account the differences of individual forms of capital, as this term is the basic "creator" of the concept of "human capital".

The analysis of scientific publications allowed to group different definitions of human capital in aspects of economic, cultural, and social sphere of its functioning and to define characteristic features of the received groups. According to the analysis, it can be concluded that the category of human capital is a multifaceted concept. However, in the economic sense, it is primarily a real source of funds that can be directly invested in the development of a particular person or group (team, group, nation, etc).

Paying tribute to the scientific achievements and practical significance of the results, it should be noted that a number of tasks to compare income and expenditure in human resources, determine the effect of the implementation of specific personnel costs of investment nature, take into account opportunity costs in determining expected future economic benefits, and to elaborate internal (corporate) social reporting are not sufficiently developed.

Methods

The purpose of the paper is a systematic study, critical assessment of theoretical principles and current practices of accounting organization of costs for human capital of the service enterprise, improvement of accounting mechanisms in terms of the use of personal human assets and human capital of the enterprise.

In accordance with the purpose of the paper, the following tasks are set:

to investigate the economic content of human capital of the enterprise as an object of accounting;

to get acquainted with the regulatory and legal support of accounting for human capital of enterprises in Ukraine;

to study the peculiarities of the organization of primary accounting of human capital;

to consider the features of synthetic and analytical accounting of human capital;

to suggest ways to improve the accounting of human capital and personal human assets in the service enterprise.

Results

The inability of the accounting system to aggregate the objects of human capital, and financial reporting under modern standardization to provide market institutions with a formalized assessment and, along with it, the cost characteristics of the company, leads to the use of weakly formalized information models.

We believe that in terms of accounting, human capital is a component of the intangible assets of the enterprise.

Traditional accounting considers only the resources that are the property of the enterprise. Due to the fact that personnel, as a special type of resource, can be neither property nor an object of property, the representatives of traditional accounting do not consider it as an object of accounting – an asset (resources controlled by the

enterprise as a result of past events, the use of which, as expected, leads to economic benefits in the future).

In our opinion, the need to reflect human capital in accounting is due to the following factors: human capital is considered an integral part of national wealth; determining the main role of human knowledge, abilities, qualifications, and education in the process of social production; change of attitude to a person – appreciation of its creative potential and intellectual abilities; the transition to a "post-industrial economy" has led to an increase in the role of the non-monetary component of capital, which creates the main part of value added; a significant increase in the share of goodwill in the asset structure of multinational corporations, the precondition for which is the lack of reflection in the accounting of human capital.

We believe that to reflect the costs of personnel development as current costs from an economic point of view is impractical because the cost of professional development, personnel training is not in itself a "used resource", so to include these costs in current costs or cost of production of services for the reporting period is not possible. In addition, including the personnel costs that meet the conditions of capitalization in the period costs, the enterprise thus underestimates its financial result and the value of the assets of the balance sheet.

The valuation model, which is based on the capitalization of labor costs, training and development, will allow to most accurately determine the economic value of labor.

However, there are some inconsistencies in accounting for personnel costs.

First, in accordance with International Financial Reporting Standards (hereinafter - IFRS), the costs incurred by the enterprise can be reflected either as an asset or as period costs, ie the concept of "future periods costs" in IFRS is absent (International Accounting Standard 38). Therefore, when preparing financial statements in accordance with IFRS, if the option of accounting for personnel development costs as future periods costs is chosen, they should be reclassified and identified separately.

Second, it is unacceptable to account for personnel development costs as current costs, as the costs of professional development, preventive examinations, and health improvement of employees are not "used resources", so they can not be included in current costs or costs of production of goods (works, services) of the period in which they were incurred. In addition, if the personnel costs incurred need to be capitalized, then this accounting option leads to an understatement of the financial result and the value of the assets of the balance sheet.

Thus, we can conclude that the current Ukrainian practice of cost accounting personnel development does not take into account their accounting and economic nature, which ultimately leads to a violation of one of the main principles of accounting – prudence and does not comply with IFRS, and therefore there is the need for improvement. This is especially true of the cost, which accumulates the human capital of the enterprise and increases its value and value for the enterprise.

The formation of human capital in the service sector should take place in two directions:

1. Professional development of personnel: employee training; retraining of employees; advanced training of employees.

2. Personnel retention: personnel health improvement; social services.

It is according to this classification that human capital will be capitalized.

The formation of human capital is due to the receipt of services for training, retraining, etc. It is necessary to form a primary observation of the relationship between the customer and the supplier.

Forms of internal primary accounting documentation are the basis for displaying information on the facts of business transactions in the accounting registers.

It should be noted that for the accounting of intangible assets, which are proposed to reflect investments in human capital formation, the Ministry of Finance has developed and approved unified forms (About the statement of standard): Act of introduction of intellectual property into circulation as part of intangible assets (standard form IA-1); Inventory card of registration of the intellectual property as a part of intangible assets (standard form IA-2); Act of disposal (liquidation) of the intellectual property as part of intangible assets (standard form IA-3); Inventory description of intellectual property as part of intangible assets (standard form IA-4).

However, the forms of primary accounting documents can be used to record the relevant employment contracts or training of employees.

At the same time, information on the cost of human capital in terms of the processes of its formation, use, and development can be recorded in the Employee Data Card (standard form P-2) as an additional Section VI “Costs per employee” (Table 1).

Table 1. Employee Data Card - VI “Costs per employee”

Type of costs	Amount of expenses, UAH	Grounds, No of order	Notes
1. Costs for professional development of the employee			
– Training of employees			
– Retraining of employees			
– Advanced training of employees			
2. Cost for personnel retention			
– Health improvement			
– Social services			

The part of human capital costs (investments in formation and development) that meet the criteria for recognition as intangible assets should be reflected in assets and liabilities, income, and costs.

This type of information must be documented by the relevant package of documents: Contract for the provision of services (performance of works), Order on the search for personnel, Work Completion Certificate, a copy of the announcement, etc.

This approach to the organization of primary accounting of human capital costs will form an effective personnel policy at the enterprise, which will further increase

employee loyalty, become a motivating factor, increase productivity, and reduce staff turnover.

Given all the above in the previous sections, we consider it appropriate to introduce separate sub-accounts to account for operations related to the personnel development and retention. With these accounts, the analysis of human capital costs is deepened and the list of accounting objects is expanded, which helps to avoid inconsistencies in the formation of financial results. To account for human capital, a separate synthetic account 128 "Personal human assets" should be created. This account will not take into account the employees themselves but only the rights to use the knowledge and qualifications of employees.

Improvements in accounting methods for the segment of personnel costs in terms of the element "accounts and double entry" are given in Table 2.

Table 2. Synthetic and analytical accounts for management accounting of personnel costs

<table>
<tr><td colspan="6">128 "Personal human assets"</td></tr>
<tr><td>128.1 "Personal (human) assets of accounting service"</td><td colspan="2">128.2 "Personal (human) assets of personnel service"</td><td>128.3 "Personal (human) assets of the legal department"</td><td>128.4 "Personal (human) assets of the administration"</td><td>128.N "Personal (human) assets of the n-th division"</td></tr>
<tr><td colspan="6">99 "Human resources development costs"</td></tr>
<tr><td colspan="3">991 "Professional development costs"</td><td colspan="2">992 "Personnel retention costs"</td><td rowspan="2">993 "Costs for pseudo-human development"</td></tr>
<tr><td>991.1 "Training costs"</td><td>991.2 "Employees retraining costs"</td><td>991.3 "Advance training costs"</td><td>992.1 Costs for health improvement of personnel</td><td>992.2 Costs for social services</td></tr>
<tr><td colspan="6">154.1. "Recognized personal (human) assets"</td></tr>
<tr><td colspan="6">154.1.1 "Recognized personal (human) assets of the accounting service"</td></tr>
<tr><td>154.1.1.1 "Training"</td><td colspan="2">154.1.1.2 "Retraining of employees"</td><td>154.1.1.3 "Advanced training of employees"</td><td>154.1.1.4 "Health improvement"</td><td>154.1.1.5 "Social services"</td></tr>
<tr><td colspan="6">426 "Human capital of the enterprise"</td></tr>
<tr><td>426.1 "Human capital of the accounting"</td><td colspan="2">426.2 "Human capital of personnel service"</td><td>426.3 "Human capital of the legal department"</td><td>426.4 "Human capital of the administration"</td><td>426.N "Human capital of the n-th division"</td></tr>
</table>

Service enterprises in many cases conduct multidirectional activities and, for the convenience of management accounting, costs and revenues are determined by the centers of responsibility. For example, if the service enterprise is a hotel complex, then it is convenient to account for costs and revenues separately for the actual hotel, restaurant, and other subsystems of the complex. This requires the need to introduce analytical accounting of employees' human capital development costs by centers of responsibility and by cost items.

Thus, in accordance with the current methodology, in the form No.1 “Balance Sheet (Statement of financial condition)”, the assets provide information on non-current assets, current assets and non-current assets held for sale, and disposal group, liabilities provide information on equity, long-term, and current liabilities. In accordance with the terms of the double entry of business transactions, our proposals for improving Form No.1 relate to:

- in the first section of assets “Non-current assets”, the value of objects that are classified as intangible assets is displayed, in which we propose to reflect personal human assets;
- in the first section of liabilities in the item “Additional capital”, we propose to reflect the formed human capital of the enterprise. That is why we consider it expedient to introduce additional articles to this section (Table 3).

Table 3. Fragment of the form No.1 “Balance Sheet (Statement of Financial Condition)”
(author's suggestions)

Liabilities	Line code	At the beginning of the reporting period	At the end of the reporting period
…	…	…	…
Additional capital	1410	130	260
…	…	…	…
including human capital*	1631	26	75

In our opinion, the proposed structure of accounts and the working plan of accounting accounts at the enterprise will: increase the informativeness of accounting data for effective management decisions; clearly separate and analyze the cost of human capital components of an individual employee and the cost of human capital of the enterprise as a whole by summarizing the information on analytical accounts; reflect human capital in the assets; allow to approximate the book value of the enterprise with its market value.

Discussion

In general, human capital at the personal level at the microeconomic and macroeconomic levels is considered. The characteristic definitions of human capital in aspects of different spheres of its functioning were also analyzed. In our opinion, the need to reflect human capital in accounting is due to the following factors: human capital is considered an integral part of national wealth; determining the main role of human knowledge, abilities, qualifications, and education in the process of social production; change of attitude to a person - appreciation of its creative potential and intellectual abilities; the transition to a “post-industrial economy” has led to an increase in the role of the non-monetary component of capital, which creates the main part of value added; a significant increase in the share of goodwill in the asset structure of transnational corporations, the precondition for which is the lack of reflection in the accounting of human capital.

Conclusion

The peculiarities of the organization of primary accounting of human capital at the service enterprises are considered. It was proposed to record information on the cost for human capital in terms of the processes of its formation, use, and development in the Employee Data Card (standard form P-2) by introducing an additional Section VI “Costs per employee”.

Prospects for further development are the study of accounting for personnel costs of the enterprise depending on the life cycles of personnel and the enterprise, development of theoretical and methodological principles of corporate social reports on human capital, improvement of personnel valuation techniques (especially residual and liquidation value).

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Anatolii Chynchyk,
Candidate of Economic Sciences (Ph.D.), Associate Professor
Kyiv National University of Construction and Architecture, Ukraine
ORCID: https://orcid.org/0000-0003-4017-4753

Lyudmyla Bilanych,
Candidate of Economic Sciences (Ph.D.),
Augustyn Voloshin Carpathian University, Ukraine
ORCID: https://orcid.org/0000-0002-9005-6985

TAX POLICY IN THE CONTEXT OF GLOBALIZATION CHALLENGES

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Abstract. *The main globalization challenges and opportunities for the formation of state tax policy in conjunction with the tax strategy are highlighted in the article. The problems and consequences of tax competition between states are studied. The peculiarities of the formation of national tax policy are summarized and the challenges posed by globalization processes are analyzed.*

Key words: *national economics, globalization challenge, taxes, tax policy, tax crime, tax competition.*

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Introduction

Globalization can have both positive and negative effects on the tax sphere. In case of acquiring negative signs, globalization challenges arise. It is necessary to understand them in order to take them into account when formulating the tax policy of the state, which is designed to level them or transform them into new opportunities. At the same time, the tax policy of states also plays a role in globalization processes in terms of their financial and economic component. The economic development of the state and its further integration into the world financial and economic space depend on the effectiveness of tax policy, taking into account the global challenges and opportunities.

Literature Review

The results of the study were obtained using the ideological developments of Ukrainian (Davtyan (2016), Ivanov (2018), Karlin (2014), Polivantsev (2013)) and foreign (P. Egger, S. Nigai, N. Strecker (2019), D. Swank (216)) scientists who have dealt with issues of taxes and the impact of globalization on them.

Methods

Purpose of this study is to identify the main challenges and opportunities posed by globalization, which must be taken into account when forming the tax policy of the modern state to ensure the competitiveness of its tax system.

Results

Tax policy and its tools have a significant impact on globalization. While maintaining the functions of the main lever to fill the budget, taxation begins to have a significant impact on the international location of production, direct and portfolio investment, activity of financial markets, and more. The new role of taxation is manifested in the functioning of various integration groups, in particular, the harmonization of taxation is one of the promising elements of integration processes and an inevitable consequence of globalization (Pavlik, O. V. (2015)).

Globalization can have both positive and negative effects on the tax sphere. In case of acquiring negative signs, globalization challenges arise. It is necessary to understand them in order to take them into account when formulating the tax policy of the state, which is designed to level them or transform them into new opportunities. At the same time, the tax policy of states also plays a role in globalization processes in terms of their financial and economic component. The economic development of the state and its further integration into the world financial and economic space depend on the effectiveness of tax policy, taking into account the global challenges and opportunities.

The formation of tax policy taking into account the challenges of globalization should be carried out in conjunction with the economic strategy of the state. It can be based on the ideology of openness and integration, neutrality, protection, and protectionism. In the context of globalization, integration is intensifying, which opens up additional opportunities for capital investment and entrepreneurship abroad; at the same time, integration processes increase the sensitivity of investment and business to taxation, as governments of individual states liberalize tax legislation, guided by opposite motivations - on the one hand try to attract foreign investment, and on the other prevent the flow of the tax base abroad (Polivantsev, A. S. (2013)). Depending on the economic and political interest of the state, its tax strategy is formulated based on liberal (motivation) or tougher approaches.

As world experience shows, simultaneously with globalization since the early 1980s of the XXth century, the implementation of neoliberal tax reforms has spread (Swank, D. (2016)). Globalization contributes to the unification of tax regimes in different countries, in particular in terms of taxation of both revenue and income of the population, which receives different assessments of expediency (Egger, R.N. (2019)). However, the globalization challenges of resource mobility, especially human resources, create a specific situation of gaps in the taxpayer’s location and its place of activity (business, work, education). This necessitates taking into account the risks of double payment of taxes on a territorial basis and ensuring the mobility of taxation.

Tax competition is one of the main challenges of globalization for the formation of tax policy. This phenomenon in science and practice receives various

assessments: as negative – with the creation of conditions by states to attract foreign financial resources and labor with a proposal instead of opportunities for tax evasion or reduction of such amounts, as well as the confidentiality of information about taxpayers and other stakeholders (critical assessments of OECD, IMF, WTO); as positive, which is a form of economic competition.

Table 1. Tax strategy to counteract the outflow of capital abroad

Factors of capital outflow	Consequences of capital outflow	Ways to counteract the outflow of capital
Unfair tax competition between states ("tax havens"/"offshore")	Distortion of financial and investment flows (acceptance of investments from "tax havens" from the withdrawn national capital as foreign), which distorts the information and possibilities of scientific statistical analysis	Regulation of controlled foreign corporations in order to credit the income of foreign companies, which are controlled by resident individuals or legal entities, to the income of these residents for tax purposes
International structuring of business processes with the transfer of some of them to countries with more favorable tax treatment, localization of profits and export of products with subsequent sale to the final consumer	Violation of the integrity and fairness of the tax system, competition in the business environment, resulting in inhibition of innovation processes	Countering artificial transactions of national business entities with companies located in "tax havens"
Low quality business climate for investment in the country	Vulnerability of the national financial system due to the possibility of withdrawal of returned (previously withdrawn) capital from the economy in the form of portfolio investments or loans in times of crisis	Creation of an effective asset recovery system, which includes tools to track, freeze, seize, and confiscate illegally acquired assets, it is based on the establishment of legal, investigative, and judicial mechanisms to remove obstacles to the return of misappropriated property and countering the creation of "safe zones" for perpetrators
Gaps in tax legislation on foreign economic activity, development of financial markets	Narrowing the tax base, shifting the tax burden from business to the population in terms of withdrawing profits from the economy and minimizing business tax liabilities	Regulation of transfer pricing, implementation of the OECD principle "at arm's length" (taxation of interdependent companies)
Globalization of financial systems with the development of international banking networks, electronic trading systems, networks of real estate transactions, which eliminates geographical restrictions	Decrease in the domestic investment potential of the economy	Improving mechanisms to combat the legalization (laundering) of funds obtained by criminal means with the establishment of stricter requirements for information that should accompany electronic money transfers by strengthening the requirements for monitoring transactions, participants or beneficiaries of which are public figures or related persons

Source: summarized by the author based on (Tishchuk, T. A.; Ivanov, A.V. (2012)

The main directions of tax competition between states are (Ivanov, Yu. B. (2018)), in particular: model of tax competition: undifferentiated or differentiated involvement of mobile factors of production, regardless of the directions and

efficiency of their use, is realized by reducing either the total tax burden or tax burden on capital and labor; the specifics of the national tax system – its structure (the importance of “resource” taxes), the tax burden on capital; tax administration and control – simplicity and cost of registration procedures, taxation procedures.

As a result, tax competition with the formation of offshore zones has become a serious globalization challenge to the formation of tax policy of each state. In fact, its ideological basis in such circumstances should be a democracy with a reasonable tax burden on business and the population. In the case of the introduction of tax crime and excessive withdrawal of capital from the economy to offshore, as formed in Ukraine, it is necessary to strengthen the control function of taxes and to introduce independent bodies with international support into the tax administration system. Thus, in Ukraine, at the request of the IMF and other international organizations, the process of introducing new analytical approaches to combat economic crimes and conduct effective investigations is underway. In particular, the reform of the tax policy involves the establishment of the Financial Investigation Service and the Bureau of Economic Security. The world practice also sees the conclusion of interstate agreements in this area as an effective way to combat tax crime and money laundering.

Tax competition arises between states as a natural consequence of globalization and redistribution of resources - financial, property, human, information. At the same time, an effective tax policy should take into account these aspects and, in the event of excessive withdrawal of financial resources abroad, follow a tax strategy to counteract the outflow of capital (Table 1).

Competition at the international level forces countries to choose not only a strategy but also an approach to the formation of tax policy depending on national interests and priorities. It is also about unification, harmonization, differentiation, and mobility of taxation. Given the national interests of Ukraine and its focus on European integration, the urgent task is tax harmonization. In terms of improving tax policy, the priority of tax harmonization in Ukraine is due to comparative interstate assessments in this area and is aimed at creating a favorable institutional environment for doing business and welfare. The country rating has a very strong image (investment, labor resource, political) effect and increases the impact of tax policy on macroeconomic indicators and foreign trade transactions (calculations have shown that higher ranking positions in taxation are more stimulating to export than import transactions (Wajeetongratana, R. (2020)).

According to the analysis, taxes in Ukraine are closer to the rates of Estonia and Lithuania. The relationship between the size of tax rates and economic development of the country is manifested in the fair redistribution of mobilized financial resources and financing of the required public goods. Differences between states in taxes and revenues are determined by the government's goals and its ability to collect taxes effectively. According to an IMF study, countries with a lower level of corruption receive on average 4% of GDP of tax revenue more than countries with a higher level of corruption (Tishchuk, T. A.; Ivanov, A.V. (2012)). For Ukraine, this issue remains acute, which confirms the results of the rating of corruption perception of the international organization “Transparency International”, according to which

our country ranked 126 out of 180 in 2019, 144 out of 177 in 2013 before the adoption of “anti-corruption” laws after the Revolution of Dignity (Corruption Perceptions Index).

Gross and systematic distortions of tax competition between countries with the withdrawal of capital from the economy to avoid taxation lead to a transnational tax crime. Unlike general economic crime, the peculiarities of tax crimes are their high latency and variety of ways of committing; tax crime has an even higher public danger than general crime because it affects the security of not one or more citizens but society as a whole, reducing its economic opportunities due to lack of budget revenues (Davtyan, L. G. (2016)).

Discussion

One of the main and urgent problems for the development of the national economy is also the outflow of capital, which experts often associate with the tax burden on business. However, some adjustments should be made to understand this burden: basic tax rates in Ukraine are lower or identical to those used in the EU and some developed countries but the mechanisms of their administration are characterized by excessive complexity and corruption (especially VAT refunds) (Karlin M. I. (2014)).

The main problem in solving these problems in Ukraine is the lack of political will, because, as a rule, the primary interest in taking advantage of the tax systems of other countries is held by powerful persons or institutions closely related to them, possessing significant capital and constantly increasing their own revenues even against the background of a decrease in the level of welfare of the population.

Conclusion

Countering the outflow of capital should be part of the system of imperatives for the formation of tax culture in the state and active interstate cooperation with the coordination of joint measures in the tax sphere in the framework of so-called fiscal consolidation (unification and harmonization of tax approaches, counteraction in reducing tax rates).

Further research will reveal in more detail the areas of tax crime and the experience of different countries in combating it, which is relevant for Ukraine in the context of excessive withdrawal of capital offshore and other illegal transactions.

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Nina Avanesova,
Doctor of Economic Science, Professor
Kharkiv National University of Civil Engineering and Architeture, Ukraine
ORCID: https://orcid.org/0000-0003-3636-9769

Sulaiman Tahajuddin,
PhD, Senior Lecturer
Universiti Malaysia Sabah, Kota Kinabalu, Malaysia

Olha Hetman,
Candidate of Economic Sciences, Associate Professor
Kharkiv National University of Civil Engineering and Architecture, Ukraine
ORCID: https://orcid.org/0000-0003-4538-5736

Yuliia Serhiienko,
PhD student
Kharkiv National University of Civil Engineering and Architecture, Ukraine
ORCID: https://orcid.org/0000-0001-9957-3631

Vyacheslav Makedon,
Doctor of Economic Science, Associate Professor
Oles Honchar Dnipro National University, Ukraine
ORCID: https://orcid.org/0000-0001-8131-0235

STRATEGIC MANAGEMENT IN THE SYSTEM MODEL OF THE CORPORATE ENTERPRISE ORGANIZATIONAL DEVELOPMENT

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Abstract. *The article describes organizational and methodological components of using strategic management within a framework of corporate governance and development. The authors have formed a range of methodological provisions, regarding the choice of a marketing strategy by the corporate enterprise. They identified the main recourse flows within the framework of the used strategies. They also determined the strategic management components, required for providing efficiency of the corporations' physical resources formation and use. They developed a graphical model for the determination of the corporation's strategic position on the market. It was proved that a functional strategy involves a close correlation between the management and incorporated ownership relations, manifesting itself in a strategy in the field of finance of the corporation, ensuring corporation industrial stability, effective use of physical resources, the formation of the cash resources funds in the established amount, real property management and caretaking control, etc. The authors offered a methodology for conducting a strategic evaluation of the corporation in the basic market conditions.*

Keywords: *strategic management, organizational development, strategy quality evaluation methods, competitive behaviour, strategy types, external and internal environment.*

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Introduction

At the modern era of global economic development, we can observe an increase in the intensity of the competitive struggle inside the commodities markets of consumption in bulk. This factor predetermines the occurrence of a growing imbalance between market supply, including a powerful potential of its growth in the possible manifestation of spare production capacity of modern corporations, and solvent demand that will depend on the real return of the consumers' sector. The efficiency of the corporate activity on the market largely depends, on one hand, on its ability to solve the tasks on effective provision of the selected ways for achieving the set objectives; and, on the other hand, on efficient use of available production resources and assessment of the market situation. This task belongs to the area of strategic management of problems. Thus, during the planning stage, it is necessary to determine the common line of the conjuncture behaviour within the strategy, which will manage further steps on the way to the main objective. An appropriately formulated and carefully-picked strategy to a large extent determines the provision of long-term commercial success for a corporation. Under present-day conditions of market activity, efficient application of the distinguished models of the corporate strategy selection is not an effective way as we observe a low level of technological effectiveness of their practical application. This justifies the practical need for appropriate applied and theoretical developments, which should be adapted for use under the transformation conditions of the global economy.

Literature review

The research papers of (Barro & Sala-i-Martin, 2003; Dentchev & Heene, 2004) mention that a strategy is the formation of the long-term basic objectives and tasks for the corporation, segmentation of operative directions, and division of resources, needed for achieving the long-term objectives. The research by (Makedon, et al. 2019; Mosley, 2007) developed an idea that a corporate strategy is a coordinated factor of combining the objectives and resources of the corporation.

At the same time, the researchers (Agboola and Salawu 2011, Van Tonder 2004) mention that the strategies have several distinctive features: 1) the process of a strategy development does not end with a specific immediate action. As a rule, it should end with the definition of general vectors, upon which the promotion will take place, and they will be able to ensure the growth and improvement of the corporation's position in the market; 2) the developed strategy should be used in pair with the method of search, in the development of strategic activities. The role of the strategy during the search will reside in, first of all, help in focusing on specific areas and opportunities; and, secondly, to balance all other opportunities, which are regarded as incompatible with our strategy.

Modern scholars (Bloom & Van Reenen, 2007; Martin & Hetrick, 2006) consider a strategy (of the corporation, organization, company) as a complex balanced programme of activities, which will provide implementation of the corporation's mission and achievement of its target objectives. A strategy is always multi-object. In particular, under the objects of such a strategy, one can consider profit maximization, produced goods, stockholder equity, market behaviour,

competitiveness, technology, and other components of the market system of economic management.

A range of scientists (Jong, 2000; Maimunah, 2011) recommend using the cost leadership strategy when the corporation focuses on a broad market and produces goods in large quantities. Such mass production makes it possible to minimize unit costs and offer rather low prices. This will make it possible to get a higher profit, compared to our competitors as well as give a more qualitative response to an increase in the cost value level and encourage price-oriented consumers. According to the differentiation strategy, corporations are in tune for a broad market. Herewith, the offered products have significant advantages. The corporations produce products, which are very attractive upon their properties, but their consumers perceive the products' uniqueness thanks to their reliability, design, and affordability.

Metods

We build the methodological platform of the research as follows:

1) The strategy of deep penetration into the market is the meaningfulness of the process of increase in sales volumes and market share of the company without certain changes of its market positions, using the available nomenclature of products in the covered markets. The strategy of deep penetration into the market is implemented upon two leading directions: a) increase in the volume of sales; b) encouragement of consumers to increase purchase amount of products; c) assurance of consumers to increase the frequency of use; d) bringing the products produced by the corporation to new consumer groups, using the competitors' products.

2) The functional strategy is a type of the supportive strategy in the strategic set, which determines the strategic orientation of a particular functional subsystem of the corporate management, providing it with goal achievement as well as (under the availability of interrelated justified functional strategies) controllability over processes of implementation of general strategies and the corporation's missions. The functional strategy is a narrower concept, compared to other strategies. Its role resides not only in concretizing of individual details in the corporate and business strategy but in creating managerial guidelines for corporation's functional goals achievement. The responsibility for the development of the functional strategies is laid on the corresponding departmental managers, obliged to coordinate major functional strategies, needed for successful implementation of the business strategy.

3) Strategies division upon the differentiation type. The differentiation strategy resides in the fact that the product, produced by the company, should be different from similar products of the competitors. The competitive advantage of this strategy grounds on is the difference and particularity with competitors. While selecting a differentiation vector, it is reasonable to use: a) product differentiation; b) service differentiation; c) personnel differentiation. To prove the differentiation strategy, there should be the following conditions: fundamental research, distinctive design, the use of material and technical resources of high-quality, active work with customers. Thus, among the advantages of this strategy is the creation of a specific image for the product and the corporation, reducing the consumer's sensitivity to the price; the liking of consumers and the uniqueness of the product set high barriers in

the market; the favour of consumers creates a type of protection from products-substitutes; high price provides an opportunity to get high profits.

Results

Under the condition of the rapidly changing international economic situation and stiff competition, industrial corporations should focus not only on the condition of their internal environment but also on the development of a long-term financial strategy, enabling the possibility to adapt to changes of the surrounding environment. The questions of improvement of the strategic planning system in the activities of industrial corporations acquire special importance. Corporation management assumes effective formation and use of available material resources in the corresponding spheres of activity. At the same time, there are other relevant questions, namely, the questions, related to material resources management within the limits of achievement of strategic directions of activity of individual corporations – the expansion of coverage of the market field of activity, maintenance of the product portfolio balance, and improvement of products' quality, which are offered in the market (Andriopoulos & Dawson, 2009).

Table 1. Primary resource flows of the corporations within the framework of the used strategies

Subjects	Life cycle phases of the corporate products			
	Application	Growth	Maturity	Decline
Inflows	investing in authorized capital; a low volume of initial payments when entering into the contracts	initial payments; investment income; income upon the results of the risks redistribution; return on investment operations	financial payments; investment income; income upon the results of the risks redistribution; return on investment operations	financial payments; investment income; return on investment operations
Outflows	high advertising costs; financing of the agency network; expenses on the preparation of contracts; payment for the labour of the corporation's employees; contributions to special funds of material resources	financing of a loss; remuneration of the market intermediaries; expenses for maintenance (sale) of contracts; expenses on the risks redistribution; payment for the labour of the corporation's employees; investments; contributions to the special funds of material resources	high expenses on marketing; financing of a loss; remuneration of the market intermediaries; expenses on running (implementation) of contracts; expenses on the risks redistribution; payment for the labour of the corporation's employees; investments; contributions to the special funds of material resources	high expenses on the support of sales; financing of a loss; remuneration of the market intermediaries; expenses on running (implementation) of contracts; payment for the labour of the corporation's employees; contributions to the special funds of material resources

Source: David, (2013); Spencer & Gómez, (2006)

That is why strategic decisions of industrial corporations should be made from the standpoint of complex reciprocal influence between the external market and internal organizational environment of each of such subjects.

The material flows of the corporations, which are determined as cash inflows and outflows, are interdependent by the stages of a life cycle of the market products of these subjects (Table 1).

Herewith, a consistent change of stages of implementation, growth, maturity, and decline determines the competitive position of the company in the market. The corporation's strategic position can be determined with the help of the SPACE-matrix, via the operation of two internal and external criteria. The internal criteria include the level of efficiency in managing the material resources of the corporation (final result index) and the competitive advantage of its financial services portfolio; the external criteria cover the level of the financial sector development and stability of the country's economic conditions.

The management effectiveness level of the corporation's material resources is the assessment of the extent to which strategic goals and tactical tasks of forming and using material resources have been achieved by indicators of socially significant, final and immediate results. Performance assessment is formed by correlating the strategic goals and tactical objectives of material resources management within the production operations of the corporation under study and the results obtained. The level of material resources management efficiency of the corporation is the evaluation of the degree of achievement of a strategic objective and tactical tasks on formation and use of material resources upon the indicators of socially significant, final, and immediate results. The evaluation of efficiency is formed by bringing into correlation the strategic objective and tactical tasks on the material resources management in the framework of production operations of the corporation under the study and the obtained results. The level of the material resources management efficiency of the corporation is determined on a phased basis (David, 2013). The first stage is characterized by the definition of the major types of manufactured products. The second stage covers the definition of a strategic objective and the tactic tasks on the formation and use of resources. The third stage includes the development of a list of operations of the corporation in the framework of the determined objective and tasks. The fourth stage is characterized by formation of the indicator framework upon the corresponding operations and their values. The fifth stage determines the character of the indicators' effect: direct or reverse.

The sixth stage covers the determination of the deviations of the values for the direct effect and/or the reverse effect. The seventh stage includes the formation of the point assessment of indicators based on calculations of their deviations by values (the unit of deviation of the indicator value corresponds to the unit of point assessment). At the eighth stage, using the expert-based methods, one should determine the specific gravity of indicators, depending on their importance within the ones, meeting the set objective and tasks (the sum of weights of indicators by goals and objectives within one financial product is 1).

Table 2. Strategic management components for provision of efficiency of formation and use of material resources of the corporations

Strategic objective	Socially desirable indicators	Tactical tasks	Subject operations	Direct indicators	Final indicators
Provision of effective material resources management of industrial corporations and efficient sales of products	Subjects' solvency margin Sufficiency of special funds of resources Liquidity of assets and level of financial protection Sustainability of the product portfolio	Expansion of coverage of the field of operation	Insurance operations	the volume of premiums; the volume of payments; reserve supply capacity; the number of signed contracts; income from basic activity	the profitability of operations; the correlation between the sum of premiums and reserves
		Optimization of return from investments	Investment operations	the volume of investments; income from investments; the number of investment directions	the efficiency of investment operations; level of return on investments
		Increase of industrial potential of the corporations	Financial operations	amount of own funds; the volume of net assets; income from basic activity	the profitability of own capital; the correlation between own capital and responsibilities; the correlation between working and non-circulating assets

The ninth stage is characterized by calculation of the result indexes upon the values through the multiplication of the point assessment of indicators on the corresponding specific weight. The tenth stage covers the calculation of the result indexes upon all operations (the sum of the result indexes by indicators in the framework of individual operations) and the final result index (the sum of all result indexes by operations) (Verma, 2012).

The strategic objective, the tactical tasks, socially desirable, final, and direct indicators of efficiency formation and use of material resources of the industrial corporations within the line of production operations are given in Table 2.The competitive advantage of the product portfolio of the industrial corporations can be characterized by a set of the following indicators: the size of the price; specific rules of activity; the number of new products; the term of activity; the volume of responsibility of the subjects, etc. The level of development of the production sector may be characterized by a set of the following indicators: the number of types of the manufactured products, the development of mechanisms for the risks redistribution, the conjuncture of the world commodity markets, the availability of the national programs on stimulation of the development of the innovative types of production. Stability of the country's economic conditions may be characterized by a set of the following indicators: solvent demand, the taxation system, types of alternative sources of financing, the condition of specific segments of the commodity market, the

level of inflation and rates of interest, the nature and the volume of responsibility, etc. (Bakan, 2004).

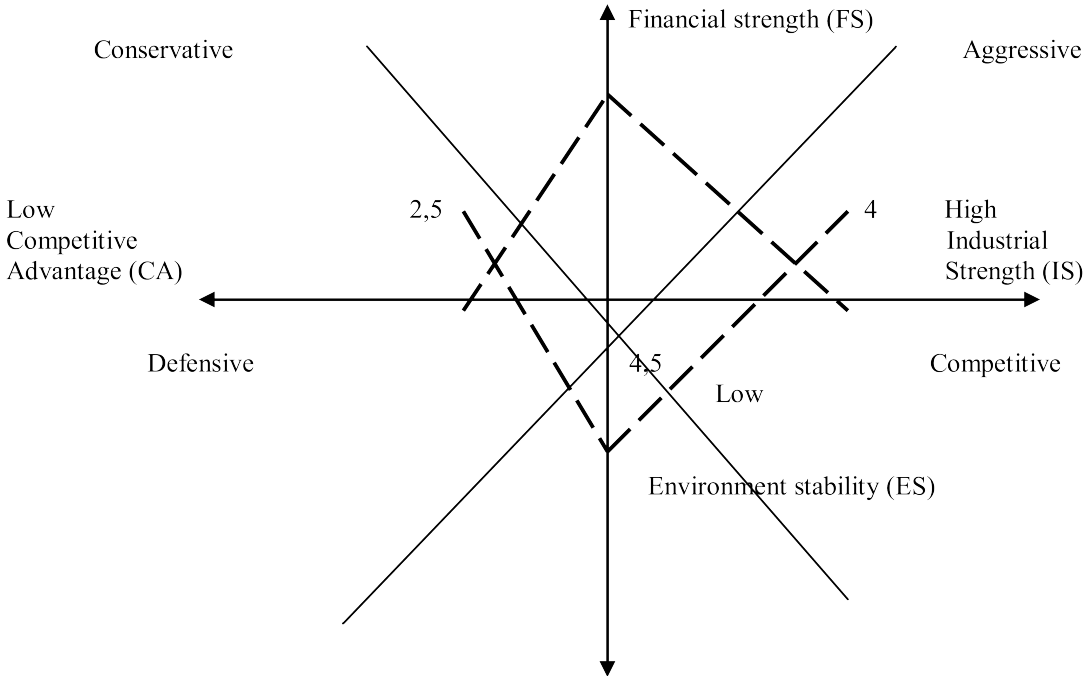

Figure 1. The model of determination of the corporation's strategic position in the market

Each of the mentioned indicators can be assessed in the range from 1 to 10. Based on the obtained values, it is possible to draw statistically average criteria of evaluation. After that, all obtained average values of criteria are put into a special scheme of the market forces distribution. As a result, we get a quadrangle of one of the types, presented in Figure 1.

If the side maximally remote from the centre of coordinates sits in the quadrant 1, then the corporation is in the aggressive strategic position in the market. Such a location is possible under the condition of a high level of development of the production sphere with insignificant uncertainty of the economic conditions in the country. The corporation receives competitive advantages, which can be saved and increased through the use of the available financial potential (Makedon, et al. 2018). Herewith, if the external threats are the low-level threats than this subject should focus on the provision of interest of stakeholders (Table 3).

Table 3. Financial interests of stakeholders of the corporation

Stakeholders	Financial interests
Shareowners	Development of earnings, cost, profitable growth of the subject
Top managers	Enhancement of profit, subject's cost and level of income
Personnel	Financial reliability of the subject, growth in the level of income
Clientele	Reliability of the corporation, financial product's cost, payment completeness

The strategic management of the corporation is aimed at: the expansion of the coverage of the field of activity, suppression of the competitors by better prices; the development and promotion of the innovative financial products. If the side maximally remote from the centre of the coordinates sits in the quadrant 2 (Fig. 1), then the subject of the financial sector is in a competitive strategic position in the financial market. This situation is typical for the high level of development of the production sphere. Herewith, the corporation gets a competitive advantage of the product with respect to unstable economic conditions in the country. The production potential of the company is a critical factor. The corporation faces an urgent need for elimination of the emerging threats, related to the lack of its material resources. Strategic management in such a corporation is focused at the attraction of the material resources, improvement of the investment operations' efficiency, optimization of the risk redistribution mechanisms, and the expansion of the number of the financial intermediaries, etc. If the side maximally remote from the centre of coordinates sits in the quadrant 4 (Fig. 1), then the corporation is in a conservative strategic position in the financial market. This situation is possible in stable markets with low growth rates. Herewith, the corporation focuses on its own financial stabilization, and the most important factor of its growth is the competitive advantage of its own portfolio of financial services (Pedersen, 2018). Strategic management of such a subject is focused at: the reduction in the price while improving the quality of the manufactured products, expansion of species diversity and entry to the new segments of the markets, etc.

If the side maximally remote from the centre of coordinates sits in the quadrant 3 (Fig. 1), then the corporation sits in the defensive strategic position in the commodities market. This position is typical for a situation when the corporation operates in an attractive industry with insufficiency of the material resources and a low level of competitiveness of its major products. Using a matrix approach, let us form the matrix of the managerial decisions on the improvement of the efficiency of the individual corporation management (Table 4).

The availability of the market strategy is a definitive advantage for the corporation. The market strategy determines the general direction of actions, regarding the establishment of the target market positions of the corporation in relation to the consumers and competitors, and, hence, encourages the concentration of forces and resources on the key tasks of development and prevents the adoption of the wrong managerial decisions. The absence of the strategy has an opposite effect: it leads to instability of the supply structure due to influence of the random or temporary factors, to the loss of control over competitiveness and commercial efficiency of goods (Norley, et al., 2001). We will carry out a situational analysis using two methods – SAC (strategic assessment of the corporation). The SAC methodology includes the expert assessment of 16 standard indicators, divided into 4 segments: "corporation management," "resources," "knowledge," and "use of the resources and knowledge for the achievement of the strategic objectives." The assessment of each of the indicators is carried out through the use of a range of questions. For example, the assessment of the indicator "Corporate structure" (segment "Corporate management") included the following questions: 1) Does the

corporation's structure meet its business activity? 2) Are there any definitions of the job duties and responsibilities? 3) Has the reporting procedure been defined in the firm? 4) Does the structure of the corporation support the changes and innovations? 5) Is there unnecessary bureaucracy in the firm? (Schmitt, 2009).

Table 4. Model of solutions for improvement of efficiency of strategic management of the corporation

Stage	The strategic position of the corporation			
	Aggressive strategic position	Competitive strategic position	Conservative strategic position	Defensive strategic position
Application	Possible positive financial result; Expansion of coverage of the field of activity; Active formation of special funds; Active investment operations	Possible negative financial result; Concentration on specific market segments; Selective nature of investment operations	Negative financial result; The search of individual segment in the market; Low volumes of Investment operations	Negative financial result; Start of the product sales; Possible withdrawal from the market
Growth	Positive financial result; Pricing leadership (possible decrease in price); Market share retention; Special funds increase; Growth in investment operations	Minimal positive financial result; Pricing leadership in specific segments of the market; Differentiation of financial products; Selective nature of investment operations.	Negative financial result; Focus on specific products; Low increase of special funds; Selective nature of investment operations	Negative financial result; Minimal coverage of the field of activity; Exceptionally low volumes of special funds; Low volumes of investment operations; Possible withdrawal from the market
Maturity	Positive financial result; Maximization of the agency network; Market share retention; Increase in growth tempos of investment income compared to the tempo of special funds growth	Positive financial result; Development of new financial products; Market share retention; Broad differentiation of investment operations	Minimal positive financial result; The search of individual segment in the market or phased withdrawal from the market; Low volumes of special funds and investment operations	Negative financial result; Low coverage of the field of activity; Low volumes of investment operations; Possible withdrawal from the market
Decline	Positive financial result; Support of the agency network; Development of new product types; Stabilization of investment operations	Low positive financial result; Saving of the agent network; Competitive volumes of special funds and investment operations	Minimal positive financial result; The search of variants for development of the subject's activity or phased withdrawal from the market; Minimal volumes of special funds and investment operations.	Negative financial result; Insufficient coverage of the field of activity; Insufficient volumes of special funds for further operation of the subject; Withdrawal from the market.

To answer the questions, we use a five-point scale: "yes" – 5 points, "more often than not" – 4 points, "partially" – 3 points, "more likely no than yes" – 2 points, "no" – 1 point. After that, one should calculate the arithmetical average of the obtained points. The estimations of other indicators are obtained in the same way (Table 5).

Table 5. The methodology of conducting a strategic evaluation of the corporation under basic market conditions

Criterion	Points		
	Previous year	Reporting year	Deviation
Corporate management	2,5	3,0	+0,5
1. Corporation structure	4,0	4,0	-
2. Corporate culture	1,5	2,0	+0,5
3. Managerial style (management of the corporation)	2,5	3,5	+1,0
4. Style of management (mid- and low-level)	2,0	2,5	+0,5
Resources	4,0	3,25	-0,75
1. Financial	4,0	2,5	-1,5
2. Communicational	4,5	3,0	-1,5
3. Level of technologies	3,5	4,0	+0,5
4. Personnel	4,0	3,5	-0,5
Knowledge of	3,75	3,5	-,025
1. Finance	3,0	2,5	-0,5
2. Customers	3,0	3,5	+0,5
3. Competitors	4,5	3,0	-
4. Peculiarities of business	4,5	5,0	+0,5
The use of resources and knowledge for achievement of the strategic objectives	1,75	3,25	+1,5
1. Financial strategy	1,5	2,5	+1
2. Market strategy	2,0	3,0	+1
3. Commercial strategy	2,5	4,0	+1,5
4. Plan fulfillment	1,0	3,5	+2,5
Total	3,0	3,25	+0,25

Based on the SAC results, it is possible to make the following conclusions. Last year, the strategy was almost inefficient and poorly coordinated. The availability of resources and knowledge could be considered as the strength of the corporation. Nonetheless, the company had no clearly determined strategies and its management was inefficient. In a particular year, the strategy may turn to be more effective, and, although the potential of resources and knowledge has slightly decreased, the level of the resources use and management has increased. In particular, low corporate grades come from the corporation's dependence on the financial situation in general and knowledge of finance in particular, as well as on communications (advertising activities) and the availability of a determined market strategy (Tang & Koveos, 2004). Thus, the corporation needs a set of measures, aimed at improvement of the market condition, a more precise determination of the market strategy and advancement of communications. The choice of a strategy is also affected by the financial condition of the corporation. The financial analysis can demonstrate that the corporation has a fragile financial state: due to low efficiency of the property use – unsatisfactory profitability and business activity. Strategic management does not solve the mentioned issues. This problem lies in the area of responsibility of operational management. Nevertheless, strategic management should consider the mentioned deviations as they limit the range of strategic alternatives, and, at the same time, develop a strategy that would include the possibility of eliminating the mentioned obstacles in the future.

Discussion

Thus, strategic management of the corporation assumes finding and implementation of the best solution for managing its financial flows, namely: cash inflows and outflows, considering the stages of the financial products' life cycle and strategic position of such corporation in the market. The research has revealed that the choice of the strategy of in-house management is affected by a great diversity of external and internal factors. Nonetheless, they all have a different level of intensity. The company's internal management strategy should be developed with consideration of the most influential factors, and the identification of the related problems becomes the primary strategic management task at this stage. It has been found that while developing a strategy of inter-corporate management, one should necessarily consider the following factors: the financial condition of the corporation; capital dispersion; employee share fraction; personal strategies of the owners; production facility management; the degree of centralization and decentralization; qualifications of personnel; personal ambitions and ethical principles of chief executives, their strategic thinking; staff encouragement; corporate culture. Significant attention should be also paid to such factor as the size of the share package, which is in free circulation. Apart from internal, there are also key external factors, affecting the formation of the corporation's strategy. They are the state of the economic system, the imperfection of the legal field, including the vulnerability of small shareholders, and the state of the stock market.

Conclusions

The application of strategic management within the corporation makes it possible to characterize economic, organizational, and technical capabilities of the production facility and their maximum use, provide timely coordination of activities on the corporation's business plans development. In general, strategic management improves the efficiency of the corporation activity under modern conditions. The main objective of modern strategic management is the establishment of the corporate governance system, which, based on the analysis of external and internal strategic potential, will provide an opportunity to formulate the mission and strategic objectives of the company, develop, justify, and implement corporate and functional strategies so that they ensure effective achievement of high economic and social results. Herewith, the effectiveness of strategic management is provided through keeping to the process of its implementation, covering several interrelated stages, namely: a) the development of the corporation's mission; b) determination of the corporation's objectives; c) evaluation and analysis of the external environment; d) identification of strengths and weaknesses; e) analysis of strategic opportunities and alternatives; f) the choice of a strategy; g) implementation of the strategy; i) assessment of the obtained indicators of the strategy.

Thus, the held analysis makes it possible to draw the following peculiarities of strategic management:

1) Strategic management takes place in the context of the corporation's mission, and its fundamental task resides in the provision of the interplay between the

mission and the target objectives of the corporation under the conditions of variable economic environment;

2) Strategic management is the management of a set of qualitative characteristics of the corporation, regarding its present and future position in the competitive environment and the potential, required for survival and development of the corporation;

3) A system of strategic management is a specific philosophy or ideology of business and management, grounding on the combination of intuition and art, high professionalism and managers' creative activity, and involvement of all its employees into the implementation of the strategy;

4) Strategic management includes interaction with the external environment.

It was proved that strategic management is a combination of concepts of the integrated, situational, systemic, and targeted approaches towards activity and development of corporations of different types, which makes it possible to:

a) compare development goals of the corporation, reflecting their orientation in adaptation to changes and/or active influence on external environment with potential, available and the one, which can be obtained in the strategic perspective;

b) use the process of formulating and balancing the system of strategies following the internal and external capabilities of the corporation in achieving its goals;

c) organize and encourage corporations' activity in the direction of the goal achievement, based on enforcement of the developed strategies through application of the selected systems of strategic planning;

d) advance corporation management systems of different types using strategic facilities for the provision of the necessary strategic level, meeting the requirements of the environment.

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Ibrokhim Xabibullayev,
DcS, Professor
Taschkent Financiel Institute, Uzbekistan

Ruslana Zhovnovach,
Doctor of Economic Sciences, Professor
Central Ukrainian National Technical University, Ukraine
ORCID: https://orcid.org/0000-0001-6758-3421

Mariia Petrova,
PhD student
Central Ukrainian National Technical University, Ukraine
ORCID: https://orcid.org/0000-0003-4442-0624

MODEL OF ASSORTMENT OPTIMIZATION AND INVENTORY MANAGEMENT IN ENTERPRISE

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Abstract. *The actual problems of work in the sphere of organization of supply and sale are considered, the existing developments in the sphere of modeling and optimization of commercial activity of the wholesale trading enterprises are analyzed. The necessity of a comprehensive approach to improving the commercial activities of wholesalers is substantiated. The composition of the solutions included in the integrated approach is determined by the sole purpose, practical possibilities of its implementation and implementation at the wholesale enterprises and is based on the analysis of actual problems of the industry as a whole, interdependence in the work of departments, development of a single optimization criterion. The effectiveness of the integrated approach is based on the fact that for the sake of maximum result it is important not to isolate the development of individual operations, but to improve the entire purchasing system of the wholesale enterprise as a whole. The scientific and methodological approach of carrying out the integrated ABC-XYZ analysis of a range of a trading enterprise by its combination with R/S analysis, which acts as a criterion for the effectiveness of the XYZ analysis and an indicator of the possibility of forecasting the dynamics of sales of individual product groups, has been improved. XYZ analysis, based on the calculation of the coefficient of variation, when there are deterministic factors such as seasonality, cyclicality or trend in a series of determinants, shows erroneous results. Therefore, it is suggested to use R/S analysis to evaluate the quality of the XYZ analysis and to pre-process the data. This will allow us to draw more adequate conclusions about the possibility of forecasting the dynamics of sales of certain product groups in the future.*

Keywords: *inventory, ABC-XYZ analysis, R/S analysis, seasonal component, turnover.*

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Introduction

Increasing competition in many sectors of the economy is creating new demands on all market agents. In addition, wholesalers are no exception. The achievement of sustainable competitiveness by a wholesale trading organization is

determined by its ability to effectively use its competitive potential. The competitive potential of a trading organization integrates a set of such important characteristics as the availability of modern technology, equipment, qualified personnel, the necessary inventory, financial and innovation resources, the degree of organization of the trading process, the level of optimization and automation of business processes of the trading organization, etc. At the same time, it is worth noting the importance of the influence of external factors on the level of competitiveness of a trading company, whose degree of influence is significantly different. However, if externalities can only be limited by their objectivity, internal factors are of great interest to business executives who, in the face of increasing competition, are constantly on the lookout for new, commercially sound management tools and leverage tools their competitiveness. In these circumstances, the issue of modeling and optimization of business processes related to the commercial activities of wholesale trading enterprises is at the forefront. This is due to the fact that modeling as a method of research of complex socio-economic systems opens the management of wholesale trade enterprises the way to find answers to many questions in the sphere of their management and represents an effective means of forecasting their dynamics in the future. Therefore, a model description of the patterns that emerge at each stage of the decision-making process, as well as the relationships between them, is an important prerequisite for further analysis of the enterprise as a whole and effective management of it.

The purpose of the work is to develop a comprehensive approach to improving and optimizing the commercial activities of wholesale businesses, in order to reduce the costs associated with its implementation. To accomplish this goal, the following tasks were formulated and solved: to determine the place of commercial activity in the economy of wholesale trading enterprises and to identify the reserves of cost reductions arising in the course of its implementation; substantiate the need to apply economic and mathematical modeling to improve and optimize the commercial activity of wholesale trading enterprises, to systematize the existing methods and to clarify their main features; to improve the scientific and methodological approach of product range optimization on the basis of integrated ABC-R/S-XYZ analysis.

Literature Review

One of the main ways to optimize supply is to manage the purchasing activities of trading companies, including managing the product mix and inventory. Increasing interest in the assortment policy of commercial enterprises is due to the pursuit of two goals: the need to improve the efficiency of internal resources and adapt to new conditions. Assortment policy of a trading enterprise is the development of a separate strategy for managing different product categories, groups of goods in order to optimally spend resources allocated to manage them. It is this need that confronts the researchers with the task of reasonably distributing the commodity range of a trading enterprise into certain clusters, homogeneous in certain features.

Traditionally, in the scientific literature, such methods of optimization of the product range as ABC and XYZ analyzes are used to solve this problem, which can be applied both independently and in combination.

And many authors lean in favor of a compatible analysis (Aktunc, E. A., Basaran, M., Ari, G., Irican, M., & Gungor, S. (2019)).

The basic idea behind ABC analysis is to take a differentiated approach to managing the various assets that result from the unequal division of cluster entities under Pareto law, which states that 20% of the causes are responsible for 80% of the consequences. ABC analysis has been successfully used to improve the various areas of activity of commercial enterprises. The objects of analysis may be the product range, suppliers, buyers, competitors and more. In this paper, we investigate precisely the use of ABC analysis to optimize the range of trading enterprises, which is based on the idea that different goods have different degrees of importance for the enterprise and can be divided into three groups - A, B and C - that make up the structure of the indicator efficiency (e.g., enterprise revenue) of 80, 15, and 5%, respectively. However, it is worth noting that this proportion is conditional, and this ratio may vary. Thus, in Dastych, T.K.D. (2018) it is proposed to distinguish clusters as follows: group A - objects whose share in cumulative total is 50% of total turnover; group B and C - from 50% to 80% and from 80% to 100% of the total turnover, respectively. In each case, the boundaries of clusters for the population should be justified separately, for which you can use the double-tangent method or the polygon method.

Methodology

The entities that form the three groups have different degrees of importance to the enterprise and therefore require different management styles for their inventory.

Group A combines the "most important" objects that bring the best result (profit, income) to the enterprise, despite the fact that they occupy a very small share in the overall range. Stocks of this group must always be full in order to avoid shortages and supply disruptions.

Group B is a 'medium-sized' entity that can be developed into Class A in the long run. As Group B is a lower priority commodity, inventory levels should be lower than Group A commodities.

Group C - these are "problem" objects, which take up excess resources (take up space in the warehouse, freeze working capital, require additional human, financial, transportation costs).

Therefore, the absence at the right moment of Group C goods in the warehouse does not significantly affect the overall turnover of the enterprise. However, this does not mean that such goods should not be presented in the product range.

The exclusion of this group from the product range of the enterprise can lead to a decrease in the overall result, since the whole set of goods will again be redistributed into three groups according to the chosen proportion, for example 80-15-5%. This product group informs the analyst of the existence of an imbalance in the range and requires him to analyze more carefully the reasons for this result. If these reasons cannot be eliminated, the product is removed from the range.

Thus, the main task of ABC analysis is not to divide a set of goods into groups as an end in itself, but to separate groups that require different styles of inventory management.

The above shows that ABC analysis cannot be called a panacea for inventory management, but rather the initial and simplest stage of optimization. It ranks goods by priority, but that alone does not bring significant savings. The fact is that, according to Pareto law, about 80% of income comes from Group A goods, which stocks should always be in stock. Therefore, only the 20% that accounts for Group B and C products are in the savings reserve. Even if you reduce the inventory by these two groups twice (which can lead to a significant and long-term deficit), the overall level of inventory maintenance costs will decrease only by 10%. In addition, ABC analysis does not take into account uneven demand, such as seasonal fluctuations or surges in demand. The importance of considering these parameters lies in the following. Considering that the main reserve for reducing inventory costs is the reduction of insurance stock, which largely depends on the degree of predictability of sales volumes and time, the level of predictability of demand is almost the main criterion for the division of goods into groups. The higher the level of demand forecasting, the less insurance reserves you need to have, and vice versa. Therefore, there is a need for a more thorough analysis of the product range of the enterprise using other methods that take into account the uneven demand.

One of the methods that is recommended in the scientific literature to identify the stability of the market and the ability to predict it is XYZ analysis, which can be both standalone and continue ABC analysis.

The content of XYZ analysis is to differentiate objects into groups based on the level of demand for them.

The objects are divided into groups according to the following scale:

- group X - goods whose variation coefficient does not exceed 10%, is characterized by stable sales volumes, slight fluctuations in demand and high forecast accuracy;

- group Y - goods, the coefficient of variation of which is in the range of 10-25%, are characterized by some fluctuations in demand and average ability to forecast sales;

- group Z - products with a coefficient of variation exceeding 25%, characterized by subpar sales and low predictability of demand for them.

However, some scholars have highlighted other gradations. For example, in for group X, the range of the coefficient of variation is 0-20%, for Y - 20-50%, and for Z - 50-100%, and Frankeová, M., Farana, R., Formánek , I., & Walek, B. (2018, April) set the following limits: X = 0-50%, Y = 50-100%, Z> 100%. Apparently, there is no consensus on this, because unlike ABC analysis, where the sum of particles is limited to 100%, XYZ analysis has no such limits. Therefore, the choice of the range of the coefficient of variation is an empirical task that must be solved taking into account the specificity of the specific product and enterprise. According to the author, the most rational in this situation is to calculate the coefficients of variation, find their minimum and maximum values and form accordingly groups of goods.

The XYZ analysis algorithm includes the following steps:

1) identification of the object of analysis;

2) the choice of parameters by which the object will be evaluated;

3) determining the period for which the analysis will be conducted;

4) estimation of the coefficient of variation and division of objects into groups;

5) analysis of the results obtained.

The methods described above have been tested numerous times in various fields of data analysis for their simplicity. Repeated use has revealed their advantages and disadvantages, which are given in Table 1.

Considering the advantages and disadvantages of ABC and XYZ analyzes (Table 1), we can conclude that these methods are complementary.

Table 1. Advantages and disadvantages of ABC and XYZ analyzes

	Advantages	Disadvantages and limitations
ABC analysis	Simplicity Transparency Versatility Automation capability Optimization of resources	The need for data homogeneity Inadequacy in some cases of division of the population exactly into 3 groups The inability to account for the seasonality factor The need for a careful approach to the choice of period, by which is being analyzed Limited applications for complex analysis multidimensional phenomena
XYZ analysis	Simplicity Transparency Mathematical validity Possibility of promotion adequacy of conclusions thanks to regularities of a number trends, cyclicals, seasonality	The need for data over a long period The likelihood of false conclusions in the case is high small sample The complexity of automation through a large proportion human logic Use in its pure form is only possible in conditions close to the laboratory Unsuitable for businesses that work for orders

While ABC analysis allows us to estimate the contribution of each product to the sales structure, the XYZ analysis assesses the persistence of demand for that product. Therefore, in the scientific literature, it is recommended to carry out a combination of ABC-XYZ - analysis.

In addition to the disadvantages of XYZ analysis, mentioned in Table. 1, there is a significant limitation that can negate the full benefit of such an analysis. It is at the heart of this analysis, and is due to the fact that all conclusions about sales stability and forecasting are based on only one indicator, the coefficient of variation. Although it is a well-known statistic that has a well-founded mathematical apparatus, it is not capable of separating cyclicality, seasonality, trend, or other explanatory changes from random fluctuations in the observed magnitude. In other words, if the sales dynamics of a particular product are characterized by seasonal changes that occur very often, then the coefficient of variation will be unjustifiably high, which will automatically attribute the product to a group of low-predicted ones, although this may not be true. After all, if a number of sales volumes are characterized by a trend or cyclicality, then it is likely that this will continue to be the case in the future. Therefore, these components (trend, cyclicity and seasonality) can be considered as well predicted components of the series. And the level of predictability of a series is estimated precisely by its random component, which remains after being excluded

from a number of such components as seasonality, trend and cyclicality. It is the likelihood of false conclusions about the ability to predict the dynamics of sales in our case, and is a major drawback of XYZ analysis, which often negates all its benefits.

As can be seen, XYZ analysis, like any other statistical method, imposes a number of requirements on the input data. Namely, for its successful use, such preconditions as linearity and taciturnity of time series, subordination to the normal law of distribution, independence of the levels of the series, etc. must be satisfied. At the same time, to say that the series of dynamics describing economic phenomena, including changes in demand for enterprise products, satisfy these prerequisites can not always.

Therefore, to optimize the product range of a trading company, we see two developments. The first variant is suitable for such series, which can be reduced to stationary by certain transformations. It consists of ABC analysis and XYZ analysis with a preliminary seasonal decomposition of time series characterizing the dynamics of sales of various goods, according to the algorithm described below. The second option is relevant for time series that do not obey the normal law of distribution. First, it differs in that XYZ analysis is replaced by another method, which allows drawing conclusions about the stability of sales of a certain product and the possibility of predicting its dynamics, but is not based on the calculation of the coefficient of variation. It is proposed to use R/S analysis as such method.

The scientific and methodological approach of carrying out the integrated ABC-R/S-XYZ-analysis of the range of trading enterprise is obtained by the combination of ABC-XYZ-analysis with R/S-analysis. This approach, unlike the existing ones, uses the results of R/S analysis as a criterion for the effectiveness of XYZ analysis, which allows to determine the feasibility of forecasting the dynamics of sales of product groups.

Based on the findings of the integrated analysis, recommendations can be developed to optimize the product range of the studied enterprise and its inventory management, which will improve the efficiency of trading enterprise as a whole.

Results

The question of modeling of commercial activity of wholesale trading enterprises is considered in the works of many scientists.

In particular, in Ivanov, D., Tsipoulanidis, A., & Schönberger, J. (2019), an algorithm is used to calculate the parameters of a trading enterprise and its counterparties that maximize the profitability of trading operations in the short term. For this purpose, the dynamics of the volume of circulating assets of the enterprise on the basis of differential equations is simulated. In general, this approach provides a satisfactory result, since, under the known initial conditions, it gives estimates of the required parameters and allows us to predict the amount of working capital for the future. However, there are a number of drawbacks to this approach. First, the assumption of chance and the absence of aftereffects in the processes inherent in the activity of a trading enterprise are taken as a basis. Secondly, the differential equation approach has its limitations, including the complexity, and often the impossibility, of

finding a solution on a large number of parameters, which is typical for modeling complex systems like trading enterprises. Third, the consideration of only the dynamics of working capital in modeling the activity of a trading company seems somewhat limited, although in the work it is explained by the short-term model.

The tools of fuzzy logic solve the following problems of modeling the commercial activity of wholesale trading enterprises: the task of finding areas of effective commercial activity, the task of calculating promising product range, the task of forming the relations of advantages in the analysis of commercial offers, the problem of semi-automatic distribution of goods. The models developed by the author of this work suggest that mathematical methods of fuzzy set theory are effective in modeling the commercial activity of wholesale trading enterprises in the context of incomplete and fuzzy information and accompanying any entrepreneurial activity of uncertainty. These methods have a number of disadvantages, in particular such models can only be resolved with a limited amount of data. In addition, the model developed by the author of the search for the optimal price of goods implies the need for information about consumer demand, which in a real situation is quite difficult to obtain, and the coefficient of elasticity is taken constant, which is rarely true. Also, built models lose sight of the possibility of influence of price change of one product on the dynamics of sale of other goods (substitute and complementary goods). Thus, the models proposed by the author have a number of significant limitations that cannot be ignored.

Klodawski, M., Jachimowski, R., Jacyna-Golda, I., & Izdebski, M. (2018) a decision support system is proposed, which contains a set of models for optimizing the commercial activity of a wholesale trading enterprise, in particular such works as: market research of the market; selection of perspective assortment for each client of the wholesale enterprise; sales analysis and demand forecasting; optimization of trade and purchasing activity; evaluation of the financial condition of the wholesale enterprise; evaluation of the efficiency of the developed system.

It is noteworthy that a comprehensive approach to modeling the business activity of a wholesale enterprise is noteworthy, but the method of selecting a prospective assortment for each customer of a wholesale enterprise using the toolkit of intersection of fuzzy sets completely repeats the approach given in Kumar, N., & Soni, R. (2017) does not allow to claim scientific novelty. To optimize trading and purchasing activity, the author developed a dynamic linear programming model that takes into account a large number of factors. However, it is based on the assumption of the linearity of economic processes, which oversimplifies the real situation and, in some cases, leads to entirely false conclusions. In addition, the model developed is complex to deal with on specific data. The author gives an example of its realization in the case of two suppliers of a wholesale enterprise, which, in turn, produce products of two types and two consumers - retail trade enterprises. Obviously, in a real situation, we are talking about a much larger number of both counterparties and types of products. With many variables, this model will become indistinguishable.

In particular, demand-forecasting models have been developed to optimize inventory and receipts from the collection of commercial arrears in deferred payment products, as well as models for organizing the sales system, including optimization of

the transport department. The auto-regression method and the integrated moving average Box-Jenkins method were chosen as the prediction method. In order to optimize the work of the transport department, it is proposed to automate the route mapping with the help of mapping technologies and satellite navigation systems. This approach is more up-to-date and relevant than, for example, the Lukinskiy, V., & Lukinskiy, V. (2017) linear programming method for optimizing traffic flows.

It is worth noting that considerable attention is paid to the optimization of inventory management (Nguyen, T. (2019)) in the modeling of commercial activity of wholesale trading enterprises. An analysis of the literature indicates that the most common method of optimizing inventory management is the symbiosis of ABC analysis and XYZ analysis. This trend was started in Permatasari, M., Ridwan, A., & Santosa, B. (2017). The authors of these sources emphasize the effectiveness of combining ABC and XYZ analysis to evaluate the contribution of each product group to the sales structure and to detect sales fluctuations. However, XYZ analysis provides adequate results only in case studies. If the time series have a seasonal component, then the XYZ analysis will show a large deviation, which means a low probability of correct forecasting of the trend for the future, although it is known that the detection of seasonality coefficients increases the chance of adequate forecasting of the dynamics of the time series. Therefore, more advanced methods, such as fractal analysis, should be used in addition to ABC-XYZ analysis. This will allow you to fully evaluate the entire range of the enterprise and find the levers to manage each product group individually.

In Walek, B. (2018, May), based on the theory of active systems, economical and mathematical models of inventory management of hierarchical trading enterprises have been developed, taking into account the uncertainty and asymmetry of the awareness of individual units of the trading network.

Particularly noteworthy is the work of Stojanović, M., & Regodić, D. (2017), which not only developed a functional and structural model of the wholesale inventory management system, but also offered an information system for optimizing its logistics activities.

The analysis of scientific works, which describes the modeling of commercial activity of wholesale trading enterprises, allows to conclude that the authors have considered various aspects of it. However, insufficient attention has been paid to optimizing the transportation function while transport costs constitute the most promising reserve for reducing the unproductive turnover of wholesale trading enterprises. In addition, most of the models developed in this field are static in nature and cannot adapt quickly to changing conditions. Therefore, we consider it expedient for the modern level of development of wholesale trade organizations to use an approach to modeling the commercial activity of such enterprises, which in a complex would solve these tasks, in particular, would allow to optimize transport flows, assortment and inventory management system, as well as to forecast the dynamics of sales on the basis of a simulation model describing the consumer market.

Thus, the analysis of the history of origin and features of the application of existing methods of economic and mathematical modeling allowed us to draw the following conclusions. A distinguishing feature of the current stage of economic

development is its mathematization. It manifests itself in the replacement of the object under study with a model, with further study of its properties and extrapolation of the conclusions to the object. For a long time, linear models of economic systems development prevailed in science. They were simple enough to understand, formalizable and mathematically solvable. However, further research and the discovery of new features in the development of complex socio-economic systems has led to the understanding that linear models well explain the behavior of only simple, closed, equilibrium systems over a short time interval, which is essentially a partial case of nonlinearity. And, starting from the end of the twentieth century, a new approach to the analysis of economic systems begins, taking into account their nonlinearity, nonequilibrium, openness, multivariance, self-organization, processes of bi- and polyfurcation, called "economic synergetics". It treats non-linearity and instability as a source of diversity and complexity of economic dynamics, rather than noise and random disturbances, as the traditional economy does.

The inefficiency of linear forecasting methods was once again proved by the unprecedented financial and economic crisis of 2008, which seriously raised the question of the ability of science to adequately describe complex socio-economic processes and anticipate their development. The emergence of new trends in the development of economic systems, of course, necessitates the change of methods of their description, which are being improved, complicated, taking into account more and more nuances, but most importantly, they are beginning to be based on a qualitatively new principle of nonlinearity. In such circumstances, the most appropriate realities are economic cybernetics and metaheuristic methods.

The efficiency of the entire logistics chain of a trading company depends largely on the features of its product range and inventory management system. This leads to the urgency of optimizing the product range, which requires the development of a separate management strategy for different groups of goods in order to minimize inventory, and therefore the most economical use of resources allocated to manage them.

Traditionally, in the scientific literature, such methods of optimizing the product range as ABC and XYZ analyzes are used to solve this problem, which can be applied both independently and in combination.

However, the XYZ analysis has a significant feature: if the sales dynamics of a particular product are characterized by seasonal changes that occur very often, then the coefficient of variation will be unjustifiably high, which will automatically attribute the product to a group of low-predicted ones, although this may not be true. Therefore, to address this shortcoming, a methodology for integrated ABC-R/S-XYZ analysis has been developed, which differs from the existing combined ABC-XYZ analysis in that it is supplemented by R/S analysis as a criterion for the effectiveness of the XYZ analysis and the opportunity indicator forecasting the dynamics of sales of product groups.

Table 2. Results of ABC analysis on turnover
(calculated by the author on the basis of enterprise reporting data)

Product group	Group turnover (pcs)	Turnover ratio	Cumulative ratio	ABC Analysis Group
Group 1	4117026	31,76%	31,76%	A
Group 2	254261	19,655	51,41%	
Group 3	243261	18,83%	70,23%	B
Group 4	79976	6,18%	76,41%	
Group 5	78270	6,05%	82,46%	
Group 6	67497	5,22%	87,68%	
Group 7	67111	5,19%	92,86%	C
Group 8	36007	2,78%	95,64%	
Group 9	24163	1,87%	97,51%	
Group 10	19343	1,49%	99,01%	
Group 11	12871	0,99%	100,00%	
Total for the period	1293786			

Table 3. ABC profit analysis results
(calculated by author based on company reporting)

Product group	Gross profit (UAH)	Profit ratio	Cumulative ratio	ABC Analysis Group
Group 1	1607043,74	24,03%	24,03%	A
Group 2	1544774,42	21,77%	45,79%	
Group 3	768881,32	11,50%	57,29%	B
Group 4	720398,80	10,77%	68,06%	
Group 5	628638,26	9,40%	77,46%	
Group 6	598363,2	8,95%	86,40%	
Group 7	290365,51	4,34%	90,74%	C
Group 8	254011,65	3,80%	94,54%	
Group 9	151818,64	2,27%	96,81%	
Group 10	140214,71	2,10%	98,91%	
Group 11	72991,60	1,09%	100,00%	
Total for the period	6688501,85			

The results of ABC analysis of turnover and profit make it possible to form a consolidated matrix (Table 4).

Table 4. Results of two-dimensional ABC analysis of turnover and profit
(built by the author)

ABC analysis of turnover	A	Groups: 1,2	-	-
	B	-	Groups: 3,5,6	Group 4
	C	-	Group 8	Groups: 1,9,10,11
		A	B	C
	ABC Profit Analysis			

From the Table 2 shows that two commodity groups have the largest share in the turnover, namely 51.41%. They form group A.

Product groups that have entered Group B occupy the middle position in terms of turnover for the enterprise and under effective marketing and pricing policies can be developed to class A.

The rest of the product groups (group C) are not selling as well as expected. The reasons may be inadequate price, too narrow range within the group, etc.

According to the algorithm of ABC analysis, the proportion of each product group in the total turnover and profit for the period was calculated, then the product groups were sorted by descending of these particles, after which their cumulative shares were calculated and the groups A, B and C were divided using the double tangent method. For the ABC analysis of turnover they amounted to 60-30-10%, and the profit - 46-41-13%. The results of ABC analyzes of turnover and profit are given in Table 2 and Table 3.

Group AA is formed by groups 1-2. These two groups of products are unambiguous leaders in the product range of the enterprise and require constant and careful accounting and control, as well as analysis of the competitive environment and forecasting demand, to form an adequate stock insurance situation and to prevent inventory shortages.

Group 4 (group BC) bring more turnover to the enterprise than profit, possibly due to a small margin.

Group8 is an outsider in terms of turnover, but provides an average profit for the enterprise. The situation may be altered by the better layout, promotion or expansion of the product line in this product group.

Group BB is formed from commodity groups that are “stable middlemen”. They require routine control and accounting. Last but not least.

Group SS are commodity groups that do not make a significant contribution to the enterprise, both in terms of turnover and profit. Before deciding to remove them from the range, it is necessary to carefully analyze the reasons for this situation. Mechanically excluding them from the product range can lead to an overall decrease in results, as all product groups will then be redistributed according to the ratio of 60-30-10% or 46-41-13%.

The next stage was the XYZ analysis of demand for the products of the studied enterprise. Data from May 2014 to October 2018, inclusive, were used. An extension of time is needed to investigate more closely the dynamics of sales.

The results of the analysis show that if you use the conventional scale (group X = 0-10%, Y = 10-25%, Z> 25%), then no product group falls into group X. This means that all the product groups listed enterprises are characterized by medium and strong fluctuations in demand, which makes forecasting for these groups inappropriate. However, this situation is ambiguous and may be related to the impact of seasonality or trend. In this case, the variation of the data will be large, as evidenced by the high values of the coefficient of variation, as in our case. Therefore, to test the hypothesis of the influence of seasonal factors, a seasonal decomposition of time series was performed using the classical method of seasonality indices.

A comparison of the results of the XYZ analysis before and after the removal of the seasonal component is given in Table 5 and Table 6.

Table 5. Results of the XYZ analysis to eliminate the seasonal component
(calculated by the author on the basis of enterprise reporting data)

Product group	Coefficient of variation, %	XYZ Analysis Group
Group 1	10,10%	Y
Group 2	11,23%	Y
Group 3	14,99%	Y
Group 4	16,70%	Y
Group 5	21,85%	Y
Group 6	22,54%	Y
Group 7	25,98%	Z
Group 8	21,14%	Z
Group 9	28,18%	Z
Group 10	32,25%	Z
Group 11	33,09	Z

Table 6. Results of XYZ analysis after seasonal component elimination
(calculated by the author on the basis of enterprise reporting data)

Product group	Coefficient of variation, %	XYZ Analysis Group
Group 1	6,50%	X
Group 2	6,70%	X
Group 3	8,64%	X
Group 4	9,47%	X
Group 5	11,24%	Y
Group 6	17,05%	Y
Group 7	19,73%	Y
Group 8	19,91%	Y
Group 9	21,22%	Y
Group 10	24,01%	Y
Group 11	29,39%	Z

As you can see, after the seasonal decomposition of time series, the situation has changed dramatically. Removing the seasonal component, which is deterministic, we obtained a number of random fluctuations, which were estimated by XYZ analysis.

The coefficients of variation across all product groups decreased significantly. This suggests that our hypothesis about the influence of seasonal factors was correct. If we did not eliminate the seasonal component, we would have made false conclusions about the possibility of forecasting demand for commodity groups, which would lead to wrong actions in the field of inventory management.

The next step was R / S analysis to identify the memory in the rows that reflect the dynamics of product group sales. Today, R/S analysis is the most common method of studying fractal properties of time series. His method is to calculate the Hearst coefficient, the obtained values of which are interpreted as follows:

→ When H = 0.5, the time series are stochastic ("white noise");

→ When 0.5 <H <1, the time series is characterized by persistence, that is, the property of long-term memory ("black noise");
→ When 0 <H <0.5, the time series is characterized by anti-persistence, i.e. the time series changes faster than in the case of a random process ("pink noise").

The calculated values of the Hearst coefficient are given in Table 7.

Table 7. Results of R/S analysis

(calculated by the author based on enterprise reporting data)

Product group	Hearst coefficient
Group 1	0,716
Group 2	0,728
Group 3	0,654
Group 4	0,677
Group 5	0,679
Group 6	0,618
Group 7	0,687
Group 8	0,613
Group 9	0,689
Group 10	0,604
Group 11	0,555

Table 7 shows that for all commodity groups, except for biscuit, the value of the Hearst coefficient is greater than 0.5. This indicates that the dynamics of such groups are characterized by persistence (i.e., sustainability), that is, long-term memory. This means that if sales were increasing in the past, then it is likely to continue. At the same time, the higher the Hearst coefficient, the more correlated the values are. The Hearst factor has the highest values in the first two product groups (cookies, crackers and caramel, iris, jelly sweets), which, according to XYZ analysis, are well-predicted.

Similarly, the R/S analysis shows the conformity of product groups, the dynamics of which can be predicted, but worse than in the previous case (the Hearst coefficient of about 0.6), with the group Y by XYZ analysis.

Table 8. The results of the combined ABC-XYZ analysis of the product range

DAREX-ENERGO LLC (created by the author)

ABC analysis of turnover	A	X	Group 1	-	-
		Y	Group 2	-	-
		Z	-	-	-
	B	X	-	Group 3	Group 4
		Y	-	Group 5	-
		Z	-	Group 6	-
	C	X	-	-	Group 7
		Y	-	Group 8	Groups 9,10,11
		Z	-	-	-
			A	B	C
	ABC Profit Analysis				

Only commodity group chocolate has a Hearst ratio of about 0.5, which indicates the random nature of the series and the inability to adequately predict its dynamics. XYZ analysis similarly singled out chocolate in the low-predicted group.

Therefore, the results of the R/S analysis and the XYZ analysis after the removal of the seasonal component are completely identical, which proves the feasibility of preliminary transformations of the input data before conducting the XYZ analysis, in particular seasonal decomposition.

The results of ABC (commodity turnover and profit) and XYZ analysis can be conveniently presented as a matrix of combined ABC-XYZ analysis (Table 8).

Based on the results obtained, recommendations were developed for inventory management of the studied enterprise.

AAH, AAY, VVH and VYY groups are offered to keep records of disposal of goods on a daily basis and to maintain stable stocks taking into account the projected amount of consumption in the future and insurance stock, since even the smallest deficit of these groups of goods can undermine the efficiency of the enterprise. At the same time, we must strive to avoid excesses, because the demand for these product groups is stable and well predicted.

Group BB3 with high turnover and profitability has a low sales forecast. This may encourage management to try to ensure that all the goods in this group are in stock by creating excess inventory. However, it can cause an increase in the average inventory of the enterprise, which will lead to higher costs and freezing of funds in the form of inventories. Therefore, the products of this group should analyze the current ordering system. Part of the goods makes sense to use a system of orders with a constant volume of orders. For the second part of the goods, it is advisable to provide a higher frequency of deliveries and increase the frequency of control.

Group CBY, as mentioned above, brings in an average profit for the enterprise, but lags behind. Therefore, it is worth expanding the product range within the group, change the layout and hold promotions. For stocks, it is necessary to switch to a system with a constant amount or volume of orders and to form an insurance stock, based on the financial capacity of the enterprise.

Group BCX is probably undervalued because it sells well, but does not bring the company the desired profit. This group proposes to increase prices and change packaging and packaging. With regard to inventory management, it is recommended that you switch to a regular periodic ordering system and reduce your inventory. The expediency of being present in the assortment of commodity groups forming the SS group should be carefully reviewed. They have a low sales volume and do not bring significant profit to the enterprise.

Therefore, it is worth carrying out various promotions to stimulate demand. As the dynamics of sales of commodity groups can be successfully predicted, it is recommended for CCX and CCY groups to maintain the insurance stock at the existing level or to apply a system of orders with constant periodicity.

Conclusion

Thus, the advanced methodology of integrated ABC-R / S-XYZ-analysis of the range of trading enterprise differs from the existing combined ABC-XYZ-analysis in

that it is supplemented by R/S-analysis as a criterion for the efficiency of XYZ-analysis and the indicator of the possibility of forecasting the dynamics of sales of goods groups. It is also suggested to pre-process the data before conducting the XYZ analysis to eliminate the influence of deterministic factors such as seasonality, cyclicality or trend. This transformation of data significantly improves the outcome of the XYZ analysis and allows us to draw more adequate conclusions, which reduces the risks of making incorrect management decisions in the area of assortment policy and inventory management of trade enterprises.

Based on the implementation of integrated ABC-XYZ-analysis of the range of trading enterprise, which allows to structure the product range of the enterprise into groups, taking into account their contribution to the turnover and profit of the enterprise, as well as the possibility of forecasting their demand in future periods, recommendations on optimization of the product range of the studied enterprise and managing its inventory, which will increase the efficiency of the wholesale trading enterprise as a whole.

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