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FACTORS FOR INCREASING THE EFFICIENCY OF UKRAINIAN ENTERPRISES

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The article presents a comprehensive theoretical, methodological, and applied study of the factors enhancing the operational efficiency and overall resilience of Ukrainian enterprises in the context of ongoing martial law, severe infrastructural constraints, energy deficits, and structural transformations of the national economy. The essence of enterprise efficiency is substantiated as a multidimensional socio-economic category integrating financial-economic, social, environmental, and technological components. The study systematizes a three-dimensional model of performance indicators, categorized into resource-based, cost-driven, and financial-result metrics. A deep decomposition of efficiency drivers into exogenous (external macro-environment shocks, taxation, institutional, security risks) and endogenous (internal technology, management, digitisation, workforce adaptability) factors is conducted. Based on the empirical analysis of statistical data from the State Statistics Service of Ukraine and analytical reviews by the National Bank of Ukraine, the paper highlights key challenges currently faced by domestic businesses, including severe labor shortages, logistics disruptions, and power supply interruptions. The paper determines key strategic levers for accelerating operational viability and long-term competitiveness: investments in autonomous distributed energy generation, deep digitalization (integration of ERP, AI, and BI systems), implementation of lean manufacturing tools (Lean concept), and innovative human capital retention strategies through cross-functional training (Multi-skilling) and dual education models. Furthermore, an applied algorithmic road map for step-by-step implementation of efficiency-enhancing measures is developed. Strategic recommendations are formulated to assist corporate managers and policymakers in building flexible business models capable of surviving external shocks and sustaining long-term growth.

Keywords: enterprise efficiency, adaptive management, digitalization, human capital, business model resilience.

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Introduction and formulation of the problem

In the modern global economy, the issue of enhancing enterprise operational efficiency remains at the center of attention of the scientific community and business entities, as it determines their level of competitiveness, technological maturity, and investment attractiveness. At the global level, key trends in operational model transformation include the digitalization of production processes, artificial intelligence-based automation, optimization of resource utilization, and orientation toward sustainable

development principles [1-3]. Enterprise-level studies confirm that digital transformation can positively impact productivity and factor efficiency, although the magnitude of the effect depends on the scale and depth of digitalization [1-3].

At the regional and national levels – specifically in Ukraine – this problem has acquired a critically acute, strategic importance. Domestic businesses operate in an environment of unprecedented exogenous shocks caused by prolonged martial law, destruction of industrial and transport infrastructure, acute labor

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shortages, and systemic risks to energy supply [5; 6]. Under such conditions, the traditional understanding of efficiency as a simple ratio of net profit to consumed resources has transformed into a comprehensive indicator of operational viability and a means of preserving the country's economic potential.

Ensuring sustainable growth in enterprise efficiency is a priority practical task for the recovery and structural adjustment of the national economy [7]. This requires enterprises not only to optimize current costs, but also to accelerate the adoption of new endogenous growth factors – specifically, establishing autonomous distributed energy generation, digitalizing management systems, and transitioning to flexible human capital models [8; 9]. Therefore, the development of theoretical, methodological, and applied foundations for building a comprehensive efficiency enhancement system for domestic enterprises under instability is directly linked to addressing priority tasks of strengthening Ukraine's economic security.

Purpose of the article

The goal of this study is the theoretical and methodological substantiation and development of practical recommendations for forming a comprehensive system to increase operational efficiency and resilience of enterprises under exogenous shocks and war-induced economic instability. Achieving this goal involves sequentially addressing a set of scientific and practical tasks, including the systematization and critical assessment of key challenges facing Ukrainian businesses (such as labor shortages, energy crises, and logistics constraints), as well as evaluating the current status, financial-economic dynamics, and profitability indicators of business entities based on 2024-2025 results. Furthermore, it is essential to determine the synergetic effect of integrating modern digitalization tools and energy autonomy systems based on distributed generation as primary endogenous factors for productivity growth, which serves as a foundation for implementing operational process optimization via lean manufacturing principles and modern approaches to personnel management, dual education, and physical workload reduction.

The evaluation, formation, and enhancement of enterprise performance belong to fundamental areas of economic science, extensively explored in the works of domestic and international scholars. Theoretical and methodological foundations for assessing resource potential, building systems of financial and economic indicators, and conceptual approaches to strategic management are covered in detail in fundamental works by domestic scientists. The issue of enhancing enterprise performance in the modern economy is viewed in close connection with digital transformation,

resource productivity, management quality, and the ability of enterprises to adapt to structural changes. Modern empirical studies confirm the positive impact of digital transformation on operational efficiency and enterprise productivity. In particular, it has been established that digitalization can increase enterprise efficiency through the optimized allocation of capital and labor [1; 2].

Firm-level studies also confirm the link between the adoption of digital technologies and growth in total factor productivity. At the same time, results from certain studies indicate that the effect of digital transformation can be non-linear: during initial stages of digitalization, an enterprise may incur additional costs, whereas after reaching a certain level of technological maturity, productivity begins to rise [3-5].

An important direction of modern research is the assessment of enterprise performance under resource constraints. Ukrainian scientific works emphasize the need to improve the management of working capital, logistics systems, fixed assets, and financial stability [6-9].

In the context of full-scale war, ensuring business continuity assumes critical importance. Studies of Ukrainian enterprises show that financial stability, adaptation of logistics processes, resource optimization, and business diversification become essential prerequisites for maintaining operational capacity [8; 9].

A distinct stream of modern research concerns human capital. Labor shortages, structural shifts in employment, migration, and mobilization create additional constraints on production expansion. According to modern research on Ukraine's labor market, the reduction in labor force supply has become one of the key structural challenges for the economy, while the shortage of skilled workers remains one of the most significant constraints on enterprise activities.

Thus, modern scientific debate is gradually shifting from the traditional interpretation of efficiency as a ratio of financial performance to costs toward a comprehensive understanding of efficiency that encompasses resource productivity, digital maturity, financial stability, operational agility, energy security, and the ability of an enterprise to retain human capital [1-10].

The theoretical and methodological basis for assessing enterprise efficiency is the systems approach, which views a business entity as a complex, dynamic, and open socio-economic system. In classical economic terms, efficiency reflects the ratio between results achieved (effect) and resources expended or total costs incurred to achieve them. However, modern management theory and financial analysis significantly expand this concept beyond pure monetary metrics.

The operational efficiency of a business entity should be viewed as a multidimensional category that includes economic performance, resource productivity, financial stability, internal process quality, and the firm’s adaptability to external environment changes [6; 10].

In contemporary research, enterprise efficiency is interpreted as a comprehensive characteristic of resource utilization effectiveness and the achievement of economic goals [6; 10].

Economic efficiency – minimizing costs per unit of created value:

$$E = \frac{\text{Effect}}{\text{Resources}}. \quad (1)$$

Social efficiency – the level of employee satisfaction, provision of safe working conditions, real wage growth, and retention of human capital.

Environmental and energy efficiency – rational use of raw materials, minimizing carbon footprint, and lowering energy intensity of production.

Combining these methodological streams within integrated evaluation models provides an objective, comprehensive picture of an enterprise’s current state and reveals reserves for further development. This

approach becomes especially relevant during digital transformation, as digital technologies simultaneously affect labor productivity, capital utilization, business process organization, and management decision quality [1-5].

Efficiency evaluation methodology relies on synthesizing resource-based, result-based (goal-oriented), and process-based approaches. The resource-based approach focuses on the rational use of existing potential (fixed assets, working capital, human capital) through indicators such as return on assets (ROA), return on equity (ROE), asset turnover, and labor productivity. The result-based approach evaluates the level of achievement of strategic and operational goals, including economic value added (EVA), market share, and stakeholder returns. In turn, the process-based approach determines the quality and speed of internal business processes. Combining these methodological perspectives within integrated models (such as the Balanced Scorecard) allows for an objective, structured assessment of the current state and highlights reserves for future growth.

A comprehensive analysis utilizes an extensive system of financial, economic, and operational indicators (Fig. 1).

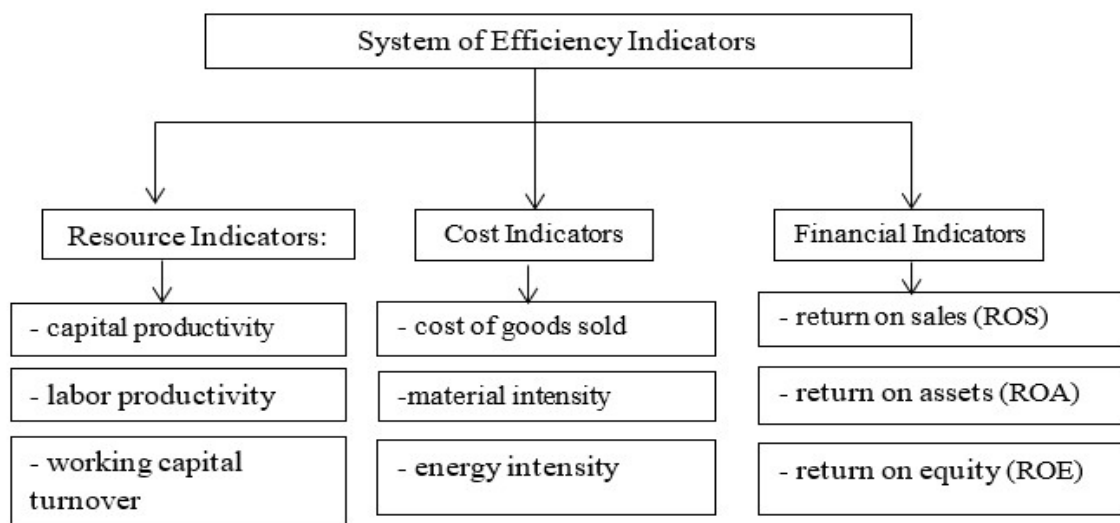


Fig. 1. System of financial, economic, and operational indicators

Sources: [3; 6]

The system of enterprise efficiency evaluation indicators is built on the principle of comprehensively covering all phases of the operational cycle and follows a three-dimensional structure comprising resource, cost, and financial indicators. Applying this triad makes it possible to evaluate not only the final financial result, but also the structural efficiency of utilized potential.

Resource indicators measure the yield from available capacity regardless of what portion was directly consumed in a specific period. They characterize the degree of engagement and efficiency of fixed assets (asset turnover), labor resources (labor productivity), and current assets (working capital turnover ratio).

Cost indicators reflect current resources consumed during production, incorporated into product cost. These include material intensity, energy intensity, labor intensity, and unit production cost. They show the resource costs required to produce one unit of physical or monetary output.

Financial indicators serve as a generalizing criterion, characterizing the ultimate economic return of the enterprise relative to capital and sales. This block relies on ROA, ROE, ROS, and modern value metrics such as Economic Value Added [13].

The interconnection of these three groups forms a logical chain: rational resource use minimizes unit costs, directly generating high financial profitability and market competitiveness.

Labor Use Indicators. Labor Productivity (LP):

$$LP = \frac{V}{N} . \quad (2)$$

where V is production volume (monetary or physical units);

N is average headcount.

Fixed Assets Use Indicators. Fixed Asset Turnover / Capital Productivity (F_v):

$$F_v = \frac{V}{OF_{avg}} . \quad (3)$$

where OF_{avg} is average annual value of fixed production assets.

Financial Efficiency Indicators. Return on Assets (ROA):

$$ROA = \frac{\text{Net Profit}}{\text{Average Assets}} \times 100\% . \quad (4)$$

Factors affecting enterprise efficiency consist of external conditions and internal management drivers that determine resource utilization performance and final economic outcomes [6; 7].

Classifying efficiency drivers into external (exogenous) and internal (endogenous) is based on controllability and origin relative to the business entity (Fig. 2). It sets management boundaries: while an enterprise can directly influence internal factors through its decisions, it must flexibly adapt to external factors to mitigate risks and capitalize on new opportunities.

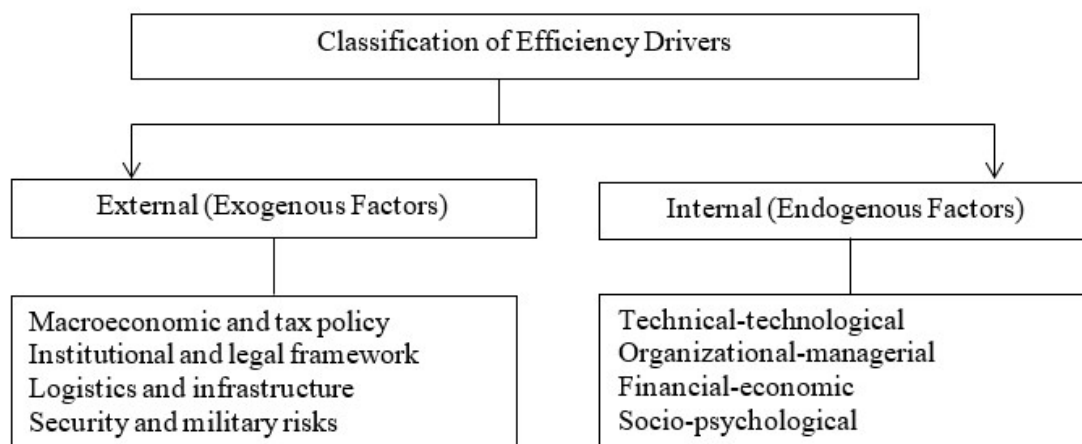


Fig. 2. Classification of efficiency drivers

Source: [5]

External (exogenous) factors shape the operating environment and are defined by the macroeconomic, institutional, and market environment. These include macroeconomic stability (inflation rate, credit availability, tax and customs policy), the institutional framework (deregulation, property rights protection), infrastructure state (logistics and energy), business cycle phases, and foreign trade market conditions. In Ukraine, the security environment remains the decisive exogenous factor, encompassing military risks, power grid stability, and transport corridor functionality. External factors define growth

boundaries and constraints that businesses must integrate into strategic planning [8-10].

Key external factors independent of direct enterprise control include:

- macroeconomic and macro-financial stability: inflation rates, NBU refinancing rates, credit access, exchange rate stability;
- institutional environment: degree of deregulation, tax/customs administration transparency, property rights enforcement;
- security and energy independence: functional transport infrastructure, continuous energy supply, war risk insurance;

– foreign trade conditions: EU market access, tariff regimes, functioning trade routes (e.g., Black Sea maritime corridor).

Internal (endogenous) factors reflect the internal capabilities of the enterprise, covering resources and processes under direct control. These are categorized into several directions: technical and technological (equipment modernization, automation, energy-efficient tech), organizational and managerial (process optimization, management system quality), personnel (qualifications, motivation, labor productivity, human capital retention), and marketing/financial (receivables management, market diversification, capital structure). Targeting internal factors represents the primary source for establishing sustainable competitive advantages and boosting overall performance. A key external constraint

for Ukrainian firms is the severe labor deficit. Reduced labor force participation and structural employment imbalances significantly hinder economic recovery [10]. Surveys consistently show that skilled labor shortages remain one of the most critical barriers to expanding output.

Endogenous (internal) factors. This is a set of internal resources and processes that the enterprise possesses and can directly manage, as presented in the Table.

The operation of domestic enterprises takes place under the influence of deep structural transformations.

The analysis of the current state and specifics of domestic enterprise operations is based on the concepts of adaptive management and economic resilience amid high uncertainty and systemic exogenous shocks.

Table

Categories of Factors for Increasing Enterprise Efficiency

Factor Category	Key Components	Mechanism of Impact on Efficiency
Technical-technological	Equipment modernization, automation, energy-efficient technology implementation	Cost reduction, improved product quality, reduced defect rates and energy consumption
Organizational	Business process optimization, re-engineering	Reduced time losses, elimination of non-productive operations
Personnel (Human)	Training/qualifications, motivation, grading systems, corporate culture	Increased labor productivity, reduced employee turnover
Marketing	Sales market diversification, branding, digital marketing	Increased profit margins, growth in sales volume
Financial	Accounts receivable management, working capital optimization	Enhanced liquidity, accelerated capital turnover

Sources: [12; 14]

The business environment for Ukrainian companies is defined by deep structural transformations: enterprises are forced to operate under the simultaneous impacts of military and economic risks, inflationary pressure, capital scarcity, and the forced restructuring of traditional sales and supply chains. Methodologically, evaluating this environment requires going beyond standard static financial analysis to assess business model flexibility, operational continuity, and an entity’s ability to rapidly relocate or reconfigure production capacity.

The modern transformation era is marked by shifting drivers of competitive advantage for Ukrainian enterprises. While scale and cost minimization were decisive factors before the crisis, key metrics today

are energy autonomy, digital agility, and retention of critical human capital. Structural divergence is evident: businesses integrating into European value chains, leveraging international grants, and adopting energy backup solutions demonstrate adaptive growth; conversely, firms with outdated fixed assets and rigid organizational structures face serious insolvency risks. Thus, evaluating domestic entrepreneurship demands a comprehensive assessment of both immediate financial results and overall adaptive capacity.

Ukrainian businesses operate in an environment of high uncertainty, facing a range of critical systemic challenges. Among these, a central place is occupied by labor shortages and labor market distortions caused by intensive mobilization processes, as well as

significant external and internal migration, which has led to an acute deficit of skilled blue-collar and engineering specialists. The situation is further complicated by constant energy shortages and rising energy costs, forcing enterprises to invest in establishing their own distributed generation-ranging from solar power plants to diesel generators-which substantially increases capital expenditures and places upward pressure on final product costs. At the same time, major operational barriers persist in the form of severe logistical constraints tied to costlier and disrupted land and maritime export-import routes, alongside high capital costs that make commercial borrowing at market rates virtually inaccessible for most small and medium-sized businesses.

Government incentive policy serves as an important external factor supporting enterprise efficiency through several key mechanisms. Specifically, the “Accessible Loans 5-7-9%” program substantially reduces the interest burden to cover both working capital and investment needs. At the same time, state grant initiatives, such as the eRobota program, provide direct funding for the creation of new businesses, processing operations, orchards, and greenhouse facilities. Furthermore, the development of industrial parks offers essential tax and customs relief on imported equipment, significantly easing financial pressures for relocated and newly established manufacturing entities.

An analysis of the practical state of Ukrainian business confirms that efficiency dynamics correlate directly with an enterprise’s ability to adapt to macroeconomic shocks. According to the State Statistics Service of Ukraine, corporate financial performance in 2025 was marked by a sustained high proportion of profitable entities, though official statistics continue to record significant variation in financial outcomes across different economic activities. Positive business expectations throughout 2025 were accompanied by major operational constraints. According to National Bank of Ukraine data, the war and its consequences remained the top factor hindering production expansion, while the shortage of skilled workers continued to exert a severe influence on business operations.

Accelerated digitalization and the development of autonomous energy infrastructure have emerged as decisive endogenous factors for efficiency growth. According to surveys conducted by analytical centers and the Ministry of Economy of Ukraine, companies that invested in their own distributed generation (solar power plants, cogeneration units, and energy storage systems) managed to reduce the share of energy expenses in product costs by 12-18%, safeguarding production continuity during grid peak loads.

Furthermore, companies that implemented ERP systems and production line automation demonstrated a 15-25% increase in labor productivity. This helped partially offset the severe labor deficit in the job market, which-according to surveys by the European Business Association and the National Bank of Ukraine-has reached critical levels, with approximately 74% of employers citing the lack of skilled workers as their primary growth constraint [14].

State and international support policies play an important role in sustaining enterprise operational efficiency. According to the Ministry of Finance of Ukraine, over 90,000 preferential loans totaling more than UAH 300 billion were issued under the government’s “Accessible Loans 5-7-9%” program, with a significant share allocated specifically toward working capital replenishment and fixed asset modernization. Alongside this initiative, grant programs-most notably the eRobota project-funded the creation and expansion of thousands of micro and small enterprises, generating tens of thousands of new jobs. Securing this preferential financing lowered the weighted average cost of capital for Ukrainian enterprises by an average of 6 to 9 percentage points, serving as a critical lever for preserving their liquidity and solvency.

Digitalization and automation remain vital endogenous drivers of operational performance. Empirical research confirms that digital technology adoption drives total factor productivity growth, optimizes capital and labor allocation, and improves operational efficiency [1-5]. However, digitalization should not be viewed as an automatic efficiency generator. Transformation success depends on organizational readiness, process quality, and management’s capability to integrate digital tools effectively. Uncoordinated digital investments risk triggering a “digitalization paradox,” where tech spending bloats operational and administrative expenses without yields [4; 5].

Впров Implementing lean manufacturing principles enhances operational efficiency by systematically eliminating non-productive operations, excess inventory, wait times, transportation waste, over-processing, and defects [11]. The core economic impact stems from preventing overproduction, reducing warehousing overheads, minimizing raw material transit, and eliminating operational downtime. Concurrently, lean systems streamline redundant tasks, optimize workspace ergonomics, and minimize defect rates, driving up labor productivity while lowering unit production costs.

Energy autonomy under current realities is not merely a cost-reduction exercise, but a mandatory

element of business continuity. Combining distributed generation, energy storage systems (ESS), and backup power supplies reduces dependence on centralized grids and boosts operational resilience. Nevertheless, the economic return on energy autonomy investments must be systematically evaluated against capital expenditure, fuel/energy prices, equipment lifespan, and blackout risks [15]

In the face of acute labor shortages, reskilling and human capital retention become essential for operational continuity. Cross-functional training-enabling employees to master adjacent roles for flexible deployment across critical production areas-serves as a primary adaptability mechanism. Expanding dual education programs via direct partnerships between enterprises and vocational/higher education institutions helps align workforce training with real-world technical requirements. Additionally, automating heavy manual labor reduces physical demands, creating opportunities to increase female participation in traditionally male-dominated technical fields, balancing labor market supply and maximizing human potential.

Conclusions

This study substantiates the theoretical and methodological foundations and develops practical tools for enhancing operational efficiency and enterprise resilience amid exogenous shocks and war-time economic instability. The scientific novelty lies in establishing a holistic, synergistic approach that-unlike isolated cost-reduction models-integrates digital transformation tools (ERP, AI, BI), distributed energy autonomy, and cross-functional personnel development into an adaptive management framework. It demonstrates that overcoming labor deficits and energy risks is achieved not merely through budget cuts, but through technological substitution of heavy manual labor and automated predictive analytics.

The findings and practical recommendations are targeted at industrial and commercial enterprise managers, SME executives, and operational management specialists. Implementing the proposed solutions yields reduced resource intensity, increased labor productivity, eliminated non-productive waste, decreased grid dependency, and enhanced continuous production workflows. Specific economic impacts should be evaluated per enterprise, accounting for industry context, scale, technological maturity, and capital costs. Future research directions include developing multi-criteria mathematical models to evaluate return on investment (ROI) in digitalization and energy independence projects, as well as examining preferential and grant financing mechanisms for structural transformation initiatives.

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ФАКТОРИ ПІДВИЩЕННЯ ЕФЕКТИВНОСТІ ПІДПРИЄМСТВА УКРАЇНИ

Василюк О. В.

У статті представлено комплексне теоретико-методологічне та прикладне дослідження чинників, що підвищують операційну ефективність і загальну стійкість українських підприємств в умовах воєнного стану, значних інфраструктурних обмежень, дефіциту енергоресурсів та структурних трансформацій національної економіки. Обґрунтовано сутність ефективності підприємства як багатовимірної соціально-економічної категорії, що поєднує фінансово-економічні, соціальні, екологічні та технологічні складники. У роботі систематизовано тривимірну модель показників результативності, поділених на метрики, що базуються на ресурсах, витратах та фінансових результатах. Здійснено поглиблену декомпозицію чинників ефективності на екзогенні (шоки зовнішнього макросередовища, оподаткування, інституційні чинники, безпекові ризики) та ендогенні (внутрішні технології, управління, цифровізація, адаптивність персоналу). На основі емпіричного аналізу статистичних даних Державної служби статистики України та аналітичних оглядів Національного банку України висві-

тлено ключові виклики, з якими стикається вітчизняний бізнес, зокрема гострий дефіцит робочої сили, логістичні збої та перебої в енергопостачанні. Визначено основні стратегічні важелі для зміцнення операційної життєздатності та забезпечення довгострокової конкурентоспроможності: інвестиції в автономну розподілену генерацію енергії, поглиблену цифровізацію (інтеграція систем ERP, впровадження інструментів ощадливого виробництва та інноваційних стратегій утримання людського капіталу через крос-функціональне навчання і моделі дуальної освіти. Крім того, розроблено прикладну алгоритмічну дорожню карту поетапного впровадження заходів із підвищення ефективності. Сформульовано стратегічні рекомендації, покликані допомогти керівникам підприємств та особам, що приймають управлінські рішення, у побудові гнучких бізнес-моделей, здатних витримувати зовнішні шоки та забезпечувати довгострокове зростання.

Ключові слова: ефективність підприємства, адаптивне управління, цифровізація, людський капітал, стійкість бізнес-моделі.

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The article presents a comprehensive theoretical, methodological, and applied study of the factors enhancing the operational efficiency and overall resilience of Ukrainian enterprises in the context of ongoing martial law, severe infrastructural constraints, energy deficits, and structural transformations of the national economy. The essence of enterprise efficiency is substantiated as a multidimensional socio-economic category integrating financial-economic, social, environmental, and technological components. The study systematizes a three-dimensional model of performance indicators, categorized into resource-based, cost-driven, and financial-result metrics. A deep decomposition of efficiency drivers into exogenous (external macro-environment shocks, taxation, institutional, security risks) and endogenous (internal technology, management, digitisation, workforce adaptability) factors is conducted. Based on the empirical analysis of statistical data from the State Statistics Service of Ukraine and analytical reviews by the National Bank of Ukraine, the paper highlights key challenges currently faced by domestic businesses, including severe labor shortages, logistics disruptions, and power supply interruptions. The paper determines key strategic levers for accelerating operational viability and long-term competitiveness: investments in autonomous distributed energy generation, deep digitalization (integration of ERP, AI, and BI systems), implementation of lean manufacturing tools (Lean concept), and innovative human capital retention strategies through cross-functional training (Multi-skilling) and dual education models. Furthermore, an applied algorithmic road map for step-by-step implementation of efficiency-enhancing measures is developed. Strategic recommendations are formulated to assist corporate managers and policymakers in building flexible business models capable of surviving external shocks and sustaining long-term growth.

Keywords: enterprise efficiency, adaptive management, digitalization, human capital, business model resilience.

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