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Organisational justice and employee commitment in Nigeria banking sector

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Abstract. Despite the potential benefits of incorporating organisational justice and employee commitment into daily operations, many organisations lack a long-term strategy for doing so, making it a pressing issue. Therefore, the purpose of this study was to analyse and examine organisational justice and employee commitment within the banking industry in Nigeria. The research collected primary data through the completion of 147 questionnaires out of a total of 192. The collected data underwent data testing and analysis through the application of descriptive statistics, multiple regression, and correlation coefficients with the assistance of the statistical package for the social sciences. The findings of the study indicate that there is a significant relationship between organisational justice constructs and employee commitment. Results show that there is a strong and significant relationship between distributive justice and affective commitment in the Nigerian banking industry ($R = 0.807$, $F^* = 2,712.536$, $p < 0.05$), and the regression result suggests that the independent variables (distributional justice) have a significant relationship with affective commitment. The findings highlight that organisations prioritise the implementation of fair and just procedures, encompassing both distributive and procedural justice. Results show that there is a significant positive relationship between procedural justice and continuance commitment ($R = 0.874$, $F^* = 2,122.507$, $p < 0.05$), and it was determined that there is a linear correlation between the model's dependent and independent variables. These findings emphasise the importance of fair and just procedures within organisations to elicit favourable responses from employees, such as commitment, positive behaviour,

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and increased productivity. The conclusions were drawn from the findings, and thus it is recommended that employers should recognise the significant benefits that organisational justice can bring in terms of employee trust, commitment, and overall organisational success. Practitioners can use the study's findings and suggestions to guide the development of socialisation, involvement, training, and development systems in their own organisations

Keywords: fair procedures; distributive; procedural; affective; continuance; survey

● INTRODUCTION

There has been a shift in perspective on the value of employee treatment in recent years. Organisations are shifting from being seen as places where people work to being seen as places where people can flourish. This change stems from the realisation that people's reactions and performance are impacted by the way they are treated. The concept of organisational justice has recently gained prominence in academic discussions, with an emphasis on the value of equity in the workplace. There is a heightened focus on achieving and maintaining organisational justice within the company, recognising its impact on both employee well-being and overall organisational effectiveness.

According to C. Supriya & S. Dadhabhai (2020) this emphasis on organisational justice underscores its crucial role in shaping corporate structure and culture. Fairness and justice in an organisation's practices, policies, interactions, and distribution systems inspire greater loyalty from workers. Employee outcomes are also improved when organisational justice is fostered, as noted by E.A. Tafamel & O.D. Akrawah (2019). There is no universally accepted definition of organisational justice, so scholars have come up with their own. Organisational justice, as defined by J.O. Ohiorenoya & E.O. Eguavoen (2019), is the degree to which employees feel they are being treated fairly, in particular with regard to the organisation's compensation practices. To put it simply, organisational justice ensures that workers are paid fairly in relation to the time and effort they put into their jobs. According to X. Pan *et al.* (2018), organisational justice is the belief that all employees are treated fairly. An effort to define and clarify justice's function in workplaces has given rise to the concept of workplace justice. Procedural justice and distributive justice are the two pillars that make up organisational justice. Workers evaluate the fairness of their treatment by comparing the system's inputs with their outcomes; if they see a disparity, they may feel mistreated.

An accessible definition of employee commitment comes from E.F. Ogbu & J.N. Ugwu (2019), who state that employee commitment is simply the feeling of belonging to one's workplace. It follows that the factors that involve the organisation's structure, laws, ideologies, reputation, and credibility all play a role in shaping commitment among staff members. Employee commitment is a strength that develops as a result of an individual's interactions within an organisation, according to K. Princy & E. Rebe-ka (2019). This strength motivates individuals to put forth greater efforts in support of organisational goals. Some researchers have classified employee commitment as a mental disorder. M.M. Eltamo & A.M. Keno (2019) point out that employee commitment entails both a connection to and an interest in staying with the company. The term "employee commitment" can also refer to the emotional investment that workers have in a company because of

its values or image. It is a sign that they are ready to put in extra work to help the company succeed, as noted by E.F. Ogbu & J.N. Ugwu (2019). As S.L. McShane & M.A. Von Glinow (2018) argued, "overall job attitude" is comprised of a number of factors, including employee commitment and job satisfaction. Organisational justice is linked to employee commitment. This idea encompasses informational justice for decision-makers as well as procedural justice, distributive justice, interpersonal justice, and distributive justice. Distributive justice and organisational commitment have a positive and statistically significant correlation, according to A.O. Chiazor *et al.* (2018) research in Nigeria. The study came to the conclusion that increasing organisational commitment requires an equitable wage distribution that is commensurate with job level.

Many companies fail to develop a comprehensive plan to reap the long-term benefits of integrating organisational justice and employee commitment into their day-to-day operations. This hinders employees' ability to develop innovative approaches to their tasks. In the manufacturing sector, employees are often prone to job changes due to the transferability of their skills to similar firms and enticing offers from prospective employers. Consequently, turnover rates tend to be higher. Since there is a cost related to training as well as retraining fresh workers, management is making an attempt to retain the current workforce. The purpose of this research was to examine how organisational justice affects employee commitment. The following null hypotheses were tested in this study. H1: there is no significant relationship between distributive justice and affective commitment in the Nigerian banking sector. H2: there is no significant relationship between procedural justice and continuance commitment in the Nigerian banking sector. The findings of this study have important practical implications, and these will help practitioners improve their abilities as they lobby for support of their decisions on behalf of themselves and the organisations they represent. The findings contribute to the literature on organisational justice and employee commitment by expanding knowledge of the correlation between the two.

● LITERATURE REVIEW

The construct "distributive justice" encompasses the equitable distribution of resources, particularly significant benefits such as compensation, resulting from collective organisational efforts. Distributive justice recognises that not all employees are treated equally and focuses on how rewards are shared among them in organisations. Distributive justice, according to S.L. McShane & M.A. Von Glinow (2018), is the degree to which employees believe their organisations fairly compensate them for the effort they put in. The construct "procedural justice", according to Z.M. Sadq *et al.* (2020), refers to how fair decision-makers believe the

procedures used to distribute outcomes are. A person’s belief in the fairness of an organisation’s outcome allocation is a function of their trust in the formal procedures of that organisation and the treatment they have received from organisational authorities in implementing those procedures. D.K. Faeq *et al.* (2020) found that when making allocations, individuals place equal weight on procedural issues, suggesting that procedural justice has a sizable effect on worker output. According to A.Z.G. Laith *et al.* (2019), procedural justice is when an employee’s perspective on their relationship with the company can change from an economic one to a social one if they feel they have been treated fairly during the disciplinary process. When one party in a social exchange interaction believes they have been treated fairly, the other party is more likely to go above and beyond in their efforts to please the first party. These improvisational moves are linked to peak performance under certain conditions. When equitable processes with fair treatment are in place, people are more likely to view the distribution of results as fair. M. Ismail *et al.* (2018) wrote that involving employees in the process of making choices and offering them details to help them understand the reasoning behind the results that they received are examples of what are considered to be fair procedures.

“Affective commitment” is related to employee traits, organisational variables, work experiences, and job characteristics, according to D. Lee (2020). S.L. McShane & M.A. Von Glinow (2018) described that employees’ affective commitment is measured by the extent to which they feel

a sense of psychological involvement and recognition with their employer. Employees’ warm feelings and attachment to their company are reflected in their affective commitment. This can be affected by how well they are treated by management, how quickly they receive their compensation, and the company’s reputation for doing good in the community, as E.F. Ogbu & J.N. Ugwu (2019) observed. D. Lee (2020) defines “continuance commitment” as the degree to which an employee has knowledge of the negative consequences of leaving the company. It entails staying with the company because of emotional ties that are difficult to replace. The employee may feel like they have no choice but to stay with the company or that they owe their achievement to the organisation. When an employee weighs the benefits of staying with their current employer against the costs of leaving, they are said to have a continuance commitment.

● **MATERIALS AND METHODS**

This study used a descriptive research approach. With the help of a quantitative study design, this research methodology sought to explain how organisational justice and employee dedication relate to the Nigerian banking industry. The top, middle, and lower-level cadres of Ogun State’s Nigerian banking industry make up the study’s participants. For this study, the Ijebu North Local Government Area in Ogun State’s banking sector in five specific areas was surveyed. The survey instrument and its items were adopted on a five-point Likert scale from “strongly disagree” to “strongly agree”, as shown in Table 1 below.

Table 1. Survey questions

Justice	
a. Distributive justice	
No.	Item statement
1	My work schedule is fair.
2	I consider my work load to be quite fair.
3	I think my job has several responsibilities.
b. Procedural justice	
No.	Item statement
1	Job decisions are made by the manager in a biased manner.
2	Employees are allowed to challenge or appeal job decisions made by their managers.
3	My manager makes sure that all employee concerns are heard before job decisions are made.
Employee commitment of the respondents	
a. Affective commitment	
No.	Item statement
1	I would be very happy to spend the rest of my career with this organisation.
2	I really feel as if this organisation’s problems are my own.
3	I do not feel a strong sense of “belonging” to my organisation.
b. Continuance commitment	
No.	Item statement
1	It would be very hard for me to leave my organisation right now, even if I wanted to.
2	I feel that I have too few options to consider leaving this organisation.
3	If I had not already put so much of myself into this organisation, I might consider working elsewhere.

Source: made by the authors based on Likert scales method

The research survey was conducted in 2023. The study was conducted in compliance with the Declaration of Helsinki (2013). All participants were informed of the study’s purpose, and their anonymity was ensured. The study was distributed among staff of the selected Nigerian banks in

the Ijebu North Local Government Area, Ogun State. The five sample banks considered in this study are Access Bank Plc, Guaranty Trust Bank Plc, United Bank for Africa Plc, Wema Bank, and Zenith Bank Plc. Three hundred and sixty-nine people work in the chosen banking sector overall

in Ijebu North Local Government Area of Ogun State. The study population of 369 employees that were distributed

among the selected banking sector in the study area is as follows (Table 2).

Table 2. Population distribution of the study

No.	Selected banks	No. of staff
1	Access Bank Plc	85
2	Guaranty Trust Bank Plc	104
3	United Bank of Africa Plc	52
4	Wema Bank Plc	68
5	Zenith Bank	60
	Total	369

Source: made by the authors

The T. Yamane (1967) formula was used to determine the sample size. These margins of error for the most crucial elements of the survey were computed using the T. Yamane (1967) formula, which is a widely accepted method of randomization. The following formula can be used to determine an appropriate sample size:

$$n = \frac{S}{1+S(\alpha)^2} \quad (1)$$

where n – sample size; S – population size; α – margin of error, i.e:

$$S = 369;$$

$$\alpha = 5\% (0.05);$$

$$n = \frac{369}{1+369(0.05)^2} = \frac{369}{1.9225};$$

$$n = 192.$$

The test-retest reliability approach was used for this research. Pilot research with 25 participants selected from

the same population was carried out to guarantee the validity and reliability of the questionnaire. Cronbach's alpha coefficient for reliability is applied to the resulting data, and its value of 83% indicates that the questionnaire contains only highly reliable items. For this study, the analytical technique employed in analysing the data collected from the respondent was the simple percentage analysis. The hypotheses of the study were tested using correlation analyses. For efficiency, the researcher properly monitored the administered questionnaires and retrieved a total of 147 copies of the instrument that were distributed among selected Nigerian banking industry in the Ijebu North Local Government Area of Ogun State.

● RESULTS AND DISCUSSION

The study analysed questions relating to organisational justice and employee commitment among selected Nigerian banking industry and tested the hypotheses. For this study, simple percentage analysis was the analytical technique used to analyse the collected data from the respondent. The following Table 3 displays the data's descriptive statistics.

Table 3. Descriptive statistics of the data

Position	Manager	Senior staff	Junior staff	Others
	3.4%	32%	57.8%	6.8%
Gender	Male	Female		
	43.5%	56.5%		
Age	25 years below	26-35 years	36-45 years	46 years above
	29.3%	44.2%	21.1%	5.4%
Marital status	Single	Married	Divorced	
	49.7%	40.1%	10.2%	
Education qualification	National diploma	Bachelor	Master	Others
	27.9%	44.9%	16.3%	10.9%
Length of service	Less than 5 years	6-10 years	Above 11 years	
	36.7%	52.4%	10.9%	

Source: made by the authors

Hypothesis 1

H1: there is no significant relationship between distributive

justice and affective commitment in the Nigerian banking sector. The model summary is described in Table 4.

Table 4. Model summary^b

Model	R	R squared	Adjusted R squared	Standard error of the estimate	Durbin-Watson
1	0.807 ^a	0.786	0.784	0.24875790	1.902

Note: a – predictors: (constant) distributive justice; b – dependent variable: affective commitment

Source: made by the authors

It was observed in Table 4 that the correlation value of *R* is equal to 0.807, while the coefficient of determination output (*R* squared) is generated as 0.786. This brings the suggestion that affective commitment is influenced by about 78.6% of distributional justice, while the rest of 21.4% (100% – 78.6% = 21.4%) is explained by other factors other than affective commitment. In addition, since the value of

the Durbin-Watson figure is 1.902, which is close to the value of 2.0, consequently, the challenge of serial correlation does not exist in the model. So, for the purpose of firm-specific prediction, the model is okay. There is no problem with heteroscedasticity or autocorrelation as the residuals are not serially correlated. Table 5 shows that the significance level of probability, denoted as 0.002, was observed.

Table 5. ANOVA^b (analysis of variance)

Model	Sum of squares	df	Mean square	F	Significance	
1	Regression	116.352	1	122.273	2,512.536	0.002 ^a
	Residual	4.534	146	0.045		
	Total	128.000	147			

Note: a – predictors: (constant) distributive justice; b – dependent variable: affective commitment

Source: made by the authors

Given that this probability (0.002) is much lower than 0.05, it indicates that multiple regression models can effectively predict affective commitment within the Nigerian banking sector. The results of the regression analysis suggest that there is a significant relationship between the independent variable “distributional justice” and affective commitment. The overall significance of the regression model is assessed through Fisher’s statistics, and in this study, the calculated *F** value of 2,712.536 is significant at a significance level of *p* < 0.05. Therefore, it can be concluded that a linear relationship exists between the dependent

and independent variables in the model. Consequently, the postulation asserting the absence of a significant relationship between the dependent and independent variables is rejected. This evidence underscores the individual and combined impact of entrepreneurship on sustainable development.

Hypothesis 2

H2: there is no significant relationship between procedural justice and continuance commitment in the Nigerian banking sector. The model summary is described in Table 6.

Table 6. Model summary^b

Model	R	R squared	Adjusted R squared	Standard error of the estimate	Durbin-Watson
2	0.874 ^a	0.869	0.867	0.31421296	1.993

Note: a – predictors: (constant) procedural justice; b – dependent variable: continuance commitment

Source: made by the authors

It was observed in Table 6 that the value of *R* = 0.874 and the coefficient of determination (*R* squared) is 0.869. This suggests the notion that continuance commitment is influenced by 86.9% of procedural justice, while the rest (100% – 86.9% = 13.1%) is explained by other factors. The Durbin-Watson statistic, which is 1.993, is in proximity to

the expected value of 2.0. Consequently, there is no indication of serial correlation within the model. This suggests that the model is robust and suitable for predictive purposes. The absence of serial correlation in the residuals confirms that there is no autocorrelation issue. Table 7 reveals a probability level of significance with a value of 0.000.

Table 7. ANOVA^b (analysis of variance)

Model	Sum of squares	df	Mean square	F	Significance	
2	Regression	227.123	1	112.243	2,122.507	0.000 ^a
	Residual	4.727	146	0.045		
	Total	128.000	147			

Note: a – predictors: (constant) procedural justice; b – dependent variable: continuance commitment

Source: made by the authors

This probability (0.000) is significantly smaller than the conventional threshold of 0.05, indicating the suitability of multiple regression models for predicting continuance commitment. The results of the regression analysis in the study indicate a noteworthy association between the independent variables related to procedural justice and continuance commitment. The assessment of the overall significance of the regression involves testing the null hypothesis, employing Fisher’s statistics as the testing tool. In this investigation, the calculated *F** value, standing at 2,122.507, is

statistically significant at a level of *p* < 0.05. Therefore, it can be confidently confirmed that there is a linear relationship between the dependent and independent variables within the model. Consequently, any suggestion that posits an absence of a significant relationship between these variables is dismissed. The evidence amassed underscores the individual and combined impact of the independent explanatory variable, procedural justice, on continuance commitment.

This research looked into the relationship between organisational justice and employee commitment in the

Nigerian banking sector. Based on the results of this research, it is clear that workers benefit when their employers allow for fair and just procedures (procedural justice and distributive justice). This, in turn, encourages workers to respond favourably to their employers through higher levels of dedication, goodwill, and output. Moreover, a high level of organisational justice resulted in enthusiastic support from workers. This demonstrates that when employees believe their workplace is fair, they are more invested in their work and feel a greater sense of loyalty to their employer.

Based on the results of the research, concrete suggestions for improving organisational justice and its impact on employee commitment in the Nigerian banking sector were required. Therefore, the following suggestions are made. Firstly, if employers want their employees to trust them and be committed to the company, they must foster an environment of organisational justice. Secondly, managers and supervisors should create and uphold policies and procedures that foster fairness within the company, as this is a key factor in motivating workers to invest in the company. Lastly, the banking sector must be fair to their employees if they want to inspire loyalty and productivity in the workplace.

After a thorough examination of the data and hypothesis testing, the study has established significant relationships. Specifically, a meaningful association between distributive justice and affective commitment within the Nigerian banking sector was found. Furthermore, there is also a noteworthy connection between procedural justice and continuance commitment in this sector. This corroborates the findings of S.O. Fafasakin (2021) in his research on the interplay between distributive justice, job satisfaction, and organisational commitment, which found no evidence that distributive justice had no influence on employees' performance. Findings reveal that distributive justice and job satisfaction all predicted organisational commitment. The results are also consistent with those of D. Novitasari *et al.* (2020), who also discovered that procedural justice significantly impacts employees' affective actions. The findings concluded that procedural justice has positive and significant impacts on employees' affective actions.

The results of this paper are in conformity with the research of N. Aeknarajindawat & K. Jernsittiparsert (2020), where they study a sample of Thai pharmacies to determine the impact of organisational justice on citizenship behaviour, job satisfaction, and financial outcomes. The research used a survey approach, with data collected through questionnaires, just like this paper's methodology. One hundred and seventy employees were selected at random. The data was analysed using the analysis of moment structures (AMOS) and the statistical package for the social sciences (SPSS). Predictably, the extent to which an organisation encouraged organisational justice was found to be substantially related to workers pro-organisational nationality actions. In addition, the results of this study are also in tandem with the study of A. Gori *et al.* (2020), in which 179 Italian workers were polled to learn more about the relationship between equitable working conditions and employee happiness, with organisational justice as a moderating variable. The researchers used three instruments to gauge topics like job satisfaction, adaptability, and a sense of organisational fairness. Their results showed that other types of organisational justice, such as procedural, distributive,

interpersonal, and informational justice, also had a positive effect on employees' levels of achievement in their places of employment.

The findings of the study are equally consistent with the work of A.D. Perainda *et al.* (2020), who looked at the correlation between employee satisfaction, annual reviews, and organisational justice. Questionnaire responses were analysed using regression and correlation to determine whether there is a link between justice in an organisation and performance reviews. Interactional justice was found to have a greater impact on appraisal satisfaction than organisational justice, which was discovered to have an important connection with job evaluation satisfaction. The other two forms of justice (interactional and procedural) and distributive justice were also strongly linked to performance evaluation. Another consistent study by T. Akram *et al.* (2020) looked into how organisational justice affected workers' propensity to be creative on the job in China's telecommunications sector. The study used structural equation modelling and confirmatory factor analysis of data from 345 participants. Their findings demonstrated that an environment of organisational justice promoted creativity and the exchange of ideas among workers. Knowledge sharing, organisational fairness, and employee creativity were also found to have a strong positive correlation. Their study's findings were restricted to certain aspects of the organisation, however, and no explanation was provided for the other dimensions of organisational justice.

Employees should then advocate for greater organisational justice with management to boost job satisfaction, loyalty, and retention. All of this will ensure that productivity rises, output rises, and the business and its workers continue to thrive. Based on the results of the research, concrete recommendations for improving organisational justice and its impact on workers' commitments in Nigeria's financial sector were required. These are: (I) if employers want their employees to trust them and be committed to the company, they must foster an environment of organisational justice; (II) if businesses want dedicated workers who will ensure the company's continued success through increased productivity, they should have and use a system of organisational justice in their dealings with their staff; (III) managers and supervisors should create and uphold policies and procedures that foster fairness within the company, as this is a key factor in motivating workers to invest in the company; and (IV) companies must be fair to their employees if they want to inspire loyalty and productivity in the workplace.

● CONCLUSIONS

This study looked into the relationship between organisational justice and employee commitment in the Nigerian banking sector. The findings of this study suggest that employees experience advantages when their employers implement fair and equitable procedures, fostering positive interactions among staff members. Consequently, employees are more likely to respond positively to their employers by exhibiting higher levels of commitment, goodwill, and productivity. The study highlights that a high level of organisational justice elicits enthusiastic support from employees, indicating that when employees perceive fairness in the workplace, they become more engaged in their work

and develop a stronger sense of loyalty to their employer. Therefore, transparent, fair, and effectively communicated decision-making procedures in the workplace inevitably lead to elevated levels of employee commitment and enhanced organisational productivity.

Research conducted within the Nigerian banking sector consistently shows a favourable connection between employees' perceptions of distributive justice and their affective commitment. When employees perceive that those rewards, including salary, advancements, and perks, are fairly allocated in accordance with their contributions and achievements, they tend to form a deeper emotional attachment to their organisation. The research indicates a positive link between perceptions of procedural justice and continuance commitment among employees. When

employees perceive that organisational procedures are fair, impartial, and consistently implemented, they are inclined to develop a commitment to the organisation based on the perceived costs of leaving, such as loss of benefits or seniority. Although this study focused on the Nigerian banking sector, it would be useful to conduct a comparative analysis across sectors, including agriculture, manufacturing, healthcare, oil and gas, and education, among others, to see if the findings generalise.

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● CONFLICT OF INTEREST

None.

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Організаційна справедливість та відданість працівників у банківському секторі Нігерії

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Анотація. Незважаючи на потенційні переваги впровадження організаційної справедливості та відданості працівників у повсякденну діяльність, багатьом організаціям для цього бракує довгострокової стратегії, що робить це питання нагальним. Отже, метою цього дослідження було проаналізувати та дослідити організаційну справедливість та відданість працівників у банківській сфері Нігерії. У ході дослідження зібрано первинні дані шляхом заповнення 147 анкет із загальної кількості – 192. Зібрані дані протестовано та проаналізовано за допомогою методів описової статистики, множинної регресії та коефіцієнтів кореляції із використанням статистичного пакету для соціальних наук. Результати дослідження свідчать, що існує значний зв'язок між конструктами організаційної справедливості та прихильністю працівників. Результати показали, що існує сильний і значущий зв'язок між дистрибутивною справедливістю та афективною прихильністю в банківській галузі Нігерії ($R = 0,807$, $F^* = 2\,712,536$, $p < 0,05$), а результати регресії припускають, що незалежні змінні (дистрибутивна справедливість) мають значущий зв'язок з афективною прихильністю. Отримані дані свідчать про те, що організації надають пріоритет впровадженню чесних і справедливих процедур, що охоплюють як дистрибутивну, так і процесуальну справедливість. Результати показали, що існує значний позитивний зв'язок між процесуальною справедливістю та прихильністю до продовження співпраці ($R = 0,874$, $F^* = 2\,122,507$, $p < 0,05$), а також було визначено, що існує лінійна кореляція між залежними та незалежними змінними моделі. Ці результати підкреслюють важливість чесних і справедливих процедур в організаціях для отримання схвальних відгуків від працівників, таких як прихильність, позитивна поведінка і підвищення продуктивності. На основі отриманих результатів було зроблено висновки, що роботодавцям рекомендується визнати значні переваги, які може принести організаційна справедливість стосовно довіри працівників, їхньої відданості та бажання загального успіху для організації. Фахівці можуть використовувати висновки та пропозиції дослідження для розвитку систем соціалізації, залучення, навчання та розвитку у своїх організаціях

Ключові слова: справедливі процедури; розподільчий; процедурний; афективний; продовження; опитування

Essence and features of economic security of the industry sector

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Abstract. Ensuring the economic security of the industry sector and its element, energy security, is critical for the economies of countries, especially in the current environment of escalating military conflicts. The purpose of this study was to investigate the most likely risks to the security of the industrial sector, taking the example of the oil industry. The study employed the formal legal method, the method of qualitative textual analysis, the descriptive method, the method of statistical analysis, and the survey method. The study determined the place of energy security, specifically the security of the oil industry, in the system of economic security and emphasised its exceptional significance, especially in times of war. The principal global risks to the security of the oil industry were identified, including increased economic dependence for import-dependent countries and for countries dependent on oil exports; escalation of conflicts due to disagreements over resource control; and terrorist and cyberattacks. It was found that the main threats to Ukraine are generated by Russia's invasion of its territory, which entails such critical risks as the physical destruction of oil industry facilities and cybersecurity breaches. The study confirmed that the war in Ukraine could have a substantial impact on the energy security of the European Union. This impact may result in the postponement of the association's environmental goals due to the need to urgently ensure its own energy security. The study identified ways to improve security in the Ukrainian oil industry in times of war, including ensuring physical security and cybersecurity, developing crisis response plans, and improving the energy efficiency of the national industry. The findings of this study may be useful in developing measures to optimise energy policy

Keywords: energy; oil sector; war; import dependence; energy shortage; alternative energy sources

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● INTRODUCTION

The economic security of industries plays a crucial role in ensuring the economic and national security of countries, achieving sustainable development goals, providing employment, and economic growth. Considering the priority areas of industrial development, the key aspects that influence the achievement of the desired level of economic security in the industry sector include energy security, innovation and competitiveness, resource efficiency,

and risk management. Energy and oil industry security in Ukraine is most relevant to EU countries due to their territorial proximity. Accordingly, it is also important to examine the EU's response and capabilities to ensure its own energy security.

According to M. Melnikova (2022), economic security is closely linked to other components of national and regional security, including environmental and energy

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security. Among the threats to economic development, a special place is occupied by threats to energy security. Energy is crucial for all aspects of human life, while energy security is considered a priority area of security policy, according to D. Mara *et al.* (2022) and J. Strojny *et al.* (2023). Greening production processes and ensuring an adequate level of energy savings and efficiency are major areas for maintaining economic security at a prominent level. A suitable security management system should be based on a combination of economic, environmental, information, and energy parameters (Shchurov, 2022). However, energy security has raised serious concerns related to environmental issues (Lin & Raza, 2020), human factors (Yeshitila *et al.*, 2021), and escalating conflicts (Zhou *et al.*, 2023) that relate to or cause problems in the energy sector. This necessitates the development of a proper energy policy that factors in the geopolitical features of the state.

As one of the principal elements of the energy industry, the oil industry plays a leading role in the global and regional economies, according to X. Gong *et al.* (2022). The modern market for petroleum products is complex and depends on a range of factors, including supply, demand, technological development, and geopolitical events. The global demand and production of petroleum products are of immense importance for the economies of countries and energy security, as stated by D. Donets *et al.* (2024). Ensuring the security of the oil industry is critical in the face of significant threats, such as military operations. The war in Ukraine, which began with a full-scale Russian invasion, has had dire consequences in all spheres of life, not only in Ukraine but also in the world, as A. Mazaraki & T. Melnyk (2022) have noted. T. Rabocha *et al.* (2023) emphasised the fact that Ukraine's industry has been under merciless enemy attacks, especially energy facilities, including oil refineries.

Therefore, the study of the main security risks of the oil refining industry in Ukraine and ways to improve security is a relevant area of research, as this topic goes beyond the regional scale, gaining global importance for countries around the world. The purpose of this study was to examine the most possible threats in the industrial sector on the example of the oil refining industry. Objectives of the study: to identify the key risks to oilfield security in the global context and for Ukraine; to analyse the consequences of the war in Ukraine for the EU's energy security; to identify priority areas for ensuring the security of Ukraine's oil industry sector.

● MATERIALS AND METHODS

The study employed a comprehensive system of scientific methods. To investigate the definitions of the term "economic security" and its components, the study employed the formal legal method, which helped to cover this term and its elements from a legal standpoint. This method was used to review such regulations as The Strategy of Economic Security of Ukraine for the Period Up to 2025 (2021) (the Strategy) and Order of the Ministry of Economic Development and Trade of Ukraine No. 1277 "On Approval of Methodological Recommendations for Calculating the Level of Economic Security of Ukraine" (2013). Risks to the security of the oil industry

as one of the key components of economic security were identified using qualitative analysis of scientific texts. The use of this method helped to identify the critical risks presented in the scientific literature, and the principal criterion for selecting risks was their global nature, as well as their impact on both import-dependent and oil-export-dependent countries. To characterise the key risks to the safety of the oil industry, the study employed the descriptive method, which allowed for an explanation of the nature and probable damage from the risks. The method of statistical analysis was used to investigate the trends and structure of a range of indicators, specifically the share of the extractive industry and its components in the Ukrainian industry in 2023, the largest producers of crude oil and condensate in 2023. The analysed data is publicly available (EU imports..., 2023; EIA: US is the leading producer..., 2024; Volume of industrial products..., 2024).

Furthermore, the study relied heavily on the results of the survey method. Seven professionals with 5 to 14 years of experience in management positions in the oil industry were invited to take part in the survey, which was conducted by sending questionnaires via email. The questionnaires were sent out for review a week before the results were collected. The survey was conducted according to the American Sociological Association's code of ethics (1997). The experts were asked to assess the threats to the energy sector contained in the Strategy in terms of their significance or criticality for the Ukrainian oil industry. The assessment was made on a scale from 1 to 10, where 1 means the threat has no real impact on the oil industry, while 10 means the threat has a critical impact on the oil industry. Based on the assessment results, weighted averages were calculated, which made it possible to derive an integrated assessment for each threat and identify a range of the most substantial threats. Similarly, integral assessments were determined for the priority areas of ensuring the security of Ukraine's oil and gas sector. The application of this method made it possible to link the risks identified in the theoretical part of the study with those that are particularly threatening in practice, as well as to identify practical areas for improving the situation.

● RESULTS

The Order of the Ministry of Economic Development and Trade of Ukraine No. 1277 "On Approval of Methodological Recommendations for Calculating the Level of Economic Security of Ukraine" (2013) defines economic security as a state of the economy that allows it to be resilient in the event of internal and external threats, to maintain the due level of competitiveness, and to be capable of balanced and sustainable growth. According to the Strategy, ensuring national economic interests has two key areas: security and development. In times of war, security comes to the fore, but this does not mean abandoning development goals. According to the Strategy, Ukraine's economic security consists of the following elements: financial security, production security, foreign economic security, investment and innovation security, and macroeconomic security. In 2010-2019, these components were characterised by an unsatisfactory or dangerous state (Table 1).

Table 1. Indicators of the level of economic security of Ukraine by components (percentage of the optimum value)

Component of economic security	Level of achievement of the optimum value	Characteristics of the state
Financial security	42%	Unsatisfactory
Industrial security	53%	Unsatisfactory
Foreign economic security	34%	Dangerous
Investment and innovation security	32%	Dangerous
Macroeconomic security	38%	Dangerous

Source: compiled by the authors based on The Strategy of Economic Security of Ukraine for the Period Up to 2025 (2021)

In the context of the subject under study, the greatest interest is occupational safety, which is directly related to the level of industrial development. In turn, energy security can be considered one of the critical elements of industrial security, as the modernisation and development of energy infrastructure facilities are part of the industrial security objectives. As noted above, in wartime, energy security has experienced considerable problems that have revealed its vulnerabilities and demonstrated its critical importance for the state. Considering the above, it is proposed to focus on energy security as a component of the country’s economic security, namely, on the oil industry. This industry in Ukraine, on the one hand, has great potential, but on the other hand, it has become one of the most vulnerable in the wartime situation, as will be discussed in detail below.

In modern conditions of geopolitical instability, the oil industry is exposed to a range of substantial risks that pose a considerable threat to the economic security of countries. These risks include increased economic dependence for both import-dependent countries and those that are heavily dependent on oil exports. For import-dependent countries, the principal threat lies in their growing dependence on external suppliers of resources and fluctuations in energy prices. This can lead to higher costs and the deterioration of relations with external partners. The most vulnerable countries are those that do not have sufficient capacity to develop alternative energy sources or obtain energy through other channels. Countries that depend on oil exports are most likely to suffer from lower energy prices, currency fluctuations, and considerable fluctuations in energy demand. This could lead to a decline in export earnings, which are a key source of revenue for such countries, and thus affect their overall financial and economic stability and security. Countries with a low diversification of

economic sectors are in a particularly threatening position. Another risk to the economic security of countries related to the oil industry is the escalation of conflicts over the control of resources. For the economy, this means the risk of a freeze in oil product exports due to possible conflicts, including military conflicts, which adversely affect both export-dependent and import-dependent countries. For the former, this will lead to a reduction in income and a deterioration in the overall economic situation, while for the latter, it will lead to a shortage of energy resources and rising energy prices. Furthermore, in case of an armed conflict, the risk of additional economic losses increases significantly.

Terrorist and cyberattacks in the oil industry pose high risks to economic security. In addition, such attacks, along with other possible accidents during oil production and transportation, threaten such a vital component of economic security as environmental safety. Ukraine is an import-dependent country, despite the fact that it ranks second in oil reserves among European countries. Prior to the full-scale invasion, production was over 1 million tonnes, and most of it was exported. At the same time, import dependence reached 80%, which can be explained by the fact that only two of the country’s six oil refineries were operating. Since the outbreak of the war, the situation has deteriorated, specifically because the aggressor country bombed the country’s largest oil refinery and has been constantly attacking Ukrainian oil depots. According to estimates, the Black Sea could produce about 10 billion m³ of oil, but this is impossible due to the occupation (Ukraine’s subsoil..., 2023). Figure 1 shows the share of the extractive industry and its components in the Ukrainian industry as of 2023. Independent experts’ surveys of the biggest threats to the national oil industry in Ukraine have identified a range of threats, as presented in Figure 2.

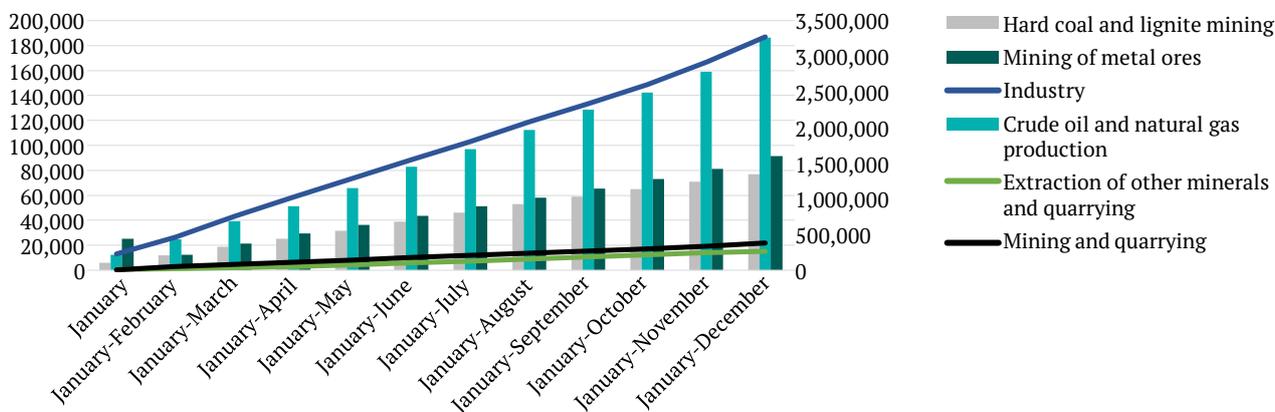


Figure 1. Share of the extractive industry and its components in the Ukrainian industry in 2023

Source: made by the authors based on Volume of industrial products sold by type of activity (2024)

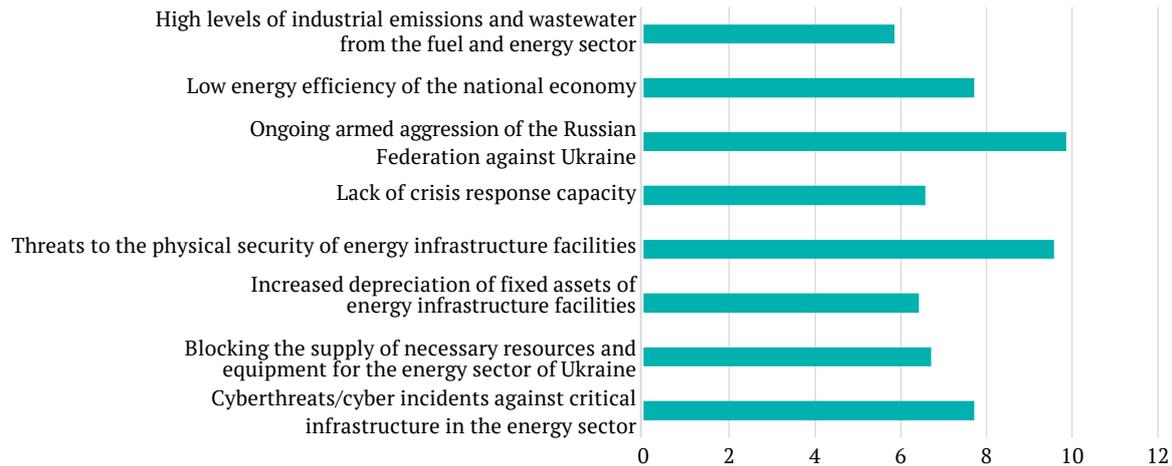


Figure 2. The greatest threats in the oil industry at the national level according to the survey

Note: the numerical value corresponds to the average of the experts' assessments for each identified threat

Source: made by the authors

Thus, the greatest threats to Ukraine's energy sector in general and the oil sector in particular are generated by the Russian invasion. First and foremost, it is the physical destruction of energy infrastructure facilities, which poses a critical threat to the country's economic and national security. Risks generated in Ukraine's energy sector in general and the oil and gas sector in particular have a direct impact on global trends in this area. Most often, these risks are associated with the fact that the aggressor country is a major exporter of oil and other energy resources (Fig. 3). However, energy security is also influenced by a range of other factors and interrelationships, which necessitates a more detailed analysis. The situation in the energy sector in Ukraine is of particular significance for the EU countries, both in the context of Ukraine's European integration intentions and considering the impact of the war on the energy situation in the EU itself.

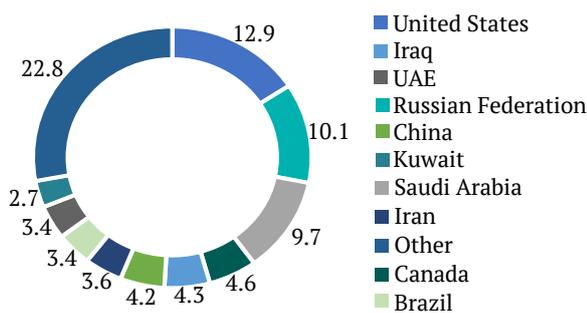


Figure 3. Largest crude oil and condensate producers in 2023, million barrels per day

Source: compiled by the authors based on EIA: US is the leading producer of crude oil for six years (2024)

The EU is facing a range of crucial issues in the areas of economic security in general and energy security specifically (Tichý & Dubský, 2024). The adoption of the European Green Deal and the Paris Agreement resulted in a rapid rise in energy prices, increased dependence on imports, including from the Russian Federation, and an energy crisis. Therewith, the expected acceleration of the

energy transition did not occur, and the rate of development of renewable sources was substantially slower than desired. Promoting the ban on nuclear power and the development of natural gas may have been somewhat premature, as it exacerbated the energy deficit. Furthermore, with very low CO₂ emissions, the EU has imposed a range of restrictions without considering the role of other actors, such as China. Against this backdrop, the consequences of the COVID-19 pandemic, followed by Russia's full-scale invasion of Ukraine, have proved to be extremely challenging for the EU. Sanctions against the Russian Federation have also affected the EU itself, driving up prices for oil and other resources. Thus, on December 5, 2022, the EU's ban on maritime imports of crude oil from the Russian Federation came into force. Import dependence on Russian fuel has proved to be a considerable problem, namely because of the need to find alternative supplies. However, statistics show that the problem of ensuring energy independence on the one hand and energy security on the other hand can be solved, among other measures, through the diversification of suppliers. Figure 4 and Figure 5 show that the EU's dependence on Russian imports is decreasing, thanks to supplies from other partners.

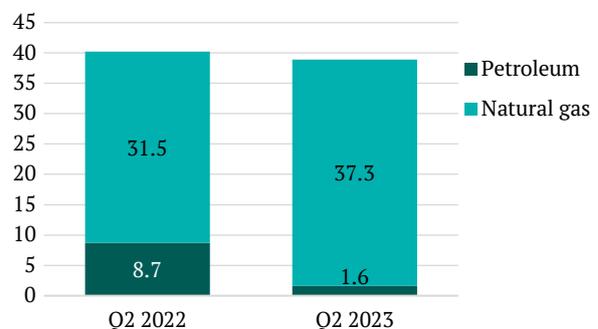


Figure 4. EU imports of petroleum and natural gas, monthly averages in net mass, million tonnes

Source: made by the authors based on EU imports of energy products continued to drop in Q2 2023 (2023)

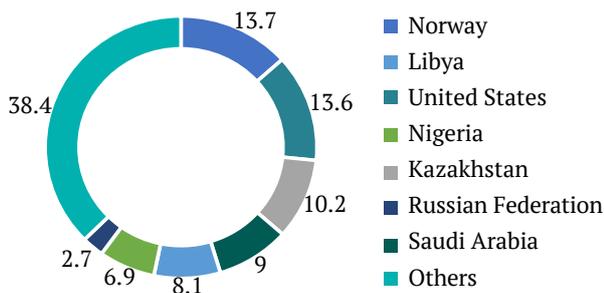


Figure 5. EU imports of petroleum by partner in Q2 2023, share of trade in value, %

Source: made by the authors based on EU imports of energy products continued to drop in Q2 2023 (2023)

Figure 4 shows how Russia’s oil imports fell over the year. In contrast, the shares of other partners increased over the same period (Fig. 5). Thus, imports from Norway grew by 3.5%, imports from Kazakhstan – by 3.2%, imports from the United States – by 2.1%, and imports from Saudi Arabia – by 2.3%. Furthermore, Libya has become an important partner of the EU. Along with diversifying suppliers, it is important to develop internal capabilities, such as hydrogen energy and renewable resources. Considering that renewable resources are desirable but unstable, this may necessitate a reserve of conventional resources. This may be contrary to achieving environmental goals,

but it may be necessary in critical circumstances. Furthermore, it is essential to put an end to Russia’s aggression in Ukraine, as this can substantially change the energy security situation for the better. Assisting Ukraine in its fight against the aggressor is therefore an important strategic task for ensuring energy and economic security in the EU.

This analysis has helped to identify the biggest threats to energy security in the EU and Ukraine in general and to the economic security of the oil sector in these regions in particular. As the analysis above suggests, the EU is addressing the challenges faced in the energy sector mainly through the diversification of suppliers and the use of internal capabilities and resources. However, for Ukraine, measures to ensure economic and energy security may have certain specific features considering the martial law and increased risks, including the risk of physical destruction of energy facilities (Zuk & Zuk, 2022; Aitken & Ersoy, 2022). Therefore, the investigation of such features is of exceptional value both for Ukraine and other countries that may find themselves in such an atypical situation when it becomes necessary to ensure economic and energy security in times of war. The same approach used to identify the biggest threats to the national oil industry in Ukraine, i.e., through a survey of independent experts, was used to identify priority areas for ensuring energy security in Ukraine as an important component of economic security. The distribution of integral scores determined by experts’ responses is presented in Figure 6.

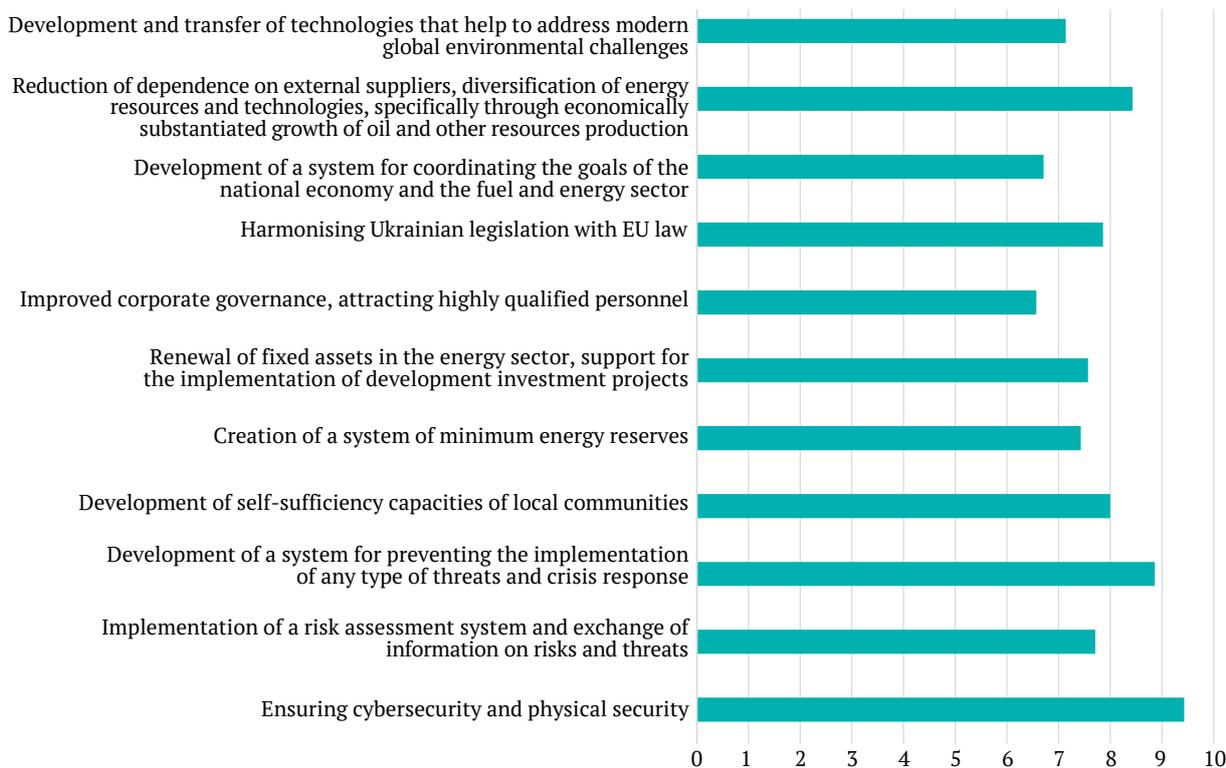


Figure 6. Priority areas for ensuring the security of the oil industry sector in Ukraine

Source: compiled by the authors

Thus, in the context of war, such measures to ensure the security of the oil sector as physical and cybersecurity, the development of response systems in case of a

crisis, and, similar to the EU approach, the diversification of energy suppliers and sources come to the fore. These measures generally apply to other branches of the energy

sector, and directly affect both the level of energy security and the level of economic security of the state as a whole.

● DISCUSSION

The study found that the key risk for import-dependent countries is increased dependence on external suppliers and fluctuations in resource prices, which is also relevant for Ukraine. J. Kamyk *et al.* (2021) investigate the security of the Polish oil refining industry. The country is also import-dependent, with crude oil imports accounting for more than 97% of internal consumption. Therewith, the share of crude oil consumed tends to grow steadily. The study identified crude oil as a critical resource for ensuring energy security in the country until 2040. Despite efforts to diversify supplies, the country's supply risk is still high. Poland's experience shows that the replacement of oil products with various types of renewable energy sources cannot develop as dynamically as in Western Europe. Unlike Poland, Ukraine has more significant oil reserves, but Russia's armed aggression is hampering the normal functioning of the oil industry. Therefore, following the example of Poland, it is important for Ukraine to make great efforts to ensure optimum diversification of supplies.

This study noted that countries dependent on crude oil exports face the greatest threats from declining energy prices, currency fluctuations, and considerable fluctuations in demand. No concrete countries were considered in the study, but there are many studies in the scientific literature covering the experience and research of economic problems of individual countries dependent on oil exports. Countries such as the United Arab Emirates have challenges in ensuring the security of the oil industry. The country has significant oil reserves and is actively engaged in its production and refining, so there is no problem of resource sufficiency or import dependence. Therefore, the country faces more substantial challenges in ensuring cybersecurity in the oil industry. M.J. AL-Dhanhani & J.E.M. Jizat (2021) note that the problem of implementing appropriate cybersecurity measures is exacerbated by the development of technology, which may threaten the implementation of new sophisticated cyberattacks. Such incidents pose risks to the viability of oil companies, which increases the relevance of researching the effectiveness of various cybersecurity measures, including multidimensional systematic risk management programmes. Considering the high risks to the cybersecurity of the oil industry identified for Ukraine in the present study, the recommendations of the researchers should be considered when developing programmes and strategies to improve energy security in Ukraine.

H. Yuan *et al.* (2023) examined the experience of China, which is also a major crude oil producer. Researchers point out that the country's economic development is highly dependent on crude oil, as China is also the largest importer and consumer of this resource. Therefore, China's oil security is crucial to its economic development. The study covers how geopolitical risk affects China's oil security. The researchers found that to ensure uninterrupted supply of the resource, many initiatives are needed from oil companies, including the acquisition of shares and development of oil fields. Furthermore, scientists insist on the need to improve ties with oil exporting

countries, which will help protect the production and transportation of this resource. For instance, this can be achieved through participation in various United Nations initiatives, such as the African peacekeeping initiative and support for Somalia. As a hedge against oil price volatility, the study proposes crude oil futures in renminbi. Similarly to the cited study, the present study covered the risks for the oil sector, but considering the differences in the geopolitical situation in the countries under study, such risks are noticeably different. At the same time, in the future, Ukraine can draw on China's experience in implementing oil security initiatives, adapting them to its own conditions.

A. Zhuparova *et al.* (2020) investigate the case of Kazakhstan. The country has considerable oil reserves, but researchers have found that the country's export-oriented economy, which has long supported the country's financial security, has exhausted itself. This is caused by the volatility of global resource markets. Thus, the commodity economy cannot ensure the country's high competitiveness on the global stage and achieve financial security. The commodity-based economy leads to an "eating up" of fixed assets and a shortage of investment resources. The researchers see the solution to the problem in economic diversification, which will allow the development of the manufacturing industry and high-tech sectors. Ukraine's economy can also be defined as a raw material economy, and therefore Kazakhstan's experience can be considered in plans to improve Ukraine's economic security. The cited study paid special attention to the EU energy policy in the current crisis conditions. It was found that the EU may be forced to temporarily postpone its environmental goals to ensure the energy security of its members.

M. Mišík (2022), like in the present study, refers to the EU experience. The study found that the crisis that took place in 2021-2022, which led to a spike in energy prices and a shortage of natural gas, changed the EU's priorities from decarbonisation to energy security. The energy measures taken have failed to ensure an adequate level of energy security in the EU. Furthermore, the association does not have a common foreign policy on energy security, and therefore member states were unable to take a common energy stance in the context of Russia's invasion of Ukraine. Finally, the researcher concludes that even though to achieve the EU's environmental goals by 2050, the pace of decarbonisation must increase, the EU is currently forced to take care of the energy security of its countries first and foremost. Analogous conclusions were drawn in the cited study in the part where he noted the significance of diversifying suppliers, using internal resources, and creating a reserve of conventional resources in critical situations.

P. Prisecaru (2022) also focuses on the EU energy sector. The researcher notes that the EU is forced to choose between energy security and independence, the rapid development of renewable energy sources; and the continued use of conventional resources for a long time, as well as between different approaches to fiscal policy in the field of ecology. The researcher believes that accelerating the development of alternative energy sources will not fully solve the problem of energy security, as it requires a long time to implement and is not sustainable

enough in the current environment. In the researcher's view, the EU's energy policy's shift away from resources supplied by Russia requires considerable consolidation of efforts and dedicated support from foreign partners. The researcher believes that for some time, environmental goals will be overshadowed by the need to ensure energy security, and therefore the EU should use all the internal resources at its disposal, including nuclear and fossil fuels. This is true; however, the cited study also expresses the hope that diversification of supplies will substantially contribute to solving the current problems. If oil and other resources are supplied to replace Russian ones, the EU can return to the task of accelerating the decarbonisation of its economy. Furthermore, the researcher suggests that a quick end to the war in Ukraine could have a favourable impact on the energy crisis in the EU, which was also noted in the present study. Still, the researcher adds that the EU, which is in close geographical proximity to Ukraine and therefore a direct stakeholder, should make its own efforts to bring the war in Ukraine to a desirable end, both in terms of energy support and in terms of making important geopolitical decisions.

To summarise the above, the conducted study identifies problems for Ukraine's oil sector, the main source of which is Russia's full-scale invasion of Ukraine. This primarily threatens the physical destruction of energy infrastructure facilities and the risk of cyberthreats. The situation in Ukraine has a considerable impact on the EU's energy security, and therefore investigating the EU's measures to ensure its own energy security and counteract the threats posed by the war in Ukraine is a valuable area of research. Along with the identified areas of ensuring energy security in the EU in general and oil industry security specifically, the priority areas of ensuring oil industry security for Ukraine were identified. This helped to demonstrate the challenges faced by the economy in ensuring the safety of the oil industry during martial law. Comparing the findings of the present study with the conclusions of other researchers who investigated the oil industry in certain regions, certain conclusions drawn in this study were reinforced, and unexplored aspects and valuable recommendations were identified. Specifically, such recommendations relate to opportunities for Ukraine to use the experience of Poland, which is also an import-dependent country. Ukraine can also draw on the experience

of export-dependent countries in improving cybersecurity, and implementing various initiatives in the oil sector.

● CONCLUSIONS

The security of the industrial sector affects the level of regional and global economic security. In a time of war, energy security comes to the fore as the industry faces critical risks. The oil industry is a strategically essential element of the energy sector. For Ukraine, ensuring the security of the oil industry is important in terms of, on the one hand, military risks and the vulnerability of the industry, and, on the other hand, untapped opportunities for the development of this sector.

The study shows that energy security, especially the security of the oil industry, plays a significant role in the country's economic security. These areas of security are of paramount importance in times of war, as they are subject to intensified attacks by invaders and have catastrophic consequences for the affected party. The study identified key risks to the security of the oil industry at the global level. These include increased economic dependence for import-dependent countries and countries dependent on oil exports; the possible escalation of conflicts due to disagreements over resource control; and terrorist and cyberattacks. The key threats to Ukraine are posed by the large-scale invasion of the aggressor country.

Military operations lead to the physical destruction of oil industry facilities and cybersecurity breaches. Furthermore, the war in Ukraine affects the EU's energy security. This may result in the postponement of the EU's environmental goals due to the priority of ensuring the energy security of member states. The study identified areas for improving security in the Ukrainian oil industry in times of war, including ensuring physical security and cybersecurity of the oil industry, developing response systems in case of a crisis, improving energy efficiency, and diversifying energy suppliers and sources. Further research should focus on identifying priority areas for international cooperation in the energy sector.

● ACKNOWLEDGEMENTS

None.

● CONFLICT OF INTEREST

None.

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Сутність та особливості економічної безпеки галузі промисловості

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Анотація. Забезпечення економічної безпеки галузі промисловості та такого її елементу, як енергетична безпека, є критично важливим для економіки країн, особливо в сучасних умовах ескалації воєнних конфліктів. Метою роботи було дослідження найбільш імовірних ризиків для забезпечення безпеки сектору промисловості на прикладі нафтопромислової галузі. У роботі застосовано формально-юридичний метод, метод квалітативного аналізу текстів, описовий метод, метод статистичного аналізу та метод опитування. У результаті проведеного дослідження визначено місце енергетичної безпеки, зокрема, безпеки нафтопромислової галузі в системі економічної безпеки, підкреслено її виключне значення, особливо в умовах війни. Виявлено основні глобальні ризики для забезпечення безпеки нафтопромислової галузі, до яких належать: посилення економічної залежності для імпортозалежних країн та для держав, що залежать від експорту нафти; загострення конфліктів через суперечності щодо контролю над ресурсами; реалізація терористичних та кібернетичних атак. Було встановлено, що для України основні загрози створюються через російське вторгнення на її територію, що спричиняє такі критичні ризики, як фізичне знищення об'єктів нафтопромислової галузі та порушення кібербезпеки. У дослідженні підтверджено, що війна в Україні може чинити суттєвий вплив на енергетичну безпеку Європейського Союзу. Цей вплив може спричинити відкладання екологічних цілей об'єднання через необхідність термінового забезпечення власної енергетичної безпеки. Виявлено напрями підвищення безпеки у нафтопромисловості України в умовах війни, зокрема, забезпечення фізичної безпеки та кібербезпеки, розробка планів реагування у випадку реалізації кризових ситуацій, підвищення енергоефективності національної промисловості. Результати дослідження можуть бути корисними у процесі розробки заходів з оптимізації енергетичної політики

Ключові слова: енергетика; нафтовий сектор; війна; імпортозалежність; дефіцит енергетичних ресурсів; альтернативні джерела енергії

Architectural frameworks for financial transformation in Ukraine

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Abstract. In the modern world, the importance of digital currencies as a tool for financial transformation and economic development is growing, especially in Ukraine, where new ways to stimulate economic growth and increase financial inclusion are being sought. The purpose of this study was to explore architectural frameworks for financial transformation through the use of digital currencies in Ukraine. Using a combined methodological approach that included an analysis of scientific literature, empirical research, and a study of the experiences of other countries in the field of digital currencies, the study applied statistical methods of data processing and comparative analysis. The article shows the need to develop adaptive architectural frameworks for the successful implementation of digital currencies in the financial system of Ukraine. In particular, the advantages of digital currencies in reducing transaction costs and increasing the availability of financial services to the population are identified. However, certain challenges related to instability and an insufficient regulatory framework have also been identified. The article identifies the problem of regulatory instability and the benefits, such as reduced transaction costs and increased access to finance, associated with the integration of digital currencies in Ukraine. The article also explores potential scenarios for the adoption of digital currencies in the financial landscape of Ukraine. These results can serve as a basis for developing practical strategies and policies for the implementation of digital currencies in Ukraine. Understanding the specific benefits and challenges associated with this process will allow for the most informed decisions on the modernisation of the country's financial system

Keywords: digital currency integration; financial technology; Ukrainian financial landscape; central bank digital currency; blockchain technology

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● INTRODUCTION

The global financial landscape has undergone a profound transformation, driven by the emergence and proliferation of digital currencies. These decentralised digital assets, enabled by blockchain technology, have disrupted traditional financial systems, prompting extensive research into the architectural frameworks governing their integration. Within this context, Ukraine stands poised to embrace this digital revolution, which presents both challenges and opportunities for its financial sector. As Ukraine navigates its path towards digital transformation, it is essential to

consider the broader implications of digital currency adoption beyond the financial sector. Digital currencies have the potential to enhance financial inclusion by providing access to banking services for underserved populations, promoting economic growth, and fostering innovation. However, they also raise concerns related to cybersecurity, data privacy, and regulatory oversight. Therefore, a nuanced understanding of the architectural frameworks governing digital currency adoption is imperative to harness their benefits while mitigating associated risks effectively.

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To contextualise the importance of this research, it is essential to analyse the findings of prominent scholars who have investigated similar themes. For instance, the classification provided by T. Ehlers *et al.* (2021) on sustainable finance taxonomies emphasises the importance of establishing clear and standardised definitions to enhance transparency and investor confidence in green finance, a strategy that could significantly benefit Ukraine's environmental and financial resilience. Furthermore, Ukrainian researchers, including I. Lomachynska *et al.* (2020), M. Zhitnar (2020), and A. Vergun (2023), have contributed valuable insights into the modernization of Ukraine's financial architecture amidst global transformations. Their work underscores the need for tailored strategies and frameworks to navigate the evolving landscape of digital finance.

Additionally, the research by R. Leal Buenfil & A. Hernandez Romanowski (2023) on decentralised finance highlights the transformative potential of decentralised finance (DeFi) in enhancing financial service accessibility and efficiency through improved regulatory frameworks. Adopting such innovative financial structures could help Ukraine spur competition and innovation within its financial sector. Similarly, A. Walther & F. Allen (2021) discuss how robust financial architecture supports economic stability; insights from this study could guide Ukraine in strengthening its financial systems to ensure stability as it undergoes significant economic reforms. The influence of fintech on financial systems, as analysed by N. Ismayilov & E. Kozarevic (2023), demonstrates that fintech innovations could enhance the efficiency and accessibility of financial services, suggesting that Ukraine should consider these dynamics when updating regulations and fostering innovation in its financial services industry. D. Freuden (2018) exploration of hybrid blockchains, combining features of both public and private models, contributes to the discourse on potential benefits and challenges. This insight informs the current research on identifying architectural frameworks that balance security, transparency, and privacy – key considerations in Ukraine's financial transformation. V. Brühl (2022) exploration of green financial products in the EU suggests that Ukraine could benefit from similar sustainability-driven financial practices to promote green investments, crucial for sustainable economic growth and European integration.

The global landscape of digital currencies is characterised by rapid innovation and experimentation, with various countries exploring different approaches to regulation and integration. Countries such as China, the United States, and the European Union have embarked on ambitious initiatives to develop central bank digital currencies (CBDCs) and leverage blockchain technology for various use cases, ranging from cross-border payments to supply chain management. By examining these international developments, this research aimed to draw insights that are applicable to Ukraine's unique context and inform its strategic approach to digital currency adoption. This study aimed to critically analyse the architectural frameworks shaping financial transformation through digital currencies and explore the specific challenges and opportunities within the Ukrainian context.

● MATERIALS AND METHODS

The research methodology integrated a systematic literature review with empirical analysis to provide a comprehensive

understanding of digital currency integration in Ukraine. The absence of primary data collection necessitated a stratified approach to identify relevant secondary data sources. These strata were delineated based on sectors, entities, and geographical considerations, ensuring a representative and diverse selection of secondary data. By structuring the data collection process in this manner, the study expected to capture a holistic view of the factors influencing financial transformation in Ukraine. This methodological framework, centred on the scrutiny of secondary data, underscored the significance of synthesising existing knowledge. The utilisation of secondary data not only contributed to the depth of understanding but also enriched the broader scholarly discourse by offering a comprehensive overview of architectural frameworks for financial transformation via digital currencies in Ukraine. Through this approach, the study sought to advance knowledge in the field and inform strategic decision-making in the financial sector. Academic publications, regulatory documents, and industry reports were scrutinised to capture the multifaceted nature of this phenomenon. Specifically, reports from international organisations such as the International Monetary Fund and the World Bank, along with regulatory frameworks from countries like the United States, the European Union, and China, were analysed to contextualise the findings within the broader international landscape.

Systematic analysis was applied to both the quantitative and qualitative dimensions of the secondary data obtained through the literature review. Quantitative aspects involved synthesising statistical information from various sources, such as reports and databases, to discern trends and patterns in digital currency adoption and usage. On the other hand, qualitative elements encompassed thematic analysis to extract concepts, perspectives, and insights embedded in the reviewed literature. Furthermore, the research methodology incorporated a comparative analysis approach to contextualise the findings within the broader international landscape. Countries such as the United States, the European Union, China, and Singapore were selected for comparison based on their varying approaches to digital currency adoption and regulatory frameworks. By examining similarities, differences, and best practices among these countries, the study intended to identify insights that could inform policy recommendations and strategic initiatives in Ukraine. This comparative perspective enhances the robustness of the study's conclusions and provides valuable insights for stakeholders navigating the complexities of financial transformation in a globalised context. By employing a mixed-methods approach, the study sought to provide a nuanced understanding of the complexities surrounding financial transformation in the digital age.

● RESULTS

A comprehensive analysis of digital currency and blockchain integration

The financial landscape in Ukraine grapples with a range of challenges that demand innovative solutions for sustainable growth (Khatri, 2019). Notably, currency instability, witnessed in the fluctuations of the Ukrainian Hryvnia (UAH) due to geopolitical uncertainties, poses risks to businesses and consumers. Additionally, a considerable portion of the population remains unbanked or

underbanked, limiting access to vital financial services. High transaction costs and prolonged processing times for cross-border transactions further hinder international trade and economic development. The sector also faces escalating threats of fraud, cyberattacks, and data breaches, underscoring the urgent need for enhanced cybersecurity measures (Koldovskyi, 2023). The National Bank of Ukraine (NBU) is actively modernising its operations, leveraging technology to enhance transparency and regulatory efficiency. The government has outlined a comprehensive digital transformation strategy, emphasising the adoption of innovative technologies to strengthen economic resilience. Notably, efforts have been made to regulate and legitimise blockchain and cryptocurrency operations, recognising their potential contributions to the economy. Moreover, financial inclusion programmes are underway to address the unbanked population, promoting accessibility to banking services and digital payment solutions.

The adoption of digital currencies in Ukraine holds substantial promise for addressing existing challenges and unlocking new opportunities for economic growth. A government-backed digital currency, such as a CBDC, could enhance currency stability and facilitate financial inclusion by providing a secure and accessible means of conducting transactions (Kuznetsova & Pohorelenko, 2021). Utilising digital currencies for cross-border transactions could significantly reduce costs and processing times, fostering international trade and economic cooperation. Blockchain technology, the backbone of digital currencies, offers ro-

bust security features, mitigating the risks associated with fraud and cybersecurity threats. The integration of digital currencies could stimulate innovation in financial services, leading to the development of novel fintech solutions and increased competitiveness within the sector. Additionally, blockchain's decentralised nature ensures transparent and efficient transactions, reducing the likelihood of corruption and enhancing overall trust in the financial system (Higginson *et al.*, 2019).

By strategically embracing digital currencies, Ukraine has the opportunity to overcome its current financial challenges, foster economic development, and position itself at the forefront of the global financial transformation. The alignment of regulatory measures with the potential benefits of digital currencies is crucial for realising a sustainable and technologically advanced financial landscape in Ukraine. In the rapidly evolving landscape of global finance, Ukraine stands at a pivotal juncture, facing challenges that necessitate innovative solutions (Kuznyetsova *et al.*, 2022). As financial systems worldwide undergo digital metamorphosis, understanding the unique architectural frameworks tailored to Ukraine becomes imperative for charting a resilient and innovative financial future. The comparative analysis of digital currency adoption in select countries provides valuable insights into the global landscape of financial transformation. Examining CBDC implementation, financial inclusion initiatives, cross-border transaction costs, and cybersecurity measures reveals distinctive strategies and priorities (Table 1).

Table 1. A comparative analysis of digital currency adoption

No.	Country	CBDC implementation	Financial inclusion initiatives	Cross-border transaction costs	Cybersecurity measures
1	Ukraine	Under consideration	Ongoing	High	Enhanced
2	Sweden	Pilot program	Advanced	Moderate	Robust
3	Singapore	Live implementation	Comprehensive	Low	High
4	United States	Research phase	Limited	High	Established
5	China	Advanced	Comprehensive	Low	Very high
6	India	Pilot program	Developing	Moderate	Established
7	Brazil	Under consideration	Ongoing	High	Moderate
8	Australia	Research phase	Advanced	Moderate	Robust
9	Japan	Live implementation	Comprehensive	Moderate	High
10	South Africa	Advanced	Developing	High	Moderate
11	Germany	Pilot program	Limited	Moderate	Established
12	Canada	Under consideration	Developing	Moderate	High
13	South Korea	Live implementation	Comprehensive	Low	Robust
14	United Kingdom	Research phase	Advanced	Moderate	Very High
15	Mexico	Under consideration	Limited	High	Moderate
16	France	Pilot program	Developing	Moderate	Established
17	Italy	Live implementation	Comprehensive	High	High

Source: made by the author based on National Bank of Ukraine (2022), A. Koldovskyi (2023), L.T.M. Nguyen & P.T. Nguyen (2024), Central bank digital currency tracker (2024), CBDC (central bank digital currencies) – statistics & facts (2024), Today's central bank digital currencies status (2024)

Countries at the forefront of CBDC implementation, such as China and South Korea, demonstrate a proactive approach to leveraging digital currencies for economic and financial development. Their advanced stages suggest a commitment to pioneering innovative solutions that may enhance financial services and economic efficiency. Conversely, those in pilot programs or research phases, such

as Sweden, India, and Germany, showcase varying degrees of exploration and experimentation, reflecting a dynamic spectrum of approaches.

Financial inclusion initiatives play a pivotal role in fostering a more equitable financial landscape. Nations with comprehensive programmes, including Singapore, Japan, and Italy, prioritise addressing financial disparities

and expanding access to underserved populations. In contrast, ongoing efforts in countries like Ukraine, Brazil, and South Africa underscore an awareness of financial inclusion’s importance, with potential variations in the specific measures taken. Developing initiatives in India, France, and other nations signal a focus on extending financial services to broader segments of the population (Kuznetsova & Pohorelenko, 2021). Cross-border transaction costs emerge as a critical factor influencing international trade and economic cooperation. Countries with low costs, such as Singapore, China, and South Korea, position themselves favourably for facilitating seamless cross-border transactions. On the other hand, high costs observed in Ukraine, Brazil, and Australia may necessitate strategic interventions to reduce barriers to international financial interactions (Higginson *et al.*, 2019).

The cybersecurity measures adopted by different nations underscore their commitment to securing digital financial systems. Countries with very high measures, including China and the United Kingdom, as well as those with established measures like the United States, Japan, and Germany, exhibit robust frameworks to mitigate potential cybersecurity threats. Enhanced measures in

Ukraine, Singapore, South Korea, and Australia demonstrate an acute awareness of the importance of safeguarding digital financial infrastructures. The global landscape of digital currency adoption is diverse, reflecting varying stages of development and strategic priorities among nations. The analysis highlights the multifaceted nature of financial transformation, emphasising the importance of ongoing research, collaboration, and the need for tailored approaches to digital currency adoption in different geopolitical contexts.

The adoption of CBDC stands as a central tenet in reshaping the financial landscape (Collomb & Sok, 2016). CBDC represents a sovereign digital currency issued by the central bank, offering a secure and efficient medium of exchange. Its implementation carries profound implications for monetary policy, financial stability, and the broader economy. By providing an alternative to traditional currencies, CBDC has the potential to enhance financial inclusion, reduce transaction costs, and mitigate the risks associated with currency instability (Table 2). However, its deployment also necessitates careful consideration of regulatory frameworks, cybersecurity measures, and the impact on existing monetary systems.

Table 2. A comparative analysis of CBDC implementation

No.	Country	CBDC launch date	Financial inclusion impact	Transaction cost reduction	Regulatory framework
1	Ukraine	Pending	High	Moderate	Developing
2	Sweden	2022	Moderate	Low	Established
3	Singapore	2021	High	Low	Comprehensive
4	United States	Research phase	Low	High	Developing
5	China	2020	High	Very low	Advanced
6	India	2023 (Expected)	High	Moderate	Developing
7	Brazil	2022	Moderate	Moderate	Developing
8	Australia	2021	High	Low	Comprehensive
9	Japan	2023 (Planned)	Moderate	Moderate	Established
10	South Africa	2020	Moderate	High	Developing

Source: made by the author based on National Bank of Ukraine (2022), A. Koldovskyi (2023), L.T.M. Nguyen & P.T. Nguyen (2024), Central bank digital currency tracker (2024), CBDC (central bank digital currencies) – statistics & facts (2024), Today’s central bank digital currencies status (2024)

The comparative analysis of CBDC implementation across diverse countries sheds light on the varying stages of adoption and their potential implications. Countries like Ukraine and Brazil, with pending or recent launches, show a strong commitment to financial inclusion, pointing to a high impact on reducing transaction costs. Developed nations like Sweden and Singapore, already implementing CBDCs, demonstrate moderate to high financial inclusion impacts and low transaction costs. However, the regulatory framework in these countries differs, with Singapore showcasing a comprehensive approach. As the global landscape evolves, ongoing research in the United States and the advanced status of China position them at distinct phases of CBDC exploration, each with its own unique set of opportunities and

challenges (Higginson *et al.*, 2019). Blockchain and distributed ledger technology (DLT) form the backbone of modern financial architectures, promising a decentralised and secure framework for transactions (Hassani *et al.*, 2018). By establishing a transparent and immutable ledger, blockchain ensures trust and accountability in financial transactions. DLT facilitates real-time settlement, reduces fraud, and streamlines complex processes such as cross-border transactions. The adoption of blockchain in financial architecture requires an exploration of interoperability, scalability, and regulatory considerations. As Ukraine contemplates its financial transformation, integrating blockchain can lead to increased efficiency, reduced costs, and heightened security within the financial ecosystem (Table 3).

Table 3. Blockchain adoption in financial systems

No.	Country	Blockchain integration date	Interoperability	Scalability	Regulatory compliance
1	Ukraine	Ongoing	Moderate	Developing	Developing
2	Sweden	2019	High	High	Established

Table 3, Continued

No.	Country	Blockchain integration date	Interoperability	Scalability	Regulatory compliance
3	Singapore	2018	High	Moderate	Comprehensive
4	United States	Pilot programs	Moderate	Developing	Developing
5	China	2016	Very high	High	Advanced
6	India	2021	Moderate	Moderate	Developing
7	Germany	2020	High	High	Established
8	Canada	2022	Moderate	Moderate	Developing
9	South Korea	2017	High	High	Established
10	United Kingdom	2019	Moderate	High	Comprehensive

Source: made by the author based on National Bank of Ukraine (2022), A. Koldovskyi (2023), L.T.M. Nguyen & P.T. Nguyen (2024), Central bank digital currency tracker (2024), CBDC (central bank digital currencies) – statistics & facts (2024), Today's central bank digital currencies status (2024)

The comparative analysis of blockchain adoption in financial systems reveals the diverse strategies employed by different countries. Developed nations such as Sweden and Singapore have embraced blockchain since 2019 and 2018, respectively, showcasing high interoperability and scalability. In contrast, emerging economies like Ukraine and India are in the developing stages, actively working on regulatory compliance and interoperability. China's advanced integration since 2016 highlights its leadership in both scalability and regulatory compliance. The ongoing pilot programmes in the United States and Canada indicate a strategic approach, emphasising developing interoperability and regulatory frameworks. Overall, the global landscape suggests a nuanced journey towards integrating blockchain into financial architectures, with countries at different stages

of development. Smart contracts and self-executing agreements with coded terms play a pivotal role in automating and enhancing the efficiency of financial transactions (Hassani *et al.*, 2018). These contracts, deployed on blockchain platforms, enable the secure execution of predefined terms without the need for intermediaries. In the context of financial architecture, smart contracts streamline processes like loan approvals, trade settlements, and compliance checks. Their automation reduces the likelihood of errors, accelerates transaction speed, and lowers operational costs. However, challenges such as legal recognition and potential vulnerabilities demand careful consideration. As Ukraine explores digital financial transformation, integrating smart contracts could revolutionise traditional financial processes, promoting transparency and efficiency (Table 4).

Table 4. Impact of smart contracts on financial transactions

No.	Country	Smart contract integration date	Transaction speed enhancement	Cost reduction	Legal recognition
1	Ukraine	Pilot programs	High	Moderate	Developing
2	Sweden	2020	Moderate	High	Established
3	Singapore	2019	High	High	Comprehensive
4	United States	Research phase	Moderate	Developing	Developing
5	China	2017	Very high	Very high	Advanced
6	India	2021	Moderate	Moderate	Developing
7	Brazil	2022	High	Moderate	Developing
8	Australia	2020	High	High	Comprehensive
9	Japan	2018	Moderate	Moderate	Established
10	South Africa	2021	High	Moderate	Developing

Source: made by the author based on National Bank of Ukraine (2022), A. Koldovskyi (2023), L.T.M. Nguyen & P.T. Nguyen (2024), Central bank digital currency tracker (2024), CBDC (central bank digital currencies) – statistics & facts (2024), Today's central bank digital currencies status (2024)

The impact of smart contracts on financial transactions reveals transformative potential across various countries. Early adopters like China and Singapore, integrating smart contracts since 2017 and 2019, respectively, demonstrate very high transaction speed enhancement, cost reduction, and legal recognition. Sweden and Australia, with established smart contract integration, showcase a balanced impact, indicating moderate to high enhancements across parameters. Developing nations such as Ukraine and Brazil, in the pilot stages, exhibit promising results with high transaction speed enhancements and moderate cost reductions. As the landscape evolves, ongoing research in

the United States and developing strategies in South Africa highlight the global pursuit of leveraging smart contracts for efficient and transparent financial transactions.

Examining successful implementations of digital currencies worldwide reveals valuable insights into their impact on financial ecosystems. For instance, Sweden's e-krona project, launched in 2017, showcases the potential benefits of a CBDC. The initiative aims to address challenges posed by decreasing cash usage and stimulate financial inclusion. Sweden's experience demonstrates the feasibility of reducing transaction costs and increasing financial accessibility through a well-implemented CBDC (Collomb & Sok, 2016).

Similarly, China's Digital Currency Electronic Payment (DCEP) initiative, officially launched in 2020, stands as a pioneering example of widespread CBDC adoption (Higginson *et al.*, 2019). The programme has demonstrated success in fostering financial inclusion, streamlining transactions, and enhancing the efficiency of the payment system. China's approach illustrates the transformative power of a CBDC when integrated into the daily lives of citizens, merchants, and financial institutions (Collomb & Sok, 2016). Drawing lessons from these case studies, Ukraine can strategically leverage digital currencies to address its unique financial challenges. The success of Sweden's e-krona underscores the importance of proactively embracing CBDC to counter declining cash usage and enhance financial inclusion. For Ukraine, adopting a CBDC could mitigate currency instability, reduce transaction costs, and provide a secure means of conducting transactions, especially in the context of international trade (Rudevska, 2021).

China's DCEP initiative offers insights into the broad applications of digital currencies beyond just monetary transactions (Collomb & Sok, 2016). Ukraine could explore integrating digital currencies into various aspects of its economy, such as supply chain management, government payments, and public services. This comprehensive approach could lead to increased efficiency, transparency, and accountability within the financial system. Furthermore, lessons from other countries emphasise the critical need for a robust regulatory framework, effective cybersecurity measures, and collaboration between the public and private sectors. Ukraine can benefit from establishing a clear regulatory environment that fosters innovation while ensuring consumer protection and system integrity. The exploration of successful digital currency implementations in other countries provides Ukraine with a roadmap for strategic financial transformation. By embracing the lessons learned and tailoring these approaches to its specific needs, Ukraine can position itself at the forefront of the global digital currency revolution, fostering economic resilience and innovation within its financial architecture.

The economic benefits of digital currency adoption in Ukraine

As Ukraine navigates the landscape of digital currencies, understanding the existing and proposed regulatory frameworks is pivotal. Presently, Ukraine has taken strides towards addressing the challenges and opportunities posed by digital currencies. NBU has expressed its commitment to exploring the implementation of a CBDC, signalling a proactive stance in adapting to technological advancements. However, concrete regulatory frameworks are yet to be fully established. In terms of existing regulations, Ukraine has made progress in recognising the legitimacy of digital currencies. However, the lack of comprehensive guidelines may pose challenges for market participants, hindering the full potential of digital currency adoption (Rudevska, 2021). The purpose of the proposed regulations is to provide clarity on legal status, taxation, and consumer protection, but their enactment is crucial to fostering a secure and supportive environment for digital currencies.

The regulatory landscape surrounding digital currencies in Ukraine presents both challenges and opportunities. Challenges include the potential for regulatory uncertainty,

which may deter businesses and investors from fully engaging in the digital currency ecosystem. Addressing issues related to fraud, money laundering, and consumer protection is paramount to building trust in the digital currency market (Vovchak *et al.*, 2019). On the flip side, embracing a conducive regulatory framework opens doors to numerous opportunities. A well-crafted regulatory environment can attract foreign investments, promote innovation, and position Ukraine as a global player in the digital currency space. Opportunities for financial inclusion, reduced transaction costs, and increased efficiency in cross-border transactions can be realised through thoughtful and adaptive regulations.

Creating a regulatory environment conducive to digital currency adoption requires a holistic and forward-thinking approach. Firstly, Ukraine should expedite the formalisation and implementation of proposed regulations to provide legal certainty and instil confidence among market participants. A comprehensive regulatory framework should address aspects like licensing, taxation, and consumer protection to create a transparent and accountable digital currency ecosystem. Secondly, collaboration between government agencies, the NBU, and industry stakeholders is vital for crafting regulations that balance innovation with risk mitigation. Engaging in a dialogue with the private sector, technology experts, and international regulatory bodies can contribute to well-informed policies that foster innovation while safeguarding against potential risks. Furthermore, implementing effective measures for fraud prevention, anti-money laundering (AML), and Know Your Customer (KYC) procedures will enhance the integrity of the digital currency market. Striking the right balance between security and innovation is crucial for long-term success. Ukraine stands at a critical juncture in shaping its regulatory approach to digital currencies. By overcoming challenges and leveraging opportunities, Ukraine has the potential to establish a progressive regulatory environment that positions it as a leader in the global digital currency arena. The adoption of clear, adaptive regulations will not only mitigate risks but also unlock the transformative potential of digital currencies for the Ukrainian economy.

As digital currencies become increasingly integrated into financial systems, addressing security concerns is paramount to ensuring the trust and confidence of users (Hassani *et al.*, 2018). Cybersecurity threats, including hacking, fraud, and theft, pose significant risks to the integrity of digital currency transactions. Ukraine must prioritise the development and implementation of robust security measures. This involves deploying advanced encryption technologies, employing multi-factor authentication, and establishing secure channels for digital transactions. By staying ahead of evolving cyber threats, Ukraine can fortify its digital currency infrastructure and safeguard against potential vulnerabilities. User privacy and data protection are critical components of a responsible and ethical digital currency framework. Striking a balance between transparency and individual privacy is essential (Hassani *et al.*, 2018). Ukraine should establish clear guidelines on the collection, storage, and usage of user data associated with digital currency transactions. Implementing privacy-centric technologies such as zero-knowledge proofs or privacy coins can enhance confidentiality without compromising the integrity of the financial system. By adhering to international

standards on data protection, Ukraine can build trust among users, encouraging wider adoption of digital currencies.

Maintaining a secure financial ecosystem goes beyond technological measures; it requires the establishment of comprehensive best practices. Regular audits and security assessments of digital currency platforms and service providers can help to identify vulnerabilities and ensure compliance with security standards. Additionally, fostering a culture of cybersecurity awareness among users and stakeholders is crucial. Education campaigns can help individuals recognise and avoid potential threats, such as phishing attacks or fraudulent schemes. Collaboration between the public and private sectors is instrumental in establishing and maintaining security standards (Collomb & Sok, 2016). Ukraine should engage in information-sharing initiatives, conduct joint cybersecurity exercises, and actively participate in international efforts to combat cyber threats. Implementing contingency plans for incident response and recovery is equally important to minimise the impact of security breaches. The security and privacy considerations surrounding digital currencies are integral to their successful integration into the financial landscape. By adopting advanced cybersecurity measures, prioritising user privacy, and implementing best practices, Ukraine can build a resilient and secure digital currency ecosystem. This approach not only safeguards against potential threats but also instills confidence in users and stakeholders, fostering a conducive environment for the sustainable growth of digital currencies in Ukraine.

The successful adoption of digital currencies relies on the active participation of key stakeholders, including banks, businesses, and consumers. Banks play a pivotal role in facilitating the integration of digital currencies into the financial system (Hassani *et al.*, 2018). Their involvement encompasses the development of interoperable platforms, secure digital wallets, and streamlined cross-border payment systems. By embracing digital currencies, banks can enhance financial inclusion, reduce transaction costs, and foster innovation within the financial sector. Businesses are integral contributors to the adoption of digital currencies, as they become both adopters and service providers. Accepting digital currencies as a form of payment opens new avenues for global transactions, reduces reliance on traditional banking infrastructure, and potentially lowers transaction fees. Businesses can also explore innovative applications of blockchain and smart contracts to optimise supply chain processes, thereby increasing efficiency. Consumers, on the other hand, play a central role in driving demand for digital currencies. Their willingness to use digital currencies for everyday transactions, investments, and savings influences the overall success of adoption efforts. Building consumer trust requires clear communication about the benefits, risks, and security measures associated with digital currencies. Education campaigns and user-friendly interfaces can empower consumers to confidently embrace the new financial paradigm.

Collaboration between the public and private sectors is essential for creating a regulatory environment that encourages innovation while safeguarding the interests of all stakeholders (Koldovskyi, 2023). The public sector, represented by regulatory bodies and government agencies, must actively engage with private enterprises to develop clear

and adaptive regulatory frameworks. This collaboration ensures that regulations align with technological advancements, fostering a dynamic and supportive ecosystem. The private sector, including financial institutions, technology companies, and startups, brings innovation, expertise, and agility to the table. Collaborative initiatives, such as joint pilot projects, information-sharing platforms, and industry consortia, can accelerate the development and implementation of digital currency solutions. These partnerships enable the public sector to benefit from industry insights, while the private sector gains clarity and guidance on regulatory compliance.

Building successful partnerships is pivotal to achieving a transformative financial landscape. Public-private partnerships (PPPs) can drive innovation, reduce implementation costs, and mitigate risks associated with digital currency adoption (Hassani *et al.*, 2018). For instance, collaborations between the NBU and private financial institutions can lead to the development of interoperable digital currency solutions that seamlessly integrate with existing banking infrastructure. Cross-industry partnerships are equally important for the success of digital currency adoption (Rudevska, 2020). Technology companies, financial institutions, and fintech startups can form strategic alliances to create comprehensive and user-friendly digital currency platforms. By leveraging the strengths of each sector, these partnerships can deliver innovative solutions that cater to the diverse needs of businesses and consumers. Stakeholder involvement, collaboration between the public and private sectors, and strategic partnerships are indispensable elements for the successful adoption of digital currencies in Ukraine. By aligning interests, fostering innovation, and building a supportive ecosystem, stakeholders can collectively contribute to the realisation of a robust and inclusive digital financial future for the country.

The adoption of digital currencies in Ukraine has the potential to yield significant economic benefits, fundamentally transforming the financial landscape. Digital currencies can streamline transactions, reduce inefficiencies, and enhance the overall economic ecosystem. One of the key advantages is the potential for cost savings, as digital transactions typically involve lower fees compared to traditional banking methods. This cost-effectiveness can lead to increased capital circulation within the economy, fostering economic growth. Moreover, digital currencies can expedite cross-border transactions, reducing the friction associated with international trade. This increased efficiency in global transactions can open new markets, attract foreign investments, and stimulate economic activities. Additionally, the transparency inherent in blockchain technology, often utilised in digital currencies, can contribute to reducing corruption and improving overall economic governance.

Table 5 delves into the potential economic benefits, emphasising how digital currencies can redefine financial transactions, reduce operational costs, and stimulate economic activities. The focus on cross-border efficiency underscores the role of digital currencies in attracting foreign investments and fostering international trade, positioning Ukraine as a competitive player in the global marketplace. Moreover, the emphasis on transparency and reduced corruption highlights the transformative impact on governance, instilling confidence in economic stakeholders.

Table 5. Potential economic benefits of digital currency adoption

No.	Economic benefit	Description
1	Cost savings	Digital currencies can significantly reduce transaction costs, leading to increased efficiency in financial transactions and lower operational expenses for businesses.
2	Cross-border efficiency	Streamlining international transactions can attract foreign investments, open new markets, and stimulate economic activity. Digital currencies enable faster and more cost-effective cross-border payments, fostering international trade.
3	Transparency and reduced corruption	Blockchain technology, the backbone of many digital currencies, ensures transparency by providing an immutable and auditable ledger. This reduces corruption risks, enhances accountability, and improves overall economic governance.
4	Financial inclusion and access	Digital currencies, with their decentralised nature, have the potential to reach unbanked and underserved populations, providing them with access to essential financial services such as payments, savings, and credit. This contributes to broader financial inclusion goals.

Source: made by the author based on National Bank of Ukraine (2022)

Table 5 sets the stage by showcasing the potential economic benefits of digital currency adoption. The robust potential for cost savings, cross-border efficiency, and enhanced transparency promises a paradigm shift in financial operations. By embracing digital currencies, Ukraine stands to optimise its economic processes, attract global investments, and cultivate an environment of financial accountability. The integration of digital currencies is poised to create a ripple effect in the financial technology (fintech) sector, resulting in job creation and fostering innovation. As digital currency platforms, blockchain solutions, and associated technologies gain prominence, there will be an increased demand for skilled professionals in software development, cybersecurity, and blockchain engineering. This surge in job opportunities not only addresses unemployment concerns but also contributes to a dynamic and skilled workforce.

Furthermore, the fintech sector, driven by digital currencies, serves as a hotbed for innovation. Startups and established companies alike can leverage these technologies to develop new financial products, services, and business models. This innovation has the potential to attract investments, stimulate entrepreneurship, and position Ukraine as a hub for fintech advancements. Table 6 explores the intricate connection between digital currency adoption, job creation, and innovation in the fintech sector. It underscores the diverse job opportunities arising from the integration of digital currencies, ranging from technology roles to legal and compliance expertise. The entrepreneurial innovation within the fintech sector showcases how digital currencies act as catalysts for groundbreaking developments, propelling Ukraine into the forefront of fintech advancements.

Table 6. Job creation and innovation in the fintech sector

No.	Impact factor	Description
1	Job opportunities	The integration of digital currencies increases demand for highly skilled professionals in various fields, including software development, cybersecurity, blockchain engineering, legal, and compliance. Job creation extends beyond technology roles to encompass legal and compliance experts due to evolving regulatory needs.
2	Entrepreneurial innovation	Fintech startups leverage digital currencies to pioneer innovative financial products and services. This innovation extends to areas such as DeFi, non-fungible tokens (NFTs), and smart contract applications. These developments attract investments, stimulate entrepreneurship, and position Ukraine as a hub for cutting-edge fintech advancements.

Source: made by the author based on National Bank of Ukraine (2022)

Table 6 delves into the human aspect of this transformation, illustrating the transformative potential of digital currencies in job creation and fostering innovation. The diverse skill sets required, ranging from technological expertise to legal and compliance acumen, reflect the breadth of opportunities that this transition can unlock. As Ukraine becomes a hub for fintech innovation, these opportunities translate into a dynamic and skilled workforce, propelling the nation towards economic resilience. Digital currencies play a pivotal role in enhancing financial inclusion, providing previously underserved populations with access to essential financial services. In Ukraine, where a portion of the population may have limited access to traditional banking services, digital currencies offer an alternative financial infrastructure. By enabling peer-to-peer transactions, digital wallets, and access to global markets, digital currencies

empower individuals who were previously excluded from the formal financial system.

The social and economic impact of digital currencies

The use of digital currencies eliminates geographical barriers, allowing residents in remote areas to participate in the broader economy. This increased financial inclusion not only empowers individuals but also contributes to a more inclusive and resilient economic growth model. By providing access to savings, credit, and investment opportunities, digital currencies can contribute to poverty reduction and overall socio-economic development. Table 7 focuses on the social and economic impact of digital currencies, particularly in terms of financial inclusion. By enabling peer-to-peer transactions and providing access to global markets, digital currencies empower individuals, especially

those in remote areas, to participate in the broader economy. The emphasis on poverty reduction underscores the

transformative potential of digital currencies in fostering long-term economic growth and alleviating poverty.

Table 7. Impact on financial inclusion

No.	Impact factor	Description
1	Peer-to-peer transactions	Digital currencies enable seamless peer-to-peer transactions, providing individuals with an alternative financial infrastructure that doesn't rely on traditional banking systems. The decentralised nature of digital currencies ensures direct transactions between users, reducing reliance on intermediaries.
2	Access to global markets	Increased financial inclusion allows residents, including those in remote areas, to access global markets and opportunities. Digital currencies facilitate cross-border transactions, enabling users to engage in international trade and investments without geographical constraints.
3	Poverty reduction	Access to savings, credit, and investment opportunities contributes to poverty reduction and overall socio-economic development. Digital currencies empower individuals by providing them with tools to build financial stability, accumulate savings, and access credit, fostering long-term economic growth and poverty alleviation.

Source: made by the author based on National Bank of Ukraine (2022)

Table 7 places a spotlight on the societal impact of digital currency adoption, emphasising financial inclusion as a key driver of change. By enabling peer-to-peer transactions and broadening access to global markets, digital currencies become catalysts for socio-economic empowerment. The potential to alleviate poverty and provide individuals with newfound financial tools further cements the transformative potential of digital currencies in shaping a more inclusive and equitable society. The potential impact of digital currencies on economic growth in Ukraine is vast and multifaceted. From reducing transaction costs to fostering job creation and driving financial inclusion, the adoption of digital currencies has the potential to be a catalyst for positive economic transformation. As Ukraine navigates this transformative journey, careful consideration of the associated benefits will be instrumental in realising a thriving and inclusive digital economy.

The amalgamation of economic benefits, job creation, and societal empowerment showcased in these tables paints a compelling narrative of the potential impact of digital currencies on Ukraine's economic growth. As the nation embarks on this transformative journey, careful consideration of these facets will be pivotal in realising a future marked by financial resilience, innovation, and inclusive prosperity. The adoption of digital currencies in any economic landscape is not without its challenges. For Ukraine, navigating potential hurdles is essential for a smooth transition to a digital financial ecosystem. One notable challenge lies in the complexity of regulatory frameworks, as the lack of clear guidelines may lead to uncertainty among businesses and investors (Kuznetsova & Pohorelenko, 2021). Additionally, concerns about technological infrastructure and cybersecurity vulnerabilities can pose significant barriers to widespread adoption. Addressing these challenges requires a proactive approach, involving collaboration between regulatory bodies, technology experts, and the private sector to establish clear and adaptive regulatory frameworks and robust security measures. Furthermore, the potential resistance from traditional financial institutions and existing payment systems may impede the seamless integration of digital currencies. Overcoming this challenge involves fostering dialogue, promoting education, and illustrating the mutual benefits of collaboration. A comprehensive public awareness

campaign can also play a pivotal role in dispelling misconceptions and building trust among users and stakeholders.

Mitigating the risks associated with digital currencies is crucial to ensuring the stability and integrity of the financial ecosystem. One primary concern is the potential for illicit activities such as money laundering and fraud facilitated by the pseudonymous nature of digital currencies. Implementing robust KYC and AML procedures is imperative, along with enhancing collaboration between regulatory bodies and law enforcement agencies to swiftly address and deter illicit activities. Market volatility and price fluctuations are inherent challenges in the digital currency space. Mitigating these risks involves educating users about the inherent volatility, implementing risk management strategies, and promoting responsible investment practices. Encouraging the use of stablecoins pegged to fiat currencies can also provide a more stable medium of exchange. Moreover, the risk of technological glitches and system failures requires the development of fail-safe mechanisms and contingency plans. Regular audits, stress testing, and continuous monitoring of digital currency platforms can help identify and rectify vulnerabilities before they escalate.

Building resilience in the financial ecosystem involves a holistic approach encompassing regulatory frameworks, technological infrastructure, and user education. Strengthening regulatory frameworks includes continuous updates to adapt to technological advancements and emerging risks. Regular collaboration between regulators, industry stakeholders, and international bodies ensures a comprehensive and globally aligned approach to resilience. Investing in robust technological infrastructure, including secure networks and scalable blockchain solutions, is paramount. This not only safeguards against potential cyber threats but also ensures the seamless and efficient functioning of the digital currency ecosystem. User education and awareness campaigns play a pivotal role in building resilience by fostering a culture of responsible use. Educated users are better equipped to understand the risks, adopt secure practices, and contribute to the overall security and stability of the digital financial landscape. Addressing challenges, implementing effective mitigation strategies, and building resilience are integral aspects of the successful adoption of digital currencies in Ukraine. By fostering collaboration, leveraging technology, and prioritising user education,

Ukraine can navigate the complexities of this transformative journey and build a robust and resilient digital financial ecosystem.

The future of financial transformation in Ukraine appears promising, marked by a trajectory towards a more digitised and inclusive financial landscape. As digital currencies become ingrained in the national economy, one can anticipate increased financial inclusion, with previously underserved populations gaining access to a broader range of financial services. The convenience and accessibility offered by digital currencies are likely to foster a significant shift in consumer behaviour, with a gradual move away from traditional banking methods. Moreover, the adoption of digital currencies is poised to stimulate economic growth by attracting foreign investments and fostering entrepreneurship. Ukraine's proactive approach to regulatory frameworks and collaboration with the private sector can position the country as a regional leader in fintech innovation. Predictions include a surge in job opportunities within the technology and financial sectors, contributing to the development of a skilled and dynamic workforce.

The evolution of financial transformation in Ukraine will undoubtedly be influenced by emerging technologies that extend beyond digital currencies. Blockchain, the underlying technology of many digital currencies, is expected to find applications in various sectors, including supply chain management, healthcare, and governance. Smart contracts, automated and self-executing contracts with the terms of the agreement directly written into code, are likely to streamline complex financial transactions and enhance contract efficiency. Artificial intelligence and machine learning are anticipated to play a pivotal role in refining financial services, offering personalised solutions, and improving fraud detection mechanisms. The integration of these technologies into the financial ecosystem can lead to more efficient decision-making processes, enhanced customer experiences, and improved risk management practices. The Internet of Things is another frontier that could shape the future of financial services. The interconnectedness of devices can create a seamless and secure environment for transactions, contributing to the overall efficiency and reliability of digital financial systems.

On a global scale, the continued evolution of digital currencies is poised to reshape the entire financial landscape. CBDCs are gaining momentum, with several countries exploring or piloting their own digital currencies. The potential for cross-border interoperability and enhanced international trade is substantial, as CBDCs could streamline transactions and reduce reliance on traditional banking infrastructure. The rise of DeFi platforms, built on blockchain and smart contract technologies, is challenging traditional financial intermediaries. These platforms offer decentralised alternatives to traditional financial services, providing users with greater control over their assets, lower transaction costs, and enhanced financial privacy. As digital currencies become more widely accepted, regulatory frameworks will likely adapt to accommodate the evolving landscape. Collaboration between countries and international bodies will be crucial in establishing standardised approaches to digital currency regulation and ensuring interoperability and global acceptance. The future outlook for financial transformation in Ukraine is one of dynamic

growth and innovation. As emerging technologies continue to shape the landscape, the strategic adoption of digital currencies positions Ukraine at the forefront of a global fintech revolution, contributing to economic resilience, financial inclusion, and technological advancement.

● DISCUSSION

The research on architectural frameworks for financial transformation via digital currencies in Ukraine aligns and diverges with existing literature, providing a nuanced understanding of the evolving landscape. The literature on blockchain and DLT provides a robust foundation for understanding the potential impact of digital currencies on financial systems. A. Collomb & K. Sok (2016) offer insights into the broader implications of blockchain/DLT in the financial sector, laying the groundwork for exploring its transformative potential in research on architectural frameworks for financial transformation via digital currencies in Ukraine. Y. Khatri (2019) study on the practical application of blockchain technology in trade finance resonates with the findings. Both studies highlight the increasing adoption of blockchain in facilitating trade-related financial processes, emphasising the technology's transformative impact on the sector. The present research complements Y. Khatri (2019) insights by delving into the specific architectural frameworks that underpin these transformative processes in the Ukrainian financial context.

A. Guley & A. Koldovskiy (2023) examination of CBDCs offers a nuanced understanding of the advantages and disadvantages of CBDCs. The research aligns with their findings by acknowledging the potential impacts of CBDCs on financial markets, institutions, and risks. However, this study goes further by delving into the specific architectural frameworks necessary for the successful implementation of CBDCs in Ukraine. This study underscores the importance of understanding the technical intricacies of blockchain in the context of digital currency adoption. The present study extends this understanding by applying technical considerations to the development of architectural frameworks tailored to the Ukrainian financial sector.

D. Freuden (2018) exploration of hybrid blockchains, combining features of public and private models, aligns with the study's focus on balancing security, transparency, and privacy. Both studies acknowledge the potential benefits and challenges associated with hybrid models. This research contributes by providing specific insights into how these hybrid models can be tailored to address the unique needs of the Ukrainian financial landscape. H. Hassani *et al.* (2018) research on banking with blockchain big data complements the broader exploration of digital currencies' implications. Both studies recognise the synergies between blockchain and big data analytics, emphasising the transformative potential in banking operations. The research extends this understanding by providing insights into the architectural frameworks that harness these synergies for financial transformation in Ukraine.

S. Kapoor (2018) overview of altcoins adds diversity to the cryptocurrency landscape discussed in the research. Both studies acknowledge the broader context beyond Bitcoin, recognising the potential diversity in digital currencies. This study contributes by providing specific insights into the architectural frameworks that can accommodate this

diversity within the Ukrainian financial ecosystem. M. Higginson *et al.* (2019) study on blockchain and retail banking resonates with the findings on the connection between blockchain technology and improved operational efficiency, security, and customer experiences. Both studies emphasise the potential transformative impact on retail banking. The research contributes by providing specific architectural frameworks tailored to the retail banking sector in Ukraine.

M. Demianchuk & N. Maslii (2021) study on modern trends in the development of financial and innovation-investment processes in Ukraine offers insights into the broader economic context within which the research operates. While their focus is on broader economic trends, this research complements their findings by providing specific insights into the architectural frameworks necessary for financial transformation in Ukraine's digital currency landscape. O. Hryniuk (2021) exploration of the digital transformation of the financial sector of the economy aligns with the research's focus on the evolving landscape of financial technology. Both studies recognise the importance of digital transformation in reshaping the financial sector. This research extends this understanding by providing specific insights into the architectural frameworks essential for leveraging digital currencies in the Ukrainian financial context.

H. Hassani *et al.* (2018) exploration of banking with blockchain big data is particularly relevant to research, which delves into the broader implications of digital currencies. Their insights into the synergy between blockchain and big data analytics contribute to the discussion on the transformative potential of digital currencies. M. Higginson *et al.* (2019) study on blockchain and retail banking highlights the connection between blockchain technology and improved operational efficiency, security, and customer experiences. These considerations are integral to developing architectural frameworks that resonate with the retail banking sector in Ukraine. S. Kapoor (2018) exploration of altcoins provides a broader context for understanding the cryptocurrency landscape beyond Bitcoin. This perspective is relevant to the author's research, as it helps contextualise the potential diversity of digital currencies and their impact on financial transformation in Ukraine.

A. Guley & A. Koldovskyi (2023) examination of CBDCs provides a nuanced understanding of the advantages and disadvantages of CBDCs. This study contributes valuable insights into the potential impacts on financial markets, institutions, and risks in Ukraine's context. Y. Khatri (2019) investigates the practical application of blockchain technology in trade finance. The study highlights the real-world adoption of R3's Corda blockchain by over 50 banks and firms in a trial trade finance app. This case study is pertinent to the exploration of architectural frameworks for financial transformation, emphasising the practical implications and industry adoption of blockchain technology in trade-related financial processes.

These diverse studies collectively contribute to the foundational understanding of blockchain and digital currencies. Integrating these insights into research on architectural frameworks for financial transformation in Ukraine ensures a comprehensive exploration of the implications, challenges, and potential benefits of the evolving financial landscape. The research aligns with existing literature in recognising the transformative potential of blockchain

technology, the importance of regulatory frameworks, and the sector-specific implications of digital currencies. However, the study contributes by providing specific insights into the architectural frameworks essential for the successful adoption and implementation of digital currencies in the unique context of Ukraine. This study represented a timely and comprehensive exploration of the architectural frameworks shaping the integration of digital currencies into Ukraine's financial system. By analysing the latest research findings, regulatory developments, and empirical data, this research sought to provide actionable insights that can guide policymakers, industry stakeholders, and researchers in navigating the complexities of digital currency adoption. Through collaboration and informed decision-making, Ukraine can position itself as a leader in the digital economy, leveraging the transformative potential of digital currencies to drive sustainable growth and prosperity.

● CONCLUSIONS

This research has revealed critical insights into the realm of architectural frameworks for financial transformation through digital currencies in Ukraine, fostering a deeper comprehension of the contemporary financial landscape. The conclusions drawn succinctly reflect the outcomes of this investigation, aligning seamlessly with the article's objectives and title. The exploration of the global financial milieu highlights the transformative potential of digital currencies and their inherent challenges. Specifically, the findings illuminate the intricate balance required to integrate these currencies seamlessly into traditional financial systems, particularly within the unique context of Ukraine. As digital currencies redefine financial transactions, the study affirms the pertinence and timeliness of architectural frameworks in navigating this paradigm shift. The research findings underscore the nuanced dynamics of digital currency integration in Ukraine, highlighting both challenges and opportunities. While regulatory ambiguity, technological constraints, and consumer scepticism pose significant hurdles, the potential for enhanced financial inclusivity, streamlined transactions, and increased transparency offers a compelling vision for the future. Policymakers and financial stakeholders must navigate these complexities strategically, leveraging opportunities while addressing challenges, to realise the transformative potential of digital currencies in Ukraine's financial landscape.

It is recommended that in Ukraine, the development of robust regulatory frameworks tailored to the unique challenges and opportunities posed by digital currencies be prioritised. Additionally, financial institutions should invest in research and development to enhance their understanding of blockchain technology and its implications for architectural frameworks. Collaborative efforts between the public and private sectors are essential for fostering innovation and ensuring the seamless integration of digital currencies into the financial ecosystem. Furthermore, stakeholders should prioritise cybersecurity measures to mitigate the risks associated with digital currency adoption. Investing in robust cybersecurity infrastructure and implementing best practices can safeguard financial transactions and protect user privacy. Additionally, ongoing education and awareness initiatives are crucial for ensuring that stakeholders are equipped to navigate the

complexities of digital currency integration effectively. This research provides valuable insights into the architectural frameworks governing financial transformation through digital currencies in Ukraine. By addressing the challenges and opportunities inherent in this transformative process, stakeholders can pave the way for a more resilient and inclusive financial ecosystem. In addition to the findings outlined above, several directions for further research in this field emerge. Longitudinal studies could provide valuable insights into the evolution of digital currency

adoption in Ukraine over time. Tracking trends, patterns, and changes in regulatory frameworks, technological advancements, and consumer perceptions could offer a comprehensive understanding of the ongoing transformation.

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● CONFLICT OF INTEREST

None.

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Архітектурні фреймворки фінансової трансформації в Україні

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Анотація. У сучасному світі значення цифрових валют як інструменту для фінансової трансформації та економічного розвитку зростає, особливо в Україні, де йде пошук нових шляхів стимулювання економічного зростання та підвищення фінансової доступності для населення. Метою цього дослідження було вивчення архітектурних фреймворків для фінансової трансформації за допомогою використання цифрових валют в Україні. Використовуючи комбінований методологічний підхід, що включав аналіз наукової літератури, емпіричні дослідження та вивчення досвіду інших країн у галузі цифрових валют, у дослідженні було застосовано статистичні методи обробки даних і порівняльний аналіз. Показано необхідність розробки адаптивних архітектурних фреймворків для успішної реалізації цифрових валют у фінансовій системі України. Зокрема, виявлено переваги цифрових валют у зменшенні витрат на транзакції та підвищенні доступності фінансових послуг для населення. Проте також виявлені певні виклики, пов'язані з нестабільністю та недостатнім регуляторним фреймворком. Ідентифіковано таку проблему, як регуляторна нестабільність, та такі переваги, як зменшення витрат на транзакції та підвищення доступності фінансів, що пов'язані з інтеграцією цифрових валют в Україні. Також у статті досліджено потенційні сценарії для прийняття цифрових валют у фінансовому ландшафті України. Ці результати можуть служити основою для розробки на практиці стратегій та політик для реалізації цифрових валют в Україні. Розуміння специфічних переваг та викликів, пов'язаних із цим процесом, дозволить приймати найбільш обґрунтовані рішення щодо модернізації фінансової системи країни

Ключові слова: інтеграція цифрових валют; фінансова технологія; український фінансовий ландшафт; цифрова валюта центрального банку; технологія блокчейну

Research of the latest technologies and approaches to ensuring safety at work

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Abstract. The implementation of appropriate measures and systems to ensure occupational safety depends not only on the economic efficiency of companies, but also on the life and health of employees, which makes this topic relevant. The purpose of the study was to assess the capabilities and effectiveness of leading technologies and new management approaches to ensuring safety at work in accordance with existing problems in the field of occupational safety. The main approaches used in the study are the statistical method, comparison, analysis, and the descriptive method. The study identified problems in the field of occupational safety in Ukraine, the main ones being a large share of undeclared labour and an inadequate system for recording accidents. Ways to ensure occupational safety are identified, which are primarily related to conducting conversations, motivating personnel, digitalisation of such safety elements as training, briefings, risk assessment, and incident management. Based on the analysis of the experience of global leading companies in ensuring

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occupational safety, effective practices for improving the effectiveness of the safety system have been identified, which include conversations with employees, special development and training programmes, the introduction of advanced technologies and unified safety systems. The conducted research allowed developing an occupational safety system that incorporates modern technologies and management approaches. The findings can be useful for company managers in selecting and implementing effective management measures and new technologies to ensure occupational safety

Keywords: occupational safety; injuries; accidents; internet of things; automation

● INTRODUCTION

The current stage of technology development and the introduction of new management approaches allow ensuring a high level of occupational safety. However, the number of workplace accidents, including those that resulted in the death of an employee, and the prevalence of occupational diseases remain significant. This problem is particularly acute in Ukraine, where occupational safety systems lag far behind those of advanced countries. Regulation of this issue can be resolved by various means, in particular, management at the state level, or at the level of an individual enterprise.

Ensuring the proper level of occupational safety in the context of Industry 4.0 significantly depends on the introduction of new, safer technologies (including digital ones) and on the effective construction of a safety management system. C. Nnaji & A.A. Karakhan (2020) and M. Akinolu *et al.* (2022) investigated the implementation of safety technologies in the construction industry. Researchers identified the main trends in the introduction of new technologies, and noted the importance of planning, management, and monitoring. W.-J. Su (2021) pointed out that an appropriate level of occupational safety is ensured through an appropriate culture. The researcher concluded that increasing management's commitment to safety is an important motivation for workers to participate in compliance with safety regulations. T. Novak (2023) noted the need for changes in the field of occupational safety at the level of international standards. The researcher noted that the right to a safe and healthy working environment should be included in the basic principles and rights at work.

The safety management concept is designed to manage the components of occupational safety. The International Labour Office (2001) defines the key components of this approach as follows: policy, organisation, planning and implementation, evaluation, measures for improvement. According to the organisation's instructions, the safety principles defined by it can be implemented both at the national and organisational levels. Many countries developed their own safety management models, which were then implemented in the activities of organisations in a wide range of industries.

In Ukraine, the protection of professional activities is also regulated by standards, considering international recommendations. O. Tveritnikova & Y. Demidova (2021), investigating this issue, noted the creation of the state standard of Ukraine (DSTU) ISO 45001:2019, which is a translation of the international standard ISO 45001:2018, IDT. Consideration of global trends, according to researchers, will help increase the competitiveness of Ukrainian enterprises, improve production safety, and ensure the implementation of certain sustainable development goals.

However, at the present stage, there are a number of problems in ensuring occupational safety in Ukraine. O. Krainiuk *et al.* (2021) pointed out the lack of a clear direction for strategic development, cyber-attacks, and legal restrictions. V. Kurepin (2022) noted the lack of qualified employees in the field of occupational safety, insufficient funding for safety measures, an inadequate system of employee motivation on safety issues, and poor quality of safety expertise. The researcher also pointed out the problems in the field of statistical reporting of industrial accidents related to the lack of a unified state system for recording such cases, which helps to conduct proper analysis and implement measures to improve the system.

These problems are mainly in the sphere of state regulation. But even at the enterprise level, researchers offer a number of measures related to improving the management system or introducing new technologies to ensure occupational safety. Y. Pushak & A. Zaverbnyj (2020) explored the possibilities of reputation management, the key element of which is to ensure the proper safety and psycho-emotional state of employees. O. Krainiuk *et al.* (2022) noted the importance of introducing the latest technologies to ensure occupational safety. Researchers argue that such technologies will contribute not only to improving safety, but also to increasing efficiency. However, there are possible negative consequences, such as negative psychosocial effects due to limited communication with employees, exposure to electromagnetic fields, diseases associated with sedentary work, etc.

Researchers often give priority to a specific area of improving occupational safety – the introduction of a particular technology or management approach. The problems are mostly addressed to public administration, as is the search for their solutions. In contrast to existing research, this paper offers an approach to solving problems that exist both at the state and micro levels, through improving the safety system at the enterprise level. The specific feature of such a system is that it does not give preference to a specific technology or approach, but provides for optimisation of both the technological and managerial components of ensuring occupational safety through proper planning, implementation, evaluation, and control. The purpose of the study was to analyse modern innovative technologies and management approaches to ensuring safety at work, considering existing problems in the field of occupational safety. To solve this goal, the following tasks are set: to identify the causes and key problems in the field of occupational safety in Ukraine through statistical analysis; to analyse international experience and positive examples of ways to reduce workplace injuries; to explore the latest technologies and approaches to ensuring occupational safety.

● MATERIALS AND METHODS

In the course of the study, a comprehensive system of scientific methods was applied, which allowed assessing existing problems and potential ways to solve them. The main methods used in the study were the statistical method, comparison, analysis, and descriptive method. The statistical method proved to be useful for assessing the current state of occupational safety at work on the example of Ukrainian enterprises. With its use, the following indicators were analysed (within Ukraine): work-related injuries (by the number of injured persons); work-related injuries, by types of economic activity in 2022 (by the number of injured persons); the number of injured persons for key causes of accidents in 2022; the number of informally employed persons in various sectors of the economy. The use of the statistical method identified key problems of ensuring occupational safety in Ukraine and their causes. A comparison was used to supplement the results obtained. Using this method, indicators of the state of workplace injuries in Ukraine, Poland, and Germany were compared, namely, the number of people injured at work, the number of people killed at work, and the most common causes of workplace injuries. The choice of countries for comparison is based on the fact that Poland and Germany are geographically close to Ukraine, have close economic, social, and political ties, but belong to developed countries, which makes their experience useful for Ukraine.

The study used the results of a survey conducted by the European company Quentic with the participation of 11 world-renowned experts and 500 occupational health and safety practitioners from Europe (Industry report..., 2022). Based on these data, priority areas for ensuring occupational safety were identified using the analysis. In addition, the analysis method was used to build the structure of the

industrial safety system (considering modern technologies and approaches in management). Using the descriptive method, the main latest technologies that can be used in the field of occupational safety were characterised. This helped to identify key areas in which such technologies can be implemented, and how they will ensure the safety of workers. The descriptive method was useful in the course of studying the experience of two world-renowned companies that are among the leaders in occupational safety in the list of Top 50 companies for worker health and safety (2020) according to Ethos ESG. Such companies are Range Resources (engaged in natural gas production) and Kosmos Energy (a leading deep-sea exploration and production company, its assets include oil and gas production and exploration). The use of the descriptive method allowed characterising the key ways in which companies ensure the safety of their employees, and the main security tasks that ensure their success in this area.

● RESULTS

Workplace injuries in Ukraine: statistics, causes and key issues

Improper safety at work in Ukraine is a problem that affects the health and safety of employees, and economic activity in general. This problem requires the search for new approaches to safety management, the introduction of new technologies, and the improvement of processes. The choice of optimal measures to improve occupational safety should be based on a detailed assessment of the current state of workplace injuries, identifying key problems and their causes. The current state of occupational safety can be assessed by analysing the number of employees injured by industrial accidents, according to information provided by the State Statistics Service of Ukraine (2023) (Fig. 1).

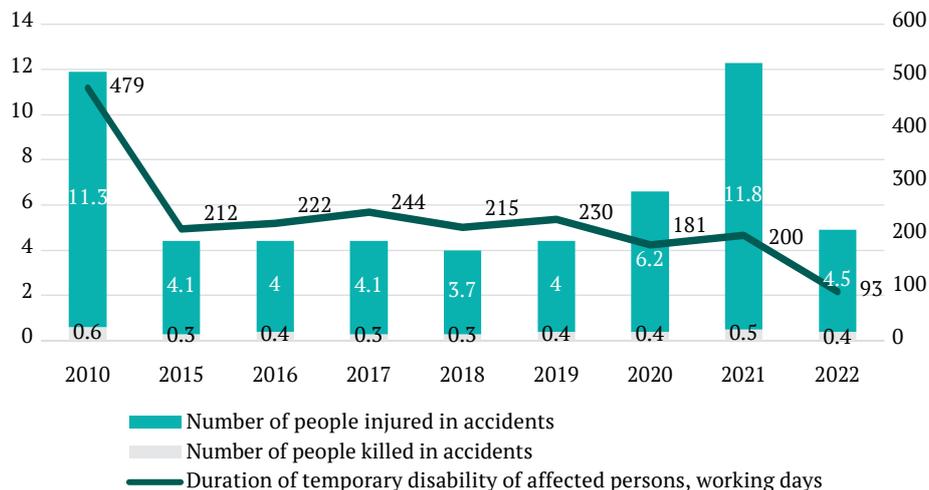


Figure 1. Work-related injuries in Ukraine

Source: compiled by the authors based on Traumatism at workplace (2023)

As can be seen from Figure 1, the number of people injured and killed in accidents during the study period was highest in 2021. In 2022, this indicator decreased significantly. The State Statistics Service of Ukraine (2023) separately provides data on workplace injuries that are not related to production. As

of 2022, the number of people who received workplace injuries that are not related to production is 17,802 people (639 – with a fatal outcome), 14,894 of whom are women (State Statistics Service of Ukraine, 2023). Figure 2 shows the number of injured persons by type of economic activity in 2022.

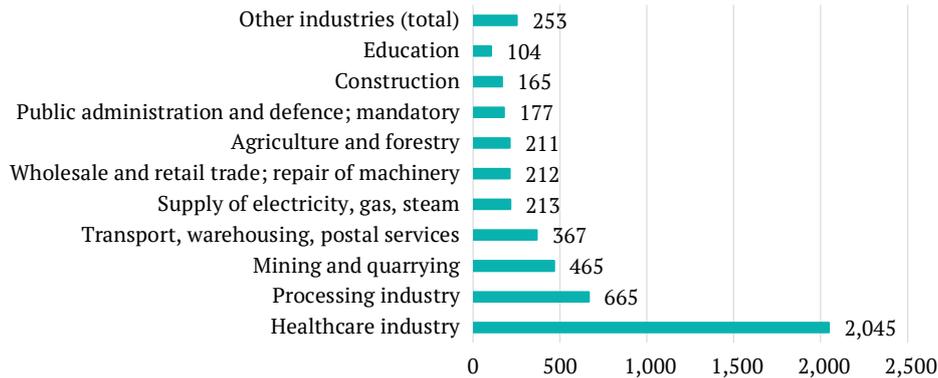


Figure 2. Number of persons injured at work, by type of economic activity in 2022

Source: compiled by the authors based on Traumatism at workplace (2023)

Figure 2 shows that the largest number of workplace accidents was recorded in healthcare and social assistance sectors. In addition, employees suffered a large number of injuries related to production in such industries as processing, mining and quarrying, transport, warehousing, postal, and courier activities. The most traumatic professions given the number of fatalities (as of 2022) are: employees of the transport industry – 99 persons, engineering and technical specialists – 75 persons, builders – 46 persons, metalworkers – 36 persons, electricians – 32 persons, employees of the socio-cultural industry – 24 persons. It is also important to note that 217 workers died as a result of injuries sustained during the hostilities (Degnera, 2023). The number of injured persons by the main causes of accidents in 2022 is shown in Figure 3.



Figure 3. Number of injured persons by key causes of accidents in 2022

Source: compiled by the authors based on Traumatism at workplace (2023)

The main causes of an accident in 2022 include organisational reasons, as well as technogenic, natural, environmental, and social ones. A fairly large number of accidents were observed due to psycho-physiological reasons (including 14 people under the influence of alcohol or other types of intoxication/poisoning) and technical reasons. Accidents for organisational reasons are most often associated with violations of labour and industrial discipline (1,483 people) (Traumatism at workplace, 2023).

Comparing the level of workplace injuries in Ukraine with some countries, the following can be noted. According to the Central Statistical Office of Poland, the country recorded 45,809 work-related injuries in the first 9 months of 2023 (99 fatalities and 206 serious cases), which is 7.5% more than in the corresponding period of 2022. Most often,

accidents were caused by inappropriate behaviour of employees or improper handling of equipment, failure to comply with safety rules (Accidents at work..., 2023). According to the Deutsche Gesetzliche Unfallversicherung, in 2022, 787,412 work-related accidents (423 fatalities) occurred in the commercial and public sectors in Germany, resulting in disability for more than three days or death (Work-related accidents, 2023). These data indicate a significant increase in the number of recorded workplace accidents in Poland and Germany compared to Ukraine. The number of fatalities in the countries is lower (99 in Poland and 423 cases in Germany compared to 437 cases in Ukraine).

It can be assumed that the above indicators differ significantly due to demographic differences. The population of Germany is more than twice the population of Ukraine in 2022 (over 84 million people in Germany and over 41 million in Ukraine). However, in the case of Poland, this hypothesis is not confirmed, because the population of this country is smaller than the population of Ukraine, and amounts to over 37 million people. According to the researchers, the most likely reasons for significant differences in workplace injury rates for the countries under study are differences in approaches to the system for collecting information on industrial accidents. In Poland and Germany, such systems can be more advanced and contribute to more accurate recording of events. Statistics on fatalities are more revealing, and the lower number of fatalities in Germany and Poland compared to Ukraine indicates that the occupational safety systems in these countries are more effective. The indicators under study may also be affected by the level of undeclared labour, which is high in Ukraine (Fig. 4).

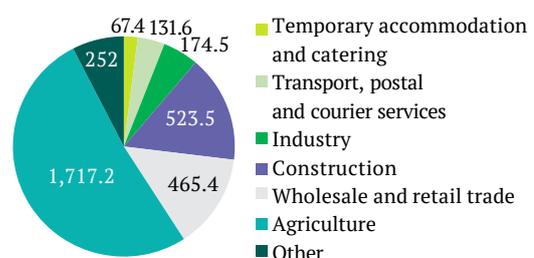


Figure 4. Number of informally employed persons in various sectors of the economy, thousand people
Source: compiled by the authors based on I. Degnera (2023)

It can be summed up that one of the problems associated with the imperfection of the occupational safety system in Ukraine may be the lack of proper recording of accidents. In addition to more accurate statistics, an effective accident recording system can provide benefits such as the ability to analyse incidents to prevent workplace injuries, grounds for paying compensation to workers, identifying key problems in the safety system and ways to improve it. Considering the causes of workplace accidents, when developing measures to counteract such cases, the largest number of them occurs due to violations of labour and industrial discipline, and due to technogenic, natural, environmental, social, and psychophysiological reasons.

An important component of the national policy in Ukraine regarding occupational safety and countering workplace accidents is preventive work. Such work consists in improving the level of safety culture through promoting safety and ways to reduce safety risks, forming a responsible attitude to one's own safety, the safety of others, the industrial and natural environment. This can be implemented through consultations, lectures, seminars, information campaigns, etc. One of the most effective methods of prevention is to conduct scheduled inspections at enterprises by qualified inspectors.

In the field of occupational safety, digital tools are increasingly used, which is especially relevant during quarantine

restrictions, and in the context of the legal regime of martial law. In particular, according to I. Degenera (2023) the State Labour Service of Ukraine implemented the following measures in the field of digitalisation: introduced the possibility to issue permits for the performance of work and the use of equipment that pose an increased danger in digital format; provided expert opinions in digital format; provided an opportunity to translate document flow in the occupational health and safety management system into electronic form; created an information platform for quick information about wage arrears; created an online consultation service "Interactive inspector". To further optimise and improve the efficiency of work in the field of occupational safety, it is worth referring to international experience in this area, in particular, considering the successful examples of individual companies.

International experience: ways to reduce workplace injuries and positive examples

Ensuring safe and decent working conditions is a priority for the world's leading countries, including the developed countries of Europe. Given this, the results of a study by the European company Quentic (Industry report..., 2022) are worthy of attention. The study analyses which areas, according to experts and practitioners, are a priority in the field of ensuring occupational safety and health (Fig. 5).



Figure 5. Priority areas for ensuring occupational safety and health according to European experts and practitioners

Note: EHSQ – environment, health, safety, and quality system

Source: compiled by the authors based on Industry report: An in-depth look at safety management in 2022 (2022)

As can be seen from Figure 5, most experts and practitioners prefer to increase employee motivation and talk to them about ensuring occupational safety. Such measures are justified, because, as it was established above, most often the causes of workplace accidents are associated with inappropriate behaviour of employees, improper use of equipment, and failure to comply with

safety rules. Experts and practitioners also pay great attention to problems related to psychosocial stress, and consider it effective to conduct conversations with management. Figure 6 shows the ratio of experts' and practitioners' responses to the question about which safety management elements their companies have digitised or plan to digitise.

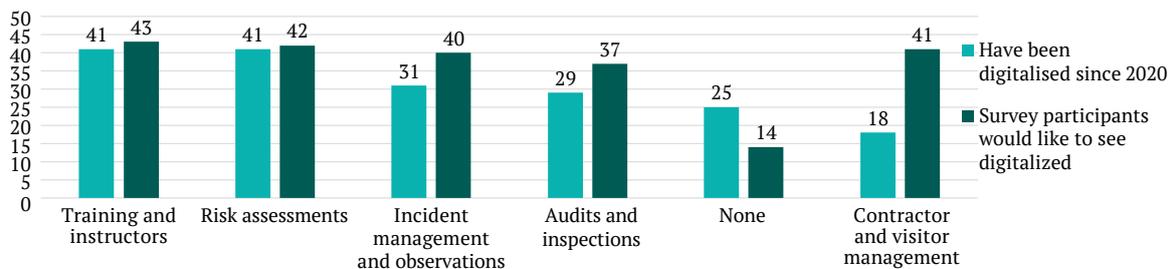


Figure 6. Safety management elements that have been digitalised since the beginning of 2020/planned to be digitalised (according to experts and practitioners)

Source: compiled by the authors based on Industry report: An in-depth look at safety management in 2022 (2022)

The most popular elements that have been digitalised or are expected to be digitalised in the future are: training and instruction, risk assessment, incident management and surveillance, audit and inspection, contractor and visitor management. In particular, training and instruction, and risk assessment, were digitalised in companies by more than 40% of respondents – approximately the same share of respondents plans to digitalise these areas in the future.

Examples of world-renowned companies that pay great attention to employee safety and health are Range Resources and Kosmos Energy. Companies occupy a leading position in the list of Top 50 companies for worker health and safety (2020) according to Ethos ESG. To ensure a high level of security, Range Resources uses both management approaches and proper technological support. Employees are regularly interviewed on occupational safety issues. The safety process involves both the safety department and senior management, as well as all employees, operational groups and contractors. There is a well-developed system of accountability, and appropriate employee development and training programmes are being implemented. The extraction and development of natural gas resources takes place using advanced technologies in this area that ensure the safety of not only employees, but also the environment and society (Our industry-leading innovation, 2023).

Kosmos Energy, in addition to information and preventive work with employees, has implemented a comprehensive management system that connects employees and contractors and conveys expectations regarding safety, risk management, emergency preparedness, and environmental protection. There is a system for evaluating each component of this system, which allows adjusting the effectiveness. The company adheres to a number of standards, including international ones, and practices corporate social responsibility. Occupational safety is ensured by implementing the following tasks: risk assessment in order to prevent incidents; reduction of emissions and waste; efficient use of energy; effective response and emergency preparedness, etc. On its official website, the company shows safety statistics: for the period from 2020 to 2022, one person died at work. The mortality rate for the corresponding year (2021) reached 0.18 (Kosmos Energy health and safety, 2023).

The data from the survey of experts and practitioners, and the study of the experience of leading companies, reveal opportunities to ensure occupational safety at work. From the above, it can be summed up that most often this applies to certain management approaches. However, it is also important to investigate what opportunities exist to ensure safety through technological measures.

The latest technologies and approaches to ensuring occupational safety

In today's digitalised environment, the introduction of the latest technologies is no less important in ensuring an appropriate level of safety at work than appropriate safety management. This applies not only to advanced equipment that can ensure the safety of employees, reduce harmful effects on the environment, etc., but also to digital technologies. Digital technologies can increase the level of safety both directly (for example, when using smart robots that can perform dangerous work instead of

humans, or exoskeletons), and indirectly – by improving the capabilities for analysis to identify risks, minimise them, and other tasks.

In the context of the study, it is worth analysing the most common technologies used in the field of occupational safety, and ways to apply them. Z. Liu *et al.* (2020) note that the concept of Safety 3.0 meets the conditions of Industry 4.0. Within the framework of this concept, the main means of ensuring safety are information and automated technologies, and an established safety system. Safety 2.0 (1930s-early 21st century) corresponded to such basic tools as safety management theory and safety management system, Safety 1.0 (1760s-1930s) – safety and inspection legislation. Previous safety concepts were implemented through compliance with relevant safety laws, conducting inspections, implementing safety management systems, etc. The key “symbols” of Safety 3.0 are: the use of smart personal protective equipment, smartphones, smart cameras, special clothing for employees, drones and robots, radio frequency identification, the Internet of Things (IoT), cloud technologies, etc. Occupational safety services are provided by a number of world-renown companies, in particular, SafetyCulture, German Bionic, Physical Sciences Inc., etc. (Top workplace safety companies, n.d.).

One of the new technologies that have successfully proven themselves in the field of occupational safety is collaborative robots – special machines that can work in a common workspace with employees and help them perform work tasks more efficiently and safely. Their work is made possible by special sensors that perceive the environment and allow robots to respond to a dynamic environment. Similar functions are performed by exoskeletons – devices worn by workers to ensure safety and efficiency during difficult or dangerous tasks. Knowledge-based smart machines are quite widespread – special machines equipped with cameras and sensors that, like robots, can perform individual tasks more efficiently than employees. Such machines can independently transmit information about potential failures in their operation to service centres. Among smart technologies, it is also worth highlighting smart mobile technologies – these include smart bracelets, smart glasses, etc. They are designed to monitor the activities of employees, working conditions, and health status.

Technologies that combine the physical and digital worlds in a certain way are becoming important. Augmented reality allows accompanying real events with computer data through the addition of digital elements to the physical world. This can be used to project computer-generated images onto real objects for various purposes (for example, for training, modelling, providing instructions, etc.). The IoT involves combining physical objects through different sensors using the Internet. The technology allows collecting and combining data about different objects into a single system. Big data technology allows analysing a large amount of information that cannot be analysed using conventional methods. Remote cloud technologies allow storing, sharing, and processing information for analysis, monitoring, and more. Virtual reality allows simulating certain work situations digitally, and also allows interacting with the virtual environment. Artificial intelligence simulates the processes inherent in human intelligence. It may be used, for example, in autonomous vehicles (Savković *et al.*, 2021).

Thus, there is a wide range of technologies that can be implemented to improve occupational safety. The choice of the technology that a particular company needs should be based on sound management decisions. The effectiveness of technologies directly depends on safety management and proper training of employees to interact with and handle such technologies. Figure 7 suggests a system for ensuring safety at work, which contains both technologies that ensure occupational safety and the main components of the management system for making effective decisions.

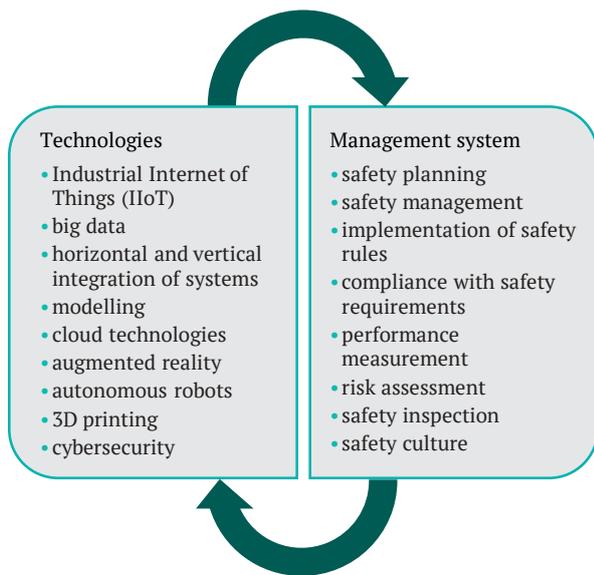


Figure 7. Components

of the industrial safety system considering modern technologies and approaches in management

Source: compiled by the authors based on U. Khalid *et al.* (2021) and A. Forcina & D. Falcone (2021)

Thus, the system of ensuring occupational safety involves the use of the latest safety technologies and effective management approaches that operate in an indissoluble relationship. The choice of technologies suitable for a particular enterprise is not possible without making balanced management decisions, detailed analysis and planning. In addition, the use of even the most advanced technologies will not bring the expected result without proper personnel management, the introduction of training programmes and motivation to participate in ensuring personal safety and the safety of others. First of all, ensuring a high level of occupational safety is based on corporate social responsibility and a safety culture, which should be considered by both management and each employee.

DISCUSSION

Thus, the study analysed the current state of occupational safety at Ukrainian enterprises, examined the main approaches and successful experience in the field of occupational safety by international companies, and outlined the main management measures and digital technologies used in this area. It was noted that the introduction of the latest technologies should be inextricably linked with the development of a proper safety management system.

Z. Liu *et al.* (2020), investigating the concept of safety management, point out its close connection with such areas of activity of enterprises as organisation, planning, decision-making, control. This approach involves the application of safety principles and methods, and the implementation of appropriate technological, organisational and managerial measures. B. Wang (2021) considers safety management as the process of implementing certain safety features and examines this approach both from an organisational standpoint (promoting safety in the company and protecting employees and property from certain risks), and from the introduction of intelligent systems and technologies for safety management. The researcher considers the concept of safety intelligence as one that aims to transform raw data into meaningful information that can be used to improve safety management. In another study by B. Wang & C. Wu (2020), the phenomenon of safety information stands out as a separate discipline – safety informatics, whose task is to solve the problem of lack of safety information. These studies reinforce the authors’ position that ensuring occupational safety occurs primarily through a combination of the latest technologies with effective management approaches, which proves the feasibility of the proposed system for ensuring occupational safety.

U. Khalid *et al.* (2021) develop the structure of an effective safety management system consisting of the following interrelated elements: implementation of safety regulations, safety management, planning, compliance, performance measurement, risk assessment, safety verification, and safety culture. Despite the close relationship between these factors, the researchers emphasise that the effectiveness of the entire system depends primarily on the proper prioritisation of these factors. The researchers note that in the field of healthcare and safety, there are more than 60 factors that were grouped into 6 groups in the study: organisational, managerial, legislative, social, environmental, and personnel. As follows from the above, the study identifies not only internal factors that depend on technology and management, but also external ones (legislative, social, and environmental). In contrast to this study, the researchers analysed purely internal safety areas related to management and digitalisation. Despite the narrow scope, this allowed for a more in-depth analysis of key problems in this area and measures to address them.

Many papers are also devoted to the study of the technological side of the problem, in particular, A. Forcina & D. Falcone (2021) define the “nine pillars of technology” through which innovation occurs in production, and an ordinary factory turns into a “smart” factory. These “pillars” include: the IIoT, big data, system integration, modelling, cloud technologies, augmented reality, autonomous robots, 3D printing, and cybersecurity. According to the researchers, in the context of production, the most representative technologies are IIoT and cyber-physical systems. These technologies allow efficient processing of digital information and high-quality monitoring. Specific ways of applying these technologies are also noted, for example, to increase the level of safety in warehouses and logistics, the safety of products, their storage and transportation places, etc.

Some studies include an in-depth analysis of one technology, in particular, many papers are devoted to the investigation of the effectiveness of the IoT in the field of

occupational safety. M.G. Gnoni *et al.* (2020) find that the IoT, which is widely used in many industries, is becoming increasingly popular in the field of occupational health and safety. Most often, solutions using IoT technologies are used for dynamic safety management in workplaces with increased complexity. The researchers devote their work to describing a prototype system using IoT technologies, the scope of which can be both analysing equipment deterioration and tracking dangerous working conditions on a remote basis. S. Misra *et al.* (2022) also focus on the benefits of the IoT and the possibilities of its implementation in the occupational safety system. The research focuses on occupational safety and various solutions based on the IoT that can increase the level of such safety in a number of areas.

A.L. Perales Gómez *et al.* (2021) investigate the use of cyberphysical systems in production, that is, those that combine the physical and cybernetic worlds. Unlike previous studies, the researchers cite not only the benefits of applying technological innovations, but also express concern about possible cyber-attacks. Such attacks can target a cyber and physical system and, given that employees interact closely with machines in a single workspace, can affect the security of the entire workflow. In this regard, researchers offer their own approach to improving the security of cyber-physical systems using a single management structure to detect and prevent cyber-attacks, and security threats in the workflow.

In contrast to these studies, the authors of this paper did not conduct an in-depth assessment of specific technologies, but provided a wide range of the most commonly used innovations. This can be explained by the desire to cover the research issues more comprehensively – from existing problems in the field (on the example of Ukraine) to a wide range of areas for their solution (considering the views of experts, practitioners, positive examples, management decisions and technologies).

While this paper reveals the areas of implementing a safety management system in production, some studies have also identified advantages and obstacles in this process. In particular, N.S.N. Yiu *et al.* (2019) find that the main benefits of implementing safety management systems include safer working conditions, minimising injuries and harm to workers, including safety management in the project management system, and improved project management in general. At the same time, researchers note barriers to the implementation of safety management systems: cultural differences in companies, significant staff turnover, short project deadlines, and obstacles caused by contractors and insufficient team interest in implementing a safety management system.

F. Simone *et al.* (2023) note that despite the reduction in the number of workplace accidents, adverse or tragic situations still occur, and incident-based training can prevent the recurrence of such situations. Researchers propose a special methodology designed to extract information from accident reports for further analysis, modelling and monitoring of safety and provide instructions on how to comply with it. However, the effectiveness of such a system depends on the accuracy of information in reports, which may not be sufficient in the case of a high share of undeclared labour, which, as revealed in the study, is typical for Ukraine.

Comparing the conclusions of researchers with the results of this study, the authors fully agree with the identified advantages and obstacles. It is worth noting that the main obstacle both in this paper and in the analysed studies is the disinterest of management and/or employees in implementing safety measures and systems. In addition, the study revealed such a problem (on the example of Ukraine) as a significant share of undeclared labour. This leads to inaccurate recording of accidents and makes it difficult to develop measures to minimise them. Imperfect recording of accidents makes it virtually impossible to implement such an important area of occupational safety as incident-based training. Ensuring occupational safety is an issue that affects the vital interests of employees and affects economic efficiency. It is possible to increase the effectiveness of occupational safety management through government measures, but given the duration of such measures, it is an important issue to ensure safety in ways available at the enterprise level. It is necessary to consider the need to improve the safety management system, and the introduction of the latest technologies that can significantly optimise the safety system.

● CONCLUSIONS

In the course of the study, an analysis of the current state of occupational safety at Ukrainian enterprises was carried out. Compared to countries such as Poland and Germany, Ukraine has significantly lower indicators in terms of the number of workplace accidents. The number of fatalities in the country is higher than in the EU countries under study. It is revealed that such differences in indicators may be conditioned by an imperfect system for recording accidents in Ukraine, and a high proportion of undeclared labour, which is confirmed by statistical data.

An analysis of the views of experts and leading practitioners in the field of occupational safety in Europe revealed that effective measures to improve safety are most often associated with conducting conversations and motivating staff. Experts and practitioners consider it appropriate to digitalise certain elements of the safety system, in particular, training and instruction, risk assessment, incident management and surveillance, audit and inspection, management of contractors and visitors. The description of the successful experience of leading companies that are leaders in ensuring employee safety helped to determine which areas of security they pay the most attention to. First of all, it is informational and preventive work with employees, which consists in conducting conversations, special development programmes, and training. At the same time, both the management and the security department, and all employees, and other interested parties (contractors, operational groups, etc.) take part in ensuring occupational safety in companies. Companies also apply advanced security technologies, and implement unified safety systems that connect all employees and ensure a proper assessment of safety elements. Important areas in the field of occupational safety are risk assessment to prevent incidents, reduce emissions and waste, energy efficiency, constant readiness and effective response to problems and emergencies.

The paper revealed the components of the occupational safety system (considering modern technologies and approaches in management), and modern technologies

that can be used to improve occupational safety, and described exactly how they can be implemented. These technologies include: collaborative robots, exoskeletons, knowledge-based smart machines, intelligent mobile technologies, augmented reality, IoT, big data, cloud technologies, virtual reality, artificial intelligence. Further research should be devoted to the development of a model for assessing the needs of an enterprise to introduce the latest

technologies, considering their potential effectiveness in specific areas of production.

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● CONFLICT OF INTEREST

None.

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Дослідження новітніх технологій та підходів до забезпечення безпеки на виробництві

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Анотація. Від впровадження належних заходів та систем забезпечення безпеки на виробництві залежить не лише економічна ефективність компаній, а й життя та здоров'я працівників, що робить дослідження цієї теми актуальним. Мета дослідження полягала в оцінці можливостей та ефективності провідних технологій та нових управлінських підходів щодо забезпечення безпеки на виробництві відповідно до існуючих у сфері забезпечення безпеки праці проблем. Основними методами, використаними в дослідженні, є статистичний метод, метод порівняння, аналіз та описовий метод. У результаті проведеного дослідження було виявлено проблеми, що існують у галузі забезпечення безпеки праці в Україні, основними з яких є велика частка незадекларованої праці та неналежна система фіксації нещасних випадків. Виявлено шляхи забезпечення безпеки на виробництві, що пов'язані насамперед із проведенням бесід, мотивацією персоналу, зокрема цифровізацією таких елементів безпеки, як тренування, інструктажі, оцінка ризиків, управління інцидентами. На основі аналізу досвіду всесвітньо відомих компаній-лідерів із забезпечення безпеки праці визначено ефективні практики з підвищення ефективності системи безпеки, до яких належать бесіди з працівниками, спеціальні програми розвитку та навчання, запровадження передових технологій та уніфікованих систем безпеки. Проведене дослідження дозволило сформулювати систему забезпечення безпеки на виробництві, що містить сучасні технології та підходи в менеджменті. Отримані висновки можуть бути корисними для керівників компаній у цілях вибору та впровадження на практиці ефективних управлінських заходів та нових технологій із забезпечення безпеки на виробництві

Ключові слова: охорона праці; травматизм; нещасні випадки; Інтернет речей; автоматизація

National policy instruments for restoring the post-war economy and factors of sustainability of the Ukrainian economy

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Abstract. Although Ukraine's economy is still suffering from the negative effects of Russia's full-scale invasion, questions are already arising about the possibilities of ensuring its post-war recovery, so it is important to study the policy instruments to achieve an effective recovery. The purpose of the study was to analyse the existing public policy instruments and identify those that would allow for the most effective recovery of Ukraine's post-war economy. The main research methods used were analysis, forecasting, and abstraction. The study examined a large number of policy instruments that could be used in the post-war reconstruction of Ukraine's economy. They covered both financial and social components aimed at facilitating recovery and ensuring long-term stability. The paper provides a comprehensive overview of the policy instruments and their characteristics, emphasising the importance of their use in the post-war period. Special attention is paid to the issues of economic stability, which was also proposed to be achieved by working on two separate components: economic and political stability, and recommendations for achieving them using certain state instruments were provided. Economic diversification is highlighted as a separate factor that plays an important role in the long-term development of the country and is a critical part of building the resilience of the Ukrainian economy after the war. The work brings new knowledge to the analysis of public policy instruments, which will allow to build a more effective strategy for rebuilding the Ukrainian economy in the post-war years

Keywords: finance; macroeconomics; stability; social policy; monetary policy

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● INTRODUCTION

The war leads to internal and external displacement of the population. This leads to the fact that some regions may be more populated, while others may be weaker, which will increase regional imbalances and make the

process of reconstruction in areas where active military operations took place much more difficult. In addition, the war leads to the departure of the population outside the country, and therefore, its number will decrease,

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which may lead to a shortage of workers. In general, this can also lead to a significant and serious internal demographic problem. The war also significantly increases government spending on defence and humanitarian aid, which can lead to increased public debt and financial challenges and, therefore, significantly impair the country's ability to recover after the end of hostilities. After the war, political and social tensions, conflicts, and risks may also increase, which leads to the consolidation of society and effective management of internal processes at the macro and micro levels.

A significant number of researchers investigated the possibilities of post-war development in Ukraine. Thus, P. Kulikov *et al.* (2022) examined the state of the country's economy after the war and opportunities for its recovery. The researchers pointed out the main directions of national policy that should be most actively used at this time and methods of how to most effectively achieve a rapid and high-quality recovery of the country's economy. Prospects and obstacles to the restructuring of Ukraine's external state obligations in the context of the war were investigated by Y. Bublyk *et al.* (2022). The researchers described the possibilities of interaction with international partners for Ukraine, and the possibilities of easing the country's financial burden during and after military operations.

N. Martynovych *et al.* (2023) described the methodological concept of effective socio-economic development in post-war Ukraine as part of their research. It was noted that for the post-war development of Ukraine, a new economic model is needed that moves away from dependence on the export of raw materials, and also indicates procedures for assessing the effectiveness of the socio-economic development of Ukraine after the war. I. Khmarska *et al.* (2022) also drew attention to the features of the country's post-war reconstruction. The researchers described the actions of individual state bodies that should be carried out to achieve the most effective results in the development of the country, and also noted scenarios for the possible development of events for the state of the country's economy in connection with the war. I. Pidorycheva (2022), in turn, examined the experience of other countries in terms of how they have managed post-war recovery. Based on this information, the researcher made separate recommendations for the development of the country in the conditions of military operations and after the war.

Rebuilding the economy after the end of the war has many complexities and challenges, which lead to its own specific features. It leads to the destruction of infrastructure such as roads, bridges, power plants, cities, etc.; therefore, one of the main tasks of restoration is to rebuild this infrastructure to ensure the normal functioning of the economy. In general, this is a rather complex and expensive process, which may be too difficult for one country, and will require active injections from other countries, both in the form of loans and investments. Therefore, the purpose of the study was to analyse the tools of national policy that can be used in the conditions of the post-war reconstruction of Ukraine. This will improve the opportunities for shaping national policy in this area after the end of the war and, therefore, increase the effectiveness of the country's overall reconstruction process.

● MATERIALS AND METHODS

The study employed a systematic approach as its primary methodology, facilitating a comprehensive analysis of the factors influencing Ukraine's current development and post-war situation. This approach ensured that interactions among various elements were thoroughly examined, enhancing the effectiveness of predictions compared to isolated assessments. Central to the research methodology was the use of analysis, which enabled a qualitative evaluation of Ukraine's economic status and its potential trajectories amidst ongoing conflict. By leveraging historical analysis, researchers gained insights into Ukraine's past development, enriching their understanding of present conditions and plausible future trends. Abstraction played a crucial role by prioritising and focusing on key factors essential for evaluation, thereby enhancing the efficiency of the model constructed for the study.

Deductive reasoning utilised established data sources to formulate conclusions about Ukraine's prospects for recovery post-war. Inductive reasoning complemented this by evaluating the potential for long-term stability based on current developmental trajectories and comparative insights from other nations. Forecasting methodologies were instrumental in projecting potential scenarios for Ukraine's recovery, providing stakeholders with rough estimates of likely outcomes. Analogies were utilised to simplify complex analytical frameworks, substituting intricate factors with more manageable ones to refine interaction models effectively. Additionally, the study employed categorization methods to classify national policy instruments into distinct groups, enabling detailed descriptions and characterizations for each category. This approach facilitated a structured analysis of policy impacts within specific sectors or areas of governance.

Furthermore, graphical methods, specifically using Microsoft Excel, were employed to construct tables that visually represented data and findings. This visualisation technique enhanced the clarity and accessibility of information, aiding in the communication of complex relationships and trends identified through the study. In summary, the systematic approach, combined with diverse research methodologies such as analysis, historical assessment, abstraction, deduction, induction, forecasting, analogy, categorization, and graphical representation, allowed for a comprehensive and nuanced study of Ukraine's post-war development prospects. Each method contributed uniquely to the depth and breadth of the analysis, ensuring robust insights and informed predictions regarding Ukraine's future trajectory amidst challenging geopolitical circumstances.

● RESULTS

In general, there are a significant number of public instruments that can somehow affect the post-war state of Ukraine. These include financial instruments that help attract resources for recovery and stimulate economic development in general. Financial methods may consist of: financing infrastructure projects (the government may issue bonds or raise loans to finance the construction and reconstruction of infrastructure facilities such as roads, bridges, airports, ports, etc.); supporting small and medium-sized enterprises (providing loans or grants to SMEs

can support the development of the private sector, which is the engine of economic growth for many countries as a whole); and introducing tax incentives (introducing tax breaks or tax discounts on certain activities can encourage investment and job creation). Each of them has a different impact on the country's recovery, but in general, they have a positive effect.

There are other components that are relevant to Ukraine in particular. These include banking and financial reform (to improve the stability of the financial system, investor confidence, and access to credit) and the creation of special investment funds (to attract investment to support projects in important sectors of the economy, such as energy, transport, agriculture, etc.). In addition, negotiations at the international level with partners (financial institutions, donors, other countries, etc.) to obtain financial assistance and technical support for recovery remain important (Hanley, 2022). Such assistance can be either repayable or non-repayable, depending on the attitude towards it.

Other national policy instruments can be distinguished as social. They must ensure a decent and sustainable level of development for the country's citizens, their standard of living, etc. This can be achieved using a number of methods. Thus, social support, namely the provision of social services and support for war-affected people, including

medical care, psychological counselling, rehabilitation, and other social services, is effective; measures to increase the inclusiveness of society, which help to eliminate discrimination and create equal opportunities for all citizens, should also remain a key component of the national policy during this period (Zhou *et al.*, 2022; Chai *et al.*, 2023). Special attention should be paid to war veterans and their families. In this context, it is important to mention support in the context of housing stock: the country should develop a strategy aimed at providing the population with an apartment, that is, housing (after all, a significant number of Ukrainians now have a destroyed apartment, which was caused by the Russians' rather deep advance into the country and the total destruction of local infrastructure).

In addition, it is important to continue providing training and education to people who have lost their jobs (or opportunities to work) due to the war. Therefore, providing training and professional courses for such people can be an effective method both to support them and to increase their competitiveness in the labour market, and therefore, to improve the functioning of the labour market in Ukraine. There are still a certain number of national policy instruments that can be used to manage the pace of economic recovery. Their action (as indicated above) is briefly described in Table 1.

Table 1. Characteristics of the national policy instruments

Instrument	Characteristics
Macroeconomic planning	A strategic recovery plan should be developed, including specific goals and objectives. The plan should cover various sectors of the economy, identify priority areas of development, and provide clear steps to achieve them.
State budget	Develop a budget that reflects the costs of reconstruction and reform and provides sufficient financial resources for reconstruction and social support, using all available funding routes in the country (internal and external).
Taxes	Implement tax reform to encourage investment and support enterprises; apply temporary tax incentives to stimulate economic activity (if necessary for individual regions, industries, enterprises, or segments of the population).
Money and credit	Ensure the stability of the financial system, control inflation, and ensure access to credit for businesses and citizens.
Prices	Monitor and regulate prices for key goods and services to avoid inflation and ensure the availability of basic needs for citizens.
Salary	Establish a decent minimum wage and ensure that its level is regularly revised to support household incomes and stimulate consumer demand.
Infrastructure and investment	Attract investment in infrastructure, education, health, and technology that will promote development and increase productivity. Ways to attract investment can be either external or internal, for which a separate national policy should be implemented.
Social support	Provide social protection and assistance to those affected by the war; implement programmes to support the unemployed, vulnerable segments of the population, and refugees.
Trade policy	Develop a foreign trade strategy aimed at increasing exports and attracting foreign investment. Promote the country's expansion into new markets and find new promising trading partners for local enterprises.
Effective governance and anti-corruption measures	Strengthen the governance system, improve transparency, and implement anti-corruption measures; ensure the effective functioning of all important institutions, in particular the judicial system.

Source: compiled by the author

As can be seen from Table 1, there are quite a number of national policy tools that can be applied in order to maximise the effectiveness of the post-war reconstruction of Ukraine. However, the difficulty lies in the fact that even in the case of poor-quality use of at least one of them, it is possible to come to a result where the entire policy chosen will be harmful rather than effective. For example, managing economic processes in a country can benefit the country's development, but if the fight

against corruption is ineffective, it can lead to negative results in general. Thus, all efforts aimed at building a foreign trade policy, managing the budget and taxes, and raising wages can go to waste in the event of poor-quality monetary policy and high inflation. Since these processes are managed by different ministries within the state, it is important to ensure their high-quality interaction, which will ensure mutual understanding of the goals and activities of each.

Equally important is ensuring the sustainability of the Ukrainian economy after the war. If, after the end of hostilities and the understanding among foreign investors that the war will not return to the country, significant capital inflows to the country should be expected, they may slow down after a while. This will be caused by a decrease in the rate of recovery and, therefore, a decrease in the level of interest among investors (the level of investment itself may be higher, given the reduced risks to investment, but the relative value of such an influx to gross domestic product will decrease, and therefore, will not lead to the same results as at the beginning of the recovery) (Nicholls & Teasdale, 2019; Grajales, 2020). Therefore, it is important not only to ensure the country's recovery at the initial stage, but also for the long term – decades.

The first and most important requirement for this is stability, both financial and political. Financial (or economic) stability is expressed in the ability to predict a clear level of the country's main macroeconomic indicators that affect the level of investor return. These include inflation and the exchange rate of the national currency. These two indicators negatively affect the income of depositors in general due to both a decrease in the purchasing power of the UAH and its weakening against other currencies. However, their impact should be predictable for the investor so that they can clearly assess future cash flows, clearly assess the return on investment, and make an investment decision. If it is difficult or impossible to achieve such indicators in the current conditions of economic development, the state should intervene, guaranteeing some support to investors (Bali *et al.*, 2021). In the long run, this should have positive effects on the economy.

The political climate consists of an established and predictable political climate, where power structures and political processes function without significant turbulence, interruptions, or crises. This includes a peaceful transition of power, a high level of democracy, ensuring respect for the law in the state, and social harmony. In other words, investors should be assured that there will be no significant political difficulties in Ukraine that could prevent them from making a profit or losing business (which was very common at the beginning of the country's development). In this context, much depends on the behaviour of the authorities and how they will respond to the various challenges that they will face after the war. In any case, society will be dissatisfied with the physical, financial, and psychological trauma received and will demand rapid improvement of the situation and changes (PuszkarSKI & Sniadach, 2022). In this case, the state authorities must either ensure an appropriate level of satisfaction for citizens (which can only be achieved through international financial support), or convey to citizens through various communication channels an understanding of the situation and the need for time for the country to recover.

Sectoral development is also one of the key factors contributing to the sustainability of the Ukrainian economy after the war. This factor includes the development of specific sectors of the economy and the creation of new sources of profit. An important goal of industry development is to create sustainable and competitive industries that can generate income and jobs. This component includes expanding production (strengthening existing industries and creating

new ones, which will lead to an increase in the production of goods and services and higher incomes for businesses and consumers), creating new jobs in industries, attracting investment in them, and improving their competitiveness.

In addition, ensuring economic diversification will play an important role. It is very important for the country's long-term resilience to various challenges due to unpredictable external circumstances. This applies, for example, to higher prices for certain types of products that the country is not able to produce independently. Thus, the increase in prices for agricultural products in African countries or for energy in Europe, causes significant difficulties. In order to be able to avoid such negative developments for the economy, its diversification is necessary, within the framework of which the country will be able to provide itself with everything necessary in the event of international crises.

The international specialisation of Ukraine has been agriculture. Although this already creates certain advantages in the event of crises (self-sufficiency), it also turned out to be a problem. After the ports were closed, the ability to export products and receive foreign currency earnings for them disappeared, and therefore, the ability to purchase other vital types of products that Ukraine cannot produce independently (pharmaceutical, technological, etc.) (Yakubiv *et al.*, 2019). Therefore, after the end of hostilities, the state authorities should ensure such conditions for the development of the country, under which local enterprises will be able to develop products with high added value, which will not only increase the revenues of companies and the budget but also improve the long-term economic stability of the company.

● DISCUSSION

The purpose of state intervention instruments was investigated by M.H.F. Vargas & D.R. Restrepo (2018). They noted that these methods serve to direct human behaviour to achieve specific goals and are important components of national policy and governance. They can correct market shortcomings and increase economic efficiency, and their use is very common in Western countries. They consider their study to be one of the most relevant components of the modern economy due to its multidimensional opportunities for use and relatively low level of research. The national policy instruments were also investigated by G. Capano & M. Howlett (2020). The researchers noted that the investigation of policy tools and combinations of political decisions is a promising and important area of national policy research, which makes it relevant to study the subtleties of this component for those people who are directly related to state power. As part of the study, they highlight critical issues that require further study in order to advance research on policy tools. The paper above also noted that the state as such, and in particular its activities, play a very important role in post-war reconstruction. This is very clearly seen in the example of Ukraine, which, during the war, became much more dependent on state intervention in the economy and support from partner countries. It is expected that even after the end of hostilities, the role of the country and the actions of its representatives will remain huge to ensure its high-quality recovery.

K. Van Assche & M. Gruezmacher (2023) assessed the challenges and difficulties that arise in organising and

reconstructing land and socio-ecological systems after major conflicts, especially with a focus on war, based on data from the reconstruction of the city of Ypres, which was severely damaged during the First World War. Researchers have noted that major conflicts, such as wars, destroy socio-ecological systems and have a profound impact on governance systems, institutional structures, and physical landscapes. The paper highlights that the consequences of such shocks can be different, and the area of post-conflict reconstruction is influenced by numerous factors. In particular, for the correct and high-quality choice of reconstruction strategy, it is necessary to consider numerous factors, such as the state of infrastructure development before the war, the actual losses received during the conflict, and the resources available for reconstruction. The reconstruction process should also be seen as an opportunity; in particular, it can lead to the development of innovations in the country or attract new capital.

A similar situation was observed in the post-war years in many countries, such as Germany. In general, the process of rebuilding the country itself is very complex due to the need to develop and restore basic interactions, values, and management methods (Daugbjerg, 2022). Recognising the interplay between old and new, local and imported elements in reconstruction efforts is also crucial, and therefore, reconstruction efforts should not only be undertaken by the government but also by other actors in the country, including the population and businesses. It is worth noting that, in the context of Ukraine, all the above comments from researchers also remain relevant. However, the country will also need additional support from international partners, as it does not have the independent ability to restore all the lost infrastructure. Such support can be expressed in the form of loans, assistance, or investment. Each of these options is very favourable for the country and should be applied.

J. Cifuentes-Faura (2023) evaluated the possibilities of post-war reconstruction of Ukraine, in particular, in the context of building “smart” cities and sustainable development. The researcher advocated the restoration of Ukraine to prioritise the development of smart cities. Smart cities use information and communication technologies to improve infrastructure, services, public transport, energy efficiency, sustainability, and transparency. To do this, Ukraine’s short- and long-term reconstruction plans should be based on sustainability, energy efficiency, and the use of new technologies. In the future, using this principle, researchers could achieve significant success in the development of the economy and ensure a better standard of living for the population. However, in addition to this, the state should implement separate actions to combat the main institutional problems in the country, in particular countering corruption and shaping the rule of law. The researcher also recommended carrying out an appropriate reform in the field of environmental protection, aimed at using newer technologies to protect nature and creating more transparent schemes for analysing its state. In general, the study emphasised the need for a comprehensive and forward-looking approach to the reconstruction of Ukraine with a strong commitment to sustainable development and the principles of sound governance.

The experience of post-war Turkey was explored in Z. Öniş & F. Senses (2007). The researchers noted that external partners, such as the IMF and the EU, played a significant role in shaping Turkey’s development policy, especially after the 2000-2001 financial crisis. The existence of a long-term external anchor, such as the prospect of EU membership, has influenced regulatory and democratisation reforms, which has had a positive impact on the reconstruction. The study also highlights the importance of developing the capacity of the state in its three forms: regulatory, transformational, and redistributive. In addition, based on data from the experience of Turkey, researchers pointed out the role of paying more attention to development in integration with the international economy. For Ukraine, its interaction with partners who provide it with significant amounts of assistance, both financial and physical, also plays a very important role. Undoubtedly, its needs will not decrease, but will increase in the future, including after the war is over.

E. Ikpe (2020) described the concept of post-conflict reconstruction development based on the state development paradigm and applied it to Nigeria after independence. The researcher showed that Nigeria’s post-independence recovery efforts focused on industrial development, emphasising the relationship between the state and the market in supporting domestic private capital while responding to the interests of foreign capital. However, he also noted that rather little attention was paid to social issues, which led to an increase in poverty and social discontent. Such a course of events is quite dangerous, given that it can lead to further riots or various kinds of upheavals, which is why the political authorities should also pay attention to social issues within the framework of national policy. The analysis also raised the question of the link between development reconstruction and authoritarianism. This is conditioned by the fact that during the war, the authorities somehow become more dependent on the role of a limited circle of people who make all the main decisions related to both the situation at the front and in the context of the economic vector of the country’s development. After the end of the war, there should be a gradual transition to the democratisation of power, but it can be painful both for state representatives themselves and for society. Therefore, its course plays a very important role in how the country’s recovery will take place and how successful it will be in the end.

Thus, the post-war reconstruction of Ukraine will be a rather complex process that will require active actions on the part of the state and its representatives, as well as enterprises, the population, and international partners. Significant success in this process can only be achieved if all these groups interact and work towards a common goal. Considering the role of the state, it has a significant number of tools described above in the paper, which can significantly improve the efficiency of recovery. However, since satisfactory results cannot be achieved without the interaction of all subjects of the country’s activities, state representatives should try to involve as many representatives of business, international organisations, etc., as possible.

● CONCLUSIONS

The post-war recovery and stability of the Ukrainian economy require a multifaceted approach and the use of

various political tools. Key national policy instruments include macroeconomic planning, public budget management, tax policy, monetary policy, price regulation, wage policy, investment strategies, social support programmes, trade policy, and effective governance with a focus on fighting corruption. The significance and role of all the tools listed above were described in sufficient detail. Special attention was paid to the issue of economic diversification, which plays a significant role in ensuring the long-term stability of Ukraine. The authorities should pay special attention to this component if they want to achieve sustainability in the country's development and strengthen its ability to withstand crises. The development of different sectors and revenue streams, such as expanding production and improving competitiveness, is also important. It is also crucial to reduce dependence on imported products; to do this, it is necessary to assess which goods the country is most dependent on and try to establish their production domestically.

Thus, a comprehensive and coordinated approach that combines fiscal, monetary, social, and governance policies

is essential for Ukraine to recover from the war and reinforce its economic resilience. The government should focus on short-term recovery measures while planning for long-term economic stability, emphasising diversification and self-sufficiency to counter external shocks and promote sustainable growth. Clear communication and cooperation between government agencies is essential to achieve these goals and ensure a brighter future for the Ukrainian economy. It is relevant for subsequent research to continue working on the topic of evaluating national policy tools and opportunities for their use for various purposes. It is also important to assess their effectiveness in the framework of the post-war reconstruction of Ukraine. In addition, an assessment of how similar instruments have already been used in other countries remains relevant.

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● CONFLICT OF INTEREST

None.

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Інструменти державної політики для відбудови повоєнної економіки та чинники стійкості української економіки

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Анотація. Хоча українська економіка досі потерпає від негативних наслідків через повномасштабне вторгнення Росії, вже виникають питання щодо можливостей забезпечення її післявоєнного відновлення, тому актуальним залишається дослідження інструментів державної політики для досягнення ефективної відбудови. Метою роботи було провести аналіз існуючих інструментів державної політики та віднайти серед них такі, що дозволять якнайбільш ефективно провести відновлення післявоєнної економіки України. Основними методами дослідження стали аналіз, прогнозування та абстрагування. У рамках роботи було розглянуто значну кількість політичних інструментів, які можуть бути використані у післявоєнній відбудові економіки України. Вони охоплювали як фінансові, так і соціальні складові, спрямовані на полегшення відновлення та забезпечення довгострокової стабільності. У рамках роботи представлено комплексний огляд інструментів державної політики та їх характеристик з підкресленням важливості їхнього використання у післявоєнний період. Окрема увага виділена питанням стабільності розвитку економіки, досягнення якої було також запропоновано за допомогою роботи над двома окремими складовими: економічною та політичною стійкістю, також надано рекомендації їх досягнення з використанням окремих державних інструментів. Виділено економічну диверсифікацію як окремий чинник, що приймає важливу роль у довгостроковому розвитку країни та є критично важливою частиною у формуванні стійкості української економіки після війни. Робота привносить нові знання для аналізу інструментів державної політики, що дасть змогу побудувати більш ефективну стратегію відбудови української економіки в післявоєнні роки

Ключові слова: фінанси; макроекономіка; стабільність; соціальна політика; монетарна політика

The significance of the Council of Europe's governance tool "Territorial and cross-border cooperation" for regional development: Literature review

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Abstract. Pursuing the best European standards and practices of public administration and good governance of territorial and cross-border cooperation to strengthen the potential and institutional capacity of communities and regions of Ukraine is among the priority tasks of Ukraine's regional policy and European integration course. Therefore, the purpose of the

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present article is to determine directions for improving the public management mechanism of regional development of territorial communities and regions of Ukraine by applying good governance standards and tools of the Centre of Expertise for Good Governance of the Council of Europe based on the expertise of the Association of European Border Regions. The following scientific methods have been applied in the course of the research: historical, logical and generalization, enabling us to investigate the state and expertise of developing scientific and theoretical provisions, as well as actions taken by subjects and participants of regional policy when developing good governance of territorial and cross-border cooperation. It has been discovered that one of the ways to improve the public management mechanism of the regional development of communities and regions is the introduction of the cyclical mechanism of good governance of the Council of Europe, which consists of: development of standards; creation of tools, recommendations, reports, manuals; research of best practices (golden triangle of good governance “standards – tools – practice”). The necessity of further formulation of directions for improving the public management mechanism of regional development of communities and regions of Ukraine through interaction and partnership with the Association of European Border Regions has been substantiated. Conducting a scientific and theoretical study of the standard and toolkit of good governance “Territorial and cross-border cooperation” of the Council of Europe, as well as the study of the Association of European Border Regions practices have made it possible to focus on the implementation of the standard and toolkit of good governance “Territorial and cross-border cooperation” at the local and regional levels. The results of the research can have practical value for representatives of public authorities and the public sector to update local and regional development strategies based on the implementation of good governance standards and tools

Keywords: public management and administration; European integration; improvement of the public administration mechanism; territory development; communities and regions

● INTRODUCTION

Improving the mechanism of good governance for the development of territorial and cross-border cooperation is a priority direction of European regional policy, in the formation of which government officials, politicians, scientists, community leaders, specialized institutions, public organizations of the EU member states and the Council of Europe (CoE) constantly participate, adhering to the mechanism of implementation of good governance “standards – tools – practice”. The development of mechanisms for the implementation of the standard and tools of good governance “Territorial and cross-border cooperation” is a priority direction of local and regional development for communities and regions of Ukraine, which will allow identifying the needs of local and regional development of the community and functional connections between communities, shaping the functional type of communities territory cooperation as a laboratory of European integration and models of public management and administration of local and regional development, as well as determining priorities, tasks and measures of socio-economic development of a functional type of territory, in particular through the development of territorial and cross-border cooperation, creation and implementation of international projects.

The Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions (2021) can be given as an example of creating a systemic universal document based on the above-mentioned mechanism, which systematizes information on innovative actions, public administration practice, applied and proposed tools for supporting the development of European border regions, b-solutions initiative, the European cross-border mechanism, cross-border cooperation practice, EU financial instruments, conducting research, public participation. It also describes ways of revealing the potential of cross-border regions, creating a legal framework for the development of civil society, more effective local

and state administration, carrying out reforms, promoting good-neighbourly relations and reconciliation, etc. Another example is more than 50-year experience of the Association of European Border Regions (AEBR), as mentioned by M. Guillermo Ramírez (2018). AEBR studies the development of border regions as living laboratories of European integration, represents the common interests of more than 100 border regions of EU countries and EU neighbouring countries, develops tools for identifying obstacles and finding better solutions in cross-border cooperation and territorial development, considers cross-border cooperation in the context of multi-level management and functions as a fundamental platform for promoting and advising local, regional, national and European politicians on cross-border cooperation and territorial development issues. E. Meideiros *et al.* (2023) have studied modern innovative management actions of AEBR and the European Commission to improve the development of cross-border cooperation in creating strategies and better solutions for overcoming various obstacles and difficulties at the EU internal borders by implementing the European b-solutions initiative.

N. Gavkalova *et al.* (2019) have studied current issues of public and regional development management in Ukraine and implementation of good governance, namely the fact that the development of cross-border cooperation is still out of focus of development priorities of communities and regions of Ukraine and it is necessary to create innovative management tools for the development of territorial and cross-border cooperation of communities and regions of Ukraine, improve managerial competencies of representatives of communities and regions of Ukraine in this area, create new organizational forms for the development of cross-border cooperation, following the practice of the CoE Centre of Expertise for Good Governance and current issues of public management of cross-border cooperation development in Ukraine and the EU. The scientific and analytical reports of the Polissya Foundation for International and Regional Studies (2018) and the

National Institute for Strategic Studies (Khymynets *et al.*, 2021) describe the issues of developing cross-border cooperation and the activities of Euroregions in Ukraine, however, disregarding the modern practice of overcoming the identified problems and obstacles to the development of cross-border cooperation in Ukraine.

Ukrainian researchers conduct studies on the development of cross-border cooperation, the principles of good governance, the implementation of local self-government reform, multi-level management, public management and administration, the development of local and regional economy, etc. However, it is worth mentioning the lack of a systematic scientific approach to the study of territorial and cross-border cooperation as an area of good governance, public management and administration, where decisions are made and implemented and the cases of their implementation failure are studied. Therefore, the purpose of the research is to promote the formation of a systematized scientific paradigm for studying territorial and cross-border cooperation as a sphere of good governance, public management and administration, and to determine directions for its improvement.

The institutional method is one of the main methods applied in the research process to study the place and role of good governance in the system of public administration and the development of territorial and cross-border cooperation. Analysis and synthesis were used to estimate problematic issues and formulate a proposal for scientific research in the above-mentioned area. Abstraction and generalization were applied to study the competences of the CoE Centre of Expertise for Good Governance, the AEBR, the AEBR Information Centre at Simon Kuznets Kharkiv National University of Economics (S. Kuznets KhNUE), public authorities and the public sector of Ukraine in shaping policy in the field of territorial good governance and cross-border cooperation. The comparative analysis contributed to distinguishing the peculiarities of territorial and cross-border cooperation development. A synergistic approach was used to formulate a vision of good governance of territorial and cross-border cooperation, as a systemic phenomenon of public management of territorial development. A graphic method was used to present information clearly. Scientific publications, statistical and informational materials of ministries and departments of Ukraine, the European Union, its state authorities and local self-government bodies, as well as authors' personal scientific works serve as the basis of the present research.

INITIATIVES TO RENEW THE DEVELOPMENT OF CROSS-BORDER COOPERATION

Using the tools and experience of the best practices of the EU territorial and cross-border cooperation in organizing community cooperation at the local, regional, inter-regional and inter-territorial levels will allow territorial communities and regions of Ukraine to proceed to planning their socio-economic development as functional types of territory, which will contribute to increasing their competitiveness and investment attraction, involving Ukrainian communities and regions of Ukraine in the regional development policy and territorial cohesion of the EU, as active participants and will promote European integration as a political course of Ukraine.

Congressional hearings on cross-border cooperation and improvement of legislation on the participation of

local self-government in cross-border cooperation (2023) held in Uzhhorod on June 15, 2023 by the Congress of Local and Regional Authorities under the President of Ukraine to consider issues of the development level and ways to activate cross-border cooperation and improve legislation: the draft law on improving the participation of local self-government in cross-border cooperation served as a new impetus for conducting scientific research on formulating the mechanism of public management and administration of territorial and cross-border cooperation development in Ukraine. The AEBR Information Centre at S. Kuznets KhNUE and the AEBR Executive Committee initiated the process of synchronizing and harmonizing scientific research in the field of good governance implementation, multi-level public administration and partnership for cross-border and territorial cooperation development of Ukraine and the EU on the eve of the 10th anniversary of the establishment of the AEBR Information Centre at S. Kuznets KhNUE (Local and regional alliance..., 2022).

The CoE Centre of Expertise for Good Governance (2022) developed policy-making recommendations for the post-war recovery plan of local self-government, containing steps for further development of good governance in accordance with European standards and best practices, suggesting the creation of closer inter-municipal cooperation around a large city or on other territories, strategic planning and strengthening of metropolitan areas ("agglomerations"), the introduction of staff training and promotion in local self-government bodies. The Council of Europe Action Plan for Ukraine "Resilience, Recovery and Reconstruction" 2023-2026 (2023) defines the direction of strengthening proper democratic governance and public administration in Ukraine, providing recommendations during martial law and post-war recovery for parties involved in the field of implementing principles of good democratic governance through innovative approaches to partnership development, integration and social cohesion, implementation of good democratic governance principles, creation of tools and training materials to develop the potential of municipal governance and public administration, etc.

The recommendations and actions proposed by the CoE for local self-government bodies of Ukraine suggest adhering to the basic mechanism of implementing good governance "standards – tools – practice". The latest legislative initiatives of the Verkhovna Rada of Ukraine on determining the types of cross-border cooperation and differentiating forms of cross-border cooperation development are a powerful legislative step for strengthening local self-government of Ukraine and implementing the CoE standards, principles and tools of good governance (Fig. 1). According to the data of the Association of Ukrainian Cities presented at the Congressional hearings on cross-border cooperation and improvement of legislation on the participation of local self-government in cross-border cooperation (2023) territorial communities of Ukraine have established 186 municipal partnerships with foreign municipalities, of which 83 are agreements and memoranda of cross-border cooperation with municipalities of neighbouring countries. The report at the congressional hearing identified priorities, problems (Fig. 2) and solutions (Fig. 3) within the framework of the proposed legislative changes.

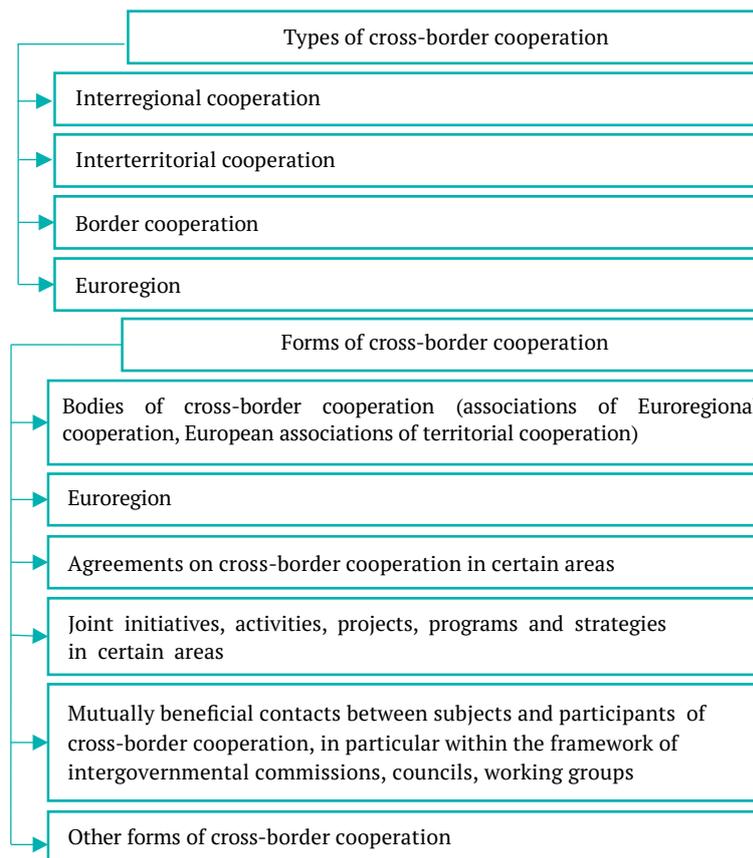


Figure 1. Types and forms of cross-border cooperation

Source: compiled by the authors based on Congressional hearings on cross-border cooperation and improvement of legislation on the participation of local self-government in cross-border cooperation (2023)

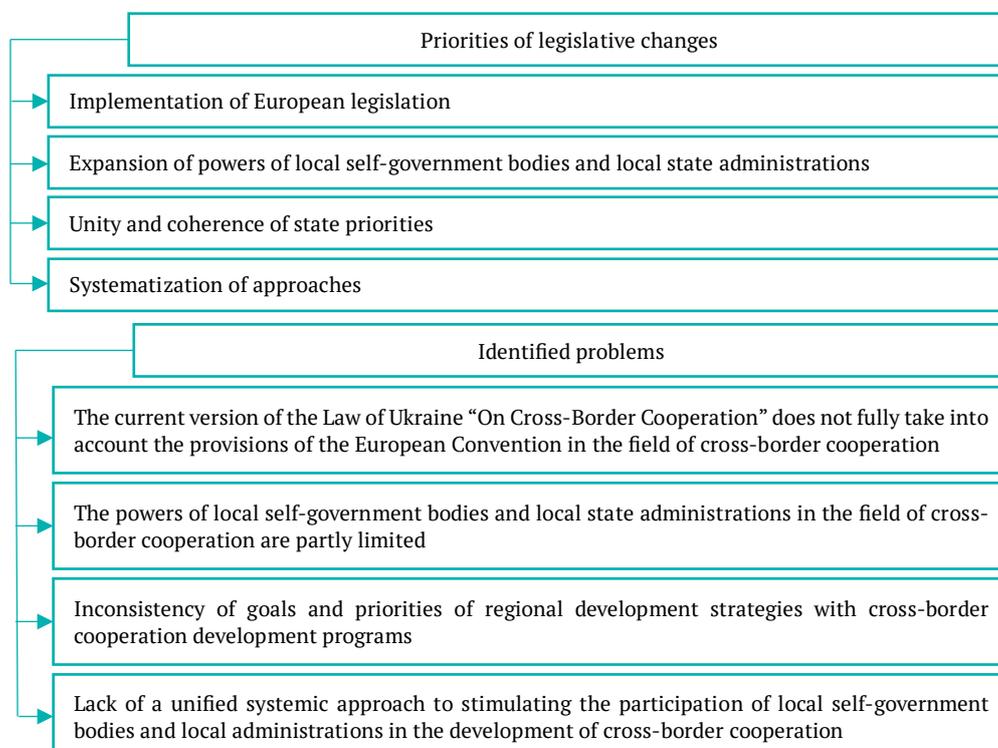


Figure 2. Priorities and problems of legislative changes

Source: compiled by the authors based on Congressional hearings on cross-border cooperation and improvement of legislation on the participation of local self-government in cross-border cooperation (2023)

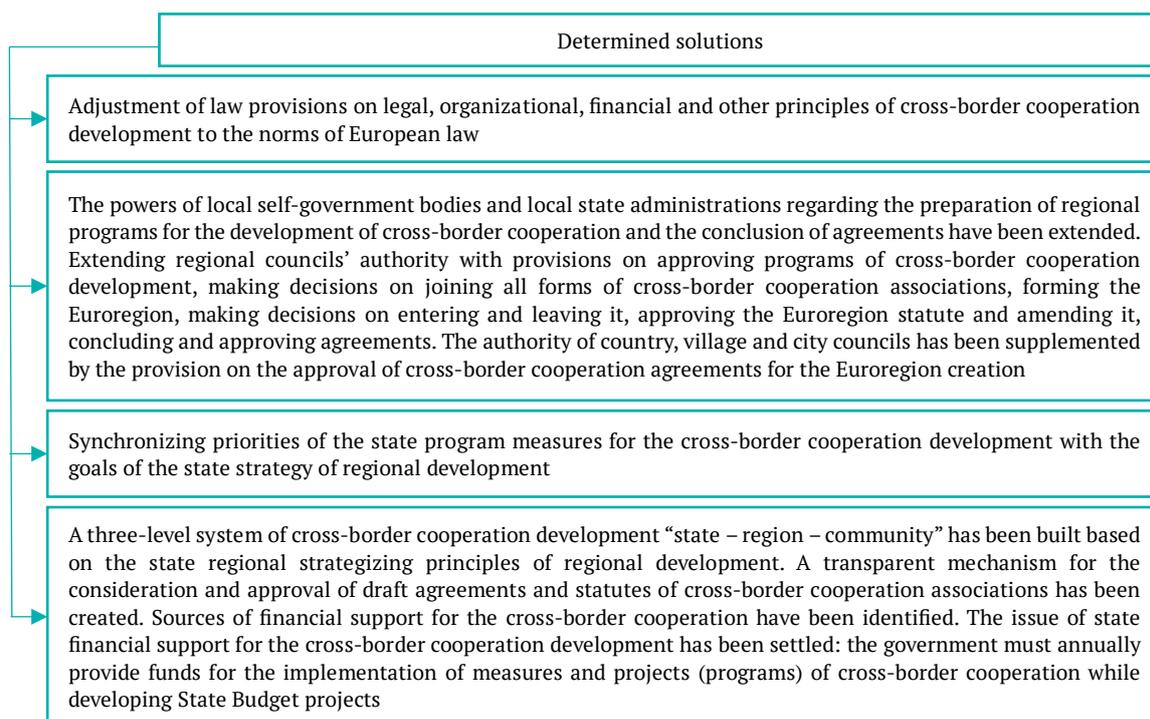


Figure 3. Decision on legislative changes

Source: compiled by the authors based on Congressional hearings on cross-border cooperation and improvement of legislation on the participation of local self-government in cross-border cooperation (2023)

The effective solution of the identified problems in the field of territorial and cross-border cooperation development in Ukraine provides for understanding and accepting that legislative changes proposed by the Verkhovna Rada of Ukraine (Draft Law of Ukraine No. 9450, 2023) are the sphere of implementation of good democratic governance of the CoE and best practices of the development of European border regions in accordance with mechanisms of good governance, namely: decision-making activities and the process, which either contributes to implementing decisions or not; the golden triangle of good governance "standards – tools – practice".

This approach will contribute to: adjusting legal, organizational, financial and other foundations of the development of cross-border cooperation of Ukraine to the norms of European law; ensuring a systematic approach to stimulating the participation of local self-government bodies and local administrations in the development of cross-border cooperation, according to existing European practices; promoting scientific interdisciplinary research on public management and administration of territorial and cross-border cooperation between Ukraine and the EU; implementing the approach of the AEBR Information Centre and the AEBR Executive Committee to the development of Ukrainian border regions as living laboratories of European integration, their initiative to create a platform for scientific cooperation between Ukrainian and European researchers in the field of cross-border and territorial cooperation development, using the long-term expertise of AEBR in supporting European border regions, overcoming obstacles in their development by implementing better management solutions, cooperating with institutions and organizations of the European Union, and work experience in Ukraine.

THE CORRELATION OF THEMATIC RESEARCH WITH THE PRACTICE OF TERRITORY DEVELOPMENT

The Cross-Border Cooperation Tool, published by the CoE Centre of Expertise for Good Governance (n.d.) in 2012, was the first to identify territorial and cross-border cooperation as a standard, a tool of CoE good governance aimed at strengthening effective management, establishing robust democratic institutions and strengthening capacity at the local level. It enables local authorities to develop and implement innovative and effective policies to improve life quality of their population. Cross-border cooperation is seen as a coordinated process of building neighbourly relations between local interested parties and authorities on both sides of the border in order to overcome such problems and promote the harmonious development of neighbouring communities. Its success must be built on clear distinct goals and readiness for cooperation.

The structure of the Cross-Border Cooperation Tool includes the following sections: 1 – Understanding cross-border cooperation; 2 – International environment; 3 – Creating a friendly environment; 4 – Initiating cross-border cooperation; 5 – Creation of cross-border cooperation; 6 – Financing cross-border cooperation; 7 – Responsibility; 8 – Examples of cross-border cooperation. The tool offers a crucial observation: cross-border cooperation initiatives can flourish even between non-adjacent local authorities. This means that they also apply to local authorities that are separated geographically from one another and from the border. In other words, cross-border cooperation is equivalent to interterritorial cooperation. It is important to note that the cross-border collaboration tool offers both well-known formats, like ones given below (Fig. 4).

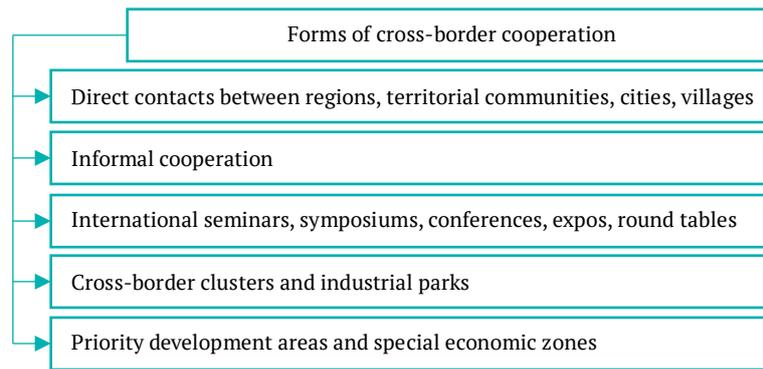


Figure 4. Forms of cross-border cooperation

Source: compiled by the authors based on the Centre of Expertise for Good Governance (n.d.)

The CoE and the Institute of International Sociology of Gorizia, Italy, have jointly created the E-DEN platform for consulting and exchanging thematic research and best practices of good democratic governance, demonstrating innovative and effective solutions on this issue

(E-DEN..., n.d.). The Cross-Border Cooperation Tool on the E-DEN platform provides recommendations on the process stages of establishing cooperation between neighbouring or non-contiguous territorial communities or authorities in cross-border cooperation (Fig. 5).

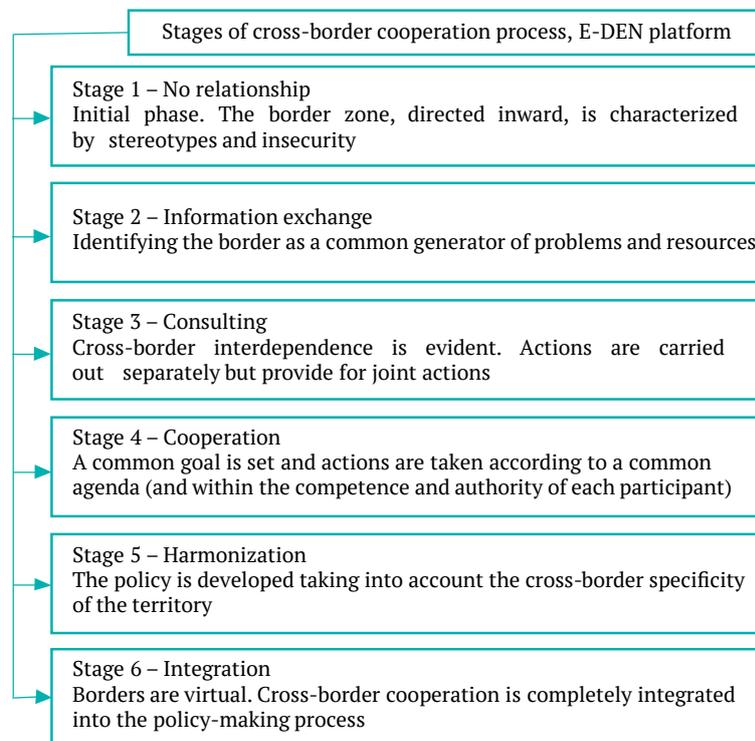


Figure 5. Stages of cross-border cooperation process

Source: compiled by the authors based on E-DEN – from e-database empowering networks to good governance platform (n.d.)

Cross-border cooperation is an official category of European territorial cooperation, as demonstrated by E. Me-deiros *et al.* (2023). It is a crucial component of territorial cohesion policy, encompassing a broader range of barrier-overcoming and multiple synergy effects between the public, civil society, and economic subjects across state borders. The number of research on the evolution of European territorial cooperation has increased since 2000. This is because the barrier effect of national borders is reduced, which significantly promotes regional growth. In the Ukrainian scientific research environment, the essence

of “Territorial and cross-border cooperation” has not yet been systematically studied as one of the sources of systematized information and European practices of public management of territorial and cross-border cooperation development, which are constantly being improved and spread in the European Union as a purposeful political process of European integration of border regions.

The authors of the article have conducted the analysis of Ukrainian and European scientific research, facts, events that can serve as a basis for implementing the CoE “Good Governance” standard and tools in the areas of good

governance of territorial and cross-border cooperation of border regions between Ukraine and Europe, carrying out more scientific research in the field of multi-level management. It is important to note that the intentional steps taken to carry out Ukraine's regional policy in the area of cross-border cooperation development were intended to establish Euroregions all the way around the country's state borders. From 1993 to 2012, 10 Euroregions were created: "Carpathian", "Bug", "Lower Danube", "Upper Prut", "Dnipro", "Slobozhanshchyna", "Yaroslavna", "Black Sea Euroregion" Association, "Donbas", "Dniester".

The European continent has a long history of creating Euroregions. Thus, the first Euroregion EUROREGIO was created in 1958 in the border territories of Enschede (Denmark) and Gronau (Germany). In order to promote the

advantages of cross-border cooperation and the unique development needs of border regions, as well as to provide political support and workable solutions, ten border and cross-border regions of Europe came together on September 27, 1971, to form the AEBR, which today unites more than 100 European border regions. According to M. Guillermo Ramírez (2018), cross-border cooperation is a crucial component of the European integration process, as it creates added value from a political, institutional, socio-economic, and socio-cultural standpoint. It also highlights the significant role of the AEBR in European policy concerning the development of territorial and cross-border cooperation. Cross-border collaboration in the framework of multi-level governance is acknowledged as a theme area in the AEBR plan until 2030 (Fig. 6).

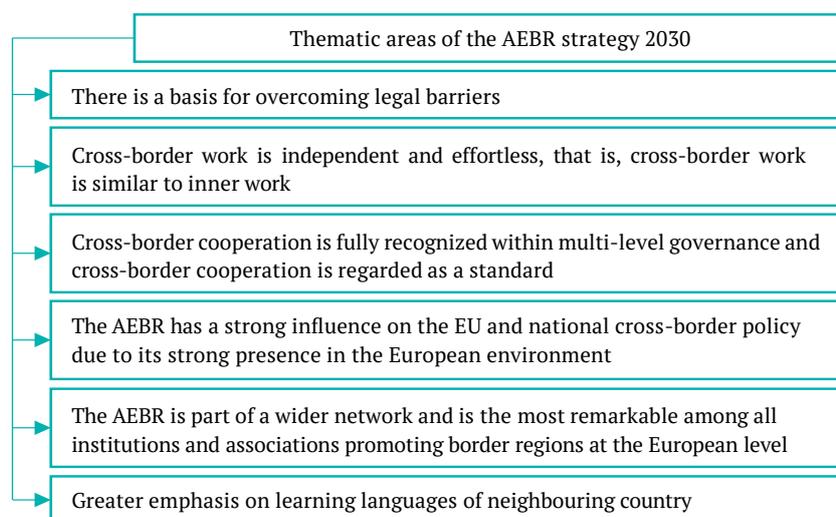


Figure 6. The AEBR strategy 2030

Source: compiled by the authors based on the Association of European Border Regions (2021)

The AEBR participates in networks, promoting cross-border cooperation, such as the Cross-Border Network of Euroinstitutes, a network of research and educational institutions under the leadership of the Euroinstitute in Keli; the Borders in Globalization Review (n.d.) project, and its sequel Borders of the 21st Century, built on a wide network of scholars and policymakers across continents. Since 2017, the AEBR has been holding the annual School of Cross-Border Cooperation for professionals and scientists. Here, they can exchange experiences and learn from one another's experiences in a more horizontal and interactive way, which encourages systematic reflection on their cross-border cooperation practices and offers feedback to researchers on the findings of their studies and professional experiences.

COOPERATION WITH THE ASSOCIATION OF EUROPEAN BORDER REGIONS AS A DIRECTION OF EUROPEAN INTEGRATION OF UKRAINE

As far as the AEBR's operation in Ukraine is concerned, it is aimed at finding a solution for the question: "What support is needed for Ukrainian border regions". The AEBR Information Centre supports the initiative to create the Assembly of Ukrainian Border Regions and Euroregions. The AEBR

promotes the development of multi-level partnerships at the international, national, regional levels and local levels of territorial communities and authorities of Ukraine and the EU, supporting diverse activities of the AEBR Information Centre, its competence in identifying and projecting territorial and cross-border cooperation, considering the AEBR Information Centre as a living laboratory of territorial and cross-border cooperation.

A living laboratory is a European user-oriented research concept realized through research and innovation processes within the framework of public-private partnerships in a territorial context, brought about as a solution to the European paradox – Europe's failure to transform scientific results into market innovations (Ark & Smyrl, 2017). In 2014, Ukraine and the EU concluded the Association Agreement, in which Article 446, Chapter 27 places particular emphasis on bilateral cooperation in the implementation of regional policies of multi-level management and partnership, with a special emphasis on the development of backward territories and territorial cooperation (Association Agreement..., 2014). Mission of Ukraine to the EU describes the directions of cooperation within the framework of the Association Agreement between Ukraine and the EU in the field of regional development,

emphasizing the engagement the regions of Ukraine in the activities of European regional associations, such as the AEBR (Regional cooperation, 2020). On June 23, 2022, Ukraine received the status of a candidate for EU membership, which makes Ukraine a full member of the programs

and initiatives of the European Union, available for both EU countries and countries with the status of a candidate for membership. The Instrument for Pre-accession Assistance III (IPA-III) for 2021-2027 focuses on the following priorities (Fig. 7).



Figure 7. Directions of cooperation between Ukraine and the EU

Source: compiled by the authors based on T. Bohdan (2022)

A. Tkachuk (2022) pointed out that Ukraine's membership to the EU provides for changes at the local and regional levels through the implementation of multi-level governance, where each level of governance is oriented towards partnership relations and identified by the CoE principles of proper governance, transition to certain rules and procedures, characteristic for the EU, effective public investment at all levels of governance to ensure better living standard for people, development of communities

and territories. T. Bohdan (2022) pointed out that the European Commission's Proposal for a Regulation of the European Parliament and of the Council on Establishing the Ukraine Facility (2023) was announced on June 20, 2023, according to which Ukraine can receive almost 50 billion euros from the EU by the year 2027 to implement plans for recovery, regional development, public administration reforms, good governance, integration of Ukraine and the EU, etc. (Table 1).

Table 1. The European Commission's Proposal for a Regulation of the European Parliament and of the Council on Establishing the Ukraine Facility

Directions of the Ukraine facility	Directions and sources of financial support
Financial support: Non-refundable and credit support according to the developed plan of the Government of Ukraine	Changes to administration, adherence to the rule of law, and prudent financial management, promotion of efficient and effective management and control systems, significant attention to the fight against corruption and fraud, as well as other reforms and rapprochement with the EU
Investment framework program for Ukraine	Involvement of private and public investments in the recovery and reconstruction of Ukraine to support the implementation of the plan of the Government of Ukraine
Technical help and additional methods of support, such as the gathering of knowledge	By mobilizing experience regarding reforms, expert support, providing grants to municipalities, covering the interest rate on loans provided

Source: compiled by the authors based on T. Bohdan (2022)

In order to reform public administration and good governance, the authors of the current research paper feel that it is essential to leverage the regional experience of Ukraine in developing territorial and cross-border cooperation as well as to disseminate the best European practices in this area among Ukrainian communities and regions. Therefore, the general directions of improving the mechanism of public administration can be characterized by the following hands-on experience in the Kharkiv Region.

Development and approval of methodological recommendations on the participation of local self-government bodies of the Kharkiv Region in the development of inter-municipal cooperation. Cross-border cooperation was defined as a type of intermunicipal cooperation at the General meeting of the Association of Local Self-Government Bodies of the Kharkiv Region (2012) on March 30. A new type of development of border regions of Ukraine as Ukrainian border regions has appeared. The definition of

the concept of the Ukrainian border region is an important step that took place in the Declaration on the creation of the Assembly of Ukrainian Border Regions and Euroregions concluded by the Ministry of Regional Development and Construction of Ukraine on March 10, 2010, which was signed by representatives of regional councils, regional administrations and Euroregions of Ukraine (Assembly of Ukrainian Border Regions..., 2010). The creation of new regional frameworks for cross-border and territorial collaboration, including the "Region of inter-municipal cooperation", through multilateral agreements between the Kharkiv Region's local self-government bodies, the report of the executive directorate of the Association of Local Self-Government Bodies of the Kharkiv Region for 2012, the Border Association of Inter-Territorial Cooperation "Slobozhanshchyna" created on September 4, 2020, Dergachiv Subregion Memorandum signed on July 19, 2021 with communities of the Kharkiv district – Dergachiv

community, Solonitsevo settlement community and Malodanyliv settlement community.

Organizing the AEBR cooperation with Ukrainian border regions through the creation of the AEBR Information Centre at S. Kuznets KhNUE. Facilitating the holding of the Assembly of Ukrainian border regions and Euroregions, initiatives to create communication platforms: at the levels of “the AEBR – Ukrainian border region”, “the AEBR – conference of border regions of Eastern Ukraine”. The creation and execution of pilot programmes to broaden representatives of local self-government organisations’ competencies in the area of public administration of territorial and cross-border cooperation: school of public administration and project management – 2017 with the Kharkiv City Council; school of public diplomacy of Eastern Ukraine – 2020 with communities of Donetsk, Luhansk, Kharkiv and Sumy Regions; Breakfast of sustainable development of Slobozhanshchyna – 2021 with communities of Chuguyiv and Kharkiv districts of Kharkiv Region. In the field of creating a tool for effective governance of territorial and cross-border cooperation in Ukraine jointly with the AEBR, the development of a management tool of the territorial cooperation development, economic growth and stability of border regions – “Citizen Diplomacy for Territorial and Cross-Border Cooperation”, the presentation of which took place at the meeting of the AEBR Task Force on External Borders, within the framework of the AEBR General Assembly in 2019 in the city of Dresden, Elba/Labe Euroregion.

Therefore, in the context of the new phase of Ukraine’s European integration, as defined by its candidature for EU membership, one measure of the growth of regional and transnational cooperation between the EU and Ukraine may be the application of good governance in the field of transnational and territorial cooperation as part of support for new financial instruments of the EU for Ukraine, planning strategically for territorial and transnational collaboration among communities and regions in Ukraine in compliance with the most recent legislative measures of the Verkhovna Rada of Ukraine aimed at enhancing local self-government’s involvement in the growth of transnational cooperation. One of the top priorities for Ukraine’s European integration as a candidate for EU membership is the continuation of the reform of public administration and good governance. This calls for the creation of mechanisms for the CoE’s territorial and cross-border cooperation’s Good Governance Tool to be implemented. The relevance of this mechanism is determined by the most recent legislative initiatives to enhance local self-government bodies’ participation in inter-territorial and cross-border cooperation, while also taking into account the 1,469 new territorial communities that have been created in Ukraine as a result of the administrative and territorial system reform.

The AEBR Executive Committee and the AEBR Information Centre at S. Kuznets KhNUE based on their hands-on experience in Ukraine and on the eve of the 10th anniversary of the Centre’s creation, suggest activities for the synchronization and harmonization of scientific research of Ukraine and the EU in the field of multi-level management, good governance of territorial and cross-border cooperation between Ukraine and the EU, in particular through joint scientific research on the issues of a joint vision of the development of Ukrainian border regions as

laboratories of European integration with the participation of politicians, scientists, community leaders of Ukraine and the EU, providing support to communities and regions of Ukraine in creating their own tools for the implementation of territorial and cross-border cooperation based on innovations, principles, rules and practices of proper governance of the CoE and long-term theoretical and practical work of the AEBR in the field of supporting European border regions and Euroregions.

AN OVERVIEW OF OTHER RELEVANT WORKS ON THE SUBJECT

One of the areas of attention is the focus on the formation of an information base on theoretical-methodological and applied research of scientists and practitioners, which contains information on standards, tools, recommendations, reports, manuals on issues of public management of the development of cooperation territories in the context of good governance of territorial and cross-border cooperation. This will allow scientists and practitioners of Ukraine and EU countries to form common areas for scientific cooperation, taking into account the experience of forming such areas with the participation of the AEBR, the CoE’s Centre of Expertise for Good Governance for conducting joint Ukrainian-European research on topical issues of territorial development and the experience of creating living laboratories (Ark & Smyrl, 2017), which are models of open innovation, where scientific research is aimed at certain users.

The databases of thematic research of territorial and cross-border cooperation (E-DEN..., n.d.) and the introduction of the CoE cyclic mechanism of good governance: “standards – tools – practice” (Centre of Expertise for Good Governance, n.d.) are important sources of information. The practice of developing European legislative acts on the mechanisms of public management of cross-border cooperation development (Jančová *et al.*, 2023) and better management solutions (B-solutions initiative, n.d.) result from scientists’ and practitioners’ studies. The AEBR Information Centre at S. Kuznets KhNUE and the AEBR Executive Committee conduct the analysis of the current state and updating the database of thematic European and Ukrainian research in the field of legislative regulation of public management of territories development, “Good Governance”, territorial and cross-border cooperation within the framework of the planned actions (Local and regional alliance..., 2022) on the synchronization and planning of joint scientific research.

Ukrainian researchers’ meaningful interpretations of “Good Governance” and public administration should be provided for the implementation of reforms of public administration and good governance in Ukraine, particularly: B. Melnychenko (2021) defines “Good Governance” as a modern and acceptable paradigm of public administration in Ukraine, being better and more effective in contrast to previous theoretical and practical achievements of democratic reforms in European countries. According to M. Gordon *et al.* (2018) the paradigm of public management “Good Governance” is a process of political activity, which provides for the development and implementation of own mechanisms of complex management solutions and it can be effectively implemented at the local and regional levels, where it is possible to achieve an appropriate level of

interaction between territorial authorities, civil society organizations and business representatives to solve socially important problems. It can be a methodological basis for the development of a new managerial interaction model of territorial authorities and civil society organizations in Ukraine and ensure the effective and efficient performance of various public functions by the public management system.

N. Gavkalova *et al.* (2019) scientifically substantiate the necessity to ensure regional development through the implementation of effective public management and administration. The authors of the present research agree with the proposals on substantiating the essence of regional management in the country, taking into account the influence of integration and globalization, as well as the need to improve the mechanisms of public management and administration of territories development. Y. Gorodnichenko *et al.* (2022) offer to consider political processes and principles of the post-war recovery of Ukraine, as a comprehensive vision of transformation processes and public administration reform in Ukraine, where the reconstruction of Ukraine is considered as a deep modernization of the country on the way to joining the European Union.

J.L. Wong Villanueva *et al.* (2022) propose a system of criteria for evaluating cross-border governance as a process of convergence of good governance and cross-border cooperation and strengthening cooperation and integration. Management is understood as an “act of management”, a political decision-making process, in which participants are organized through relational structures, forming a set of principles, rules, etc. to implement processes (discussion, negotiation, decision-making, etc.) to ensure better productivity and/or obtain better results. R. Ferreira *et al.* (2019), as representatives of the European Commission, reveal modern European challenges in the development of cross-border cooperation and border regions. The characteristic given by the representatives of the European Commission on actual processes of territorial development taking place in the European Union (EU), particularly in overcoming the existing administrative barriers, obstacles, disparities occurring on the internal borders of the EU, as well as on tools for solving them on local, regional, national and trans-European levels is of great importance.

J. Beck (2022), characterizing the European experience in the development of cross-border cooperation, provides information on the creation of a large number of structures with more than 21,000 full-time employees in the field of territorial development at the local, interregional and macroregional levels during 30 years. The given information on the implementation of the “Open Government” model in European border regions will be useful for representatives of local self-government bodies of Ukraine in the context of the latest initiatives of the Verkhovna Rada of Ukraine in the field of inter-territorial and cross-border cooperation development. E. Brunet-Jailly (2022) specifies the importance of trade in the development of economic integration in cross-border regions. The authors agree with the presented conclusions that in the conditions of globalization, increased trade between world regions, cross-border cooperation took various forms, ranging from intensive trade relations to cross-border institutionalization. The regional driving forces, creating these forms of cross-border cooperation in different regions of the world determine types

of relations, ranging from the absence of active relations to intensive trade and state forms of cooperation.

According to K.K.A.R. Aldrou *et al.* (2023), a holistic approach that involves effective interaction between high levels of government, ranging from local to worldwide, is made possible by the sustainability of regional development. Consequently, from a theoretical and practical standpoint, a comprehensive examination of the administrative and legislative issues influencing sustainable regional development is crucial, especially for areas where the external environment is changing very quickly. N. Kalakun (2021) points out that pursuing governmental reforms at both local self-government level and at the level of state executive bodies of Ukraine is impossible without revising the main legislative framework, making changes to the current legislation and developing and adopting new normative legal acts. The experience of European countries regarding the implementation of the reform on the new power distribution among authorities is particularly valuable.

S. Bentaleb (2021) emphasizes that borders and cross-border issues are a significant phenomenon of modern scientific research in this field and they are of geostrategic relevance. The purpose of cross-border cooperation provides for initiatives and strategies both at the local and regional levels established by legal entities in cooperation with other subjects in multimodal cooperation, spatial dimension and solving the issue of supporting the development of territorial borders in all social aspects, taking into consideration new local, regional and international factors. About 30% of EU citizens reside in the areas along the 40 land borders that separate the EU from its member states, which make up 40% of the EU’s total area (Opiola & Böhm, 2022). In the national context, border regions are frequently the least developed areas. Although the process of European integration has produced notable outcomes, there remain several unresolved issues stemming from variations in the legal and administrative frameworks among the member states. The study demonstrates that the ability of locals to establish institutions that can provide a solid foundation for regional and cross-border growth is a key factor in determining a region’s long-term success.

N. Crossey & F. Weber (2023) emphasize that border regions are a form of multi-level governance and alternative cross-border arena of political action, through both the practical management of cross-border projects and through the representation of cross-border interests in multi-level governance structures. The system resource for border area management is the EU KEEP project database, which includes structured data on funding for cooperation, including the terms, budget, and thematic scope of the project as well as the locations of primary partners and project partners (Chilla & Lambracht, 2023). A. Duleba (2022) points out that pursuing symmetry in the EU and Ukraine relations in the field of institutional mechanisms of their mutual interaction and cooperation is in the interests of both parties. The implementation of the Association Agreement with Ukraine is a test for the EU to maintain its ability to be a transformative party in Europe through the expansion of its common space of the four freedoms. The authors agree with T. Oriekhova (2022), who points out that the status of a candidate for EU membership can be an impetus for attracting foreign investment to the economy

of Ukraine for its reconstruction in the post-war period and it marks the beginning of radical changes and the inevitability of aligning Ukrainian legislation with the European Union legislation. According to S. Hippe *et al.* (2024), border regions are important components of European integration and territorial objects with great potential. It is suggested that more theoretical and empirical study be done in border regions to explain the processes of territorial stability and convergence as a means of assessing the potential that now exists in those territories.

Summarizing the research results, it should be pointed out that good governance, territorial and cross-border cooperation are the focus of European and Ukrainian scientists and practitioners in the field of public management of territorial development. However, it is worth mentioning that the European experience suggests the mechanism of scientific research influence on making better management decisions at the national legislative level and creating appropriate program and financial instruments for their implementation at local and regional levels. In Ukrainian practice, this important mechanism of influence on regional development still remains undeveloped, unresearched and needs to be improved with the participation of European and Ukrainian scientists and politicians, taking into account the latest legislative initiatives of the Verkhovna Rada of Ukraine regarding the participation of local self-government bodies in inter-territorial and cross-border cooperation and updating the regional policy of Ukraine.

According to the AEBR representatives, the first steps could be a discussion of a range of thematic issues in the field of public management of territorial development, good governance, territorial and cross-border cooperation by publishing joint thematic articles in Ukrainian and European journals by European and Ukrainian scientists and politicians. The creation of legislative implementing acts, which are also the result of the joint efforts of European scientists and politicians, with appropriate financing, as well as the above-mentioned aspects, is a specific feature of European experience. This direction of public administration is not developed in Ukraine. The AEBR's proposals, presented in the article, are aimed at creating this mechanism of influence and are the first stage of this process.

● CONCLUSIONS

Cross-border cooperation through the CoE's Good Governance Tool is based on a number of factors, including the institution's current theoretical and practical potential, the collaboration of scientists, politicians, and community leaders; the development of tools for implementing regional policies of multi-level management and partnership; the adoption of novel processes; financial support; and the achievement of regional development goals. During the past five years, the European Union has witnessed a number of noteworthy changes in the evolution of territorial and cross-border cooperation. These developments have been linked to the establishment of European regional policies aimed at surmounting barriers, obstacles, and challenges in the development of territorial and cross-border cooperation, as well as the development of institutional, financial, and programming tools to support European border regions. Practical work on the

development of border regions in Ukraine and scientific study have not yet taken these dynamics into account.

The AEBR Executive Committee and the AEBR Information Centre at S. Kuznets KhNUE propose the implementation of a promising pilot initiative and the joint publication of thematic scientific articles by scientists and practitioners in the fields of public management of territorial development, good governance, territorial and cross-border cooperation, taking into account the partnership relations between the AEBR and S. Kuznets KhNUE. In order to overcome barriers and disparities in the development of inter-territorial and cross-border cooperation, more attention should be paid to the development of the AEBR cooperation development programmes with Ukrainian border regions. These programmes serve as a direction for Ukraine's European integration processes, the state strategy of regional development, and a tool for public management of the development of regions' territories and communities in Ukraine. They also present the potential of Ukrainian border regions and communities, create multi-level inter-territorial inter-municipal partnerships, and effectively participate in EU projects and programmes. The project initiative to establish the Assembly of Ukrainian border areas and Euroregions should be developed further.

The steps listed above are pertinent when considering Ukraine's European trajectory and the implementation of public administration reform in light of recent legislative initiatives of the Verkhovna Rada of Ukraine. These initiatives include the restoration of Ukraine's regional development strategy, the improvement of local self-government bodies' participation in the development of inter-territorial and cross-border cooperation, the establishment of a Ukrainian-European environment for scientific research in the fields of territorial development management, good governance, territorial and cross-border cooperation, and the involvement of Ukrainian scientists in European research grants and projects.

The above-mentioned initiatives and proposals of the AEBR Executive Committee and the AEBR Information Center at S. Kuznets KhNUE can become the foundation for the implementation of the CoE's "Good Governance" standard and tools in the field of territorial and cross-border cooperation in Ukraine, as a modern European paradigm of public and multi-level governance and post-war recovery of Ukraine. Further research is planned to be carried out in the field of designing a model for the Ukrainian border region development as a living laboratory of European integration, applying the European b-solutions initiative methodology for public management of territories development and the implementation of better management solutions, creating methodological suggestions for the creation of multi-level development partnerships between the territorial and transnational cooperation of Ukrainian communities and regions in accordance with the most recent initiatives of the Verkhovna Rada.

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● CONFLICT OF INTEREST

None.

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Сутність інструменту доброго врядування «Територіальне та транскордонне співробітництво» Ради Європи для регіонального розвитку: огляд літератури

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Анотація. Серед пріоритетних завдань регіональної політики та євроінтеграційного курсу України є застосування кращих європейських стандартів та передового досвіду публічного управління та доброго врядування територіального та транскордонного співробітництва для зміцнення потенціалу та посилення інституційної спроможності громад та регіонів України. Тому метою статті було визначення напрямів удосконалення механізму публічного управління регіональним розвитком територіальних громад та регіонів України через застосування стандартів та інструментів доброго врядування Центру експертизи Доброго врядування Ради Європи, керуючись практикою Асоціації європейських прикордонних регіонів. У дослідженні використані методи наукового пізнання: історичний, логічний та узагальнення, що дозволили дослідити стан і досвід розробки науково-теоретичних положень та практичної діяльності суб'єктів і учасників регіональної політики у сфері розвитку доброго врядування територіального та транскордонного співробітництва. Визначено, що одним із напрямів вдосконалення механізму публічного управління регіональним розвитком громад та регіонів є запровадження циклічного механізму доброго врядування Ради Європи, який складається з: розробок стандартів; створення інструментів, рекомендацій, звітів, посібників; дослідження кращих практик (золотий трикутник доброго врядування «стандарти – інструменти – практика»). Обґрунтовано необхідність подальшого проведення формулювання напрямів вдосконалення механізму публічного управління регіональним розвитком громад та регіонів України через взаємодію і партнерство з Асоціацією європейських прикордонних регіонів. Проведення науково-теоретичного студіювання стандарту та інструментарію доброго врядування «Територіальне та транскордонне співробітництво» Ради Європи та дослідження практики роботи Асоціації європейських прикордонних регіонів дозволили акцентувати увагу на імплементації стандарту та інструментарію доброго врядування «Територіальне та транскордонне співробітництво» на місцевому та регіональному рівнях. Результати дослідження можуть бути використані на практиці представниками органів публічної влади та громадського сектору для оновлення стратегій місцевого та регіонального розвитку на основі імплементації стандартів й інструментарію доброго врядування

Ключові слова: публічне управління та адміністрування; європейська інтеграція; удосконалення механізму публічного управління; розвиток території; громади та регіони

Business diversification and changes in perspective strategies for managing innovation activities during martial law

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Abstract. The purpose of this article was to study the changes in the directions of entrepreneurial activity and approaches to managing innovation in the context of the Russian-Ukrainian war. The analysis shows that during the Russian-Ukrainian war, the Ukrainian market for innovation and development suffered significantly. This is evidenced by both the global innovation index of Ukraine and the European innovation index. This deterioration has had a significant impact on the development of innovation at Ukrainian enterprises. In order for an enterprise to function effectively in the context of war, more effort and attention should be paid to innovation and changes in the long-term strategies for managing such activities. The author identifies ten areas that should be implemented by Ukrainian enterprises in the context of war: the development of a “business core”, the introduction of artificial intelligence, machine learning, augmented and virtual reality, blockchain technologies, the introduction of “smart solutions” using the Internet of Things, as well as the implementation of “green reconstruction”, genetic engineering or biotechnology, quality improvement, and the creation of their own ecosystem. The study found that the main role in this process is played by the effective management of innovation activities, so it is important for Ukrainian enterprises to change their long-term management strategies. The process of changing the strategy of innovation management and choosing a new way of business diversification for Ukrainian entrepreneurs should take place in five consecutive stages: formation of an individual innovation process, increasing attention to research and development, internal sources of innovation, promoting the interaction of internal and external sources of innovation, combining various components into a single innovation system, and effective management of the created innovation ecosystem. The study identifies the main aspects that should be present in the changed strategies to enable enterprises to function as efficiently as possible during martial law. These aspects include accelerating the emergence of innovations, creating motivation to invest, and developing partnerships in the investment process

Keywords: business adaptation; market situation; digitalisation; enterprise ecosystem; full-scale invasion

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● INTRODUCTION

One of the main tasks in the process of sustainable development of both the national economy in general and individual enterprises in particular, even during the war, is the effective implementation of innovations. Innovative productivity is the basis that ensures the competitiveness and development progress of each business entity. Prior to the full-scale invasion, Ukrainian entrepreneurs had well-developed and proven-effective systems of strategic management. However, after the full-scale invasion in 2022, the

systems that were previously effective in practice became irrelevant and ineffective. Since the beginning of the full-scale invasion, Ukrainian businesses have been operating with limited resources and less support from the state. Nevertheless, even in a time of war, the development of entrepreneurship and the national economy through innovation remains one of the main strategic objectives. At the same time, it is important not only to return to the pre-war level but also to strive to create innovative development.

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The business management systems that were effective in the past now require rapid changes in line with the new operating environment and the change in the long-term strategies for managing innovation. One of the possible ways to develop business in such conditions is to diversify its activities in various aspects.

In analysing the crisis response strategies of enterprises, M. Wenzel *et al.* (2020) concluded that innovation is one of the top four effective strategies for enterprises to respond to the crisis, along with cost reduction, market exit, and resilience strategies. Similar conclusions were reached by K. Beyer (2022), analysing the barriers created by the crisis situation for the innovation activities of the enterprise. Exploring business survival through innovation during the SARS-CoV-2 pandemic, Q. Liu *et al.* (2022) concluded that during a crisis, market competition is significantly intensified, which has a positive and significant impact on the performance of companies. Analysing the spread of innovations during crises in the world, A. Dilletta & S.S. Pongting (2021), based on an empirical study, determined that during crises, enterprises should change their strategies for operating in the market. It is advisable to develop new approaches to managing innovation at the enterprise. The interaction between innovation and the efficiency of enterprises was studied by I. Nemlioglu & S. Mallick (2021). In countries whose economies are still in the development stage, enterprises have limited resources. This affects management and performance, even if innovation is at a high level. Nevertheless, even in times of crisis, such as the economic crisis of 2008, innovation increases the profitability of enterprises, and innovation management in enterprises increases the efficiency of business activities. That is, enterprises that have a better management system in crisis conditions have better performance indicators.

Similar conclusions were reached by such scholars as Y. Kyrdoda *et al.* (2023), exploring the role of innovative capabilities as tools for the survival of firms in crisis conditions. Although global crises are destructive for businesses, they also present opportunities for improving business performance. It is innovation and business diversification that have a direct impact on the survival of businesses in a crisis environment. It is how companies cope with crises through improved innovation management that influences the establishment of internal processes and shows how these same companies can succeed in the long run. Such results also coincide with the findings of C.C. Guderian *et al.* (2021), who concluded that crisis phenomena, on the one hand, contribute to financial constraints and a reduction in innovation. On the other hand, the crisis provides an opportunity for an enterprise to succeed. In this case, entrepreneurs must respond quickly to changes, but such decisions must be balanced and therefore require a certain strategy. The crisis particularly affects small businesses. Such conclusions were made by researchers T. Clauss *et al.* (2022). The researchers noted that most business models are limited during a crisis, so it is advisable to introduce temporary innovative business models. However, a sudden and unexpected crisis can also unlock enormous potential for companies, provided they are open-minded and willing to look for potential opportunities. Businesses can recognise new opportunities in a rapidly changing environment and need to be aware of their core competencies to recognise opportunities.

Many researchers point out the positive impact of crisis phenomena on the innovation activities of entrepreneurs in crisis conditions, which can be used as an opportunity in practice. Most scholars refer to crisis phenomena as pandemics or crises for other reasons, but military actions as a crisis phenomenon are overlooked by scholars. In addition, no similar studies have been conducted for Ukrainian enterprises in the context of the Russian-Ukrainian war. For Ukrainian business, it is still unclear what these strategies should be, as well as what enterprises need to change in the management process in order to succeed, even during martial law. This is the reason for the relevance of this study. The purpose of this study was to analyse the feasible areas of business diversification and find effective strategies for managing innovation activities at enterprises in the context of the Russian-Ukrainian war. To achieve the research objective, the following tasks are necessary: to analyse the market for innovation in the context of the war in Ukraine; to identify the most promising strategies for managing innovation projects during martial law; and to analyse and determine the necessary aspects of restructuring management processes inside and outside the enterprise or startup in order to remain competitive in the market.

● MATERIALS AND METHODS

In order to analyse the possibilities of business diversification and changes in innovation management in Ukrainian enterprises during martial law, as well as to identify development prospects, the study was conducted using three consecutive stages. Since the basis for business diversification and changes in innovation management for each enterprise is the conditions created by the state, the study first analysed the development of the innovation market in the pre-war period and during the war years. To determine the state of Ukraine's innovation potential, the global innovation index for the period 2011-2023 was analysed. At this stage of the study, secondary data from the INSEAD (2011) and World Intellectual Property Organization (2014; 2017; 2020; 2022; 2023) was used. Ukraine's indicators were compared with the leading countries in innovation development, such as Switzerland, Sweden, and the United States, as well as with countries that are outsiders in the international arena, such as Burundi, Niger, and Angola. The comparison method helped to determine the state of innovation development in Ukraine and, accordingly, the conditions for improving the activities of enterprises in the country. The components of the global index for Ukraine for 2022-2023 were analysed to identify those parameters that have deteriorated significantly since the beginning of the full-scale invasion.

The development of the innovation market in Ukraine based on the European innovation index for the period 2016-2023 was analysed. At this stage of the study, secondary data was used (European innovation scoreboard..., 2023). Ukrainian indicators were compared both in terms of dynamics over the years and in comparison with the European average. Also, the components of the European innovation index for Ukraine were analysed to determine the country's innovation development potential and possible problems for Ukrainian enterprises. After analysing the potential of the Ukrainian market for the development of innovations, the article analyses the main

ways that may be appropriate for enterprises in the process of business diversification in the conditions of war, as well as the main components of promising strategies for managing the innovation activities of Ukrainian enterprises under martial law. Usually, the theory of innovation management is perceived by researchers as a theory that meets the prerequisites. However, in this study, innovation management is considered in terms of expanding such a theory. The change in innovation management strategies considered in this study is an overview and description of the most important areas of business diversification that require close attention. In fact, it is a strategic view with long-term positive consequences that has not yet been given due attention by Ukrainian entrepreneurs. The key choice in determining the research plan was to focus on the inductive method, which is appropriate for the work being carried out. Also, the induction method was used to study the reasons for the change in innovation management strategies for Ukrainian enterprises in martial law countries. Thanks to the abstract and logical method, the conclusions of the entire study were drawn.

● RESULTS

The innovation market in the context of the Russian-Ukrainian war

In the process of digitalisation, innovation is one of the main criteria for assessing the effectiveness of a country's innovation policy on an international scale. A country's innovative development is assessed and analysed using a certain system of indicators. Before analysing the effectiveness of changes in the innovation management strategies of Ukrainian enterprises, it is crucial to analyse the innovation potential of Ukraine after the full-scale invasion. Such an analysis will allow to conclude whether it is advisable or not to introduce changes to the management of innovation in Ukraine in the crisis environment as of 2024. The study of the

national innovation potential is the basis for analysing effective management strategies at each individual enterprise.

As of 2024, researchers in the international scientific field have not come to recognise a single correct way to determine a country's innovation potential, so different indicators are used in practice. The most common in practice are the global innovation index and the European innovation index (Orlova *et al.*, 2023). The global innovation index was developed by the World Economic Forum and is a composite index of various indicators, which in turn consist of 80 variables that together allow assessing and analysing the potential of each country in the field of innovation compared to other countries on an international scale. The indicators that make up the global innovation index characterise both domestic research and scientific and technological development, infrastructure, and the country's overall readiness for innovation. To compare the global innovation index of different countries, an international ranking is compiled to determine the place of each country in the list, from leaders to outsiders.

For comparison, the leaders in the world in 2023 according to the global innovation index were Switzerland (67.6 points and 1st place in the ranking), Sweden (64.2 points and 2nd place in the ranking), and the United States (63.5 points and 3rd place in the ranking). As of 2023, African countries became outsiders in the global innovation index, namely: Burundi (12.5 points and 130th place in the ranking), Niger (12.4 points and 131st place in the ranking), and Angola (10.3 points and 132nd place in the ranking) (World Intellectual Property Organization, 2023). As can be seen from Table 1, as of 2023, Ukraine's global index was 32.8 points, which corresponds to 55th place out of 132 possible in the world ranking. Ukraine is characterised by indicators that are higher than expected for the level of development, but Ukraine is in the group of countries with lower-than-average income.

Table 1. Ukraine's global index, 2011-2023

Year	Number of points	Place in the ranking
2023	32.8	55
2020	37	45
2017	37.6	50
2014	36.2	63
2011	35	60

Source: made by the author based on INSEAD (2011), World Intellectual Property Organization (2014; 2017; 2020; 2022; 2023)

For the first time since independence, Ukraine has been ranked among the top 3 most innovative economies in the group of lower-middle-income countries, based on data that mostly relates to the period up to 2022. Ukraine, which was ranked 55th, improved its position in 2023 compared to last year, when it was ranked 57th (World Intellectual Property Organization, 2022). The highest rating scores were given to the level of development of Ukrainian education (60.9 points) and information and communication technologies (72.6 points). The lowest scores were given to the state of the institutional field (17.2 points) and the state of infrastructure (16.3 points), which are the consequences of functioning under martial law (World Intellectual Property Organization, 2023). However, comparing the data for 2023 with the data from previous years, a negative trend can be

identified. Analysing Ukraine's global innovation index score in the pre-war period and during the war, it can be concluded that before the start of martial law, the country's place in the international ranking of the global innovation index was increasing, except for the 2014 score. However, after the start of the full-scale invasion, Ukraine's place in the international ranking dropped significantly, and its score was lower than in 2011.

Another important indicator of a country's innovation potential is the European innovation index. This indicator focuses on the innovative development of EU countries. The European innovation index characterises the country's readiness for the nearest innovative changes in practice. The indicators that make up the European innovation index characterise both resource and structural aspects, as

well as achievements. To compare the European innovation index among different EU countries, a European ranking is compiled, which determines the place of each country in the list from leaders to outsiders (Orlova *et al.*, 2023). As of 2023, the European innovation index for Ukraine was 31% of the EU average out of 160 possible points. As of 2023, Ukraine was an emerging innovator. Over the period 2016-2023, the indicators slightly decreased and are lower than in the EU (by 8.5% points). It is important to note that the rate for 2016-2023 decreased by 0.2%, and the rate for 2022-2023 decreased by 0.7%. However, these are only growth rates, but if paying attention to the annual growth rates, it is possible to conclude that in the period 2016-2020, the European innovation index of Ukraine decreased from 100% points to 85% points.

In the following years, in the period 2020-2022, a similar indicator increased from 85% points to 100% points. With the start of the full-scale invasion, the index began to decline again. Having analysed the performance of Ukraine and other European countries, it can be concluded that the gap between the country's performance and that of the EU is growing. Ukraine's relative strengths in innovation are primarily in the export of knowledge-intensive services (105.6% points), environment-related technologies (87.8% points), employment in knowledge-intensive activities (80.7% points), venture capital expenditure (53.6% points), and expenditure on innovation not related to research and development (R&D) (53.6% points). Ukraine's relative weakness in the innovation area is primarily observed in the following indicators: product innovators (0% points), design applications (0.7% points), sales of innovative products (3.1% points), international scientific joint publications, and public sector R&D expenditure (11.8% points). Analysing individual indicators that represent relative strengths and relative weaknesses for Ukraine, it can be concluded that the country has sufficient potential for further development in the innovation sector (European innovation scoreboard..., 2023).

Both the global innovation index and the European innovation index group countries according to their results. As a result of the grouping, Ukraine was classified in 2023 as an emerging innovator. Emerging innovators as of 2023 are the lowest possible category. Ukraine ranked last in it (European innovation scoreboard..., 2023). This is a consequence of Russia's full-scale invasion of Ukraine, as well as population migration and the economic crisis. However, despite the martial law in the country, Ukraine is making efforts to improve its position in the innovation sector, as it has the potential, which is expressed in its geographical location, free trade with EU countries, and high level of human development (Orlova *et al.*, 2023).

Thus, by analysing Ukraine's performance in the global innovation index and the European innovation index, it is possible to understand the opportunities and risks in the innovation sector of Ukraine, as indicated by the indicators of the analysed indices. Based on these indicators, it is possible to develop strategic and effective directions for the development of innovations at enterprises in Ukraine, on the one hand, and to ensure the competitiveness of the national economy, on the other hand. The current state of innovation activity in the country at the macro level indicates that it is important to introduce changes in the

management of innovation processes at the micro level, i.e., at individual enterprises. It is determined that it is essential for Ukrainian enterprises to pay attention to the feasibility of introducing changes in business diversification aimed at economic, environmental, and social aspects of functioning. The main directions of business change towards the introduction of innovations in the functioning of enterprises during the war should simultaneously take into account the needs of the global market. The analysis of the country's innovation potential on an international scale is the basis for the innovation potential of Ukrainian enterprises and the development of management strategies to improve it, since the innovation activities of individual Ukrainian enterprises directly depend on government policy, scientific potential, infrastructure development, and other indicators that make up the global innovation index and the European innovation index.

New areas of innovation activity

Based on the analysis of the innovation market in Ukraine in the context of a full-scale invasion, it is possible to draw conclusions about changing the strategies of innovation management at Ukrainian enterprises and business diversification, focusing on the opportunities provided by the state and on innovative changes on a global scale. Changes in management strategies at individual enterprises in Ukraine should be in line with national and international needs. Such changes should further improve the efficiency of enterprises and increase their competitiveness in a competitive market. There are many appropriate strategies for the innovative development of an enterprise. Conventionally, all strategies can be divided into three groups based on environmental, economic, and social aspects.

In times of war, businesses should focus on producing goods and services that will be relevant in the market during wartime and in demand. This can be the production of food products, medical equipment, or equipment needed directly by the military in combat zones (Mykhailyk & Birak, 2023). For this approach, firstly, attention should be paid to an innovative strategy for developing a "business core". Such a strategy should focus on the core of the business. The actions of entrepreneurs should be focused on enhanced digital transformation, which should include changing the way business is conducted and managed on an online platform. In this case, services and goods should be provided through digital channels. This minimises physical interaction and ensures a higher level of business flexibility and responsiveness to external changes. This is especially useful in the context of a power outage. A striking example is the creation of the anti-cafe "What's the Game" in Kremenchuk, which positions itself as a co-working and entertainment venue where people can spend their free time. This establishment was created by refugees from the city of Kharkiv, focusing on different areas of the same institution (Perekrest *et al.*, 2021).

The strategy of using artificial intelligence and machine learning is another appropriate strategy for managing innovation in a country under martial law. With this strategy, all attention should be focused on analysis methods. In order to implement this strategy in practice, it is important to develop intelligent analytical systems that can automatically analyse the necessary data to identify

forecasts and understand how to meet the needs of potential and regular customers. In this case, it is advisable to use chatbots to automate customer service and support in order to effectively implement the strategy in practice (Orlova *et al.*, 2023). Artificial intelligence has many risks and disadvantages compared to human work when used in innovation management, but it is crucial to pay attention to its advantages. Innovations carry the risk of high implementation costs. In this case, managers need to be well-informed about the cost-effectiveness of their efforts. In this case, artificial intelligence has an informative advantage in information processing and can also bring real benefits to the enterprise by reducing risks in management and reducing the cost of innovation processes (Haefner *et al.*, 2021).

A separate type of innovation management strategy is the introduction of blockchain technologies into the company's operations. It is important to understand that the strategy of introducing chatbots and machine intelligence is not identical to the strategy of introducing blockchain technologies. In the case of this type of strategy, the main focus should be on sales channels. This should involve the development and implementation of decentralised platforms to enable secure financial transactions without third parties. It is the use of blockchain technologies in logistics activities to register all actions in the company's distribution channels that increases the level of trust in the company in the supply chain. In the process of managing innovation activities on the basis of blockchain technologies, confidentiality, data protection, and high-quality accountability are maintained. Blockchain technologies can radically change the experience of doing business in terms of customer-centricity by disclosing data and information and ensuring confidentiality. They form innovative mechanisms to meet consumer needs that can contribute to value creation (Wang *et al.*, 2022).

It is also possible to focus on the strategy of creating products or services using augmented or virtual reality. These technologies not only entertain and provide immersive experiences for users but also have significant potential to impact communities and society as a whole (Perekrest *et al.*, 2021). These can be both augmented reality and virtual reality applications that can allow current and potential consumers to try and test products or services virtually before making a decision to purchase a product or service (Orlova *et al.*, 2023). Since innovation activities should be aimed at the consumer of goods or services, there are examples of the use of augmented or virtual reality for businesses operating in various sectors of the economy. For example, in tourism, the practical use of augmented or virtual reality provides an advantage in terms of timely information for tourists. In education, the advantage is expressed in the ability to transform the learning process and create a more engaged and interactive experience for students. For urban planning and architecture, it is the ability to design and visualise buildings on a real scale in real locations. Given the expanding use of Internet of Things (IoT) technologies, it is advisable for Ukrainian entrepreneurs in wartime to implement such a strategy, the focus of which should be shifted to "smart solutions" in the management and operational activities. The advantages of such a strategy lie in its accessibility, as smart devices can be connected to smartphones, which facilitates the control

process. In addition, the advantage is that the IoT allows analysing performance.

Another appropriate strategy for Ukrainian enterprises is a strategy based on product quality and focused on its improvement. In today's environment, enterprises should pay attention to the environmental aspect of their operations, so eco-friendly goods and their packaging or services can reduce the level of negative environmental impact. Focusing on the environmental impact of business, it is also advisable to implement an environmentally friendly "green restructuring" strategy. This implies the introduction of renewable energy sources, such as solar panels and wind turbines, as well as the introduction of energy efficiency and energy-saving technologies for the efficient use of resources in the enterprise (Miller *et al.*, 2020). Corporate social responsibility does not have a direct impact but indirectly affects environmental performance in the presence of mediating variables such as environmental strategy and green innovation (Kraus *et al.*, 2020).

Another strategy based on environmental aspects is the strategy of using genetic engineering and biotechnology in the process of enterprise activity. This strategy is based on the use of various biotechnologies to create new types of goods or services. Analysing all the conditions for the functioning of Ukrainian enterprises, as of 2024, it is advisable to create their own ecosystems based on the integration of business processes (Talmar *et al.*, 2020). In other words, it is advisable to develop and implement platforms that will allow Ukrainian entrepreneurs to combine the interaction of Ukrainian entrepreneurs with consumers to obtain services or goods. In this case, it is advisable to expand business activities based on application software interfaces and create their own applications (Granstrand & Holgersson, 2020). Despite the fact that Ukraine is in a state of war, both the Ukrainian economy in general and Ukrainian enterprises in particular are still focused on sustainable development, which involves a system of economic, environmental, and social actions. As it has been identified that most strategies focus on economic and environmental aspects, it is also important to focus on the feasibility of a social strategy as a type of business diversification, which should include the creation of online communities to exchange ideas or issues that are relevant to Ukrainian society.

Peculiarities of forming new strategies for innovation management

Innovation management can be viewed in different ways. On the one hand, innovation management is the regulation of the process that results in innovation. On the other hand, innovation management is the management of the system in which innovation processes are implemented (Perekrest *et al.*, 2021). Hereinafter, innovation management refers to the management system and its features. When analysing these strategies for changing the functioning of Ukrainian business, it is critical to manage them efficiently and effectively. The management of the investment and innovation process involves primarily attracting financial resources, creating favourable conditions for business, and controlling their functioning (Mykhailuk & Birak, 2023). Furthermore, the main tasks of innovation management at the enterprise include the formation of innovation strategies, decision-making on the implementation

of innovation strategies, planning, analysis, and monitoring of strategy compliance. In other words, when talking about managing innovation at Ukrainian enterprises, it is primarily about creating an innovative culture at the enterprise, a system that will involve the creation of its own innovation ecosystem. It is these innovation ecosystems that convey to potential and regular customers a holistic offer that becomes effective in action as a result of the individual contributions of various participants. On the one hand, interdependence in ecosystem relationships constrains firms; for example, the launch of new products or services is delayed until additional elements from ecosystem participants are available. On the other hand, firms can leverage ecosystem relationships to create higher value by exploiting synergies and network effects that result from complementarities between actors (Talmar *et al.*, 2020).

Analysing the proposed business changes, it can be concluded that they are all aimed primarily at the survival of Ukrainian enterprises in the context of martial law and instability in the country. The above strategies are also aimed at developing innovation potential, improving their competitive position in a competitive market, and entering new markets after the end of hostilities. Such strategies offer the prospect of sustainable enterprise development and the development of innovations on an international scale. If analysing specific examples where such strategies can be put into practice, it is possible to identify such areas as R&D, start-ups, the development of certain types of goods or services at enterprises, and modernisation of production

processes. Each of these areas of activity has its own advantages and opportunities, as well as risks and disadvantages, but it is more expedient to invest in innovative projects in new markets, as such actions can quickly and effectively ensure a high level of competitiveness in the market.

However, not all sectors of Ukraine’s national economy can actively and seamlessly implement effective innovation management strategies under martial law. A striking example is the tourism industry. Even without martial law, innovations in this industry are much less frequent than in other sectors of the economy, as this is a specific feature of the functioning of tourism enterprises and depends on fragmentation and seasonality. In the context of the Russian-Ukrainian war, the situation has become even more complicated, as it is difficult to implement innovative approaches to tourism in dangerous areas of Ukraine that are under constant shelling, such as eastern and central Ukraine. One of the possible options for diversification could be the development of soft tourism infrastructure. The economic essence of infrastructure is that the higher the level of its development, the higher the investment and innovation attractiveness, and the attraction of highly skilled workers in the tourism sector (Pityulych & Feier, 2022). The most important thing for managing innovation activity in Ukraine under martial law is to focus the management strategy on three main components: accelerating the emergence of investments, creating motivation for investment, and developing partnerships and cooperation (Fig. 1).

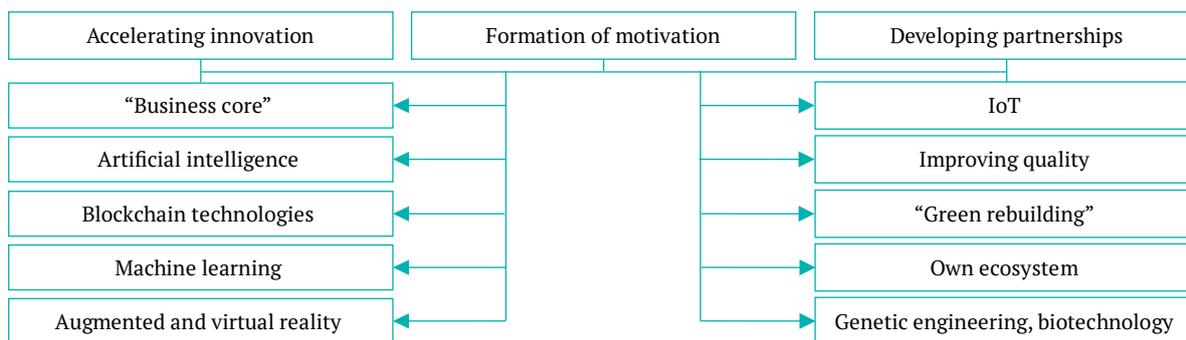


Figure 1. Changes in strategies and directions of innovation management of enterprises under martial law

Source: made by the author

Implementing the changes outlined in Figure 1 should help to accelerate the introduction of innovations that are tailored to market demand and national security needs. This may include developing new designs, improving production processes, or introducing new technologies. This is how businesses can diversify their activities during martial law. It is also important to attract investors to Ukrainian enterprises. These can include banks and investment funds, private and public investors, credit institutions, and grants. As the demand for goods in the national market may be reduced in times of war due to a decrease in the number of consumers and lower consumer incomes, an essential step in the innovation management strategy is to enter new alternative markets. At the same time, it is crucial to seek cooperation with other companies to improve the situation with the material or intellectual resources of the enterprise

(Trzeciak *et al.*, 2022; Mykhailuk & Birak, 2023). This process should take place in five main stages. At the first stage, the entrepreneur is the driving force at the individual level and shapes the individual innovation process. At the second stage, it is relevant to pay attention to R&D activities and focus on internal sources of innovation in the enterprise. At the third stage, it is important to form an interaction between internal and external sources of innovation. At the fourth stage, it is advisable to combine various components into a single innovation system. At the fifth and final stage, it is essential to focus on the management of the newly created innovation ecosystem (Wang *et al.*, 2022).

On the one hand, the consequences of a full-scale invasion pose significant risks and complicate the functioning of Ukrainian enterprises. On the other hand, digitalisation processes and Industry 5.0 contribute to an

increase in innovation activity. Since most enterprises face significant challenges in implementing the IoT in their innovation management processes, it seems that the implementation of this concept in practice is only an illusion. However, such a concept can be effective if it combines elements such as the innovation ecosystem, design thinking, and corporate strategy. The concept of absolute innovation management connects the innovation ecosystem with the corporate strategy of the company, which is adopted as an innovation strategy through design thinking management. In this case, innovations become customer-focused and technically feasible for implementation. During such implementation in practice, innovation management affects business activities, increasing their value as well as that of consumers. In this way, innovation can stimulate entrepreneurial activity and contribute to achieving better competitive advantage and economic growth to meet the needs of the IoT and Industry 5.0 (Aslam *et al.*, 2020). In addition, it is relevant that the innovation management strategy in enterprises is not just seen as an innovation in the process of developing software and related services in companies but as a new and competitive management strategy for organisations.

● DISCUSSION

Having analysed the innovation potential of Ukraine on a global scale using the global innovation index and the European innovation index, it was determined that, as of 2023, Ukraine has a critical state of innovation development. The analysis showed that although Ukraine has a good basis for innovation, there are obstacles at the country level that impede the development of innovation. These obstacles include insufficient infrastructure development and insufficient state support due to the impact of the Russian-Ukrainian war. As a result of the analysis, it is determined that the identified strategies for managing innovation activities consider the risks and problems that may arise in the context of war and in the context of Ukraine's readiness for innovative development. The main strategies for innovation management should be aimed at survival in conditions of instability and martial law. This includes the creation of flexible and adaptive management processes that can quickly respond to changes in the external environment.

The results obtained show that in the context of martial law in Ukraine, innovation management should take into account the specific challenges and opportunities of different industries. For example, in the tourism industry, innovation is significantly hampered by seasonality, fragmentation, and insecurity in regions subject to shelling. However, despite these challenges, the key components of effective innovation management include accelerating the emergence of investment, creating incentives for investment, and developing partnerships and cooperation. It is also important to adapt innovations to market demand and national security needs, attract investors, and enter new markets. P. Chaithanapat *et al.* (2022) also pointed out the importance of the above aspects in their study, which underlines the relevance of the conclusions drawn from the analysis. The results of the study indicate that the strategy of innovation management should be formed into an innovation ecosystem at the enterprise. After all,

this approach will enable enterprises in wartime to get the greatest benefits from such implementation in practice. These results were confirmed in the work of P. Yaghmaie & W. Vanhaverbeke (2020). In analysing innovation ecosystems, the researchers concluded through a systematic literature review that different actors participate in the ecosystem to maximise their value. This highlights the complexity of the ecosystem environment. Furthermore, the interdependence of actors and their influence on each other's performance indicates that analysing innovation ecosystems requires a holistic perspective. This conclusion emphasises the results obtained in this study.

The conclusions of the study differ from those of J. Chen *et al.* (2018). The researchers note that this approach to managing innovation activities at an enterprise does not consider vertical integration. As a result, such actions can lead to significant openness and a lack of key competencies and do not reflect the strategic direction of the enterprise. The researchers concluded that such a disconnect between innovation and strategy is undesirable, especially for technological and information innovations, as they cannot be considered a separate independent activity and should be embedded in the overall mission, vision, and goal of the enterprise's development and management process. Additional limitations of this model include that it tries to define innovation on the basis of total quality management. At the same time, it lacks tools and methods for implementation and does not explain how this model can be put into practice. This management model does not assign responsibility for innovation in the organisation; it simply states that everyone should innovate, and everyone should be an innovator, without explaining who will control and monitor the whole process. The interaction of such a governance model with corporate strategy is not specific or ambiguous, as it is not clear how such a governance model will be linked to corporate strategy.

The study found that the most significant thing for managing innovation activity in Ukraine under martial law is to focus the management strategy on three main components: accelerating the emergence of investment, creating motivation for investment, and developing partnerships and cooperation. The results of the study showed that a new strategy for managing innovation activities at Ukrainian enterprises in wartime should be aimed at consumers, which was confirmed by F. Gault (2018), who argues that the main task of innovation is to create a certain value for potential and regular consumers of goods or services. If innovations do not bring a certain value to consumers, they should not be recognised as innovations. A similar conclusion is reached by researchers V. Özdemir & N. Hekim (2018) and T. Keiningham *et al.* (2020). The researchers argue that it is the development of the IoT and Industry 5.0 that is pushing enterprises to introduce the combination of human and machine labour into their management activities. Such interaction brings greater efficiency to enterprises. This statement fully underlines the results of this study. However, the study did not take into account the aspect of the population's opposition to innovations from entrepreneurship in Ukraine. As a result of a systematic literature review, S. Talwar *et al.* (2020) concluded that this may include resistance to digital innovation, organisational resistance to technological innovation, resistance

to technological innovation in healthcare, and consumer resistance to innovation (offline). Some populations may find it difficult or unwilling to adopt digital technologies due to a lack of knowledge, experience, or access to the necessary resources. In companies, the introduction of new technologies may be met with resistance from employees and management, especially if they fear that innovation may lead to changes in workflow, job losses, or the need for additional training. In the healthcare sector, the adoption of new technologies can be difficult due to concerns about their reliability, safety, and effectiveness, as well as the need to comply with strict regulatory requirements. Some consumers may prefer traditional methods and approaches, feeling distrustful of new products or services due to a lack of habit or concerns about quality and safety. These types of resistance need to be considered when developing and implementing innovation strategies to ensure their successful adoption and implementation. Therefore, taking into account the results of this study, it can be concluded that in the current conditions of the functioning of Ukrainian enterprises, attention should be focused on the greater introduction and development of innovations, as well as changes in innovation management strategies that will meet market requirements during the Russian-Ukrainian war.

● CONCLUSIONS

In the conditions of the Russian-Ukrainian war, the main goal of Ukrainian entrepreneurs is to focus on the innovation activities of enterprises and their development. During the wartime period, Ukraine has significantly slowed down the pace of innovation development at the national level but has a high potential for development in this area. The corresponding situation at the macro level is reflected in the activities of business entities at the micro level. The study found that during the years of war in Ukraine, the country's innovation potential, although improved compared to the pre-war period, was in a crisis state. Accordingly, the investment activity in innovations by Ukrainian enterprises has decreased during the war due to the uncertainty and risks caused by the Russian-Ukrainian war. For individual enterprises, the development of innovations is driven by the tendency and ability to create new and improve existing products and technological processes, as well as new organisations and management systems, as well as other creative and imitative changes that lead to the creation of new enterprise values. The analysis shows

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that all strategies can be divided into three groups based on environmental, economic, and social aspects.

As a result of the study, ten promising and expedient changes in the activities of Ukrainian enterprises in wartime have been identified, and elements of changing the promising directions of innovation management strategies have been identified, namely: accelerating the emergence of innovations, creating opportunities for investment, and actively developing cooperation. Such a change in innovation management strategies will enable enterprises to operate efficiently and increase their competitiveness in the market. It is determined that the process of changing the strategy of innovation management and choosing a new way of business diversification for Ukrainian entrepreneurs should take place in five consecutive stages: the formation of an individual innovation process, increasing attention to R&D activities and internal sources of innovation, promoting the interaction of internal and external sources of innovation, combining various components into a single system of innovation, and effective management of the newly created innovation ecosystem.

This study and its results are not exhaustive, but the results show the most critical areas and concepts that are important in modern innovation management and offer a basis for further development. The study considers not just one direction of innovation management and diversification of Ukrainian business but several, since the choice and focus of business development on one strategy out of many offered will allow enterprises to choose the best option for implementation under martial law. As a result, such a choice will be effective not only in the short term but also in creating sustainable value for the company's stakeholders. This study has some limitations. It is a theoretical study and is not enriched with quantitative data from the annual reports of Ukrainian enterprises. A comprehensive quantitative study with a large sample of data would be advisable. It would also be useful and relevant to study the experience of those entrepreneurs who have already implemented changes in the strategy of managing innovation activities at the enterprise and determine their consequences, effectiveness, and risks.

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Диверсифікація бізнесу та зміна перспективних стратегій управління інноваційною діяльністю під час воєнного стану

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Анотація. Мета даної статті полягала в дослідженні зміни напрямків підприємницької діяльності та підходів щодо управління інноваційною діяльністю в умовах російсько-української війни. У результаті аналізу визначено, що за період російсько-української війни значно постраждав український ринок інноваційного розвитку. Про це свідчать як глобальний індекс інновацій України, так і європейський інноваційний індекс. Такі погіршення значно вплинули на розвиток інновацій на українських підприємствах. Для того, щоб підприємству вдалось ефективно функціонувати в умовах війни, потрібно більше зусиль та уваги приділяти інноваційній діяльності та зміні перспективних стратегій управління такою діяльністю. Встановлено десять напрямків, які доцільно впровадити українським підприємствам в умовах війни: розроблення «бізнес-ядра», впровадження штучного інтелекту, машинного навчання, доповненої та віртуальної реальностей, блокчейн-технологій, впровадження «розумних рішень» із використанням інтернету речей, а також впровадження «зеленої перебудови», генетичної інженерії чи біотехнологій, підвищення якості, створення власної екосистеми. У результаті дослідження встановлено, що головну роль у такому процесі займає ефективне управління інноваційною діяльністю, тому українським підприємствам важливо змінити перспективні стратегії з управління. Процес зміни стратегії інноваційного менеджменту та вибору нового шляху диверсифікації бізнесу для українських підприємств має проходити в п'ять послідовних етапів: формування індивідуального інноваційного процесу, збільшення уваги до науково-дослідних та дослідно-конструкторських робіт, внутрішніх джерел інновацій, сприяння взаємодії внутрішніх та зовнішніх джерел інновацій, поєднання різних компонентів у єдину систему інновацій та ефективне управління створеною інноваційною екосистемою. У дослідженні визначено головні аспекти, які мають бути присутніми в змінених стратегіях, аби підприємства могли максимально ефективно функціонувати під час воєнного стану. До таких аспектів належить прискорення появи інновацій, формування мотивації до інвестування та розвиток партнерства в інвестиційному процесі

Ключові слова: адаптація підприємництва; ринкова ситуація; цифровізація; екосистема підприємства; повномасштабне вторгнення

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