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ADAPTATION OF BUSINESS AND CONSUMERS TO MODERN CHALLENGES IN UKRAINE

Purpose. To study the process of adaptation and identify factors influencing the adaptability of business and consumers. To develop recommendations for increasing the level of adaptation of business and consumers and for ensuring the appropriate level of consumption by individuals. To develop a mathematical model of the current assessment of the level of adaptation.

Methodology. General and special methods of cognition are used: abstract-logical method – to establish the complex nature of impact of large-scale challenges on the level of adaptation; induction and deduction – to establish the additive and multiplicative nature of threats; comparative analysis – to establish the fact that the adaptation process has a differentiated and unstable character and to identify factors influencing the adaptability of business and consumers. The generalization method is applied to propose the formation of a state Strategy for promoting the adaptation of business and consumers and ways of implementing it. The method of induction and deduction is used to establish the fact that the unstable nature of the adaptation capabilities of consumers requires the implementation of institutional measures, to propose these measures. Based on mathematical methods, a model of step-by-step adaptation and assessment of the level of adaptation was developed.

Findings. Factors affecting the level of business and consumer adaptation were studied. It is established that adaptation processes have differentiated, uneven and unstable character and reasons for this are indicated. It is indicated that the impact of set threats can be additive and multiplicative in nature. It is indicated that effective adaptation of enterprises is possible only with the integration of efforts by management of enterprises and by state institutions. It is proposed to introduce the State Strategy for Facilitating the Adaptation of Businesses and Consumers.

Originality. A mathematical model of the current assessment of the level of adaptation is developed.

Practical value. The developed mathematical model makes it possible to assess compliance with the direction of adaptation and conduct operational planning of the enterprise in a more relevant manner.

Keywords: *adaptation process, level of adaptability, mathematical model, Strategy for support adaptation*

Introduction. The level of challenges for the Ukrainian economy has been steadily increasing in recent decades. Combat operations on the territory of Ukraine led to the destruction of enterprises of the metallurgical, chemical, and oil refining industries and, in general, to the deindustrialization of the East of the country. Not only industrial, but also agricultural enterprises and companies involved in the processing of agricultural products were destroyed.

Opportunities for conducting foreign economic activities for Ukrainian companies have significantly decreased due to the blockade of sea ports, the closure of transport links with Belarus and the logistical collapse on the western borders of Ukraine. The aggressor's missile and bomb attacks on the energy infrastructure led to significant energy supply disruptions, and, accordingly, to disruptions in the work of 89 % of Ukrainian companies [1]. As a result, the rate of decline of Ukraine's economy in 2022 reached an unprecedented value – 30.4 %; consumer prices increased, inflation amounted to 26.6 %; the national currency depreciated by 1.38 times; the number of citizens who were below the poverty line increased to ~30 %, which, accordingly, significantly reduced the solvency of the population [1]. Direct business losses reached \$13 billion, total – estimated by experts at \$33 billion [1]. A significant decrease in the level of economic well-being due to loss of work, decrease in income and rapid inflation, etc. lead to a drop in the level of aggregate demand.

This caused the deterioration of indicators at all levels of economic activity – from the sectoral structure of the econo-

my to consumer sentiment, forced a significant number of companies to relocate and geographically diversify business processes. But the impact of threats was not only negative. They opened a “window of opportunity” for some regions of the country, some types of business activities. Accordingly, such shifts required changes in business conduct for the survival and adaptation of subjects of economic activity to new conditions. The management of Ukrainian companies at an extreme level of threats acquires invaluable experience, which requires detailed scientific analysis and should become the basis for the development and substantiation of recommendations, the relevance of which is not limited to Ukraine. Given the significant level of political destabilization in the world, the growing threat of military conflicts in various regions of the world, recommendations on the adaptation of business and consumers can be useful for other countries as well.

Literature review. Many scientific works are devoted to the problems of adaptation of business and consumers to challenges and threats. Conditionally, they can be divided according to the significance of the challenges – into the study on adaptation to the challenges of the pandemic, economic crises, military actions of a local nature and threats of a significant level due to full-scale military actions. The first group includes, in particular, the article by Ivanov, et al. [2], dedicated to the marketing strategy of small business adaptation in the conditions of the COVID-19 pandemic, where the rapid adaptation of regional retail trade in Ukraine is indicated – the index of the physical volume of retail trade in 2020 compared to 2019 increased by 1.15 times, and the turnover of retail trade in 2019 showed only a slight deviation from the growth trend for the period of 2017–2020. Measures to increase adaptability

proposed by Ivanova, et al. [2], in particular: integration of digital infrastructure and business processes; “improvement of the management system for the development of entrepreneurship as a whole as a type of economic activity and individual business structures” are taken into account in the given article. Zakharchyn [3] indicated the need for a quick response to challenges in order to preserve the viability of the enterprise and proposed specific measures for the adaptation of enterprises and “using the consequences of changes in their own and public interests”. Zakharchyn’s thesis [3] about the need to apply the consequences of changes for its certain improvement is used in the presented study. In the article, Calinescu, et al. [4] studied the adaptation of the accounting and financial mechanism to business conditions. The approach of operational analysis for the use of borrowed crisis experience is useful and is modified in the presented article. In the article, Prokhorova and Zalutska [5] developed “the structure of the mechanism of managing the development of the enterprise from the position of its main adaptive advantage for the effective strategic activity of the enterprise”. The proposed application of local mechanisms of “operational and adequate response” to changes in business conditions and the balanced impact of management measures in the strategic period is used in this article. Kyrylenko and others [6] indicated a significant dependence of the level of adaptation of business processes on the stability of energy supply under war conditions. The proposed methods of increasing the level of adaptation, in particular, indicate the need for timely identification of vulnerable places and the introduction of innovative approaches to reduce the impact of threats. The proposal for the implementation of an innovative approach to increase the level of business adaptability is considered in this article. In the scientific work by Danylyshyn [7], the need to modernize the economy of Ukraine is indicated and the path of evolutionism is proposed to increase the level of adaptability of Ukrainian business. The need for threat analysis is indicated. The proposed modernization tools include strengthening state support for aggregate demand and supply, increasing efficiency in the redistribution of economic income and directing these incomes to create jobs and stimulate the “production of military goods”. The proposed recommendations [7] regarding modernization are correct, but the path of evolutionism with a rapid increase in the level of threats is questionable.

Scientists have devoted a significant number of works to the problem of business adaptation to drastic changes in conditions for logistics processes caused by crises and military actions. Such works, in particular, include articles by Zaverbnyj, et al. [8] and Mitsenko, et al. [9]. So Zaverbnyj, et al. [8] researched non-standard business measures caused by quarantine restrictions and due to military actions. The impact of threats on business processes has been identified, improvement measures, adaptation of logistics for the implementation of business activities have been analyzed. Approaches to improve logistics are identified: “refusal (full/partial) from accumulation, storage of goods in significant volumes; high level of dynamism of warehouse conditions; lengthening of logistics chains, their diversification and versatility; forecasting demand and, accordingly, planning sales and logistics operations; optimization of logistics chains under conditions of uncertainty” [8]. These theses require additional analysis and clarification. Mitsenko, et al. [9] studied the problems of cross-border logistics under crisis conditions and military operations. It was established that “the ruined system of international logistics of Ukraine, due to objective reasons, does not sufficiently cope with the functions assigned to it, and therefore needs a radical transformation” [9]. The measures of this transformation are indicated as conditions for proper adaptation of business to threats. Unfortunately, these measures are only partially outlined. A significant number of scientists have devoted their work to the development of recommendations for institutional structures on the promotion of business adap-

tation to threats caused by military actions in Ukraine. Thus, in the thorough work by Heyets [10], the results of modeling the losses of the country’s economy as a result of military operations are given. The need to change approaches to operational planning and the development of a strategic plan for the restoration of branch infrastructure and the functioning of the energy industry is indicated. Havryliuk [11] studied the behavior of business after the start of full-scale military operations, determined the amount of losses, “showed the main directions of adaptation to new operating conditions – relocation of production facilities and employees, sectoral transformation of firms”. It is proposed to implement an intra-regional development strategy to ensure endogenous development. Deineko and others [12] indicated the level of non-adaptation of industry due to a reduction in production by 60–65 % as a result of military operations and predicted irreversible losses of industrial potential of ~ 30 %. The need for relocation of industrial enterprises, transformation of the structure of the economy, formation of new regional industrial complexes, attention of institutional structures to the deployment of new logistics schemes, restoration of production “capable of replacing the links of production and sales chains destroyed as a result of Russian aggression” is indicated. The thesis about the necessity of restoration and geographical diversification of industries is developed in the presented article. Arefieva, et al. [13] indicated that the time required for business adaptation depends on “the availability of financing, the effectiveness of the implementation process and coordination between line ministries, local authorities, civil society, public organizations and implementing agencies, the willingness of the private sector to support capital investment during war”. It is noted that the role of regional structures in this is growing.

In general, the review of literary sources indicates many aspects of the impact of the crisis, which calls for the implementation of many ways and measures of adaptation to significant threats, and the significance of the adaptation process for business and consumers requires its further research.

Purpose. To study the process of adaptation and identify factors influencing the adaptability of business and consumers. To develop recommendations for increasing the level of adaptation of business and consumers and for ensuring the appropriate level of consumption by individuals. To develop a mathematical model of the current assessment of the level of adaptation.

Methods. In the research, the results of which are presented in this article, general and special methods of cognition were used.

The application of the method of abstract logical analysis made it possible to establish the comprehensive, complex nature of the impact of large-scale challenges on the level of adaptation; the method of induction and deduction – to establish the fact that threats can be both additive and multiplicative in nature; comparative analysis – to establish the fact that the adaptation process has a differentiated and unstable character and to identify factors influencing the adaptability of business and consumers. The use of the generalization method made it possible to propose the formation of a state strategy for promoting the adaptation of business and consumers to significant challenges and ways of implementing this strategy, to indicate the need for the formation of strategic plans of regions for the promotion of adaptation and the factors that should be taken into account. The method of induction and deduction also made it possible to establish the fact that the unstable nature of the adaptation capabilities of consumers requires the implementation of institutional measures and to propose these measures, to develop recommendations for increasing the level of adaptation of business and consumers, and recommendations for ensuring the appropriate level of consumption by individuals.

The use of mathematical methods made it possible to develop a step-by-step adaptation model. This model allows step-by-step assessment of compliance with the direction of

adaptation. In addition, assessment of the level of adaptation is necessary for operational planning of the enterprise. To assess the level of adaptation, enterprises often use a comparison of the absolute values of economic indicators. This does not always make it possible to obtain a relevant assessment of the level of adaptation due, in particular, to fluctuations in regional and sectoral development disparities. For example, the growth of gross agrarian production in the central regions of Ukraine is connected, in particular, with the elimination of competitors whose enterprises are close to the combat zone, and not with management efforts aimed at increasing the level of adaptation. Improvements in adaptation by a single factor may also not be long-term due to fluctuations in the synergistic interaction of these factors, which is not always obvious in real fast-moving circumstances. Therefore, to assess the level of adaptation, a comparison of two linear matrices of changes in influencing factors at short Δt_s and long time intervals Δt_L is proposed. A comparison of the specified matrices allows, in particular, revealing short-term fluctuations in changes in individual factors and compliance with the direction of change

$$\forall \begin{bmatrix} \Delta y_1 & \dots & \Delta y_i & \dots & \Delta y_n \\ \Delta t_s & & \Delta t_s & & \Delta t_s \end{bmatrix} \Leftrightarrow \begin{bmatrix} \Delta y_1 & \dots & \Delta y_i & \dots & \Delta y_n \\ \Delta t_L & & \Delta t_L & & \Delta t_L \end{bmatrix},$$

where Δy_i is the change in the influence of the i^{th} factor; $i = 1, \dots, n$ is the index of this factor.

The principle of evaluation is that the duration of each influence factor Δt is significantly longer than the maximum evaluation time $\Delta t \gg \Delta t_L$. Therefore, observing the direction of decrease of Δy_i indicates the adaptation of the enterprise to this influence. That is, the set of Δy_i by all factors are elements of the integral indicator of adaptation – changes in the integral vector of influence $\overline{\Delta Y}$.

But in the general case, the directions of change of all influencing factors may not coincide at sufficiently significant time intervals. Then it is proposed to consider parameter segments as successive elements of a broken line – in general, as projections of a multidimensional broken line. In this case, a modified comparison model is proposed, where each change in the influence of the factor Δy_i is considered as a projection (Pr) on the corresponding axis O_i of the change in the integral vector of influence $\overline{\Delta Y}$

$$\Delta y_i \doteq Pr O_i \overline{\Delta Y}.$$

Next, to compare the coincidence of two multidimensional broken lines, the level of their congruence is considered.

For this, the vector of the influence vector \vec{Y} is considered as a generalization of a set of factors, and then the coincidence of the integral indicator of adaptation can be considered as a sign of congruence (or approaching congruence) of two subsets $\overline{\Delta Y}_s, \overline{\Delta Y}_L$ – at short and long time intervals. As it is known, two subsets $\overline{\Delta Y}_s \equiv \overline{\Delta Y}_L$ are congruent in the multidimensional space R^n under the condition of the existence of the isometry $f: R^n \rightarrow R^n$. For example, if there is a significant subelement of influence $f(\overline{\Delta Y}_s) = \overline{\Delta Y}_L$.

Results. The impact of large-scale threats, such as military action, is comprehensive and complex in nature. If business activity is considered as a system, the deterioration of any of its components will have a sign of emergency. For example, technological degradation due to the loss of fixed assets and the lack of financial opportunities for the timely purchase of the latest equipment leads to a decrease in the quality of products, a forced decrease in the wage fund, a reduction in production volumes, a decrease in the efficiency of business management, etc. That is, it has economic, social, environmental consequences and, in general, significantly reduces the level of business adaptability.

The complex nature of large-scale threats is indicated by factors affecting the reduction of industrial production vol-

umes (Table 1): a significant increase in production costs; lack of working capital; infrastructure destruction; labor shortage due to migration and direct participation of production personnel in hostilities; reduction of logistics capabilities; narrowing of sales markets; instability of energy supply, etc.

Disproportions in the regional and sectoral concentration of production (item 11 of Table 1), which have developed historically, have increased the complex vulnerability of industry and made it difficult to adapt to challenges. Thus, since the beginning of the full-scale war, hostilities have covered ten industrial regions and the city of Kyiv, which provided manufacturing of ~52.9 % of products with high added value. The impact on the adaptability of enterprises of the sectoral disproportion of state business support is also significant. In particular, on March 15, 2023, under the Government program “Affordable loans 5–7–9 %”, during the period of operation of this program, a total amount of UAH 181,600 million of assistance was allocated to businesses. Of this amount, less than 14 % was given to the industrial sector which is most vulnerable to the challenges of war [14].

The speed of changes in the conditions for the implementation of business processes increased significantly after the beginning of large-scale military operations, new threats became more frequent, and their level increased significantly. This, firstly, causes rapid changes in the level of adaptation of businesses and consumers of all categories; secondly, it determines the need to accelerate adaptation to new threats. The level of business adaptation (~41 %) is indicated by the data shown in Figure [14].

The adaptation process is complicated by the fact that this process has many aspects, components, and layers. This is the adaptation of business activities, and the adaptation of production and sales chains, and corporate, social, and economic adaptation; tactical and strategic adaptation, etc. Adaptation processes are also complicated by their uneven nature, caused, in particular, by the frequency of the appearance of new threats and the sectoral and regional unevenness of the impact of these threats. New manifestations of threats often lead not only to the inhibition of the adaptation process, but also to its significant reduction. Individual consumers are more sensitive not only to the challenges of military operations, but also to insufficiently thought-out institutional measures during this period, for example, the increase in electricity prices. For businesses, the unevenness of adaptation depends on branch

Table 1

Factors influencing business adaptability and the degree of their influence

No.	Factor	Degree of influence
1	Destruction of enterprise infrastructure	14
2	The level of approach to the combat zone	14
3	Destruction of transport infrastructure. The need to change logistics routes	29
4	Lack of vehicles	19
5	Unstable power supply	18
6	Rising prices for fuel, energy resources, raw materials and components	27
7	Losses of human capital. Lack of qualified workers	17
8	Restriction of access to credit resources	16
9	Loss and narrowing of sales markets	50
10	The discipline of payment for the delivery of products (or services rendered) has deteriorated	20
11	Sectoral disparities in state business support	14
12	Inflation	17

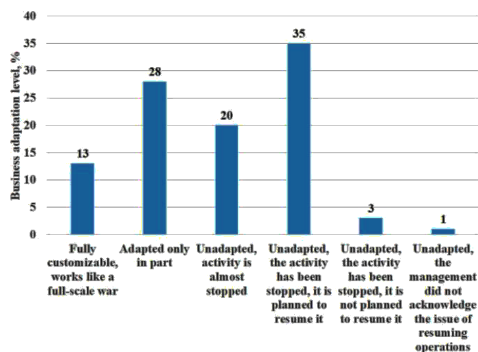


Fig. Business adaptation level

affiliation, territorial location and other characteristics. The sectoral unevenness of adaptation is evidenced by the data of Table 2 [11], regarding the unevenness of changes in the sectoral structure of exports, and Table 3 [15], regarding changes in the share of business by types of economic activity. Thus, compared to the period before the start of the full-scale war, the share of information technologies tripled, trade activity increased by ~17 %, “Public catering, restaurant activity” – doubled, construction increased by 67 %. At the same time, the shares of the processing industry in the field of non-food products decreased by four times, and that of the machine-building industry by two times. It also indicates both the difference in the level of sectoral adaptation and the areas that need the attention of public institutions.

For consumers, uneven adaptation depends on whether they are in business or not. Also, the uneven adaptability of consumers – individuals is affected by their age, belonging to one or another social group, place of residence, etc.

It should also be taken into account that adaptation to new, even large-scale challenges does not exclude the need to adapt to the effects of other threats. The integral impact of threats can have not only an additive nature – threats, under certain circumstances, can even strengthen each other, that is, realize a multiplicative impact on the adaptation process. This also leads to an uneven and unstable nature of adaptation and requires the introduction of institutional measures to neutralize the negative impact on the adaptation process.

An example of a multiplier effect is the loss of sales markets as a result of full-scale hostilities (item 9 of Table 1) for some types of Ukrainian products and their replacement by products of other countries due to the increased impact on national exports of the risk of globalization of the world market. The loss of markets will have a lingering effect on national business even after the active phase of the war is over. This requires not

Table 2

Change in export structure

Type of products	Monetary volume of exports, million dollars			Share of products in the total volume of exports, %		
	2020	2021	2022	2020	2021	2022
Black metals	7691	13,950	323	15.6	20.5	14.2
Any kind of ore	4421	7120	224	9.0	10.5	9.8
Crops	9411	12,344	424	19.1	18.1	18.6
Fats and oils	5747	7037	275	1.7	10.3	12.1
Machines, equipment and mechanisms, electrical equipment	4487	5260	211	9.1	7.7	9.3
In total	49,192	68,072	22,732	100	100	100

Table 3

Share of business by type of economic activity in % of the total volume

Type of activity	At this time	Before the start of large-scale military operations
Wholesale	6	5
Retail trade of non-food goods	15	13
Retail trade of food products	6	11
Marketing, consulting, design activities	4	7
Scientific and technical activity	3	5
Processing industry in the field of non-food products	1	4
Processing industry in the field of food products	2	2
Information Technology	12	4
Education	4	4
Construction	5	3
Agriculture, forestry and fisheries	3	2
Machine-building industry	1	2
Water supply, sewage, waste management	0.3	2
Catering, restaurant activity	4	2
Arts, sports, entertainment and recreation	5	1
Health care	3	1
Repair of motor vehicles	2	1

only consideration when implementing adaptation measures, but also coordination of adaptation measures of operational and strategic nature. An institutional tool – the State Strategy for Facilitating Adaptation – can increase the adaptive capabilities of business and consumers under the conditions of a complex, systemic nature of the impact of threats. In particular, the implementation of this Strategy will ensure the predictability of institutional measures and state policy, which will contribute to predictable business activity and ensure the relevance of consumption planning by individuals.

The ways of implementation of this Strategy in particular are: implementation of an effective mechanism of risk analysis and forecasting; institutional support for deployment of new transport infrastructure, creation of new logistics schemes, optimization of logistics processes under significant uncertainty; formation of the required level of reserves and their deconcentration; rapid development of options for management actions based on the variability of risks and an effective mechanism for implementing these options in business activities; change in the nomenclature of products (services) of the enterprise; change of type and, even, field of activity, etc.

In particular, an example can be the development and implementation of options for the transportation of raw materials necessary for production and enterprise products. A peculiarity of this business process is the need to predict that each of the selected routes, and even each of the subsequent stages of these routes, may turn out to be unusable (for example, due to damage to the track) in the process of transportation (item 3 of Table 1). This may require the formation of transit warehouses, planning the possibility of replacing modes of transport at each of the stages, etc.

When formulating the State Strategy for Facilitation of Adaptation, it should be taken into account that during the active phase of the war: the number of orders for products (ser-

vices) decreased by 50 %; logistics deteriorated by 29 %; a noticeable lack of raw materials by 21 %; the discipline of payment for the delivery of products (or services provided) has deteriorated by 20 %; the labor shortage factor increased by 17 %; part of the production facilities was destroyed or damaged by the war by 14 %. According to the significance of the areas of implementation of institutional measures, business management indicated the need for: tax holidays – 37 %; improving logistics – 17 %; cheaper financial resources and simplification of their obtaining – 16 %; promoting entry into new markets and acquisition of new consumers – 16 %; preserving personnel potential – 15 %; technical and technological assistance – 10 %; receiving government orders – 9 %; simplification and acceleration of customs procedures – 7 %; receiving consulting services – 7 %; deregulation – 7 %; business relocation – 6 %; managing export deliveries of products (or performance of services) – 6 % [14].

A significant factor in increasing the level of business adaptation to wartime conditions is its relocation. According to the state business relocation program, 761 enterprises were relocated from dangerous regions, and by the end of 2022, ~80 % of displaced enterprises resumed work [16]. The complexity of relocation and the need to strengthen its institutional support is indicated by the fact that at the end of 2022, 274 enterprises did not decide on a place and logistics for relocation [16]. By type of economic activity, among the enterprises that have changed their geographical location and have already continued their activities, the largest share of ~40.24 % belongs to the business of wholesale and retail trade, repair of auto and motorcycle equipment; the share of processing industry enterprises is ~31.71 %; the share of companies in the field of information and telecommunications is ~34 %; in the field of “Professional, scientific and technical activities” ~5.85 %; construction ~4.15 %. By region of relocation: ~30 % – Lviv region, ~17 % – Zakarpattia region, ~11 % – Chernivtsi region, ~8 % – Ivano-Frankivsk region, ~7 % – Khmelnytskyi region and ~7 % – Ternopil region [16]. It also indicates industry differentiation of business adaptability. To strengthen adaptation, the process of business relocation should be adjusted taking into account the interests of the regions. Its implementation should also ensure the requirement of geographical diversification of business processes to reduce the risks of damage, for example, dispersion of warehouse stocks, vulnerable production processes, etc. The process of business relocation should contribute to the formation of new industrial complexes in the regions, which requires the formation of strategic plans of the regions to facilitate adaptation, where the mentioned factors will be taken into account. Accordingly, this should be taken into account in the State Adaptation Promotion Strategy. Effective adaptation of enterprises is possible only with the integration of efforts in this area of enterprise management and institutional structures.

The data that the economic situation at the end of 2022 did not change for ~18 %, significantly worsened for ~52 %, rather worsened for ~28 %, indicate the adaptive capacity of individual consumers. That is, according to this indicator, the level of adaptation among consumers is ~18 %. Among consumers – individuals who had a job in January 2022 (53 %) in December of the same year, ~53 % said they were unemployed, ~45 % continued to work; of them, ~22 % work in the usual mode, ~21 % work remotely or partially, ~2 % switched to a new job [14]. That is, according to this indicator, the level of adaptation is ~45 %. The highest levels of non-adaptability according to the indicator of the availability of work are found in the population of Eastern Ukraine ~74 %, young people under 35 years old ~60 % and temporarily displaced persons ~66 %. To increase the level of adaptation, consumers – individuals use various tools for acquiring financial security. These tools have been tested in previous crises, including the COVID-19 pandemic. Nowadays, even among pensioners, the financial condition of ~25 is not threatening, although at the

beginning of the pandemic, ~40 % of pensioners stated that their financial resources would not last more than a month [14]. Material security reduces the psychological pressure of threats, promotes the growth of consumerism.

A significant level of differentiation of human capital should also be taken into account when developing measures for institutional support of the population. For example, it should be considered that the loss of jobs will encourage, first of all, highly qualified specialists to look for a place of permanent work abroad, which will stimulate their irreversible emigration.

One of the ways of business adaptation is its sectoral transformation, which allows neutralizing some of the influencing factors indicated in Table 1. The spread of such an adaptation path is indicated by the fact that ~21 % of the surveyed managers testify to the beginning of the specified process, ~16 % testify to the end of the transformation and ~16 % are ready to start it [14]. Industry transformation requires a certain amount of time to restore income from product sales or service provision, both due to the need for established business processes, increasing production funds, and due to the need, sometimes from scratch, to restore the client base. This way of business adaptation also leads to a reduction in external investments and the need for additional financial resources. This leads to a significant increase in costs and leads, in particular, to the need to save wage funds and reduce the level of payments with suppliers. Thus, only ~3–5 % of enterprises under the conditions of inflation managed to increase their wage fund, ~14–19 % froze wage increases to the level at the end of 2021, ~39 % stopped paying wages (Table 4 [14]). The indicator of deterioration in the discipline of payments with suppliers is significant (item 10 of Table 1), ~29 % stopped payments (Table 4). Thus, in March-April 2022, the arrears of trade networks to suppliers increased to ~\$5,000 million.

The factor determining business adaptability is also the level of efficiency and leadership qualities of its management. Thus, the data in Table 5 [15] indicate that the share of enterprises whose level of indicators corresponds to the state before the start of full-scale hostilities and the share of enterprises that have improved their situation is inferior to the share of those whose management cannot even position their situation.

The above said allows drawing a conclusion about the significant differentiation of the level of adaptability of business and consumers – individuals to significant challenges. There are more vulnerable groups of enterprises: by location close to the areas of intense hostilities and/or bomb/missile attacks; by type of activity; depending on the stable supply of energy and

Table 4

Levels of payments to employees and suppliers of products, raw materials or services relative to the level before the start of large-scale hostilities, %

Assessment of the level of payments	Payment of wages to employees, %	Settlement with suppliers of products, raw materials or services, %
Increased	3	5
Left at the same level	14	19
Reduced to 70–99 %	8	8
Reduced to 50–69 %	13	8
Reduced to 30–49 %	8	6
Reduced to less than 30 %	9	8
Payments will be suspended	33	29
Payments have not been specified	13	17

Table 5

The value of business indicators relative to the level before the start of large-scale hostilities, %

Evaluation of the level of change	Loading of the enterprise	Employees, in the production process	Volume of planned work for the next week	Volume of planned production for the next month
not specified	3	15	12	12
≤10 %	20	19	17	12
by 10–29 %	21	14	16	16
by 30–49 %	14	12	15	12
by 50–69 %	21	13	14	20
by 70–99 %	10	10	12	11
by 100 %	6	14	11	12
≥100 %	6	3	3	4

resources, stable access to Internet networks; according to the level of differentiation of logistics routes; flexibility of business processes and management efficiency, etc. The biggest losses were incurred by enterprises of the metallurgical, mining, and chemical industries. Thus, the workload of metallurgical enterprises, which are not completely destroyed or captured by the enemy, is ~15 % of the level at the beginning of a full-scale war, mining and beneficiation enterprises ~25 %. ~40 % of metal deposits, including gold deposits and deposits of rare earth elements (zirconium, lithium, strontium, uranium) were captured by the Russian Federation [17].

A significant technological and innovative difference in the results of the comparison of production volumes from 2022 to 2021 is also a sign of sectoral differentiation of the level of industry adaptability. For example, there is an increase in the share of medium-low technology industries in the volume of industrial production by –12.6 % and, at the same time, a decrease in the share of medium-technology industries from –27.3 to –17.4 %, a decrease in the share of mining industries from 16.1 to 14.1 %, no change in the share of high-tech industries –2.3 %.

The known level of destruction of the infrastructure of processing enterprises (item 1 of Table 1), the decrease in demand for products of the non-consumer segment of the domestic market (item 9 of Table 1) stimulates the adaptation of enterprises not to increase the volume of raw material processing, but to increase its export. A favorable factor for the adaptation, in particular, of metallurgical enterprises is the abolition of tariffs and quotas for the export of Ukrainian products by the leading countries of the West.

At the same time, the agricultural sector demonstrated a higher level of adaptation than industry. Institutional support for production aimed at meeting consumer needs, support for the export of agrarian products to ensure global food security stimulates the preservation and increase of production volumes, which increases sectoral disparities in business. This is due to the difference in state and international financial support. Thus, agricultural production receives compensation for the cost of purchased equipment, a reduction in the VAT rate has been introduced for the agricultural industry, it has been made easier to obtain cheap loans under the Government program “5–7–9 %”, etc.). This also leads to an increase in the risk of Ukraine becoming a predominantly agrarian state. As indicators of the level of adaptation of the agricultural industry, it is possible to mention that the harvest of 2023 exceeds the needs of the domestic market by 1.5–3 times. The dairy industry not only meets the needs of the Ukrainian consumer, but also exports products due to the relocation of livestock to safer regions and the increase in the efficiency of agricultural enter-

prises in these regions. Despite the reduction in the volume of production as a whole across the country, the dairy industry was able to increase production according to 2022 data in some regions (Chernivtsi – by ~23.4 %, Ternopil – by ~21.5 %, Vinnytsia – by ~8.4 %) [18]. The needs of the Ukrainian consumer are also met in meat and meat products. According to the data of 2022, the export of this type of product even increased by ~9 % compared to 2021. At the same time, it is necessary to take into account certain changes in the structure of consumption and the structure of export of meat and meat products, in particular, a significant increase in the share of poultry meat. In the domestic market, this indicates that consumers have begun to focus on more affordable types of meat and meat products. Domestic demand for fruit and berry crops is satisfied, although ~5 % of berry orchards and ~20 % of orchards have been lost [18]. It should be considered that the balancing of demand and supply in this segment is ensured, in particular, due to a significant increase in the price of products. A promising way to increase the level of adaptation of agrarian business is to change the production structure by increasing the share of highly profitable areas of agricultural production and reducing the share of labor-intensive areas (in particular, reducing the production of crops of the so-called “borscht set” to the level necessary to meet the needs of the domestic consumer.

It is possible to predict, even with considerable uncertainty, an increase in the level of business adaptation in the post-war period for those types of economic activity that will be aimed at meeting the needs of post-war economic recovery [19, 20]. Factors influencing the level of adaptability of consumers-individuals to significant challenges partially coincide with factors for business, for example, in relation to the proximity of the place of residence to areas of intense hostilities (item 2 of Table 1), but there are also certain differences, for example, by age, professional and social groups, employment opportunities in their geographical location.

This leads to the need for differentiation of institutional support for both business and consumers. For example, for individual consumers, such a tool for ensuring the minimum consumer level is material assistance. At the same time, the possibility of decent employment is more acceptable for ~62 % [16, 21].

Inflation is a well-known factor affecting the adaptability of business and the population (item 12 of Table 1). Inflationary risks are significantly increased today due to high spending, which is not offset by investment incentives. This reduces the consumption opportunities of citizens, as evidenced by the comparison of changes in nominal income with price growth (which is why the inflation indicator is used). This comparison determines the purchasing power of citizens, the willingness to buy non-food products. At the beginning of 2022, the Government of Ukraine introduced regulation of consumer prices, but with a significant increase in tariffs for energy resources, the effectiveness of these measures will significantly decrease due to the formation of the so-called “inflationary canopy” – i.e., the rate of growth in the cost of production will be higher than the rate of change in consumer prices. This could lead to a spike in inflation. Inflationary expectations allow drawing a conclusion about the unstable character of consumers’ adaptive capabilities, which requires the implementation of state and regional measures aimed at increasing jobs, the prerequisite of which is the recovery of the economy [22].

The full-scale war has led to a significant risk of depopulation and loss of human capital, which is one of the main factors of business maladaptation (item 7 of Table 1). This presents the institutional structures with the following tasks: facilitating the return of refugees from abroad; restoring the effectiveness of the education sector, primarily professional education, where human capital is formed; improvement of pension provision (an indicator of which is the “Ratio of the average accrued pension to the average salary”, which significantly decreased from 2022 to 2021); more effective promotion of the

return of pensioners to production activities; effective promotion of investments, primarily domestic, with the broad involvement of the population, and, for this, an increase in the level of bank reliability, an increase in the level of reimbursement by the Deposit Guarantee Fund of individuals, free access of the population to the purchase and sale of currency, and tax-free receipt of money from relatives abroad.

Recommendations for increasing the level of business and consumer adaptation are institutional support for: full-cycle production processes, increasing the level of processing and increasing added value; production and export of industrial products; modernization of industrial enterprises; diversification of energy supply sources; autonomization and decentralization of energy production; reduction of the level of investment crisis and assistance in obtaining financial resources; promoting the improvement of logistics, simplification and acceleration of customs procedures [23, 24]. It is also necessary to contribute to the reduction of the share of imports in consumption, in particular, under institutional measures to reduce gray and contraband imports (comparing the indicators of 2022 and 2021, the share of imports in consumption by the metal products industry increased from ~36.9 to ~46.2 %).

Taking into account the specifics of conducting business in war conditions, in order to increase the level of adaptation and in accordance with Table 1, specific tools for neutralizing the influencing factors are offered: decentralization of the most vulnerable company divisions; with the approach of the combat zone – relocation of the enterprise; insurance of risks due to military actions, which is especially relevant for the agricultural sector, where the postponement of one of the types of seasonal work can mean the loss of annual turnover; reducing the number of links in the management, which accelerates decision-making and increases the awareness of the top management in a fast-moving situation in war conditions; flexible diversification of export products, which is especially relevant for agricultural and processing industries in wartime conditions. To neutralize the influence of factors 3, 4, 6 of Table 1, it is proposed to increase the volume of warehouse stocks of products and raw materials in the warehouses of the enterprise and partners, to disperse warehouse stocks, to form transit warehouses on the most problematic routes, to plan variable logistics routes with the possibility of using different types of transport, at crossing points of which reconstruction of own infrastructure is required.

A promising direction of business adaptation in war conditions is also the use of changes in the structure of demand in the domestic market to reduce the market share of imported goods and flexible reorientation to their production; focusing on local raw materials, which will reduce the costs and risks of their transportation. Also, the sectoral transformation is an important factor in the adaptation of business under wartime conditions [25].

As for individual persons, in order to ensure the appropriate level of consumption, it is necessary to: develop a strategic policy to reduce unemployment and introduce a structured system of population employment management taking into account regional and social disparities, increase jobs, in particular, with the support of the creation of processing enterprises. For this, an increase in financial assistance through the “Work”, “New Level” programs, etc. is necessary. It is also necessary to increase the level of compensation of costs to employers for employment of internally displaced persons; increasing the volume of micro grants for those wishing to start their own business; institutional support for the creation of foreign enterprises in the unoccupied territory of Ukraine; provision of temporary support to highly qualified personnel of strategic enterprises to prevent loss of human capital; adjustment of social benefits taking into account inflation; implementation of institutional measures to stabilize the social protection system. This requires amendments to the Law “On the Organization of Labor Relations in Martial Law” No.

2136-IX regarding increasing the legal protection of employees, in particular, correcting the provision on the removal of responsibility from the employer for violation of the terms of payment of labor “as a result of the conduct of hostilities or acts of other circumstances of force majeure”.

Conclusions. It is indicated that the emergent nature of the influence of large-scale threats, such as military actions, has a complex nature for all spheres of economic activity and leads to a decrease in the level of business adaptability. Factors affecting adaptation have been studied. It is indicated that adaptation processes have an uneven and unstable character, caused, in particular, by the uneven impact of challenges on different industries and different regions of Ukraine. This is illustrated by the statistical data presented in the tables. It is noted that new threats often lead not only to the inhibition of the adaptation process, but also to its significant reduction. Individual consumers are more sensitive not only to the challenges of military actions, but also to insufficiently thought-out institutional measures (for example, a significant increase in electricity prices). For businesses, the level of adaptation is differentiated by industry, territorial location, and other characteristics. For consumers – by their belonging to the business.

It is indicated that new large-scale threats do not exclude the effects of smaller threats. The integral impact of a set of threats can be not only additive in nature, but also, under certain circumstances, threats are able to influence each other, that is, to have a multiplicative impact on the adaptation process. It also leads to an uneven and unstable nature of business and consumer adaptation and requires the introduction of dynamic institutional measures to neutralize the negative impact on the adaptation process.

The need to form a state strategy for promoting the adaptation of business and consumers to significant challenges is pointed out. This will ensure the predictability of the consequences of institutional measures. Ways of implementing this Strategy are also proposed. The introduction of a strategic approach will simultaneously reduce the level of uncertainty, reduce the amplitude of the dynamic effects of threats and introduce predictable business activities, ensure the relevance of planning by consumers.

It is indicated that the business relocation process should be adjusted taking into account the interests of the regions. Its implementation should also ensure the requirement of geographical diversification of business processes to reduce the risks of damage, for example, dispersion of warehouse stocks, vulnerable production processes, etc. The process of business relocation should contribute to the formation of new industrial complexes in the regions, which requires the formation of strategic plans of the regions to facilitate adaptation, where the mentioned factors will be taken into account.

It is indicated that effective adaptation of enterprises is possible only with the integration of efforts of enterprise management and institutional structures in this direction.

Based on mathematical methods, a model of step-by-step adaptation to external challenges has been developed. This model allows step-by-step assessment of compliance with the direction of adaptation. In addition, assessment of the level of adaptation is required for relevant operational planning of the enterprise.

Recommendations on increasing the level of adaptation of business and consumers and recommendations on ensuring the appropriate level of consumption by individuals are provided. Taking into account the specifics of conducting business in war conditions, specific measures to neutralize factors that have a negative impact on the economic activity of enterprises are proposed to increase the level of adaptation.

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Адаптація бізнесу та споживачів до сучасних викликів в Україні

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Мета. Дослідити процес адаптації й виявити фактори впливу на адаптабельність бізнесу та споживачів. Розробити рекомендації щодо збільшення рівня адаптації бізнесу та споживачів і забезпечення належного рівня споживання фізичних осіб. Розробити математичну модель поточного оцінювання рівня адаптації.

Методика. Використані загальні та спеціальні методи пізнання: абстрактно-логічний для встановлення комплексного характеру впливу масштабних викликів на рівень адаптації; індукції й дедукції – встановлення адитивного й мультиплікативного характеру загроз; порівняльного аналізу – встановлення, що адаптаційний процес має диференційований і несталий характер, та виявлення факторів впливу на адаптабельність бізнесу та споживачів. Використання методу узагальнення – для пропозицій щодо формування державної Стратегії сприяння адаптації бізнесу та споживачів і шляхів її реалізації. Метод індукції та дедукції також дозволив встановити, що несталий характер адаптаційних можливостей споживачів вимагає впровадження інституційних заходів, запропонувати ці заходи. За використання математичних методів розроблена модель покрокового адаптування та оцінювання рівня адаптації.

Результати. Досліджені фактори, що впливають на рівень адаптації бізнесу та споживачів. Встановлено, що адаптаційні процеси мають диференційований, нерівномірний і несталий характер, вказані причини цього. Указано, що вплив сукупності загроз може мати адитивний і мультиплікативний характер. Указано, що ефективне адаптування підприємств можливе лише за інтеграції зусиль менеджменту підприємств і державних інституцій. Запропоноване запровадження державної Стратегії сприяння адаптації бізнесу та споживачів.

Наукова новизна. Розроблена математична модель поточного оцінювання рівня адаптації.

Практична значимість. Розроблена математична модель дозволяє оцінити дотримання напряму адаптації та більш релевантним чином провадити оперативне планування діяльності підприємства.

Ключові слова: адаптаційний процес, рівень адаптабельності, математична модель, Стратегія сприяння адаптації

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