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ASSESSING THE LEVEL OF RESILIENCE OF ENTERPRISES AS A PRECONDITION FOR ENSURING THEIR SUSTAINABILITY AND COMPETITIVENESS

The object of research is the resilience of industrial enterprises of Ukraine in a crisis environment (martial law), which is a prerequisite for ensuring their stability and competitiveness. One of the significant limitations is the imperfection of existing resilience assessment systems. Existing methodological approaches do not allow for a general assessment of its level, identifying weaknesses and problems. To eliminate these shortcomings, a functional-integration approach to assessing the level of resilience of enterprises is proposed, which covers four key areas: production, sales, personnel and financial. The proposed approach involves assessing the level of functional types of resilience, which subsequently form an integral assessment of the level of resilience. The information base is the balance sheet indices of economic activity, which are calculated based on a survey of enterprises on the dynamics of more than 20 indicators of their economic and financial activities. A study of the monthly dynamics of the level of functional and integral resilience in 2023–2024 showed that the food industry, which ensures the production of essential goods, is the most resistant to crisis impacts. The resilience of chemical industry enterprises is growing steadily, which indicates an increase in demand for its products and adaptation to the realities of wartime. Enterprises in other industries are characterized by significant fluctuations in resilience, which indicates the need for additional measures to ensure it at the proper level.

The integral assessment of the level of resilience of industrial enterprises of Ukraine in November 2024 is +0.05, which indicates their adaptation to current business conditions. The highest level of resilience is demonstrated by the food and printing industries, while metallurgy and mechanical engineering remain more vulnerable to the challenges of wartime.

The main problems affecting the resilience of enterprises have been identified: disruptions in the supply of raw materials, instability of demand, personnel difficulties and financial risks. The development of focused management influences (diversification of sales markets, support for export activities and investments in personnel development) will contribute to a faster restoration of their stability and competitiveness.

Keywords: *enterprise resilience, functional types of resilience, integrated assessment of resilience, production resilience, sales resilience, personnel resilience, financial resilience.*

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1. Introduction

In the modern world, crises occur quite often and suddenly. This is due to the complexity and interconnectedness of socio-economic systems at different levels, globalization, technological changes and political instability. Crises increasingly have global (COVID-19 pandemic, war in Ukraine) and multifaceted consequences. For example, the military conflict in Israel had a "domino" effect and led to a redistribution of political and economic influence in the Middle East (change of power in Syria), which will further affect other regions.

It is precisely because of the frequent and multifaceted crises of the modern world that there is a need to study resilience – the ability of systems, communities, organizations and individuals to adapt, withstand and quickly recover from crisis situations and despite their negative impact. This phenomenon requires appropriate assessment. Without it, neither an assessment of its current level, nor the development of support measures, nor monitoring the effectiveness of their implementation is possible.

In scientific circulation, this term has become widespread and has become the subject of study for quite some time. Translated from English, "Resilience" means "Stability", "Elasticity". The scientific term "Resilience" is studied in many areas, including psychology, medicine, physics, the IT industry, politics, economics and others. Borrowed from biology, it characterizes the reaction of any living beings to negative external and internal influences on them.

In psychology, the term resilience is understood as the ability of an individual to overcome difficulties and stress, while maintaining psychological stability and integrity [1]. More in-depth studies formulate resilience not simply as the ability to return to a previous psychological state, but also as the formation of the ability to post-traumatic growth, that is, to get out of a crisis situation and gain greater mental endurance [2]. Internal factors underlie the development of stress resistance, a significant number of structural psychophysiological and socio-psychological characteristics of the individual can determine its ability to withstand the impact of stress in a complex way [3].

In economic research, scientists use this term to describe the processes of resilience, recovery, and prevention of crisis impacts. According to the definition of the Cambridge Business Dictionary, "resilience is the quality of the ability to quickly return to a previous good state after problems" [4].

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Ensuring business resilience is based on several key aspects. Financial stability implies the availability of sufficient reserves to support operations during crisis periods. Operational flexibility allows companies to quickly adapt production processes, change suppliers, and adjust operations in accordance with new conditions. Human capital plays an important role, since qualified employees contribute to effective adaptation to change. Technological readiness involves the introduction of innovations that optimize business processes and increase productivity [5].

Resilience through business diversification is recognized as a key factor in the survival and development of enterprises in today's dynamic business environment [6].

Scientists emphasize the positive practical impact of resources on the resilience of organizations. They confirm that crisis situations can serve as "windows of opportunity" for gaining experience. However, it is emphasized that this experience is not always successfully absorbed by the enterprise in the process of increasing resilience [7].

Research by the Fraunhofer Institute for Industrial Engineering IAO in Stuttgart (Germany) [8] focuses on the resilience of organizations in the context of managing innovations and change processes. This work, based on previous scientific achievements and an interdisciplinary approach (psychology, physics, medicine, methodological approaches to assessing socio-economic resilience, etc.), deeply explains how resilience helps enterprises to withstand stress, constantly introduce innovations and quickly adapt to changes. However, it is noted that in order to create a solid theoretical basis for resilience, it is necessary to gain more knowledge about its mechanisms and methods of development.

To characterize the ability of an enterprise to ensure stability, competitiveness and efficiency of its activities in the event of deterioration of external environmental conditions (market changes, technological progress, social challenges, military events, natural disasters, etc.), other terms have become widespread and more actively used in Ukrainian-language scientific literature – stability [9–11], adaptability [12, 13], risk tolerance [14, 15], viability [16–18]. Each of these terms describes specific aspects of the ability of industrial enterprises as business organizations to self-preservation and development despite (despite) a change in the external environment (Table 1).

The term resilience should not be considered simply as a synonym. It allows for an even more comprehensive description of the capabilities of an enterprise in conditions of changes in the external environment:

– characterizes the ability of enterprises to adapt to changes;

– to resist external crises and minimize their negative impact;

– to recover quickly after crises, to use them as development opportunities, ensuring not only the continuity of activities, but also the achievement of their strategic goals in these conditions – increased competitiveness and success of business activities.

Different approaches and methods are used to assess resilience. Thus, a group of German scientists use the systemic risk index (SRISK) to assess the stability of the financial system, which measures the level of risk of large European banks and shows their vulnerability to financial crises. To analyze bottlenecks in supply chains, the concept of Time-to-Survive (TTS) and Time-to-Recovery (TTR), which helps to determine how quickly companies can resume work after failures [20].

Researchers at the Fraunhofer Institute for Applied Materials Research IMW in Leipzig, Germany, use combined methods to assess the resilience of business models [21]. They combine both theoretical and practical approaches to assess the resilience of business models of small and medium-sized enterprises (SMEs) in crisis situations, such as the COVID-19 pandemic. On the theoretical side, the researchers used the PRISMA method to identify relevant scientific papers and identified 13 key factors of business model resilience. Inductive categorization approaches were used for the analysis. The practical study was based on the results of an online survey of managers and strategic leaders of small and medium-sized enterprises (SMEs) in Saxony, Germany. Item-Total Correlation analysis was used, as well as content analysis of open-ended responses regarding internal factors that helped or hindered during the pandemic.

The systematization of existing approaches to assessing resilience, which are used by various world institutions (Peace Fund, Food and Agriculture Organization of the United Nations, Rockefeller Foundation, FM Global, Institute for Future-Oriented Economics Research) is presented in an article by the M. I. Dolishny Institute of Regional Studies of the NAS of Ukraine [22]. Based on a comparative analysis, it was stated that the most widespread is the index assessment method. It is based on a different set of input parameters, but has similar methodological principles. The advantages and disadvantages of using the index method in assessing the resilience of socio-economic systems are determined.

The demand for studying and assessing the resilience of enterprises encourages the development of integral indicators that should cover all areas of enterprise activity as widely as possible, be based on both quantitative and expert assessments and judgments. The need for such integrated information is particularly important for Ukraine, given the limited availability of public reliable information during the war. It is important for the timely development (adjustment) of economic policy and the provision of timely recommendations and guidelines to economic agents to maintain their resilience and ensure competitiveness.

The aim of research is to develop methodological principles and conduct an assessment of the level of resilience of enterprises in various industries of Ukraine to business conditions during a crisis situation (military aggression by russia) during 2023–2024.

To achieve the specified aim, the following research objectives will be solved:

1. To form an information base for the study, which contains systematized information on changes in the parameters of economic activity of enterprises during the military aggression of russia.

2. To develop a methodology for assessing the resilience of enterprises based on a functional-integration approach.

3. To assess the level of selected types of functional and integral resilience of industrial enterprises during 2023–2024.

Table 1

Terminology used to characterize the ability of an enterprise to adapt to changes in the external environment

Terms/Parameter of comparison	Stability	Adaptability	Risk tolerance	Viability	Resilience
Main emphasis	Maintaining stability	Ability to change	Threat management	Long-term development	Crisis recovery
Orientation	Passive (resistance to impacts)	Active (change under conditions)	Risk forecasting and management	Systemic sustainability	Flexibility and rapid response
Time perspective	Long-term	Short- and medium-term	Long-term	Long-term	Short- and medium-term
Relationship	Based on stability	Based on rapid response	Combines stability and flexibility	Includes all previous categories	Combining all approaches with a focus on recovery

Note: compiled on the basis of [5–19]

2. Materials and Methods

A critical analysis of the available information capabilities (in conditions of limited statistical information) allowed to choose the monthly reports of the Institute for Economic Research and Policy Consulting (IER) as the information base for the study. These reports were prepared with the support of the European Union and the International Renaissance Foundation within the framework of the joint initiative "European Renaissance of Ukraine" [23]. As of the date of completion of the article, 31 monthly reports have been published. Information on the parameters of the enterprise's economic activity is available for the period from April 2023 to November 2024. To collect information on the current state of the economy and forecast economic trends for the future, IER uses the Business Tendency Survey approach [24]. This methodology is used worldwide to assess the economic situation from the "baseline" – the judgments and expectations of the main economic agents – heads of enterprises and entrepreneurs. The result of market research is a short, "concise" picture of the economy or a particular sector, economic trends in the short and medium term and future "turning" points of the economic activity cycle. The data was collected through telephone interviews with business representatives with answers entered into an online form by interviewers or by independently filling out an online form.

The study contains an assessment of economic trends and expectations based on the calculation of the so-called "balance indices", which are calculated as follows:

+1 – if the company reports an increase in the indicator;
0 – if there have been no changes;
–1 – if the indicator has decreased.

Thus, if among a hundred respondents 20 noted an increase in a certain indicator, 50 reported its decrease, and 30 indicated no changes, the index will be –0.30. A positive (negative) value of the index indicates that the share of enterprises that experienced growth is greater (less) than those that experienced a decline. Indices with values greater than +0.05 or less than –0.05 are considered statistically significant and differ from zero with a 5 % error probability [23].

3. Results and Discussion

The available information on the share of enterprises (among respondents in the relevant industry) in which there was an increase (decrease) in the relevant indicator of economic and financial activity (resilience indicator) allows to propose for practical use the following methodological approach to functional and integral assessment of the level of resilience of individual industries and Ukrainian business as a whole.

To assess the level of functional types of resilience, it is proposed to aggregate the existing indicators of changes in economic and financial activity indicators into 4 groups, which will allow assessing the stability of the relevant areas of activity to crisis management conditions, in particular, martial law (Table 2).

Table 2

System of indicators of the level of functional types of enterprise resilience

Type of resilience	Indicators	Description of the impact of indicators on the resilience of the enterprise	Nature of influence
Production resilience	Production	*Production volume.* Growth or stability of production volume indicates the ability of the enterprise to adapt to changes in demand or market conditions. A decrease in volume may indicate problems with production capacity, new orders or raw materials	P
	Raw material inventories	*Availability of raw materials and materials to ensure continuity of production.* A high level of inventories guarantees the enterprise the ability to continue production even in the event of a supply disruption	P
	Raw material prices	Increasing costs of materials can negatively affect production costs. Stability of prices or the ability of the enterprise to adapt to their changes indicates its ability to have financial flexibility and an effective purchasing policy	N
Sales resilience	Sales	*Volume of products sold.* Constant sales volume is an indicator of the stability of demand for the enterprise's products and its competitiveness	P
	Exports	*Volume of products sold in foreign markets.* The growth of export sales increases the company's resilience to internal economic fluctuations and demonstrates international competitiveness	P
	New orders	An indicator of stable demand for products, despite the crisis conditions of the economy	P
	Finished goods inventories	A high level of finished product inventories allows to reduce the risks associated with possible production stops or supply disruptions, but more often it is evidence of difficulties in selling products	N
Human resource resilience	Number of employees	*An indicator of providing the company with the necessary personnel.* The growth or stability of the number of personnel can serve as an indicator of the compliance of its personnel policy with current conditions	P
	Number of employees on furlough	*An indicator that may indicate the financial difficulties of the company.* A high level of such vacations indicates problems with production load and cash flow	N
	Skilled employees	The number of highly qualified personnel characterizes the ability to introduce innovations and develop the enterprise	P
	Unskilled employees	The increase in the number of unskilled workers may indicate its inability to attract personnel with the necessary qualifications, which reduces the innovative potential	N
Financial resilience	Finished goods prices	The increase in prices is a prerequisite for income growth, which allows the enterprise to receive more financial resources for development and adaptation to changes	P
	Accounts receivable	The increase in the volume of debts of counterparties characterizes the potential improvement of the liquidity of enterprises and replenishment of working capital	P
	Accounts payable	A decrease in accounts payable may indicate an improvement in financial stability and the ability to timely fulfill obligations to suppliers	N
	Tax debt	A decrease in tax debt is a positive signal for the financial stability of the enterprise, as it can reduce the risks associated with tax sanctions	N

Notes: P – positive impact (increase in the indicator increases resilience), N – negative impact (increase in the indicator decreases resilience)

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The assessment of the level of functional types of resilience was carried out by calculating the average value of individual indicators of resilience of the corresponding functional plane:

$$FAR_i = \frac{1}{n}\sum_{f=1}^{n} Rf, \quad (1)$$

where FAR_i – the level of the i-th functional type of resilience; Rf – the value of the f-th indicator of resilience; n – the number of indicators which values are aggregated.

The calculation of the integral level of resilience was carried out by calculating the average value of the levels of functional resilience:

$$IAR = \frac{1}{n}\sum_{i=1}^{n} FAR_i, \quad (2)$$

where IAR – the integral level of resilience; FAR_i – the level of the i-th functional type of resilience; n – the number of functional types of resilience which values are aggregated.

The value of the resilience level characterizes the difference between the share of enterprises with an increase in indicators of resilience and the share of enterprises with a deterioration in indicators of resilience.

The level of resilience is positive if the share of enterprises that increased resilience indicators is greater than those that decreased them. A negative level of resilience characterizes the opposite situation.

Table 3 presents the results of assessing the level of functional and integral resilience as of November 2024.

As shown by the calculations in Table 3, the level of integral resilience for all industries in November 2024 is +0.05, which indicates the adaptation of enterprises to business operations in wartime.

The sectoral analysis of functional resilience revealed that in November 2024, the resilience of the woodworking and printing industries is positive (+0.07); the level of resilience of enterprises producing building materials (–0.03) and metalworking (–0.02) is negative. The level of resilience of enterprises in other types of economic activity is lower (0.01–0.02), but positive.

Table 3

Information base and results of assessing the level of resilience of enterprises as of November 2024

Indicators	All	Metal production and metalworking	Chemical industry	Mechanical engineering	Wood-working industry	Building materials	Food industry	Light industry	Printing
Production resilience (PR)									
Production	0.12	–0.15	0.08	–0.04	0.12	–0.12	0.15	0.06	0.5
Raw material stocks	0.03	–0.15	–0.06	–0.16	–0.06	–0.12	0.08	–0.09	–0.5
Raw material prices*	–0.36	–0.26	–0.17	–0.33	–0.45	–0.21	–0.34	–0.45	–0.25
Total PR:	–0.07	–0.19	–0.05	–0.18	–0.13	–0.15	–0.04	–0.16	–0.08
Sales resilience (SR)									
Sales	0.14	–0.15	0.06	–0.02	0.24	–0.16	0.16	0.09	0.5
Exports	0.12	0	0.14	–0.16	0.11	–0.11	0.22	0.08	0
New orders	0.06	–0.19	–0.03	–0.05	0.21	–0.21	0.09	0	0
Finished goods stocks*	0.07	0.15	–0.17	0.24	0.13	0.08	0.12	0.11	0
Total SR	0.10	–0.05	0.00	0.00	0.17	–0.10	0.15	0.07	0.13
Human resource resilience (HR)									
Number of employees	–0.08	–0.07	–0.11	–0.19	–0.09	–0.24	–0.07	–0.09	–0.25
Number of employees on forced leave*	–0.02	–0.05	–0.07	0.04	0.04	–0.05	0.02	0	–0.25
Skilled employees	0.58	0.64	0.28	0.64	0.62	0.59	0.6	0.56	0.5
Unskilled employees*	–0.33	–0.29	–0.11	–0.38	–0.03	–0.32	–0.45	–0.24	–0.25
Total SR	0.04	0.06	0.00	0.03	0.14	–0.01	0.03	0.06	–0.06
Financial resilience (FR)									
Finished goods prices (sale prices)	0.34	0.11	0.19	0.3	0.39	0.2	0.35	0.38	0.5
Accounts receivable	–0.09	–0.17	–0.12	–0.2	0	–0.29	–0.16	0.03	0.67
Accounts payable*	0.14	0.23	0.18	0.26	0	0.41	0.18	0.12	0
Tax debt*	0.15	0.14	0.21	0.32	0	0.25	0.2	0.07	0
Total FR	0.14	0.08	0.12	0.17	0.10	0.14	0.14	0.15	0.29
Integrated resilience assessment	0.05	–0.02	0.02	0.01	0.07	–0.03	0.07	0.03	0.07

Notes: calculated by the authors based on [25] and their own assessment methodology; * the increase in the indicator has a negative impact on resilience

The analysis of functional levels of resilience allows to state the following:

– *Production resilience* of Ukrainian business in November 2024 demonstrates negative dynamics (compared to the same period last year), which indicates the difficulties of organizing production processes in all industries (types of economic activity). The highest level of resilience is in the printing industry (0.50), which indicates its greatest stability (adaptability) to current business conditions. The production resilience of enterprises in metal production and metalworking (–0.15) and mechanical engineering (–0.04) is negative and has deteriorated.

– *Sales resilience*. The highest level of sales resilience (0.17) is in the woodworking industry. This is due to high demand for its products, supported by export deliveries and new orders. The printing industry is in second place (0.13) due to stable sales and effective management of finished product inventories. Metal production and metalworking demonstrates negative sales resilience (–0.05) due to a decrease in exports and new orders due to the war and global economic fluctuations.

– *Personnel resilience* assesses the ability of the enterprise to maintain personnel potential, retain key employees and ensure effective personnel management in times of crisis. The highest indicator is demonstrated by the woodworking industry (+0.14), as evidenced by the stable retention of qualified personnel and a low level of forced leave. Metal production and metalworking (+0.06) demonstrates some stability of personnel, but there is a reduction in personnel due to economic difficulties. The negative indicator of the printing industry (–0.06) indicates a high share of employees on leave and difficulties in retaining qualified personnel. A slight deterioration was recorded in the construction materials industry (–0.01) due to staff reduction.

– *Financial resilience*. The printing industry (+0.29) has the best indicators due to the growth of product prices, control over receivables and zero payables. Mechanical engineering (+0.17) – moderate financial stability due to effective debt management. The production of building materials demonstrates an average level of financial stability (+0.14), but has high debt loads. The lowest financial stability indicator (+0.08) is in the metal production and metalworking industry due to the high level of payables and the growth of tax liabilities.

Similarly, calculations of the levels of functional types and integral resilience of enterprises of individual types of industry were carried out for 20 periods: from April 2023 to November 2024. The results obtained are presented in Table 4 and Fig. 1.

Fig. 1 shows the dynamics of the integral assessment of resilience for various sectors of the economy.

Table 4

Dynamics of the level of functional types and integral resilience of industrial enterprises during 2023–2024

Period No.	Period (year, month)	Functional types of resilience				Integral assessment of resilience
		Production	Sales	Human resources	Financial	
1	23_04	0.13	0.23	0.13	0.10	0.15
2	23_05	0.12	0.19	0.13	0.09	0.13
3	23_06	0.13	0.18	0.15	0.12	0.14
4	23_07	0.13	0.18	0.15	0.12	0.14
5	23_08	0.16	0.17	0.11	0.11	0.14
6	23_09	–0.04	0.17	0.08	0.19	0.10
7	23_10	–0.03	0.15	0.06	0.15	0.08
8	23_11	0.00	0.15	0.04	0.13	0.08
9	23_12	–0.06	0.23	0.02	0.17	0.09
10	24_01	–0.08	0.06	0.04	0.14	0.04
11	24_02	–0.06	0.08	0.05	0.14	0.05
12	24_03	–0.01	0.14	0.04	0.15	0.08
13	24_04	0.07	0.20	0.04	0.11	0.10
14	24_05	0.05	0.16	0.02	0.12	0.09
15	24_06	0.04	0.14	0.00	0.13	0.08
16	24_07	0.04	0.10	0.01	0.08	0.06
17	24_08	–0.02	0.07	0.03	0.11	0.05
18	24_09	0.02	0.11	0.04	0.09	0.06
19	24_10	0.00	0.10	0.03	0.12	0.06
20	24_11	–0.07	0.10	0.04	0.14	0.05

Note: calculated by the authors based on [23] and their own assessment methodology

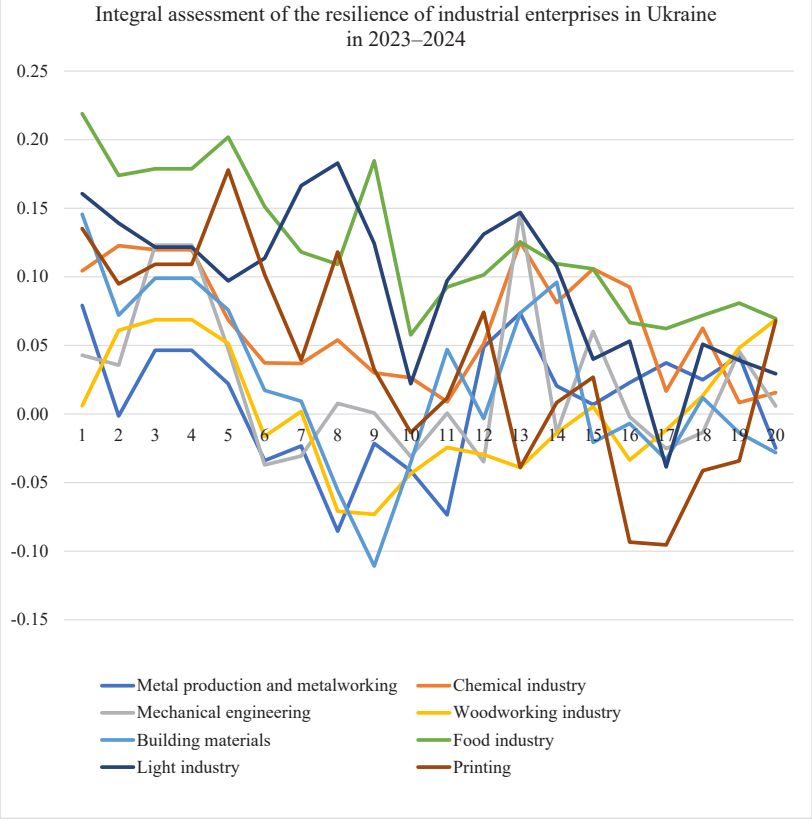

Fig. 1. Dynamics of the integrated assessment of the resilience of enterprises of various types of industry during 2023–2024 (calculated by the authors based on [23] and their own assessment methodology)

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The food industry demonstrates the highest and consistently positive resilience. Metal production and metalworking and mechanical engineering have unstable indicators, with periods of both growth and decline in resilience and acquisition of a negative level. The production of building materials and the woodworking industry demonstrate significant fluctuations in resilience, which may indicate an unstable sales market for their products and, accordingly, indicators of their economic activity. The resilience of chemical industry enterprises is steadily increasing, which indicates adaptation to the realities of wartime and increased demand for its products. Printing industry enterprises have an unstable level of resilience, which is generally deteriorating. However, in the recent period there has been some improvement in resilience, which may be associated with the optimization of business processes or increased demand.

Thus, the food industry is the most resistant to crisis influences, which confirms its importance in critical conditions of wartime, since it is this industry that ensures the production of essential goods. Enterprises in industries with significant fluctuations in resilience require additional strategic measures to ensure it at the proper level.

Practical significance. The developed methodology for grouping indicators by production, sales, personnel and financial areas makes it possible to assess the level of functional types of resilience of enterprises in a particular industry. This allows to identify problem areas that require priority attention for the development of appropriate adaptation measures, increasing resilience, and restoring competitiveness. Assessing the integral level of enterprise resilience allows to comprehensively assess the ability of enterprises to adapt to business conditions in wartime.

An important direction for implementing the resilience acquired by enterprises is to increase the competitiveness of enterprises, especially if to consider it from the position of comprehensive implementation of acquired competitive advantages in the main sectoral markets – commodity, personnel, and investment. A high level of integrated resilience of enterprises will allow to increase the effectiveness of their struggle for the subject of competition in the commodity market – consumers' purchasing power. In the personnel market, where there is a shortage of labor in wartime conditions, to find ways to attract qualified personnel capable of adapting to rapidly changing environmental conditions. In the investment market – to offer better conditions to investors, based on the acquired resilience of enterprises in the studied functional types of resilience. In turn, growing competitiveness will serve as a source of strengthening the resilience of enterprises in production, sales of products, attraction and use of personnel, and financial activities.

Reflection on the results of the resilience assessment allows to focus on the need to diversify the markets for the products of Ukrainian industry, since increasing exports will reduce dependence on internal economic fluctuations. The current task is to increase personnel resilience by investing in personnel development at the level of individual enterprises, as well as implementing national and sectoral retraining and advanced training programs taking into account the realities of the current labor market.

Prospects for further research. The results obtained confirm the need for further improvement of approaches to assessing resilience, which serves as a prerequisite for developing adequate strategies to ensure the adaptation of Ukrainian enterprises to military realities of management and the growth of their competitiveness.

Research limitations. A certain limitation of the proposed approach is the use of a simple average for aggregating primary indicators of resilience and levels of functional types of resilience. To eliminate this limitation, in further research it is planned to conduct an expert survey of specialists on the strength of the impact and consequences of the deterioration of individual resilience indicators, which will allow moving to a weighted average assessment of the level of functional and integral resilience indicators.

4. Conclusions

During the study, a functional-integration approach to assessing the level of resilience of industrial enterprises was developed and tested. The proposed methodology, unlike existing ones, involves assessing four key components of resilience: production, sales, personnel and financial. For each component, appropriate indicators were determined that allow assessing the ability of enterprises to adapt to changes in the operating environment and maintain their competitiveness.

During the study of assessing the resilience of enterprises in seven industrial sectors of Ukraine for 20 periods (April 2023 – November 2024), the most resilient to crisis conditions were enterprises in the food and printing industries, which is confirmed by the positive value and dynamics of the integral level of resilience. Metal production and mechanical engineering demonstrate a low level of resilience, which indicates their vulnerability to crisis factors.

The integral level of resilience in November 2024 is +0.05, which indicates the adaptation of enterprises to wartime conditions.

Identification of the level of functional types of resilience allowed to establish that the greatest difficulties are observed in the field of production resilience. This may be due to disruptions in the supply of raw materials, energy risks and resource limitations, as well as personnel resilience, in connection with the mobilization and departure of part of the working population outside Ukraine.

The proposed model of functional-integrated assessment allows to effectively identify weaknesses in the activities of enterprises and contribute to the development of adequate strategies for adapting to changes in the external environment in order to increase their competitiveness. The priority should be to support export activities, training and retraining of personnel.

The results obtained can be used for:

– development of strategies to increase the resilience of enterprises to crisis management conditions;

– formation of state policy to support industry during periods of instability, in particular, by promoting exports and ensuring access to critical resources.

The research results are of interest to enterprises, state administration bodies and analytical centers dealing with issues of economic security and competitiveness of national industry.

The prospects of further research are associated with improving methodological approaches to assessing resilience, including the use of expert assessments to determine the weighting coefficients of indicators, which will allow increasing the accuracy of the assessment and forming more differentiated recommendations for its strengthening.

Conflict of interest

The authors declare that they have no conflict of interest in relation to this study, including financial, personal, authorship or other, which could affect the study and its results presented in this article.

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Data availability

Manuscript has no associated data.

Use of artificial intelligence

The authors confirm that they did not use artificial intelligence technologies when creating the current work.

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