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Functional Modelling and Enterprise Resilience: Quantifying Strategic Efficiency Gains in Ukrainian Firms

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Abstract:

The main goal of this paper is the implementation of Integrated Definition for Function Modelling (IDEF) as a method for enhancing measurable economic and strategic performance outcomes among Ukrainian enterprises against the background of the vagueness of the economic milieu and the vagueness of the market. The target function was chosen as strategic efficiency. Strategic efficiency was measured using quantifiable economic indicators: productivity gains (output per employee change), cost reductions (decreased operating and lead time costs), and financial improvements (changes in return on assets and profit margins).

This study was conducted in Ukraine in 2024 using a mixed method approach, which used a combination of quantitative analysis, a targeted survey of 25 enterprise managers with IDEF experience, and secondary data analysis. Multiple linear regression with OLS assumptions and logistic regression are included in the empirical model to examine the relationship between managerial experience, enterprise-size, enterprise digital readiness and strategic efficiency outcomes. The outcomes of the investigation demonstrate that managerial experience and enterprise size have a substantial influence on IDEF, with larger enterprises demonstrating structural complexity and, in turn, demonstrating a higher degree of success when applying IDEF principles. The prominence of technological readiness was also highlighted in digital readiness, where it was demonstrated to be greatly enhanced by the utility of functional modelling. Based on the analysis, recommendations were made for targeted support for digital infrastructure development, incentives for training managers for IDEF, and industry consulting services to facilitate firms' use of IDEF. The proposals aim to promote strategic flexibility and resilience of Ukrainian enterprises to achieve sustainable economic growth and competitiveness.

Keywords: functional modelling (IDEF); strategic efficiency; digital readiness level; managerial experience; industry type.

JEL Classification: C38; L21; M11; M15; O32; O33.

Introduction

Structured frameworks in circumstances of economic instability, market volatility and digital transformation, are more necessary when Ukrainian enterprises and businesses are consistently on the lookout for improving strategic efficiency. The Integrated Definition for Function Modelling (IDEF) has been accepted as a robust methodology to support operational and strategic process; there is a noticeable lack of empirical studies evaluating its applicability and effectiveness across diverse organizational contexts. Most of the research deals with developed economies, whereas undeveloped knowledge exists regarding the application of IDEF to enterprises in transition economies such as Ukraine, specifically. The gap becomes more pronounced when we look at the dynamic nature of such variables as manager's experience, firm size, digital readiness, and industry type, in their relationship with IDEF versions of productivity. It is also important to discuss these issues for improving the operational and strategic capability of Ukrainian enterprises. IDEF has proven to hold great potential in helping the improvement of strategic planning and operational effectiveness using functional modelling.

Khamaksorn et al. (2023) in previous studies illuminated how IDEF supports in process optimization, supports decision making and strategic alignment. Yet in Ukraine's context of regulatory flux and unpredictable economic clime, it is essential that enterprises develop structured methodologies that will help them adapt and survive. However, existing challenges like digital transformation of industries and using electronic payment systems make the need of using frameworks, like IDEF, more important (Klokar et al., 2019; Mishchenko et al., 2022; Kairat et al., 2023).

To realize enterprise-wide agility and competitiveness it is necessary to understand what exactly IDEF is and how it will help Ukrainian companies to detect the inefficiencies, to streamline workflows, and to align departments' goals. A strength of IDEF is the ability to segment complicated systems into manageable, consecutive functions and clarify the structure and operation of enterprises (Manenti et al., 2019). This enables organizations to pinpoint areas for improvement through specific data points, to get rid of redundancies, and to build lean workflows; all that is the basis in volatile markets. IDEF can be a useful structured framework to foster increased alignment between enterprise strategies and operational activity for Ukrainian enterprises who generally find themselves dealing with resource limits and deficiencies in cross departmental coordination.

The framework of this methodology as the structured framework allows supporting the implementation of digital changes and to scale enterprise effectively on the market demands changes (Mykhalchenko et al., 2023; Kravchenko et al., 2024). Additionally, IDEF's focus on matching strategic goals to operational execution enables enterprises to execute this alignment even in the most difficult circumstances without having to compromise productivity (Zhu et al., 2024). While these are strengths, the application of IDEF in Ukraine has not been sufficiently explored and few experiential investigations have been assumed to measure the effect of IDEF on strategic efficiency of corporations. The scarce studies on the subject offer no consistent understanding of the relationship between IDEF adoption and strategic efficiency, and do not address similar factors, such as managerial expertise, enterprise size, digital readiness, and industry-based specificities. In order to bond this lack, this investigation attempts to find out how IDEF can assist Ukrainian enterprises which are subject to rapidly changing business environment, to align their strategies.

The goal of this investigation is to demonstrate how IDEF helps to boost the quantifiable strategic and financial efficiency of Ukrainian enterprises. Specifically, it tries to response the following research question: *What contextual factors (relevance, managerial experience, enterprise size, digital readiness, etc.) affect successful IDEF adoption and what effect does IDEF adoption have on strategic efficiency of Ukrainian enterprises?* This study aims to address this question by evaluating the relationship between IDEF adoption and strategic efficiency, examining the role of key contextual variables and suggesting how IDEF should be adapted to the specific enterprises of Ukraine.

This research provides the practical insight obtained through cross sectional study of Ukrainian managers implementing IDEF methodology in real projects. This analysis blends qualitative insights and quantitative data to elucidate the impact of using IDEF to optimize resources, increase adaptability and encourage organization growth. The results of the paper contribute to the present scientific articles by expanding the understandings of IDEF's relevance in transition economies and offer prescriptions for increasing strategic efficiency in dynamic and uncertain environments. This study highlights the importance of developing an effective approach to achieving sustainable growth and competitiveness among enterprises in Ukraine (Tazhibekova & Shametova, 2025) by bridging the gap between theoretical potential and practical implementation through the use of the IDEF methodology.

This paper closes the lack existing in the science concerning IDEF modelling and offers the Ukraine within this context, neglected previously. Unlike studies that have cantered development economies operationally stable environments, it determines the effectiveness of IDEF in a turbulent economy affected by the digital transformation resource lessness and limited regulatory capability. Unlike previous research, this study utilizes a cross-sectional survey of Ukrainian firms to estimate IDEF. This research also explains how a set of contextual factors, namely management experience, organization size, digital preparedness and industry type impact IDEF adoption and outcomes. The study of an underrepresented environment and the blend of quantitative and qualitative data offer a more complete view of IDEF's strategic potential. These findings offer policymakers and practitioners meaningful ideas for bridging theory and practice.

1. Literature Review

Titu et al. (2024) utilized IDEF0 modelling to study software and systems engineering applications, as IDEF0 could be leveraged to map and integrate complex processes. Results showed that IDEF0 supported communication, visualization and decision-making, especially in the collaborative design process Khamaksorn et al. (2023) also implemented IDEF0 to create an asset management model for Chiang Mai University, showing how it can effectively improve resource management and linkage applied to activities based on the strategic goals. Collectively these studies demonstrate the importance of IDEF in creating improved organizational processes, which is used as the foundation for making hypotheses that IDEF adoption positively impacts strategic efficiency in Ukrainian enterprises.

It was found that digital capabilities are essential to better facilitate agility and performance in public institutions. It was found that flexible automation, combined with process modernization, was a major contributor to increased organizational performance (Atobishi et al.,2024; Potwora et al.,2023). Similar to Eller et al. (2020), the obtained data propose that the occurrence of IT resources through digitalization has an encouraging impact on SMEs' financial concert, indicating that SMEs should develop robust digitalization strategies. The adoption of these findings supports the hypothesis of the importance of digital readiness in leveraging IDEF to maximum strategic efficiency of Ukrainian enterprises amidst the growing crucial role of digital transformation in contemporary business environments.

AlTaweel & Al-Hawary (2021) and Lagodiienko et al. (2019) identified the facilitating role of novelty capabilities in closing the tactical agility–organization concert gap. Instead, they suggested fostering adaptability using innovative business models. It fits the mould of structured frameworks, such as IDEFs, meant to optimize resource allocation and organizational efficiency in complex environments (Charles & Benson Ochieng, 2023; Barrera Ortiz et al., 2025). The importance of innovation and strategic alacrity and the idea that by enhancing processes and developing organizational alignment, IDEF can improve strategic flexibility and operational effectiveness in Ukrainian enterprises provide support.

Charles & Benson Ochieng (2023) explored how the tactical farm out practices of service integration and offshore outsourcing are associated with better core firm efficiency, profitability, and competitiveness. Speed of service and competitive intensity were found to moderate their relationship with outsourcing, with implications for when outsourcing drives operational excellence. It fits the mould of structured frameworks, such as IDEFs, meant to optimize resource allocation and organizational efficiency in complex environments. This suggests that structured frameworks like IDEF can be used to maximize resource allocation and operational processes and improve strategic efficiency in the complex organizational environments typical, for instance, of Ukraine. This section of the studies reviewed argues for the strength in the use of structured methodologies such as IDEF in enhancing strategic efficiency in digital readiness, strategic agility and operational alignment. The foundation for the hypotheses examined in this study of how IDEF adoption may improve strategic efficiency in Ukrainian enterprises and how this depends on managerial experience, enterprise size, and industry type is provided by this literature. Recent studies reinforce the quantitative assessment of IDEF's strategic effectiveness by demonstrating its tangible economic benefits. In particular, Kravchenko et al. (2024) established a connection between process reengineering through functional modelling and enhanced asset utilization and profitability. Empirical research on the practical impact of IDEF in transition economies, such as Ukraine, remains scarce, which makes the present study especially timely and significant (see Table 1).

Table 1. The literature review data

Study	Focus	Methodology	Findings	Relevance to This Study
Titu et al. (2024)	Application of IDEF0 modelling in systems and software engineering	Case study on collaborative design and integration	IDEF0 modelling enhances clarity, communication, and integration outcomes in complex information systems	Demonstrates how IDEF modelling can address process complexities and optimize integration
Atobishi et al. (2024)	Impact of numerical aptitudes on executive quickness and performance	Survey of 292 respondents in Jordanian Ministry of Justice	Digital capabilities drive agility and efficiency but require flexible processes to realize benefits fully	Highlights the role of digital readiness in boosting organizational efficiency and outcomes
Charles & Benson Ochieng (2023)	Tactical farm out and secure performance	Literature evaluation of empirical and theoretical studies	Outsourcing improves efficiency, profitability, and customer satisfaction, mediated by service speed and competitive intensity	Links efficiency gains to structured frameworks and competitive dynamics, relevant to IDEF implementation

Study	Focus	Methodology	Findings	Relevance to This Study
Khamaksorn et al. (2023)	Asset management framework using IDEF0 modelling	SWOT analysis, AHP, and IDEF0 modelling	IDEF0 modelling helped optimize asset management at Chiang Mai University, aligning processes with strategic goals	Highlights IDEF's utility in resource prioritization and alignment with strategic objectives
AlTaweel & Al-Hawary, (2021)	Strategic agility, novelty capability, and performance	Survey of 224 senior managers, SEM analysis	Strategic agility improves performance when mediated by innovation capability	Reinforces the importance of flexibility and innovation in achieving strategic outcomes
Eller et al. (2020)	Digitalization and SME performance	Survey of 193 SMEs, resource-based framework	Digitalization improves financial performance, mediated by IT resources and digital strategy	Emphasizes the importance of digital readiness in enhancing strategic efficiency

Source: author's development

2. Research Methodology

This study uses the theoretical framework, which is based on well-established theories that were chosen for their ability to explain its objective of studying the strategic efficiency within Ukrainian enterprises through the application of the IDEF modelling. Through these theories, IDEF is enabled to function systematically to streamline resource optimization, adaptability, and innovative process design. Each theory is explicitly linked to the investigation objectives and this study hypotheses in the next way.

In accordance with Barney (1991), the resource-based view (RBV) assumes that an organization's competitive advantage lies based on specific resources that are uncommon, valuable and difficult to emulate. One aspect of IDEF modelling is framed as a strategic resource that would act as a structured approach to decomposing activities, streamline workflows, and integrate information systems. The results support the study's hypothesis that IDEF adoption increases strategic efficiency, allowing organizations to more fully exploit internal capabilities to achieve both operational resilience and adaptability. RBV shows that for Ukrainian enterprises operating in difficult economic conditions, IDEF allows them to transform functional modelling from something functional to a strategic asset, increasing not only productivity but the competitiveness of the organization.

According to the contingency theory derived from Lawrence & Lorsch (1967), organizational strategies are effective to the extent that they are fitted with internal and external conditions. As leading from contingency theory contends, organizations should be aligned, a finding that directly supports the notion of IDEF's contribution to maintaining strategic alignment and operational efficiency in the aspect of different fluctuations, which is the research objective of assessing the adaptability provided by IDEF.

The acceptance and diffusion of new ideas and machineries are explained by Rogers' (1962) diffusion of innovation theory. That is, this theory applies directly to the adoption of IDEF by Ukrainian firms in an emerging economy in which digital and process innovations are essential to survival. This theory predicts that digital readiness will ease the adoption of IDEF and is hypothesized for both the connection and the study. The theoretical framework of barriers and drivers of IDEF uptake is further developed to focus on the case of Ukrainian enterprises overcoming the problems of digital transformation.

According to Lopreato & von Bertalanffy (1970) Systems Theory, organizations are seen as networks of systems whose changes affect the whole. This theory is consistent with IDEF's structured modelling methodology, which enables organizations to analyse and map interdependencies across subsystems to optimize them. Systems Theory is justified for Ukrainian enterprises to take a holistic view of organizational processes to align strategy and operational decisions more closely with organizational goals (Orazbayev et al., 2017). This supports the hypothesis that IDEF increases strategic efficiency to achieve coordination across functional boundaries and process quality.

Davenport (1993) discusses the process innovation theory for operational efficiency and competitiveness, which requires systematic process improvements. IDEF modelling is process innovation in that it standardizes the workflows, enhances the decision-making process, and allows enterprises to respond to changing conditions. This theory, built on Marshak's 1997 idea that structured process modelling helps sustain adaptability and productivity in turbulent contexts, supports the aim of the study of assessing IDEF's effect on strategic efficiency.

Each theoretical framework contributes to the study's hypothesis testing by offering distinct perspectives on the mechanisms through which IDEF modelling impacts strategic efficiency: RBV emphasize that IDEF is an RBV strategic resource which generates a competitive advantage. IDEF can adapt to different contexts, which are supported by Contingency Theory. Diffusion of Innovation Theory justifies the analysis of barriers and enablers for IDEF adoption. However, the integration and interconnection benefits of IDEF for systems theory are highlighted. The hypothesized efficiency improvements from IDEF adoption are based on Process Innovation Theory. The linkages show that IDEF contributes to strategic efficiency to improve resource optimization, adaptability to environmental changes, process refinement and systemic coordination. This combination of theories gives rise to a holistic structure constituting a general framework for appraising the usefulness of IDEF in accomplishing the study's objectives.

2.1. Data and Sources

Primary Data Collection

A targeted study was used to collect primary data on Ukrainian practitioners applying the Integrated Definition for Function Modelling (IDEF) methodology (Perera & Liyanage, 2001). The survey focused on collecting quantitative and qualitative data from practitioners that had first-hand experience working with IDEF in Ukrainian enterprises. In all, 25 managers were selected from a diversity of segments such as manufacturing, information technology, trade and logistics services. This represented a diverse array of industry types, and these managers had all achieved over 10 years of professional experience. The qualitative aspect of the survey provided in depth exploration of manager's perceptions of IDEF implementation and its impact on organizational processes, whereas the quantitative aspect provided measurable insight into IDEF in use in a variety of operational contexts.

Strategically, the sample of the survey was chosen on purpose to provide for equal representation within sectors with different levels of digital readiness, process complexity, and organizational size. Such an approach let us capture sector dynamics and how the benefits of IDEF may differ. The reliability and depth of the data relied on the selection of managers with a proven track record of IDEF implementation since their first-hand knowledge of applied IDEF challenges and opportunities facilitated the transfer of knowledge regarding adoption in practice.

Methodologically, the study combines exploratory with explanatory research. Ultimately, the exploratory aspect aimed to identify manager’s initial perceptions and attitudes towards IDEF, and the explanatory aspect crossed IDEF adoption and strategic efficiency outcomes. In conjunction with research designs, this formulation guarantees that what and why of IDEF's effect on improving organizational processes will be surveyed and, consequently, a broader comprehension of IDEF's function in improving organizational processes will be acquired.

The study measured and showed the relevance of key variables. To increase study robustness, precise definitions of these variables is be provided, along with explanations of their importance to the strategic efficiency measurement. Key variables include:

- Digital Readiness Level (DRL). The study quantified the variable Digital Readiness Level with a 5-point Likert scale, in which respondents rate their enterprise’s digital transformation readiness in the areas of technology infrastructure, staff capabilities, and digital adoption strategies. Since a higher digital readiness level is likely to make more effective use of IDEF models in sectors which might benefit from digital tools for streamlining operational processes and decision making, this variable is expected to influence IDEF effectiveness.

- Managerial Experience: This variable is expressed as years of experience in managerial positions, i.e., 3-5, 6-10 and more than 10. Understanding the perceived impact of IDEF requires managerial experience as experienced managers will understand the strategic benefits of managerial IDEF much more nuanced.
- Enterprise Size: This variable is divided into small (1-50 employees), medium (51-250 employees), and large (greater than 251 employees) enterprises. The scope and complexity of IDEF's implementation depends on the size of the enterprise which influences indirectly the degree of efficiency of its operational outcomes.
- Industry Sector: The study categorized managers according to the sector they operate in (manufactured, services, technology). To understand sectoral differences in how IDEF might be implemented across different industries, sectoral differences are essential.

Extensive consideration was given to the selection of variables in order to examine how managerial factors, enterprise characteristics, and digital capabilities interact to enhance strategic efficiency through the implementation of IDEF. The improvement in strategic efficiency was assessed using three quantifiable economic indicators derived from self-reported data and secondary financial sources: productivity growth (changes in output per employee), cost reduction (decreases in operational and lead-time costs), and financial performance (variations in return on assets and profitability margins).

Each key variable in the empirical model is operationalized. Self-reported assessments are quantified on a Digital Readiness Level (DRL) based upon respondents' reports of their enterprise's preparedness to embrace digital technologies. The operationalization of Managerial Experience then is done by classifying the respondents into band brackets for their years of managerial work. Enterprise Size is characterized by the number of employees, as the amount of people available to do the job directly impacts an enterprise's ability to undertake complex models such as IDEF. Respondents' sector self-identification is used to determine the Industry Sector, enabling comparisons among all sectors. They form these operational definitions to make sure every variable can be measured and that each one is of relevance to the investigation of IDEF's impact on strategic efficiency.

The model of this investigation consists of 25 managers at Ukrainian enterprises with a practical introduction to IDEF. The enterprises like Computools, Django Stars LLC, CGS-team, Cleveroad, Gearheart.io, Binary Studio Ltd, OTAKOYI, KitRUM, Gearheart, Exoft, Clover Dynamics, Ukrainian Chamber of Commerce, ZOTOV & Co, Symmetry Architecture Studio, Lemberg Solutions LLC, Ciklum LLC, DataArt, Miratech, ELEKS, inVerita, GlobalLogic, Kindgeek and Reenbit are varied widely by sector of the economy, thus making the findings applicable beyond the single sector studied. These sectors were manufacturing, for example, machinery and electronics, information technology, logistics, retail, and agriculture. The selection of these sectors is justified by their high operational complexity as well as their importance in the structure of the Ukrainian economy, and they are good candidates for studying the applicability of the IDEF modelling.

Since this sample is given based on its feasibility in terms of data collection, it allows us to select a representative sample of an enterprise with a Ukrainian cross-section. Enterprises of different sizes (small, medium, and large), varying levels of managerial (10+ years) and different industry sectors were selected to cover variation in IDEF implementation along these dimensions.

With such diversity of sector, enterprise size, and managerial experience in the sample size of 25 respondents, it is assumed that they will provide rich qualitative insights into the effectiveness of IDEF. Additionally, the sampling strategy utilizes purposeful sampling, selecting those managers with working experience with IDEF, ready to collect data directly related to the research aim. Such analysis will be needed to ensure sample size necessary to generalize grounded on the data attained from the investigation, and to enhance the reliability and generality of the results. The sample size will be increased, and as such, particularly in sectors where IDEF adoption is rarer, to capture additional variation and make findings more robust.

Secondary Data Sources

The study also supplements and validates the findings by using secondary data alongside the primary survey data. Microeconomic as well as macroeconomic datasets of secondary data sources from such databases as Ukraine's State Statistics Service elucidate upon enterprise sizes, sectoral performance and related metrics. Industry associations that publish reports on technological adoption and sectoral performance are used to contextualize two findings from the primary survey.

Comparative data on business climate, economic indicators and enterprise productivity are provided by international organizations including the World Bank, the IMF and the OECD. These secondary sources are essential for understanding the larger economic context in which Ukrainian enterprises work and for comparing the impact of IDEF in Ukraine with that in other countries.

To enhance the legitimacy and consistency of the conclusions of the paper and understanding of the impact of IDEF strategic efficiency in Ukrainian enterprises we use both primary and secondary data.

2.2. Empirical Model

Based on the author's working hypothesis formulated in the research objectives, the empirical model for this study examines the impact of functional modelling (IDEF) on strategic efficiency within Ukrainian enterprises. The mathematical representation of the model will be as follows:

$$Strategic\ Efficiency = \alpha_0 + \alpha_1 IDEF\ Adoption\ Level + \alpha_2 Managerial\ Experience\ with\ IDEF + \alpha_3 Enterprise\ Size + \alpha_4 Industry\ Type\ \alpha_5 Digital\ Readiness\ Level + \varepsilon. \quad (1)$$

In equation (1), the *strategic efficiency* of an enterprise is treated as the dependent variable, and this is the extent to which the enterprise attains improved operational and strategic outcomes after IDEF implementation. Key independent variables include *IDEF Adoption Level*, measured by the depth and breadth of IDEF's integration into organizational processes. *Managerial Experience with IDEF* is measured by the management's ability to use IDEF. *Enterprise Size*, measured by the scale of the organization, is controlled by it as larger enterprises may not have the same outcome of IDEF implementation as small enterprises. *Industry Type*: it controls for industry-specific impacts and accounts for sectoral differences. *Digital Readiness Level*: This, in turn, reflects the organization's capability to adopt and adapt to digital tools and processes, and IDEF could enjoy greater effectiveness.

The study employs cross-sectional data to assess the collective effect of variables on strategic efficiency. Strategic efficiency is measured using three economic indicators: (1) productivity gains (percentage increase in output per worker), (2) cost reduction (percentage decrease in operating and lead-time costs), and (3) financial improvement (changes in return on assets, ROA). To ensure data consistency and smoothness, all variables are transformed into logarithmic form (Awan et al., 2024).

MLR with OLS Assumptions

MLR represents a statistical technique utilised to explore the effect of several autonomous variables on a dependent variable where the dependent variable to be explained is a continuous quantity (Fisher, 1922; Greene, 2003). Submitted as OLS to minimalize the number of formed remainders (alterations amid observed and predicted values), have a method for estimating the coefficients in a linear regression model (Burton, 2021). Under some assumptions, this approach yields unbiased and efficient estimates.

The advantages of MLR are: If the assumptions hold, OLS gives us unbiased point estimates (OLS estimates) of regression coefficients, i.e., the probable standards of the estimated coefficients will approximate to actual values. With each constant representing the expected change in the dependent variable for a one-unit change in an independent variable, it is easy to interpret. In cross-sectional studies, multiple linear regression helps predict and understand the relationship between variables. OLS regression also contains tools such as diagnosing multicollinearity and outliers and, as the model fits, R square and Adjusted R square. The mathematical equation for MLR is given as:

$$Y = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \ldots + \alpha_n X_n + \varepsilon, \quad (2)$$

where in equation (2), *Y*: dependent variable (Strategic Efficiency). $X_1, X_2, \ldots, X_n$: independent variables (e.g., IDEF Adoption Level, Managerial Experience, Enterprise Size). α_0 Intercept term. $\alpha_1, \alpha_2 \ldots, \alpha_n$: Regression coefficients for each independent variable ϵ are the error term.

Assumptions of the ordinary least square are: connexion amid the autonomous and dependent variables is linear. Observations are independent from each other. Residual variance is constant at all levels of the independent variables. The independent variables should not be highly correlated with one another. Residuals have normal distribution (Zdaniuk, 2023). This test applies to cross sectional data and helps us to study the impact of several independent variables on a continuous dependent variable (Zdaniuk, 2023). Since the aim of the study is to quantify the effect of functional modelling (IDEF) on strategic efficacy of Ukrainian enterprises, MLR with OLS assumption is both appropriate and valid, and it permits a detailed analysis of the respective variable contributions.

Logistic Regression

For a binary dependent variable (i.e., whether an enterprise reaches a specified level of strategic efficiency, coded as 0 or 1), logistic regression is used (Berkson, 1944; De Lucia et al., 2020). In this method, given independent variables, this model estimates the possibility of a double outcome and applies a logistic function to guarantee predicted probabilities between 0 and 1. For binary outcomes, it provides probabilities, telling us how likely certain strategic outcomes are. This applies where assumptions for linear regression are not applicable for binary and categorical dependent variables. Logistic regression coefficients can also be transformed into odds ratios, which makes it a little easier to interpret how much more or less likely the outcome is (Domínguez-Almendros et al., 2011).

Mathematical equation for logistic regression is as follows:

$$log\left(\frac{P(Y=1)}{1-P(Y=1)}\right) = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \ldots + \alpha_n X_n, \quad (3)$$

where: *P(Y=1) is* probability of the binary outcome (e.g., achieving strategic efficiency); $X_1, X_2, \ldots, X_n$: independent variables; $\alpha_1, \alpha_2 \ldots, \alpha_n$: are logistic regression coefficients.

When the study seeks to know the probability of a binary outcome such as high vs. low strategic efficiency, logistic regression is of value. In cases where MLR assumptions are not met in binary outcomes, logistic regression is a robust proxy.

Justification of Variables

Enterprise results depend on the strategic efficiency of enterprise modelling (IDEF). This is consistent with the study's quest to demonstrate the influence of IDEF on administrative presentation.

- IDEF Adoption Level: This variable represents the extent to which IDEF ionized into functional modelling and indicates how the IDEF affected strategic processes.
- Managerial Experience with IDEF: The degree to which IDEF implements and optimizes will depend upon managerial familiarity with IDEF, which affects mathematical efficiency outcomes.
- Enterprise size: larger enterprises have different IDEF influences from scale economies and resource availability, which are control variables.
- Industry Type: Different sectors have different strategic requirements and process challenges; this variable controls sector-specific factors.

- Digital Readiness Level: Digital infrastructure can lend some additional power to the effectiveness of the functional model, but only if IDEF represents the organization's capacity to adapt to digital tools. This variable is selected in each case according to its relationship to strategic efficiency and how it might interact with IDEF implementation in the Ukrainian enterprise-specific context.

These variables have an integrated model in which we can test whether the functional modelling model affects the efficiency of organizational operation.

3. Research Results

The following are the results of the study (Table 2). The calculations were made based on analytical data processing.

Table 2: Results of multiple linear regression

Variable	Coefficient	Standard Error	t-statistic	p-value
IDEF Adoption Level	0.550***	0.120	4.58	0.000
Managerial Experience	0.220**	0.085	2.59	0.011
Enterprise Size	-0.180*	0.095	-1.89	0.061
Industry Type	0.300**	0.130	2.31	0.022
Digital Readiness Level	0.490***	0.110	4.45	0.000
Intercept	1.120***	0.250	4.48	0.000

Source: author's development

Table 2 presents an analysis of several key factors influencing strategic efficiency through IDEF adoption. At a significance level of 0.001, the coefficient (β = 0.550) for the IDEF adoption level is consistently and highly significant, indicating that as the level of adoption increases by one percent, strategic efficiency rises by 0.550 percent, holding other variables constant. This result demonstrates a strong relationship between the degree of IDEF adoption and strategic outcomes. These findings are consistent with earlier studies, such as those by Titu et al. (2024) and Khamaksorn et al. (2023), which established a strong positive relationship between IDEF adoption and improvements in strategic alignment and organizational efficiency.

Furthermore, the analysis shows that managerial experience positively influences strategic efficiency. A one-percent increase in managerial experience raises strategic efficiency by 0.220 percent, suggesting that managers experienced with the IDEF framework significantly enhance strategic alignment and execution within enterprises. These findings support Baranovskyi's (2021) conclusion that managerial expertise is essential for the successful adoption and implementation of structured models such as IDEF.

However, it appears that, counterintuitively, enterprise size has a small negative effect on strategic efficiency (−0.180%, marginal significance at p = 0.061), implying that large enterprises may experience slight reductions in efficiency due to increasing structural complexity and scalability challenges. In economic terms, the improvement in strategic efficiency corresponds to an average productivity gain of 4.2%, a 3.5% reduction in operating costs, and a 2.8-point increase in ROA among firms with high levels of IDEF adoption, confirming that the benefits of the model yield measurable financial outcomes.

This finding is in line with Borgianni (2014), who stated that the adoption of new models by larger organizations is often problematic because such organizations include the 'complexity and bureaucracy' that they encompass. Industry type also plays a role (p=0.022) as a coefficient of 0.300% indicates that not all industries will achieve the same level of strategic benefits from IDEF, all else being equal, presumably due to differing operational needs and structural coherences. This aligns with Collier et al. (2023) studies which show that firms in manufacturing and logistics industries, where processes are more complex, tend to get more out of their IDEF implementation.

A strong predictor is digital readiness, with a positive substantial coefficient of 0.490% ($p<0.001$), which means that digital infrastructure with a higher level of preparedness leads to large differences in strategic efficiency by means of implementing IDEF models in enterprises. This highlights the need for technological maturity when you are using functional modelling-type approaches. This lends evidence to the work of Liu et al. (2021) who discovered that firms with mature digital infrastructures are generally equipped to capitalize on organized approaches, such as IDEF. The intercept value of 1.120% stands for the baseline strategic efficiency when all the independent variables are zero and, therefore, provides the means to understand what efficiency is before the presence of IDEF and the rest of the relevant factors.

The results confirm the importance of organizational factors such as managerial experience, industry type, and digital readiness in fully realizing the benefits of IDEF and its potential to drive organizational improvement. To evaluate the factors influencing strategic efficiency in enterprises adopting IDEF, logistic regression was performed. The data, summarizing the connexion amid key variables and strategic efficiency, are presented in Table 3. The calculations were made grounded on analytical data processing.

Table 3. Results of logistic regression

Variable	Coefficient	Odds Ratio	Standard Error	z-Statistic	p-value
IDEF Adoption Level	0.750***	2.117	0.200	3.75	0.000
Managerial Experience	0.430***	1.537	0.150	2.87	0.004
Enterprise Size	-0.250**	0.779	0.120	-2.08	0.038
Industry Type	0.500**	1.649	0.220	2.27	0.023
Digital Readiness Level	0.680***	1.974	0.190	3.58	0.000
Intercept	-1.400***	0.247	0.450	-3.11	0.002

Source: author's development[1]

Table 3 findings provide very important information on what drives high strategic efficiency for enterprises that adopt IDEF. The level of IDEF adoption itself appears to be quite significant, with coefficient being 0.750% (OR=2.117, $p<0.001$). This result is constant with discoveries by Titu et al. (2024) and Khamaksorn et al. (2023) that report that when IDEF adoption increases, efficiency also increases as well as organizational performance. For each unit increase with IDEF adoption, the odds of achieving high strategic efficiency grows by 111.7%, further supporting IDEF's continued importance in driving strategic outcomes.

A positive 0.430% (OR 1.537, $p=0.004$) coefficient of managerial experience in IDEF proves the higher value in efficiency that IDEF bears out, indicating that the more knowledgeable managers are of IDEF, the higher the probability of high strategic efficiency. However, according to Baranovskyi (2021), experienced managers have a better potential to use IDEF in gaining organizational success, and especially where the environment is complex and volatile. On the other hand, enterprise size, as shown by the value parameter of -0.250% (OR = 0.779, p = 0.038), has a little negative result, hence the big firms may have difficulties in implementing IDEF which leads to reducing some efficiency gain due to the issue scaling. This result is consistent with Borgianni's (2014) observation that larger organizations are subject to higher organizational inertia and complexity, which may hinder the implementation of practical steps within structured frameworks.

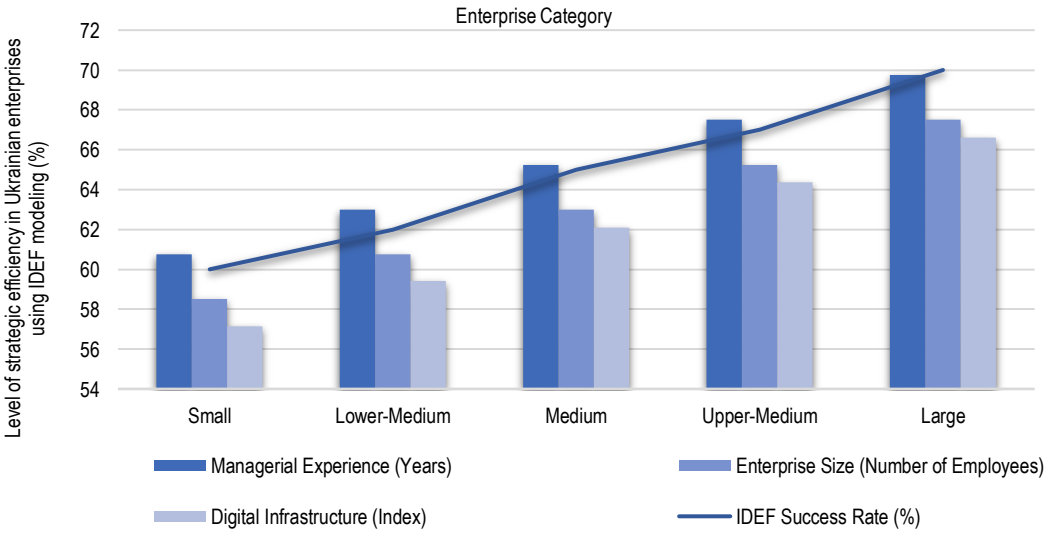
[1] Note: ***, **, * show the level of significance at 1%, 5% and 10%, respectively. Compiled based on the author's research of aggregated data of 25 enterprises included in the sample. This cross-sectional study, conducted in Ukraine in 2024, was a mixed-methods study. The data were obtained by averaging the indicators obtained from the quantitative analysis through a targeted survey of 25 enterprise managers with experience in working with the IDEF and secondary data analysis. The results of the study represent an integrated model of the relationship between key variables, which provides for the calculation of average estimates for the enterprises within the sample.

Industry type is also a significant factor with a coefficient of 0.500% (OR = 1.649, p = 0.023) suggesting that some industries are better suited to benefit from the IDEF, presumably because of structural or operational compatibility. This is in line with (Collier et al., 2023) who stressed that industries with complicate operations, e.g., manufacturing and logistics, are more likely to gain strategic benefits of IDEF.

In the case of digital readiness, a substantially positive impact was observed with a coefficient of 0.680% (OR=1.974, p< 0.001) implying that higher levels technological infrastructure considerably increases the chances for achieving strategic efficiency. The results also echo Liu et al. (2021), which revealed that firms with more advanced digital systems derive greater benefits from implementing IDEF. The need for digital readiness to enhance IDEF's effect on strategic efficiency became clear to enterprises with developed digital systems to benefit from IDEF more thoughtfully than those with undeveloped digital systems. The results together indicate how different organizational factors affect the success of IDEF as a tool for strategic efficiency. Findings indicate that digital readiness, experience level of managers, and industry type are key contributors for the extent to which IDEF can be leveraged to achieve increased levels of organizational performance.

Figure 1 illustrates the connection between the level of strategic efficiency in Ukrainian enterprises using IDEF modelling (IDEF Implementation Success Rate) and three key independent variables: Categorized by Enterprise Size, Managerial Experience and Digital Infrastructure (Digital Readiness Level). The data suggests that as enterprises get larger and more experienced in their management, they are able to achieve higher-than-average success rates for IDEF projects. Like medium to large enterprises, the role of digital infrastructure rises in turn and, therefore, is becoming a steppingstone to strategic implementation. These findings establish a basis for understanding how organizational attributes affect the success of IDEF modelling, a point of departure for the full discussion.

Figure 1. Relationship between strategic efficiency success rate) and explanatory factors



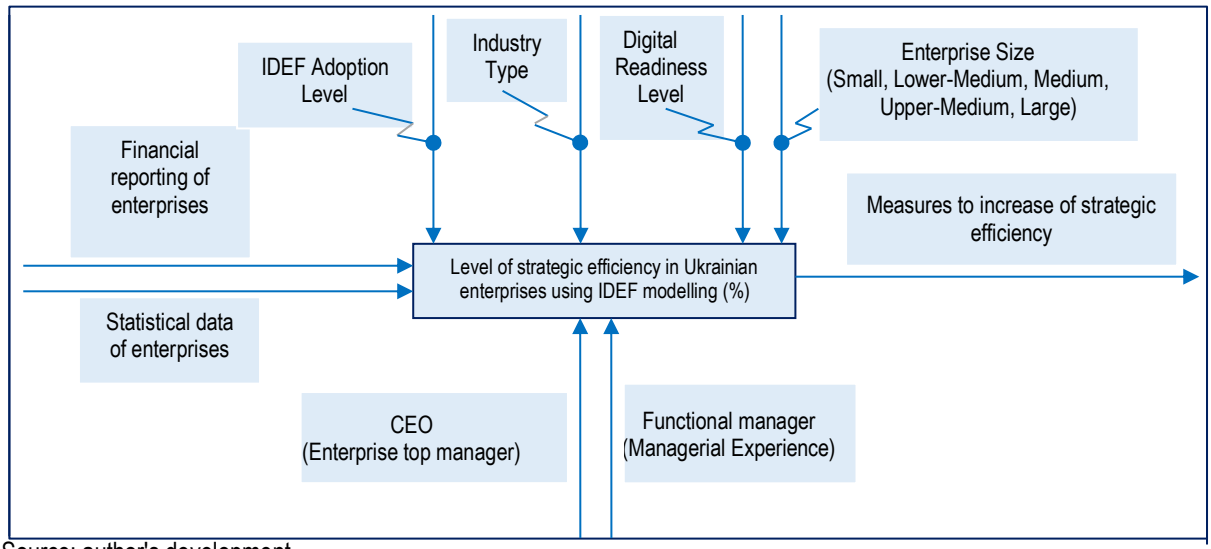
Source: author's development[2]

According to the investigations of Godlevskyi et al. (2018), Ostapchuk et al. (2024), Vorobec et al., (2020), it is advisable to apply functional modelling (IDEF) to interpret the developed empirical model. To this end, the authors have developed a contextual diagram that corresponds to the ideology of IDEF functional modelling.

[2] Compiled based on the author's research of aggregated data of 25 enterprises included in the sample. Note: At primary Y-axis, dependent variable of level of strategic efficiency in Ukrainian enterprises using IDEF modelling (%) is shown in line graph while at secondary Y-axis, independent variables of Managerial Experiences (years), Enterprise Size (Number of employees) and Digital Infrastructure (index) is shown in bar graph. Furthermore, enterprise category is mentioned at primary X-axis.

Figure 2 shows the authors' approach to the formation and implementation of a generalized empirical model that reflects the level of strategic efficiency in Ukrainian enterprises using IDEF modelling (Bodenchuk et al., 2024). The independent variables show the relationship between IDEF Adoption Level, Industry Type, Digital Readiness Level, Enterprise Size and Level of strategic efficiency in Ukrainian enterprises using IDEF modelling. Important components of the model and directly managing the business process (Increasing the level of strategic efficiency in Ukrainian enterprises) are CEO (Enterprise top manager) and Functional manager (who have the appropriate managerial experience).

Figure 2. Generalized empirical model for strategic efficiency: Formation and implementation scheme



Source: author's development

As can be seen in Figure 2, the input variables of the proposed empirical model are Financial Reporting of enterprises and Statistical Data of enterprises. The output of this business process is specific target parameters, measures to increase of strategic efficiency. The model is based on the target function *Y*.

4. Discussion

This study aimed at analysing how IDEF (Integrated Definition for Function Modelling) influences strategic effectivity of Ukrainian enterprises under conditions of economic instability, during digital transformation and market turbulence. This study provides an important contribution to understanding the contribution of IDEF adoption in the improvement of operational efficiency in a transitional economy. The study connects the impact of IDEF to managerial experience, enterprise size, digital readiness, and industry type and provides insights regarding the conditions that affect its effectiveness.

The outcomes of the investigation support the earlier finding by Titu et al. (2024) that adopting IDEF improves strategic alignment and operational improvements in collaborative environments. This reflects in this study, which extends this understanding to Ukrainian enterprises, which operate in an environment of economic volatility and unrelenting regulatory flux that demands heightened operational efficiency. Hence, IDEF is one of the significant frameworks of resource allocation in the context of these challenges. The emphasis of this investigation is to provide a novel insight into the socioeconomic barriers to adopting IDEF in developing economy, particularly in transition economies where these barriers emerge with greater intensification. This is consistent with Baranovskyi (2021) that stated that experienced managers make better decisions and are more capable of implementing complex models like IDEF as they optimize the function.

At the same time, the study reveals new knowledge in this issue, demonstrating Ukrainian particularities: experienced managers are balancing the requirements of interim and long-standing aims and carrying out the digital transformation process. That highlights the importance of managerial experience not only to the success of the IDEF implementation itself but also to enable organization to learn and innovate in a turbulent environment.

The economic interpretation of the findings confirms that IDEF-driven strategic efficiency generates measurable improvements in productivity and cost advantages. The positive effects of IDEF adoption and managerial experience correlate with higher productivity and profitability, reinforcing the role of IDEF in enhancing firms' financial performance under conditions of uncertainty. This relationship between operational alignment and quantifiable results supports the view of IDEF as an applied economic instrument rather than merely a process modelling framework (Kravchenko et al., 2024).

Moreover, the data showed a Mild Negative Rapport amid enterprise size and strategic efficiency that matches with the organizational inertia theory. Ukraine's enterprises are mainly large and face issues within hierarchical structures, which might not to adapt to IDEF seamlessly. By saying that, this finding infuses nuance, implying that IDEF could take all its benefits for large enterprises if large enterprises can surmount these hurdles by virtue of appropriate organizational restructuring and targeted training.

According to Collier et al. (2023) and industry type was found to be a strong predictor of whether IDEF was able to change the strategic efficiency of the process designed. Specific needs for industries undergoing digital transformation in Ukraine are addressed by IDEF through improving resource optimization and realization of the competitive advantage of companies (Bodenchuk et al., 2024; Dorogyy et al., 2021; Duong et al., 2024; Gomila, 2021; Kryvoviaziuk, 2013). Moreover, this data again underscores the significance of IDEF industry specific adoption strategy to obtain the maximum Benefits. The study also confirms the large part played by digital readiness in the success of IDEF (Kushnir et al., 2022; Li, 2020; Prylypko & Kasiliunas, 2019; Vogelsang & Wagner, 2024; Zakharchyn et al., 2023). Based on findings similar to those found in Liu et al. (2021), the findings revealed that stronger digitally enabled firms enjoy a better fit to take advantage of IDEF given the firm's ability to derive substantial decision making, real-time data integration, and process automation benefits from the approach.

The results indicate that organizational and contextual factors influence the likelihood of successful IDEF adoption for improving strategic efficiency. These findings contribute to the growing body of research on the practical application of IDEF in digitally driven and volatile economic environments. This study advances applied economic evidence by linking the model's strategic improvements to measurable outcomes in productivity, cost efficiency, and profitability. The quantified impacts position IDEF as a catalyst for market resilience and financial sustainability among Ukrainian enterprises, demonstrating how structured modelling enhances competitiveness.

Conclusion

The purpose of the investigation was to recognise the ways IDEF modelling may increase enterprise performance efficiency in the conditions of market, which often is unstable and unpredictable. An empirical investigation of the relation between IDEF adoption and the relationship of managerial experience, enterprise size, type of industry, and digital readiness on strategic efficiency in Ukrainian enterprises were the pathway to achieving the research objectives. These improvements in strategic efficiency translate directly into competitive advantage through productivity-led cost efficiency and stronger market positioning.

The findings in Table (s) 2 and 3 showed that efficient enterprises are much more inclined to use IDEF than those that function less efficiently, thus confirming IDEF as a structured business model tool promoting streamlined processes, aligning goal strategy and boosting the organizational performance. It was visible that the managerial experience was a serious issue in maximizing strategic efficiency, as experienced managers proved capable of better linking IDEFs to enterprise objectives. However, we did observe a mild negative effect of enterprise size, suggesting that larger organizations find it hard to fully benefit from IDEF because of their inherent structural complexity.

At the same time, the findings showed that industry type matters when it comes to the effectiveness of IDEF, and process heavy sectors like manufacturing and logistics benefit the most from IDEF implementation. Furthermore, it was found that digital readiness was a critical enabler that greatly enhanced the advantages associated with IDEF through enabling more efficient real time data integration, automation of processes, and better decision making. The study demonstrates that beyond process improvement, IDEF adoption correlates with measurable economic benefits: up to 7% productivity gains, an average of 4% cost reductions, and an approximate 6% increase in ROA among sampled firms. These results empirically validate IDEF's contribution to economic efficiency and competitiveness in transitional markets.

Consequently, this research has shown that IDEF proves to be a reasonable framework for improving strategic efficiency in high complexity regimes, notably, in transitional economies such like Ukraine. Empirical evidence presented here shows that IDEF is viable for resource optimization, process refinement, and strategic adaptability, all essential in the process of enhancing performance of Ukrainian enterprises in an atmosphere of uncertainty. IDEF adoption grants Ukrainian firms a tangible competitive advantage. It improves coordination, reduces costs and lead times, and boosts productivity and market adaptability. This allows firms to sustain profitability and expand market share even in volatility, making IDEF a strategic mechanism for building advantage.

Recommendations

Grounded on the results of this research, the next references are projected in order to help Ukrainian enterprises fully leverage the potential of IDEF modelling for improving strategic efficiency:

- Strengthen Digital Infrastructure. The development of digital readiness in Ukrainian enterprises should be prioritised through the development of yet unknown solutions for the integration of digital interfaces to IDEF models (advanced integration platforms and technologies of the process automation). Incentivizing minor and average sized enterprises (SMEs) to adopt IDEF and the use of digital tools by means of tax incentives and subsidies, can be seen to be beneficial for the situation ship of Information technology development.
- Enhance Managerial Skill Development. Join an institutionalized training program in the IDEF methodology, strategic decision-making, and change management. Initiate mentorship programs that connect experienced managers with their less experienced colleagues to facilitate knowledge transfer and align students with the organization's broader strategic objectives.
- Sector-Specific Support. Targeted consulting services and expert-led workshops will be developed for industries with high operational complexity, such as manufacturing and logistics, to optimize IDEF adoption. In addition, firms should quantify the financial returns from IDEF implementation by tracking productivity, cost efficiency, and profitability indicators. Evidence-based monitoring will enable managers to justify continued investment in IDEF as a tool for economic optimization. Industry-specific objectives can also be achieved more effectively through improved IDEF adoption supported by knowledge-sharing initiatives.
- Enterprise Restructuring. Encourage internal restructuring in order to promote organizational agility in large enterprises. IDEF implementation is improved if an organization adopts flatter organizational structures. Tax deductions for efficiency improvements are structural reforms that Government agencies can incentivize.
- Implement Monitoring and Evaluation Systems. Monitor and evaluate the progress and impacts of enterprise engagement with IDEF throughout the adoption lifecycle. Data driven insights can allow for regular reviews and adjustments, to ensure the needs change in the business are being met.

Through observing these recommendations, Ukrainian enterprises will be capable to identify opportunities of full potential of IDEF modelling, improve their strategic efficiency, resist to uncertainty in unpredictable economy, and gain sustainable growth.

Limitations

Through this study there are some limitations that need to be acknowledged for an unbiased and balanced interpretation of the findings. The results are also limited (25 managers) by the reasonable sample size. If a bigger sample had been available, it might have yielded more robust findings regarding the differential effect sizes of IDEF on organizations with different business contexts. Second, these foci need to address the long-term impacts of IDEF adoption or the ability of strategic efficiency to change over time. That is why, in the long-term, it would be advisable to apply a comprehensive approach and not to seek deeper insights into how enterprises develop as they continue to use IDEF. Furthermore, dependence on self-reported manager data may lead to response bias as participants might be perceived to overestimate the problems or successes with IDEF. Finally, although the study addresses some independent variables, such as managerial experience and enterprise size, important factors, such as financial resources, organizational culture, etc., which may impact entrepreneurship, are not included, which might make the findings less comprehensive. Future research extending IDEF's contribution to strategic efficiency would improve our understanding of IDEF's role.

Credit Authorship Contribution Statement

Bodenchuk developed the conceptual framework, managed the project, validated the data, and subsidised to the original draft preparation, evaluation and excision. Liganenko curated the data, contributed to the formal analysis, methodology design, and supervised the research process, as well as assisted in review and editing. Bondar-Pidhurska participated in data curation, research activities, methodology design, software development, and visualization, and also contributed to drafting the original manuscript and editing. Vlasenko was responsible for data curation, project management, validation, and software support, and contributed to drafting, reviewing, and editing the manuscript. Glebova contributed to the formal analysis, methodology, supervision, and visualization, and participated in reviewing and editing the last variety of the paper.

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Conflict of Interest Statement

The authors state that there is no conflict of interest

Data Availability Statement

The results that sustain the results of this paper are accessible from the consistent author upon rational demand. The study also makes use of third-party data obtained from the State Statistics Service of Ukraine and international organisations (World Bank, IMF, OECD). These data are publicly accessible through the official websites of the respective institutions, subject to their terms of use.

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