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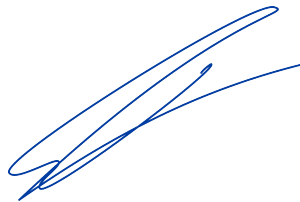
In the modern world the formation of knowledge-based society is accompanied by the increase of importance of human resources, unprecedented expansion of information and communication technologies in all aspects of life and overwhelming globalization.

In this situation education and science, which also change, acquire new contents and organisational forms in the context of new, post-industrial economy, gain significant importance. Education and science become key factors of social and economic progress.

This is what gave us an idea about the necessity of creating a scientific periodical issue, which would help popularize scientists' ideas and developments related to modern processes and tendencies in the area of economics and education. The cooperation of these two areas of modern society determines not only economic development of specific countries, but of the world as a whole.

Throughout more than 20 years of operation ISMA University has accumulated a huge scientific potential and formed scientific traditions. ISMA is represented by scientists of various areas and directions. One of the results of their activity is the scientific journal E&E, which is aimed at facilitating international cooperation, exchanging of new ideas and elaborations and, of course, developing science not only in Latvia, but in the whole world.

We invite for cooperation all scientists and everyone interested in current development of economics and education!



Sincerely yours,
Chief Editor, Rector, Dr.oec., As. Prof.
Deniss Djakons

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Formation of information support system for the management of agricultural enterprises

Abstract

The *purpose* of the article is to generalize and present the peculiarities of the process of forming a system of information support for the management of agricultural enterprises in Ukraine. *Methodology*. General scientific (generalization, comparison, induction and deduction) and empirical and theoretical methods (analysis, synthesis) were used in the research. The use of system-structural analysis made it possible to identify the main features of the process of forming a system of information support for the management of agricultural enterprises in Ukraine. The *results* of the study showed that with the help of big data analysis in agriculture it is possible to remotely detect problems that can be used to identify nutrient deficiencies, diseases, lack or excess of water, pest and weed infestation, insect damage, etc. It is determined that the use of analytical tools based on the analysis of geographic information systems data is useful in modeling and mapping, which can be used to predict crop yields. *Practical implications*. The results of the study can be used in the management of agricultural enterprises in Ukraine. The obtained results can be directed to further research on the analysis of big data in agriculture in the management of agricultural enterprises. *Value/originality*. The scientific novelty of the results obtained is determined by the solution of an important scientific task, which is to develop theoretical provisions and practical recommendations for the formation of a system of information support for the management of agricultural enterprises in Ukraine. The work has further developed research on the use and analysis of big data in agriculture in the management of agricultural enterprises in Ukraine.

Keywords

agricultural enterprise,
information support,
management

JEL: Q13, Q14, M11



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1 Introduction

Agriculture is noted as one of the main human activities for survival. The increase in the world's population has increased the demand for food, as a result of which it is necessary to promptly address the problems of food security. In modern conditions, socio-economic development of the country is impossible without the formation of an effective agro-industrial complex. Due to the increasing competition in the world market, the process of ensuring the sustainability of the enterprise in the agricultural market is of great importance. Therefore, agriculture

is noted as an ideal environment for the application of information technology. In this regard, for the effective and continuous functioning of business entities, the use of the latest information technologies in the industry will increase the productivity of agricultural production and will have a powerful positive impact on its development. In this regard, it is quite relevant and necessary in modern conditions to consider the existing trends in the formation of information support system for the management of agricultural enterprises in Ukraine.

The aim of the research is to study the process of formation of the information support system for the

management of agricultural enterprises in Ukraine. To achieve the purpose of the study, the following tasks have been defined: to analyze the features of the application and analysis of big data in agriculture in the management of agricultural enterprises of Ukraine; to analyze the software used to manage agricultural enterprises of Ukraine; to identify digital technologies used in the management of agricultural enterprises. The study used general scientific and special research methods, in particular analysis and synthesis, comparison, generalization, system-structural analysis.

2 Big data in agriculture

Building on past achievements, the current wave of technological advances focuses on the creation, use, consolidation, analysis and exchange of agricultural and other data in digital format in order to increase the resilience and productivity of agricultural systems. According to the Food and Agriculture Organization of the United Nations, digital agriculture is the planning, development and application of innovative ways to use information and communication technologies (ICTs) in rural areas, with a focus on agriculture and food, including fisheries, forestry and livestock (Liu et al., 2020; Ang, Seng, 2021).

The implementation of precision agriculture technology generates a huge amount of diverse data from the agricultural sector, where data collection includes soil characteristics, seeding rates, crop yields, which can be combined with historical records such as weather conditions, topography and crop productivity. Big data is noted as a powerful platform for storing a variety of collected data and consists in analyzing the resulting data to make effective decisions. The term "big data in agriculture" helps to understand the need to invest in infrastructures for storing and processing agricultural data. Big data promises accurate data storage, processing and analysis that was previously impossible with traditional methods. It allows searching, aggregating, linking different sets of agricultural data in order to obtain optimal conclusions on agricultural management. Linking factors such as remotely sensed data (crop condition, area index, soil mapping, etc.) with statistical data (rainfall, temperature, and previous yields) supports decision making such as recommendations for increasing yields, yield forecasting, fertilizer recommendations, pest control, etc. (Nandyala, 2016).

Big data in agriculture is a huge amount of digital data that is difficult to manage and analyze using traditional software and technologies (Kshetri, 2014). Big data in agriculture is often used to describe a modern trend in which the combination of technology and advanced analytics creates a new way of useful information processing. For example, Gartner, Inc. defines big data with a similar interpretation: "Big

data is viewed as voluminous, high-velocity and diverse information assets that require cost-effective, innovative forms of information processing to improve insight and decision-making." (Gartner, 2013)

The collected big data in agriculture can be classified as machine generated data, process generated data and human generated data (Abawajy, 2015). Machine-generated data includes data from sensors, drones, GPS, etc. Process-generated data include data collected from farms, such as information on sowing, monitoring and recording of agricultural processes such as fertilization, as crop yields are closely related to geographical location, which is referred to as spatial data, and stored as coordinates to locate an area (Yan-e, 2011).

Big data in agricultural analysis can be applied in agriculture with the support of experienced agricultural experts (farmers, agricultural researchers, agricultural market analysts, distribution specialists, etc.) (Nandyala, 2016). Farmers and related organizations can benefit economically from very large volumes of diverse data through high-speed analysis of agricultural information (Waga, Rabah, 2014; Lokers et al., 2016). Big data in agriculture can generally be divided into five stages: data collection, data storage, data transformation, data analysis, data marketing (see Figure 1).

A variety of big data analytics software tools are available in agriculture (see Table 1) (Kamilaris et al., 2017; Bhat, Huang, 2021).

Various agricultural issues related to crop selection, irrigation methods, fertilizer selection and yield forecasting can be solved with the help of big data technologies. The collected data is unstructured and heterogeneous, and NoSQL technology has become popular for storing such data. For storing heterogeneous data and performing preprocessing, a NoSQL data model such as Mongo DB, Couch DB, and HBase is best suited.

Recently, machine learning has been used by data analysts to exploit the information hidden in big data by identifying associations and understanding patterns and trends in the collected data (Garg, Himanshu, 2016). In agriculture, the huge amounts of data that are regularly collected require analysis and interpretation using machine learning methods (Weersink et al., 2018). Research scientists are trying to develop a large-scale data analysis tool using machine learning. The collected data has many problems for direct application of machine learning, so data transformations are needed to solve problems such as data redundancy, data noisiness, data inconsistency, and data imbalance.

As a result of big data analysis in agriculture, mobile messages can be sent that are related to crop selection and best farming practices, which can be provided to farmers to adapt to analytical suggestions. The results obtained from the analysis can be best understood through data visualization, namely, with the help of

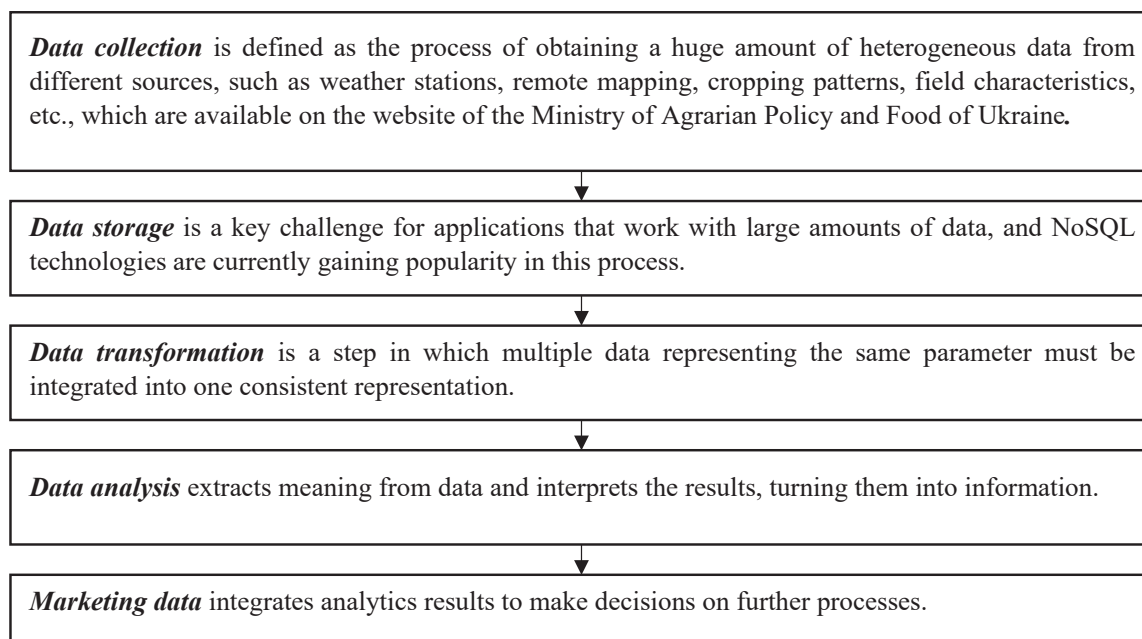


FIGURE 1 Big data in agriculture

Source: compiled by the authors according to official data (Javaregowda, Indiramma, 2019)

visualization tools such as R, Rapid miner, D3, it is easy to determine the structure of sown areas, weather conditions, price fluctuations, etc. (Javaregowda, Indiramma, 2019).

3 Features of the use of digital technologies in agriculture

The report "Digital Opportunities for Improving Agricultural Policy" (OECD, 2019) identifies the stages of digital technology application in agriculture and its most important components: data collection, data analysis, data storage, data management, data transmission and exchange.

Stage 1 – data collection. The collection of basic data in digital agriculture should be done through remote sensing and on-site sensing. In the first case it is automated using sensor technologies such as drones (manned aircraft can also be used) and satellites, or in the second case it can be done manually by a human observer. Recently, significant progress has been made in using satellite remote sensing to obtain more accurate data in agriculture.

Problems in crops can be detected remotely even before they can be detected visually. Remote sensing images can be used to detect nutrient deficiencies, diseases, lack or excess of water, pest

TABLE 1 Software tools for big data analysis

Category	Software
Image processing tools	IM Toolkit, VTK Toolkit, OpenCV Library
Cloud platforms	Cloudera, EMC Corporation, IBM InfoSphere BigInsights, IBM PureData System, Aster SQL MapReduce, Pivotal Gemfile, Pivotal Greenplum, Map R Converged Data Platform, Hortonworks and Apache Pig
GIS systems	ArcGis, Autodesk, Map Info, MiraMon
Machine learning tools	Google TensorFlow, R, Weka, Flavia, Scikit-learn, SHONGUN, miPy, Mipack, Apache Mahout, Milib and OrtX
Large databases	Hive, HadoopDB, MongoDB, ElasticSearch, Apache HAWQ, Google Big Table, Apache HBASE, Cassandra, Rasdaman, MonetDB/ SciQL, PostGIS, Oracle GeoRaster, SciDB
Message-oriented middleware	MOTT, RabbitMQ
Modeling and simulation	AgClimate, GLEAMS, LINTUL, MODAM, OpenATK
Statistical tools	Norsys Netica, R, Weka
Time series analysis	Stata, RATS, MatLAB, BFAST

Source: compiled by the authors according to official data (Kamilaris et al., 2017; Bhat, Huang, 2021)

and weed infestations, insect, hail or wind damage. This information is valuable because it is used as the basis for variable rate fertilizer and pesticide applications.

Information from remote sensing images allows farmers to treat only affected areas of the field. Crowdsourcing of information promotes public engagement and participation in science and innovation. Currently, there are publicly available programs that aim to involve citizens' efforts in data collection or processing. These applications should include elements of gamification (i.e., adding game elements to existing applications) to help motivate "volunteers". In the agricultural context, such applications have so far been used mainly for land use monitoring and land classification, but their scope could be much wider.

Stage 2 – data analysis. The use of analytical tools based on GIS data analysis is useful in modeling (watersheds, relief) and mapping (vegetation cover), which in turn can be used to predict crop yields. Digital technologies can harness the accumulated knowledge of groups of people and expand access to information, finance and markets through crowdsourcing. First of all, this digital tool helps with information gathering, but it can also be used for analysis (USAID, 2013).

Plantwise is an initiative that offers farmers tools to diagnose crops and pests. Plantwise collects information from farmers about soil conditions and other risk factors and then transmits data from their fields to a central Plantwise database. This database

is then analyzed by its staff. In exchange for their participation, farmers receive technical assistance via SMS and voice messages on how to get rid of or avoid pests, thereby reducing crop losses. Figure 2 shows four main categories of AI applications in agriculture (Tanha et al., 2020).

Stage 3 – data storage. As the amount of information is constantly increasing, an agricultural enterprise needs a reliable and easily accessible way to store data. Cloud services allow you to increase flexibility, reduce infrastructure requirements, optimize processes, increase availability and efficiently process large amounts of data. Cloud-based software (SaaS) is expected to lead the farm management software market in the future. When using the software, users only need to access the records provided by the providers through appropriate web browsers (Alan, 2021).

Stage 4 – data management, which is provided by distributed ledger technology, namely blockchain. According to the FAO study, blockchain is widely used in areas such as agricultural insurance, land registration, supply chains, etc. For example, by increasing the transparency of agricultural supply chains, blockchain can help ensure traceability of products from the point of origin to the retail store. It can increase consumer confidence in the products they buy and reward producers who use good agricultural practices to grow their products. Ultimately, it can lead to responsible consumption, food safety, as well as reduce food fraud and improve brand reputation (FAO, 2019).

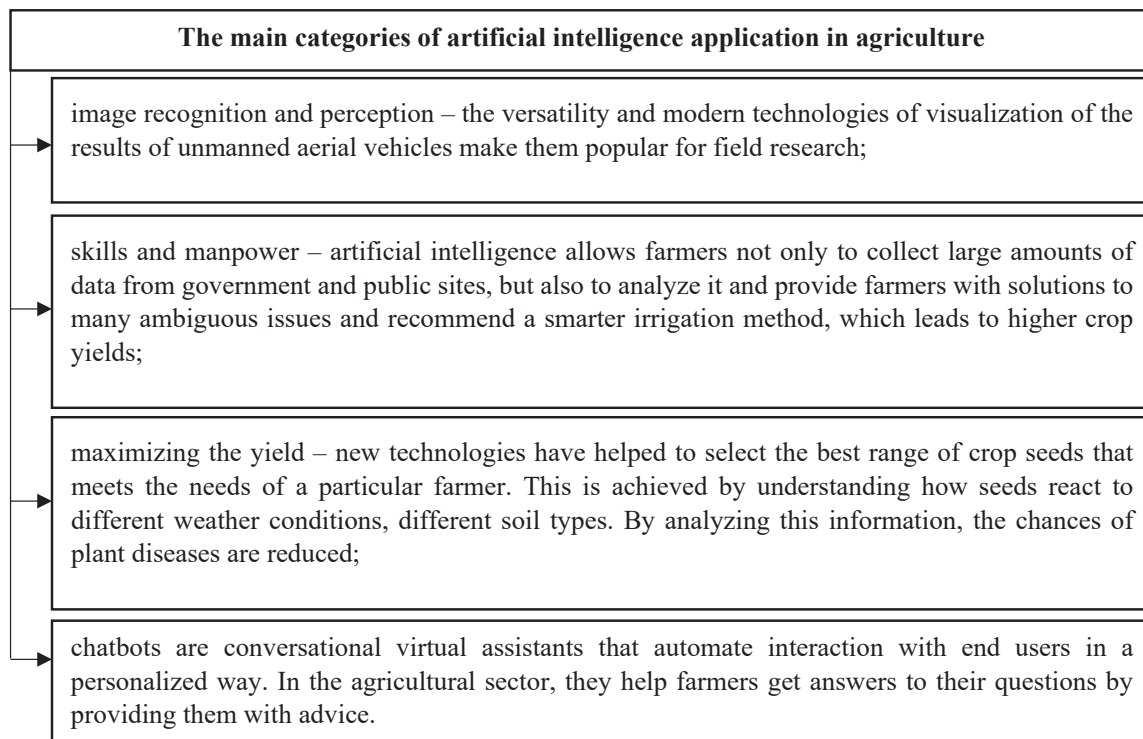


FIGURE 2 Main categories of artificial intelligence application in agriculture

Source: compiled by the authors according to official data (Tanha et al., 2020)

Stage 5 – data management, transfer and exchange. This area of digitization includes technologies that actually use the transfer or exchange of data to facilitate other types of transactions, such as property, communication (between people or digital devices) and digital services. Farmer age and irrigation use have been shown to be factors influencing the tendency to share farm data. Older farmers are less likely to share their data than younger farmers, most likely because the older generation is more skeptical and less familiar with new technologies. In addition, producers who do not use irrigation systems are less likely to share their data, which may be related to lower production intensity. Farmers with more technical skills, namely those who use a mobile phone with internet access and more digital technologies in agriculture, were less inclined to share their data, possibly because they have a better understanding of agricultural problems, which allows them to solve them at their own discretion (Michael et al., 2016). Thus, the directions and opportunities for digitalization in agriculture are extremely diverse and multifaceted.

4 The state of digitalization of Ukrainian and European agricultural enterprises

The official website of the State Statistics Service of Ukraine presents summary data on the use of information and communication technologies (ICT) in Ukrainian enterprises by type of economic activity, but according to the methodology of this state statistical observation, which is developed in accordance with EU Regulation No. 808/2004, agriculture is not the object of research. Therefore, it is currently impossible to analyze the state of digitalization of the agricultural sector of Ukraine based on statistical observations (State Statistics Service, 2022).

Thus, the situation in Ukraine is similar to that in the EU. The official Eurostat website displays quite a wide range of information, broader and more interesting, including general information on ICT systems, Internet access (including mobile Internet use), e-commerce and e-business use (cloud computing, software, Internet of Things, big data analysis, 3D printing, robotics, artificial intelligence, etc.). However, the established statistical observation also ignores agriculture for unclear reasons.

Given the role and importance of agriculture for most EU countries and their food security, a gap in the methodology of statistical observations was identified. EU Regulation No. 808/2004 needs an urgent correction by expanding the list of spheres (types of activity) for which relevant information is collected, in particular the inclusion of companies operating in the agricultural sector (Eurostat, 2022). Despite the lack of systematized information (based

on systematically organized statistical observations), certain conclusions about the state of digitization of both Ukrainian and European farmers can be drawn on the basis of information from special studies conducted in this area.

It was found that about 10% of Ukrainian agricultural companies use digitalization, which is extremely insufficient (National Investment Council, 2018). An example of effective implementation of digitalization of business processes in management can be such agricultural enterprises as Kernel, AgriChain, Syngenta and Ukrlandfarming. It is established that Kernel uses digital technologies in all areas defined in Figure 1 by the stages of the digital cycle. The company has created a digital ecosystem DigitalAgriBusiness to consolidate all agricultural production processes. The reason for this was the scale of the enterprise, namely the complexity of managing the largest land bank in Ukraine, so digitalization became necessary for further quality solutions.

5 Conclusions

Based on the study, it can be concluded that in the conditions of intensive implementation of diversification of agricultural enterprises in the system of ensuring their competitiveness through the use and analysis of big data in agriculture, the issue of forming a system of information support for the management of agricultural enterprises in Ukraine is becoming increasingly relevant among scientists. It has been established that big data in agriculture can be useful through yield recommendations, yield forecasting, fertilizer recommendations, pest control, market forecasting, marketing and sales optimization, productivity improvement, asset condition monitoring, etc.

It is found out that it is impossible to analyze the current state of digitalization of agricultural enterprises in Ukraine on the basis of systematically organized statistical research, since it is necessary to amend EU Regulation No. 808/2004 on the inclusion of agribusiness (agriculture) in the list of objects of state statistical observations. It is determined that the current state of digitalization of agriculture in Ukraine is extremely insufficient and requires appropriate organizational efforts at both macro- and micro-levels. At the same time, some Ukrainian agricultural enterprises successfully apply the benefits of digitalization in their business processes.

The results of the study can be used to apply modern approaches to the management of agricultural enterprises in the context of digitalization of business processes, which will stimulate agricultural activity, increase profits and ensure the competitiveness of the agro-industrial complex.

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Macroeconomic aspects of bank lending to industrial enterprises: current challenges

Abstract

The *aim* of the article is to highlight the key modern macroeconomic aspects and trends in the development of bank lending to industrial enterprises in highly developed countries of the world and to identify promising areas for its further development. The *methodological basis* of the study is the generalization of the results of applied research in the field of economics, scientific papers, statistical data, which highlight certain aspects of the development of the modern globalized economy, in particular its impact on the macroeconomic features of industrial development and bank lending to industrial enterprises. *Results.* The influence of financialization on the macroeconomic environment and the development of bank lending to industrial enterprises (on the example of the USA, Great Britain, Germany) is investigated. The influence of such unprecedented for the XXI century force majeure factors as the COVID-19 pandemic and the war in Ukraine on the macroeconomic environment and the development of bank lending to industrial enterprises is considered. The key trends in global economic development that stimulate transformations and structural changes in the macroeconomic environment of highly developed countries are highlighted. The role of bank lending to industrial enterprises in these processes is determined, which consists in lending to industrial innovations, as well as in the development of such promising areas as the "green" and "blue" economy. *Practical implications.* The practical results can be the basis for further research: on solving the problems of convergence of the financial and real sectors of the financialized economy, in particular with the participation of bank lending to industrial enterprises; on the role and importance of bank lending to industrial enterprises in overcoming the current macroeconomic consequences of the war in Ukraine; on certain aspects of the integration of bank capital into the development of industrial enterprises that are part of the "green", "blue" economy. *Value/originality.* The results of the study provide a deeper understanding of the role and contribution of bank lending to industrial enterprises in the processes of ensuring positive macroeconomic dynamics and maintaining macroeconomic stability, as well as allow to assess the depth of prospects for the development of bank lending to industrial enterprises.

Keywords

bank lending to industrial enterprises, macroeconomic environment, financialization, COVID-19 pandemic, macroeconomic consequences of the war, "green" and "blue" economy

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1 Introduction

The development of national economies in most countries of the world is significantly influenced by the current realities of strengthening globalization processes. Global trends in economic development are gradually integrated into the macroeconomic environment of countries and can be a source of numerous processes of its transformation and the emergence of new challenges and risks. Accordingly, of particular scientific interest is the development of bank lending to industrial enterprises as an important financial and credit instrument for promoting positive dynamics of macroeconomic

indicators and ensuring macroeconomic stability. In this context, the following issues deserve special attention: the impact of financialization on the development of bank lending to industrial enterprises; the impact of force majeure factors of the XXI century, such as the COVID-19 pandemic and the war in Ukraine, on the macroeconomic environment and the development of bank lending to industrial enterprises; the impact of global innovation trends on the macroeconomic goals of developed countries and the response of the banking business (in particular, in the field of lending to industrial enterprises). To date, not many scientific works have been devoted to the study of the impact of

modern macroeconomic aspects on the development of bank lending to industrial enterprises. At the same time, attention should be paid to the works of M. J. Buchanan, A. R. Musgrave, A. Fisher and many others, which explore the general and specific aspects of financialization of the modern market economy. In the study of the impact of the COVID-19 pandemic on the industrial sector and macroeconomic dynamics, it is necessary to pay tribute to the works of L. Lebedeva, O. Moskalenko. The prospects for the development of bank lending in the context of the formation of a "green", "blue" economy are the subject of research by a large international group of scientists of the organization "Green Finance Platform" and many others. Accordingly, the purpose of the article is to highlight the key modern macroeconomic aspects and trends in the development of bank lending to industrial enterprises in developed countries and to identify promising areas of its development.

2 Financialization and bank lending to industrial enterprises

The process of financialization of the economy is one of the most distinct macroeconomic trends of today as a consequence of globalization of the world economy. "Modern economy is a financial market economy, first of all." (Buchanan, Musgrave, 1991)

In general, the increasing role of the financial sector in the economy is commonly understood as financialization. This phenomenon originated in the 1980s. Financialization is associated with the following negative macroeconomic consequences: a decrease in material production; a decrease in the capitalization of the real sector; a decrease in the share of labor in national income; the emergence of socio-economic problems (for example, an increase

in the financial burden on the state in terms of social payments, benefits, etc. due to an increase in the number of laid-off employees of enterprises) (Fischer, 2021).

The process of financialization significantly distorts the role of finance, which ideally should be to serve the needs of the real sector of the economy, to ensure the accumulation, efficient distribution and redistribution of value in the national economy. The current hypertrophied development of the financial sector leads to deepening income inequality, long-term reduction of aggregate demand, inefficient allocation of financial resources, decline of the real sector, uneven development of countries and concentration of capital in financial centers, increased risks of bankruptcy, destabilization of socio-economic development (Herasymenko, 2016).

Accordingly, the process of financialization of the economy also affects the state of bank lending to industrial enterprises: bank investments in the development of industrial enterprises often look less attractive than existing instruments in the financial market. This leads to processes that ultimately reduce the role of bank lending in the development of the industrial sector of the economy.

In particular, on the example of such a highly developed country as the United States, whose financial system is focused on the development of the stock market, it is possible to observe how the share of industrial sectors of the economy (mining and quarrying, construction, manufacturing, utilities) and the share of finance, insurance and real estate in the national income of the United States for the period 1948–2021 changed (Figure 1).

Thus, in 1948, the share of the industrial sector in the US national income was 38.46%. Since then, the situation has changed significantly: in 2021, the share of the industrial sector in the US national

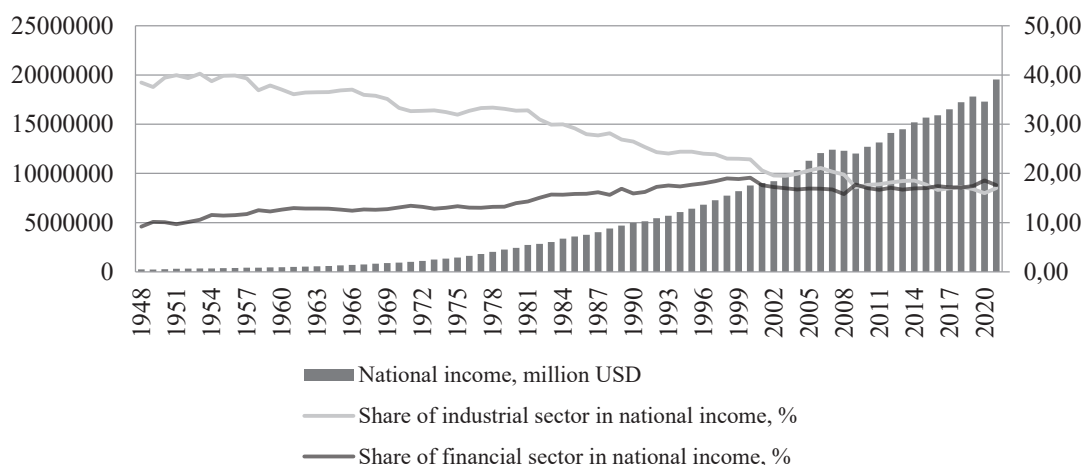


FIGURE 1 Shares of industrial and financial sectors of the economy in the national income of the USA, 1948–2021, in %

Source: compiled by the author based on the data (Official web-site of Bureau of Economic Analysis)

income was 17.01%. The changes shown in Figure 1 are primarily due to an increase in the share of the financial sector by 8.40 percentage points (from 9.20% in 1948 to 17.60% in 2021) or 91.32%, as well as other non-manufacturing services. These changes took place against the background of a reduction in the total number of US commercial banks in 1945–2020: their number decreased by 216.78% (from 13,419 institutions in 1948 to 4,236 in 2021) (Official website of Federal Deposit Insurance Corporation).

It is expected that the share of commercial and industrial loans in the loan portfolio of US commercial banks and savings institutions in the period 1984–2022 will also decline: in general, over the period of analysis – by 4.78 percentage points or 25%, and in the second quarter of 2022 will amount to 21.13% (Official website of Federal Deposit Insurance Corporation).

Thus, given the pace of development of the US economy, including industrial production, it can be concluded that the role of bank loans in the development of the industrial sector (in particular, the smart industry) in the post-war period was not decisive. According to the author, such a scenario of bank lending to industrial enterprises on the example of the United States has its roots in the change in the model of relations between banking and industrial business during the Great Depression (1929–1933). Thus, the veto of the US government on the mixing of banking and industrial business excluded the influence of the factor of personal interest of the bank (represented by its individual representatives) in the implementation of certain credit projects of industrial enterprises (Moffatt, 2019).

The situation of convergence of the real and financial sectors of the economy is observed in other countries whose financial system model is based on the stock market. A relevant example is the

United Kingdom. The data in Figure 2 show that the dynamics of the financial sector's contribution to GDP has become more rapid since the 2000s. At the same time, the financial sector proved to be less resilient than the real sector to global challenges such as the COVID-19 pandemic. At the same time, lending to industrial enterprises by monetary institutions looks different than in the United States: the share of lending to industrial business over the past 2 years has increased from 28.21% (September 2020) to 38.38% (August 2022) (Official website of Bank of England).

It should be noted that in those countries where the financial systems are dominated by banks, there is a lower degree of penetration of financialization in the processes of economic development, in particular, if to compare the example of the United States and Germany.

Based on the data of Table 1, it is possible to make the following scientific assumption: the process of financialization of the economy gradually affects both the development of the industrial sector and the financial mechanisms of its development. Thus, the shares of the industrial sector in the gross value added of the United States (a country where financialization has gained significant momentum: the share of the financial sector in gross value added over the past 13 years has increased by 65%) and Germany (a country where financialization is weak – the share of the financial sector in gross value added over the past 13 years has decreased by 5.5%) are at a fairly high level. At the same time, the share of the industrial sector in the gross value added in Germany is much higher than in the United States (on average by 6.41 percentage points over the analyzed period). As for the development of bank lending, it is worth noting the following: in Germany, the share of bank loans to the industrial sector in the total volume of loans to business entities is quite high (an average of 55% over the past 13 years);

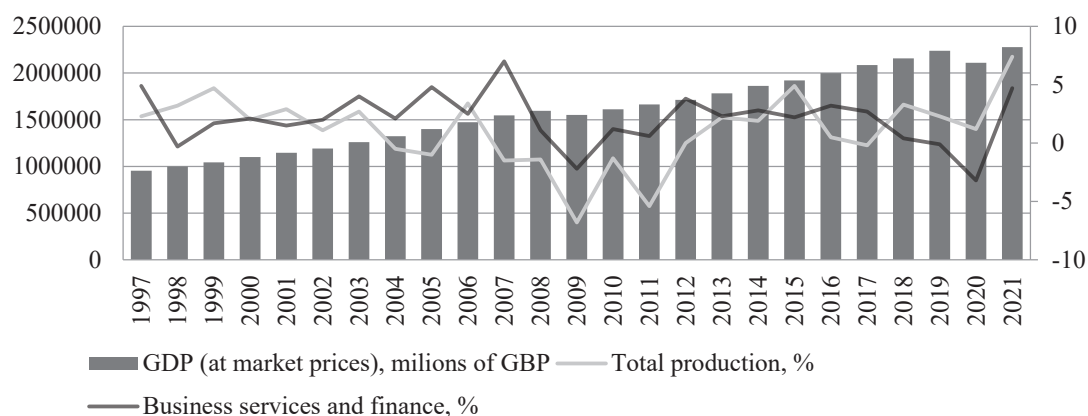


FIGURE 1 GDP and dynamics* of output of the real and financial sectors of the Great Britain, 1997–2021

* Change in percentage, last year to previous year

Source: compiled by the author based on the data (Official website of Office for National Statistics)

TABLE 1 Selected indicators of bank lending to industrial sectors: United States and Germany, 2008–2020

Year	Share of industrial sector in value added, %		Share of finance, insurance and real estate operations in value added, %		Commercial and industrial loans in loans to enterprises granted by banks, %	
	USA	Germany	USA	Germany	USA	Germany
2008	21,56	29,86	18,50	15,90	19,01	56,53
2009	19,58	27,59	19,23	16,99	16,67	56,29
2010	20,40	29,86	19,86	16,35	16,05	55,98
2011	21,25	30,15	20,46	16,30	18,00	56,63
2012	21,86	30,38	21,85	15,89	19,41	56,56
2013	22,75	29,79	22,28	15,82	19,85	54,42
2014	23,81	30,00	23,55	15,42	20,64	54,16
2015	23,75	30,14	24,48	15,40	20,78	53,86
2016	23,67	30,62	25,57	15,02	20,76	53,64
2017	25,21	30,48	26,55	14,66	20,66	53,76
2018	26,82	30,30	27,99	14,46	21,32	54,40
2019	27,44	29,97	29,27	14,39	20,99	54,47
2020	27,04	29,29	30,56	15,03	22,47	54,24

Source: compiled by the author based on the data (Official website of OECD; Official website of Federal Deposit Insurance Corporation; Official website of Deutsche Bundesbank)

in the United States, it is relatively small (an average of 19.74% over the past 13 years).

According to the author, this comparison once again confirms that bank lending to industrial enterprises is the most developed in bank-oriented financial systems. At the same time, it is the mechanism of bank lending that ensures the efficiency of the use of financial resources by industrial enterprises, as well as significantly contributes to the increase of their share in gross value added.

3 Macroeconomic dynamics and industrial lending: the impact of modern force majeure

The national economy of any country in the world is significantly affected by global challenges, in particular, such as the rapid spread of the COVID-19 pandemic in the world since 2019, as well as the aggravation of numerous geopolitical conflicts and the unprecedented war in Ukraine since February 24, 2022. The consequences of such dramatic events cannot but affect the macroeconomic environment and, accordingly, the state of bank lending to industrial enterprises.

COVID-19 pandemic has become the most serious test for the countries of the world in the last 150 years (Lebedeva, Moskalenko, 2021).

If to consider some macroeconomic indicators of the economic development of the EU countries (Figure 3) and the USA (Figure 4) during the emergence and course of the COVID-19 pandemic (2018–2021), a number of common trends can be identified: a rapid decline in GDP in 2020 compared to 2019 – by 1.5% in the United States and by 4.04%

in the European Union; a record decline in the industrial production index in April 2020 – to 84.20% in the United States and to 76.80% in the European Union; a number of programs to support the industrial sector, as evidenced by an increase in the share of industrial loans in the loan portfolio of non-financial corporations in the United States by 7.05%, as well as a slight decrease in the same share in the European Union – by 0.6%.

Thus, in the European Union, the government's response to the challenges of the COVID-19 pandemic for the industrial sector worked, as a result of which an important role was played by industrial business support programs. In particular, it was the provision of loans on preferential terms (preferential interest rates, extended maturity, etc.) and debt guarantees for industrial business (Official website of OECD).

Analyzing the macroeconomic situation in Ukraine against the backdrop of the COVID-19 pandemic (Figure 5), it can be observed that the negative macroeconomic consequences came quite later than in the United States and the European Union: although GDP did not decrease during the analyzed period, the industrial production index fell sharply by 6.41% in 2021, and the share of loans to industrial enterprises in total bank loans to non-financial corporations decreased by 11.87% in 2021.

The negative nature of the delayed response of the Ukrainian economy and authorities to the challenges of COVID-19 is exacerbated by the fact that the Ukrainian economy did not have time to recover to a certain level, as it happened in the United States and the European Union, and immediately suffered a new macroeconomic shock as a result of the full-

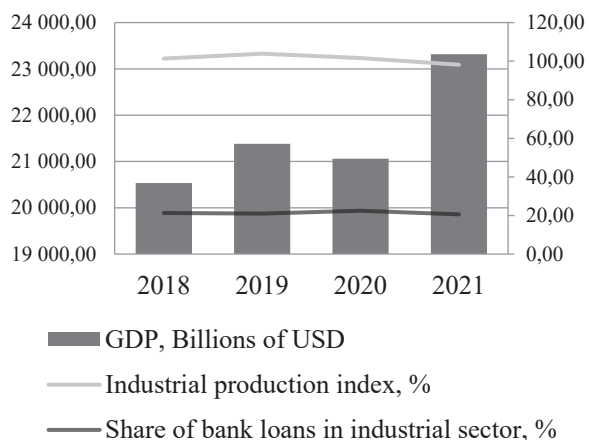


FIGURE 3 Dynamics of GDP, industrial production index, share of loans in the industrial sector (%), USA, 2018–2021

Source: compiled by the author based on the data (Official website of OECD; Official website of Federal Deposit Insurance Corporation)

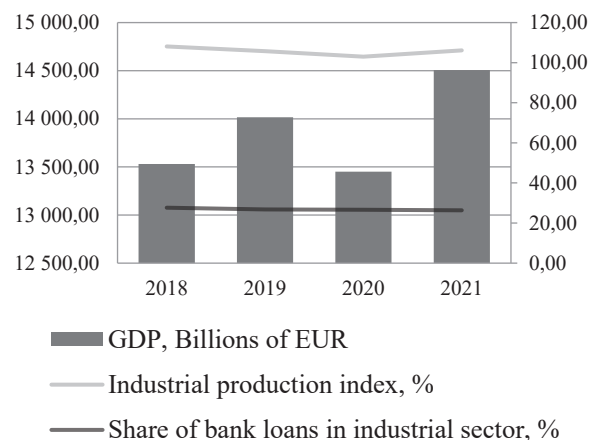


FIGURE 4 Dynamics of GDP, industrial production index, share of loans in the industrial sector (%), Europe, 2018–2021

Source: compiled by the author based on the data (Official website of OECD; Official website of European Central Bank)

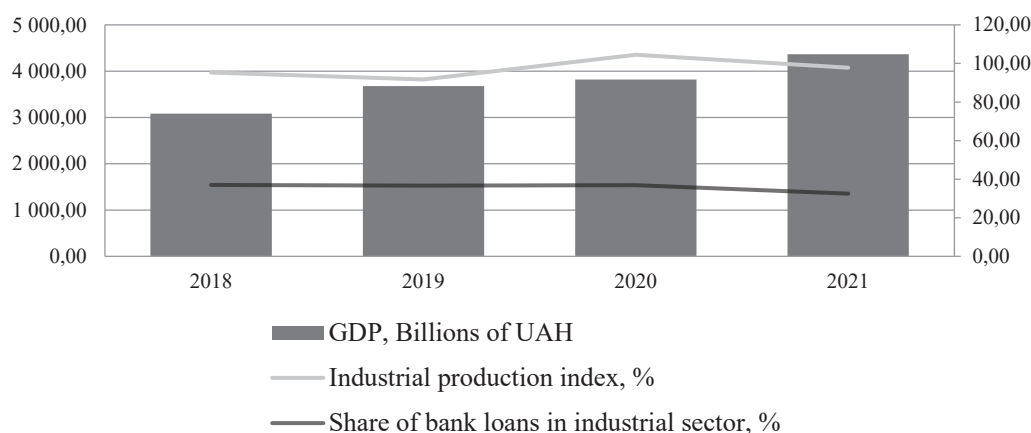


FIGURE 5 Dynamics of GDP, industrial production index, share of loans to the industrial sector (%), Ukraine, 2018–2021

Source: compiled by the author based on the data (Official website of the State Statistics Service of Ukraine; Official website of National Bank of Ukraine)

scale invasion of the Russian Federation into the territory of Ukraine on February 24, 2022. In particular, only in the second quarter of 2022, compared to the same period last year, GDP decreased by 37%; the inflation index for January-September 2022 was 121.8% compared to 110.0% in 2021; the share of loans to the industrial sector in the total volume of loans granted by banks to non-financial corporations since the beginning of 2022 and as of July 2022 decreased by 2.75 percentage points, and the total volume of loans granted to industrial enterprises decreased by UAH 11.14 billion over the same period.

A large number of industrial enterprises, industrial facilities (including critical infrastructure facilities) in Ukraine have suffered and suffer almost daily as a result of numerous enemy shelling: as of 27.09.2022, 422 industrial enterprises were completely or

partially destroyed. According to the World Bank's PDNA methodology, as of 01.07.2022, the total cost of losses caused to the industrial sector is estimated at USD 8.1 billion, which is almost 4.1% of the country's GDP for 2021, 6.3% of total fixed assets and 24.9% of total equity capital in the industrial sector of Ukraine as of Q3 2021 (Moroz, Bondarenko, 2022).

At the same time, the issue of future reconstruction of the Ukrainian economy is being actively considered. Bank lending to industrial enterprises can play an important role in the process of national economic reconstruction: for example, in case of creation of a special bank for reconstruction and recovery in Ukraine (similar to the "Kreditanstalt für Wiederaufbau", Germany) and building a strong industrial policy. Given that banks are the dominant

institutions in the financial system of Ukraine, it is bank lending to industrial enterprises that can significantly contribute to overcoming the macroeconomic consequences of the current war.

4 Promising areas of bank lending to industrial enterprises

The impact of current trends in the global economy on the national economy is an impetus for structural changes in its macroeconomic environment. Current trends in the global economy significantly affect the formation of macroeconomic policies of individual countries. The readiness of countries to solve the problems of increasing national competitiveness, macroeconomic indicators, resource saving, etc. is usually formalized in a clearly defined macroeconomic policy. Bank lending to industrial enterprises plays an important role in solving certain macroeconomic problems, directly or indirectly. The industrial sector is the engine of the national economy, which also introduces the latest ideas, and bank lending to enterprises is a powerful tool, given its financial and analytical potential.

According to the author, the macroeconomic basis for the development of promising areas of bank lending should include the following key trends:

- The Fourth Industrial Revolution. Building on the widespread adoption of digital technologies that resulted from the Third Industrial, or Digital, Revolution, the Fourth Industrial Revolution will be largely driven by the convergence of digital, biological and physical innovations during the XXI century (Schwab, 2021);
- The newest theory about the seven colors of the economy: white, black, gray, brown, purple, green, blue. While the white economy refers to the healthcare industry as a whole, the black economy is often used to refer to illegal or unauthorized trade activities. The grey economy is also known as the informal or underground economy. Based on the colours of nature, the green economy refers to sustainable and environmentally friendly economic activities such as agriculture, clean technology and renewable energy. Similarly, the blue economy refers to water-related activities like marine biotechnology, fisheries and aquaculture. However, the brown economy is the opposite, where activities are based solely on fossil fuel resources, which have been proven to harm the environment in the long run. The purple economy is the care activities and services (Darwish, 2021).

The role of banks and bank lending to industrial enterprises in the transformation of the macroeconomic environment through the financing of innovation is well known. Banks remain an important source of financing innovative projects of industrial enterprises to date. It should be noted

that the banking business and lending operations, including those with industrial enterprises, have undergone significant changes under the influence of the industrial revolution in recent decades: many banking processes have been digitized; the decision-making process on the feasibility of lending has been accelerated; the banking analytical and information resource has been improved; new types and forms of bank lending have been developed, etc.

However, a completely new trend in the development of banking business is its participation in the development of the "green" and "blue" economy. Over the past decade, the banking industry has become increasingly aware of the importance of green finance. Both commercial and investment banks are beginning to take action, including integrating environmental factors into banking strategy and management, and mobilizing capital for specific green assets through lending, credit and savings products and capital markets activities, including green bonds.

The need for action has been highlighted by central banks, especially the Bank of England, whose Governor has warned that climate change is a systemic risk to the banking sector. This has led to the creation of the Task Force on Climate-related Financial Disclosures (TCFD), which has produced recommendations for the financial sector and public companies to integrate climate change into their business strategies (Official website of Green Finance Platform).

Multilateral development banks (MDBs) also play an important role in mobilizing international climate finance and increasing financial leverage for low-carbon and climate-resilient investments by improving the planning, preparation, structuring, financing and risk mitigation of public and private investments. More broadly, sustainable development and responsible investment are increasingly being integrated into the investment process of MDBs. Many of them have made ambitious commitments to ensure that their loan portfolios support environmental activities and integrate natural capital and social impacts into their investment decision-making processes.

5 Conclusions

Based on the results of the study, the following conclusions can be drawn:

1. The current macroeconomic aspects of the development of bank lending to industrial enterprises are: financialization of the economy, the degree of which varies depending on the country and its model of the financial system; force majeure factors that affect the macroeconomic environment, and, accordingly, the development of bank lending to industrial enterprises (COVID-19 pandemic, war in Ukraine); rapid integration into the macroeconomic

environment of the phenomena and trends of the globalized economy, such as the Fourth Industrial Revolution, the theory of colors of the economy.

2. Comparison of the degree of penetration of financialization and the state of bank lending to the industrial sector (on the example of the USA, Germany) showed that the process of financialization of the economy gradually affects both the development of the industrial sector and the mechanisms of financial support for its development. In countries whose financial system model is oriented to the stock market (in particular, the United States), the role of the financial sector is growing faster, and the share of bank lending to the industrial sector in the loan portfolio of banks is decreasing over the years.

3. Countries in which the macroeconomic consequences of the COVID-19 pandemic manifested themselves immediately (end of 2019 – first half

of 2020), and whose governments quickly focused on the need to introduce measures to support the industrial sector (including bank lending programs), were able to quickly restore their macroeconomic performance. In Ukraine, where the macroeconomic consequences of the COVID-19 pandemic manifested themselves somewhat later (second half of 2020–2021) and the economic recovery did not come, the real macroeconomic shock occurred from the beginning of 2022 as a result of the war with Russia.

4. Bank lending to industrial enterprises, despite the emergence of new mechanisms for financing industrial business, is a traditional and effective tool for overcoming numerous negative macroeconomic consequences. Bank lending to industrial enterprises is in a state of constant development and improvement, which indicates the growth of its role in such new trends as the development of the "green" and "blue" economy.

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State regulation of internet banking in European countries

Abstract

The purpose of the study. The purpose of the article is to analyze the state of state regulation of Internet banking in European countries. The subject of the study is the legislation and trends of state regulation of online banking in European countries. The research methodology is based on a comparative analysis of legislation regulating online banking in the EU countries on the example of Switzerland and the UK. The main methods of research are comparative legal analysis, statistical analysis of the development of online banking in the EU countries. Conclusion. The growth of technological innovations in the financial sector and active user demand for financial and technological services have led to the need to develop a regulatory framework for Internet banking in European countries. As a result, the EU seeks to create a single financial space that unites providers and users of Internet banking, so it is constantly improving the regulatory framework. The article defines that the key documents at the EU level for state regulation of online banking are the EU Payment Services Directives (PSD1 2007/64, PSD2 2015/2366, the Reviewed Payment Services Directive PSD2 2021/1230). The main prerequisites for the adoption of the Directive were to create a level playing field for payment service providers, protect consumer rights and increase the provision of payment services by non-banking institutions. It is determined that Directive PSD2 2015/2366 updated the existing legal framework for payment services in the EU and introduced increased requirements for transparency and security. The updated Payment Services Directive PSD2 2021/1230 harmonises business rules for all electronic payment service providers across the EU and creates a tiered authorization regime for non-bank payment service providers such as payment institutions. Commission Delegated Regulation (EU) 2018/389 came into force on September 14, 2019, defining mechanisms for electronic payment transactions and online banking to ensure higher levels of security. The state regulation of online banking is considered on the examples of Great Britain and Switzerland. The Swiss financial sector is one of the most competitive in the world and a leader in cross-border wealth management. It offers a first-class environment for technological innovation and its regulatory system is internationally recognised as exemplary.

Keywords

online banking, regulation of open banking, government regulation of financial and technological services, Internet banking

JEL: E50, E51, E52, E58



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1 Introduction

The European Union has long sought to create a single financial area within Europe that would allow consumers in one country to benefit from financial markets and activities in other countries. With the emergence of the Internet as a platform for providing online banking services and the spread of online and mobile banking in recent years, the creation of a pan-European banking market has become more widespread. This requires continuous improvement of legislation in the field of state regulation of online banking.

The supervision of banking networks, payment institutions and e-money institutions, as well as the licensing procedures differ across Europe. The banking regime is determined at EU level by the European Central Bank (ECB) as a single regulator, while payment and e-money transactions require a national license and are supervised by national regulators. Such nationally licensed and supervised institutions can offer their services in other Member States using the EU passport system. This creates a risk of fragmented supervision or even supervisory competition, which is increasing as the fintech sector focuses on specific services, outsourcing non-

core parts of its business to third parties (including banks). This growing trend has led to a complex network of interconnected financial institutions providing services in Europe, while supervision is fragmented across EU countries. This supervisory fragmentation could have implications for pan-European systemic financial stability, regulatory compliance and consumer protection, as the fintech and big tech sectors become increasingly important and develop at a rapid pace. Accordingly, this requires harmonization of the regulatory framework, supervision of payment and electronic money institutions at the EU level in order to ensure the responsibility of all participants in the value chain of financial services, identify, manage and monitor systemic and non-financial risks.

The study of state regulation of online banking in European countries is devoted to a number of works of foreign scientists (Apostolos, 2006; Delgado & Nieto, 2004; Gkoutzinis, 2010).

The works highlight the problems of development of legislation regulating the financial sector. However, there is no analysis of the chosen direction of research in recent years, which actualizes its study.

The aim of the article is to analyze the state of state regulation of online banking in European countries.

2 General trends in the online banking development in EU countries

December 3, 2020. The European Banking Federation has published a report "Banking in Europe: Facts and Figures" on the state of the banking sector in Europe, which indicates a reduction in the number of staff and bank branches in the European banking sector. These trends continued in 2019 due to the positive perception of banks' customers of electronic payments, online and mobile banking due to the convenience, simplicity, speed of transactions. The European Banking Review 2019 shows that the total number of credit institutions in the European Union has steadily decreased every year during 2008–2019: by 2,544 since the beginning of 2008 to 5,981 institutions in 2019. Widespread networks of bank branches among the population play a less and less important role. The number of bank branches in the EU fell to 163,270, with around 10,000 branches closed in 2019. Compared to 2008, the total number of bank branches has decreased by 31%, or almost 75,000 units, reflecting the rapid expansion of online and mobile banking services in recent years. In 2019, 58% of people in the EU used online banking, up from 25% in 2007. The number of people employed by credit institutions in the EU fell to its lowest level since the ECB measured the figure in 1997, standing at around 2.62 million at the end of 2019, down from 2.67 million in 2018 and 3.26 million

in 2008. Approximately two-thirds of all banking staff in the EU work in banks headquartered in one of the five largest EU economies (Banking in Europe – Facts & Figures: Banks continue to adapt to customer demand).

In 2021, 96% of the Norwegian population had access to online banking sites, making Norway the country with the highest internet banking penetration in Europe, followed by Denmark (95%) and Iceland (95%). Online banking is becoming one of the most popular payment methods in Europe, allowing customers of a bank or other financial institution to carry out a wide range of financial transactions through their websites. Therefore, over time, the confidence of Europeans in this system of electronic payments has increased (Arnaboldi & Claeys, 2008; Jakšič & Marinč, 2019).

At the same time, in some countries, such as Germany or Austria, the use of physical cash is significantly reduced (Europe: online banking penetration by country 2021, n.d.).

Internet banking is especially popular among people aged 25 to 34: 68% use this service according to Eurostat 2017. The use of online banking tends to increase according to the level of education of the user. While only 24% of the less educated use e-banking, 77% of those with a higher level of education do (Goldby, 2008; Individuals using the internet for internet banking, n.d.; Eurostat, 2018).

3 Overview of online banking regulation in European countries

The existing EU legal framework for the regulation of online banking is the basis for the formation and standardization of payment transactions in the European Economic Area through two Payment Services Directives (2007/64/EC and Payment services (PSD 2) – Directive (EU) 2015/2366) (Payment services (PSD 1) – Directive 2007/64/EC, 2007).

The main prerequisites for the adoption of the Directive were to create a level playing field for payment service providers, protect consumer rights and increase the provision of payment services by non-banking institutions.

The Open Banking Directive PSD2 was adopted in October 2015 by the European Parliament as a revision of the existing Payment Services Directive 2007/64. The new rules are designed to promote the innovative development of online payments through open banking. Directive PSD2 2015/2366 updated the existing legal framework for payment services in the EU and introduced increased transparency and security requirements. In particular, the requirements for payment transactions where there is only one payment service provider in the EU are defined ("Open banking PSD2 regulation in the EU," 2022).

In legal terms, PSD2 defines a list of services, obligations, and definitions for market participants. The most relevant ones are ("Open banking PSD2 regulation in the EU", 2022):

1. Strong Client Authentication (SCA) is a type of advanced authentication based on two or more elements in the following categories: possession (request for something that only the user possesses); knowledge (request for something that only the user knows about); client characteristic (request for the characteristic or personal data of the client).

2. Payment Initiation Service (PIS) – a service that allows you to make a transfer through a third-party payment service provider using a bank account opened with another authorized banking service provider.

3. Confirmation of Funds Availability (COFA) is a service aimed at verifying the availability of the amount necessary to perform a payment transaction on the current account of the user performing the transaction.

4. Account Information Service (AIS) – a service that allows the exchange of information stored in at least one bank account managed by a particular service provider with another (or several) payment service provider.

5. Third Party Providers (TPP): a new category of service providers. Banking institutions must provide customers, businesses and retailers with the ability to access their accounts through a TPP, providing an unrestricted experience as if the customer had logged directly into the bank's portal. This is possible through an application programming interface (API). External suppliers can be:

5.1. Payment Initiation Service Providers (PISPs) are entities that offer consumers the ability to complete a payment transaction on behalf of a customer with their authorization without having to visit the online platform of the bank where the account is held. PISPs provide users with greater flexibility when making digital transactions.

5.2. Account Information Service Providers (AISPs) are third-party companies that can log in to a user's Online Banking to retrieve their bank account information. One of the advantages of this is certainly the fact that in this way the consumer will have all the information about the different accounts he may have on one platform, having a clear and general overview of his financial situation, the payments he has made and his current accounts.

5.3. Payment instrument issuing service providers (PIISPs) are companies that have the ability to issue debit cards linked to bank accounts at other institutions. These institutions do not maintain the accounts directly, but verify the availability of funds in the auxiliary account and allow the payment to be made to the merchant. The obligation to provide account service providers (ASPs) with a special application programming interface (API) that

allows third-party providers (TPPs) to provide the categories of services mentioned above (PIS, AIS, CAFO, ...) and others.

All third-party service providers are supervised by special financial supervisory authorities in all EU member states. It should be noted that two years after the entry into force of PSD2 (it happened on September 13, 2019), the European Commission decided to start working on the revision of the Directive. In October 2021, the European Commission published a call for proposals addressed to the European Banking Authority (EBA), in which it outlined the areas to be revised in the directive: obligations and rights arising from the directive; customer authentication procedures using methodologies provided by SCA; definition and scope of the directive; transparency of information conditions and requirements; payment institution license and payment service provider compliance; procedure for access to payment systems; procedure for access to accounts. The changes under discussion are expected to be adopted by the Commission starting from the fourth quarter of 2022 ("Open banking PSD2 regulation in the EU", 2022).

The second Payment Services Directive (PSD2) gave the European Banking Authority a number of mandates to draft regulatory technical standards (RTS), including regarding strong customer authentication and general secure communications, adopted by the Commission on November 27, 2017. Commission Regulation (EU) 2018/389 (European Banking Authority's opinion on strong customer authentication, n.d.).

Commission Delegated Regulation (EU) 2018/389 entered into force on 14 September 2019, which defines how electronic payment transactions and online banking should be carried out in the future with the aim of increasing the security of payment transactions and online banking. Pre-processing such as online banking registration with username and password or online payment with credit card number, expiration date and confirmation number will no longer be sufficient for authentication. As of September 2019, payers must identify themselves using two items from the categories of "awareness," "ownership," or "affiliation" (von der Osten, 2019):

1. "Knowledge" (something only the payer knows): e.g., password or PIN-code.

2. "Possession" (something only the payer knows): for example, a token or smartphone.

3. "Affiliation" (something that identifies the payer): e.g., fingerprints, facial traces, or voice.

The combination of these elements aims to reduce the risk of fraud. Companies and banking institutions should prepare for strict customer authentication. First of all, it is important to assess in which cases such customer authentication is mandatory. Reliable customer authentication is

always required when a payer initiates an electronic payment transaction (so-called push payment) or when a payer accesses his payment account online. An electronic payment is activated, for example, when paying online by credit card (Raza et al., 2020).

The Regulation also excludes the following cases of mandatory authentication due to the low level of fraud: contactless payments at points of sale for up to EUR 50; unmanned terminals for payment of transport services and parking, such as payments of beneficiaries classified by the payer as secure; recurring payment transactions; transfers between accounts of one person; small transactions up to 30 euros; highly secure payment methods, to which only companies are allowed; familiarization with account balances and turnover through online banking. In the second stage, companies must introduce strong customer authentication (von der Osten, 2019).

The updated Payment Services Directive PSD2 2021/1230 harmonises business rules for all electronic payment service providers across the EU and creates a tiered authorization regime for non-bank payment service providers, known as payment institutions. Directive 2021/1230 affects banks, building societies, e-money issuers, money remitters, non-bank credit card issuers, non-bank acquirers, and their customers. PSD2 2021/1230 focuses on electronic means of payment, including direct debits, debit cards, credit cards, standing orders, mobile or landline payments and payments from other digital devices, and money transfer services. This does not apply to physical cash transactions or payments based on paper checks. PSD2 2021/1230 updated the existing legal framework for payment services in the EU and introduced increased transparency and security requirements. For example, PSD2 2021/1230 specifies certain requirements for payment transactions where there is only one payment service provider in the EU ("Open banking PSD2 regulation in the EU", 2022).

Among the legal acts of state regulation of online banking in the EU is the Multilateral Monetary Commission Regulation (MMC Regulation), which was officially adopted on April 29, 2015, and entered into force on June 9, 2016. The MMC Regulation sets limits on foreign exchange fees at 0.2% and 0.3% of the transaction amount for consumer debit and credit cards, respectively. The regulations also set requirements for organizational separation of payment systems and transaction processing infrastructure and prohibit territorial restrictions in licensing agreements or rules of payment systems. On 19 August 2021, the new Cross-Border Payment Regulation also entered into force. This Regulation contains provisions on (among other things) currency conversion fees and cross-border payment fees.

4 State regulation of online banking in the UK and Switzerland

Examples of the implementation of the EU Directives to regulate online banking include the example of the United Kingdom. In August 2016, the UK Competition and Markets Authority (known as CMA – Competition and Markets Authority) issued an order covering nine major UK banks (Barclays, Santander, HBSC, RBS, Allied Irish Bank, Lloyds, Bank, Danske Bank, Nationwide) to give licensed companies or startups direct access to their data, in particular account transactions. In January 2018, a CMA directive came into force that uses standards developed by Open Banking Limited, a non-profit organization set up specifically to implement EU online banking legislation. This directive applies exclusively to the nine banks mentioned above and operates on the basis of the general Open Banking PSD2 rules that apply to all payment service providers. The enforcement of PSD2 in the UK is the responsibility of the Competition and Markets Authority. Control over the protection of customers, their data and account information, the execution of payment orders is carried out by the Information Commissioner's Office and the Financial Conduct Authority (FCA). As of January 2020, 202 service providers regulated by the FCA are registered in the Open Banking UK system. Many of them offer applications that provide financial services online (e.g., financial management), and service providers also own consumer lending companies that use Open Banking tools to access bank account information to verify and confirm affordability ("Open banking PSD2 regulation in the EU", 2022).

The state of state regulation of online banking in Switzerland should be considered separately. The issue of open banking has been on the agenda of the Swiss financial sector for about four years. One of the initial driving factors was the EU PSD2 regulation, which has been in force for all member states since 2018. Currently, Switzerland has chosen a market-based approach to the implementation of Open Banking. Open Banking creates simplified and efficient cooperation between banks and third-party service providers (TPPs) through open and standardized APIs. At the heart of the concept is the end customer, who can decide without assistance how their (banking) data will be processed. Open banking not only allows to develop its business model, but also promotes cross-industry innovation in digital ecosystems (Study on open banking in Switzerland, n.d.).

The banking sector makes a vital contribution to the success of the Swiss economy and financial centre, especially in uncertain times like these. The country is one of the world's leading financial centres and number one in cross-border wealth

management. By the end of 2021, 239 banks were operating in Switzerland. The financial sector, and especially banking, is one of the cornerstones of the Swiss economy. It accounts for 9.7% of gross value added. At the end of 2020, there were 243 banks in Switzerland with 2,477 branches and 6,901 ATMs. In addition, Swiss banks have 187 branches abroad. The sector is very diverse, with banks differing in size, business model, ownership structure and regional orientation. They include four large banks, 24 cantonal banks, 39 stock exchange banks, one Raiffeisen bank, as well as 59 regional and savings banks. The rest is distributed among private banks, foreign banks and foreign branches in Switzerland. Banks contribute to Switzerland's high international competitiveness by catalyzing economic development, offering a large number of skilled jobs, paying above-average wages and having a significant share of public sector funding in the form of taxes. The rapid issuance of loans by Swiss banks to fight COVID-19 in March 2020 was a significant factor in counteracting the economic downturn caused by the pandemic. However, the challenges currently faced by Swiss banks are indeed diverse: high regulatory costs; shrinking margins; price-sensitive customers; limited access to foreign markets; increasing competition from both financial and non-financial entities; and the persistence of negative interest rates. Overall, Swiss banks remain vulnerable to negative interest rates.

Swiss banks are now focusing mainly on digital innovation to develop new business models, improve internal efficiency and cost structures. In addition, the Swiss fintech landscape has expanded significantly and currently has more than 363 fintech companies. One third of them work on the distributed ledger technology. In August 2019, the first two blockchain service providers received licenses for banking and securities trading. In 2021, the Swiss Financial Market Supervisory Authority approved the world's first independent digital asset market, the first Swiss DLT-based stock exchange and the first Swiss crypto fund. Almost half of the 7,879 billion Swiss francs (7,280 billion euros) now managed by Swiss banks comes from abroad. With a market share of 24%, Switzerland is the world leader in private cross-border wealth management (Banking barometer 2022 – banking barometer 2022, n.d.).

In 2020, 106631 people worked in Swiss banks, of which 89958 were employed in Switzerland. Most of them work in one of the four largest banks (26%), followed by cantonal banks (20%). The share of women employed in Swiss banks was 38.4%. In 2021, 239 Swiss banks recorded the second consecutive increase in staff numbers, adding 619 full-time employees. However, this cannot be seen as a trend reversal. Consolidation in the industry, increased regulation and outsourcing have been driving a steady decline in staff numbers since 2013. According to

the State Secretariat for Economic Affairs (SSEA), the unemployment rate in the financial sector was 2.4% at the end of 2013. 2021, slightly lower than in the economy as a whole (Banking barometer 2022 – banking barometer 2022, n.d.).

Switzerland's financial sector is one of the most competitive in the world and a leader in cross-border wealth management. It offers a first-class environment for technological innovation and its regulatory system is internationally recognized as exemplary.

Compared to other economies, the Swiss economy has so far withstood the COVID-19 pandemic well. In 2021, protective measures have been gradually eased, leading to a strong recovery and lower unemployment. Economic trends in 2022 will be highly uncertain due to factors such as the war in Ukraine and related risks of energy shortages, as well as the possibility of renewed measures to combat COVID-19 and higher inflation. Gross domestic product (GDP) is expected to grow by 2.6% this year. Central banks are raising interest rates due to persistently high inflation. In June 2022, the Swiss National Bank (SNB) raised its benchmark interest rate for the first time in 15 years and expects further increases to maintain price stability (European Banking Federation, 2020, November 17).

Negotiations between Switzerland and the United Kingdom (UK) have elaborated key principles of liberalization and expansion of mutual market access in the field of financial services. The main elements should be enshrined in an international agreement by the end of 2022. Private digital money and central bank digital currencies are gaining attention around the world. Various central banks, commercial banks and technology firms are working on forms of digital money to meet the needs of the growing number of users of the digital economy. Depending on the form of digital money implementation, banks can radically change the business model and operational activities of banking institutions. In Switzerland, the Swiss Bankers Association (SBA) has published a discussion paper as a contribution to the important debate on the development and use of digital money and its implications for the economy and society. Amendments to the Liquidity Decree for systemically important banks come into force. The regulatory concept is based on two dimensions: basic requirements, precisely calibrated and subject to reporting obligations, and additional requirements for individual institutions, which may be set by the Swiss financial markets supervisory authority FINMA (Economic policy environment, n.d.).

FINMA supervises financial technology institutions based on principles and a risk-based approach. External audit firms play an important role in this. Institutions that hold a FinTech license or a DLT trader license are subject to FINMA supervision. The key here is continuous compliance with licensing requirements. FINMA's supervisory

system distinguishes between direct supervision – FINMA itself conducts supervisory work – and indirect supervision – FINMA appoints a regulatory audit firm to extend the scope of regulation (Putnis, Goldstein, & Kasal, (n.d.).

For this purpose, the FSA engages audit firms approved by the Federal Audit Supervision Authority. Audit firms regularly request regulated entities to conduct regulatory audits. FINMA has various supervisory tools at its disposal, some of which it applies independently in the field. In addition, FINMA may collect data as necessary. When supervising FinTech licensed institutions, FINMA takes into account the fact that deposits are not covered by deposit protection under the Swiss Banking Act. The legal basis for the supervision of FinTech-licensed institutions can be found in the Banking Act (BA), the Banking Ordinance (BO), as well as further details in relevant FINMA circulars. The legal basis for supervising DLT merchant facilities is found in the Financial Market Infrastructure Act (FinMIA), the Financial Market Infrastructure Ordinance (FinMIO), and the FINMA Financial Market Infrastructure Ordinance (FinMIO-FINMA) (Finma, n.d.).

Among the examples of online banking regulation is the case of Dukascopy Bank, a Swiss innovative online bank founded on November 2, 2004 (Geneva), which provides online and mobile trading, banking and other financial services through its own technological solutions. Dukascopy Bank is supervised by the Swiss Financial Market Supervisory Authority FINMA (Swiss Financial Market Supervisory Authority) as a bank and securities firm. Dukascopy Bank is wholly owned by Dukascopy Europe IBS AS, a European licensed broker located in Riga, and Dukascopy Japan, a Type-1 licensed broker located in Tokyo. Dukascopy Group currently has over 300 employees. Dukascopy Group mainly provides existing real-time and mobile trading services via SWFX – Swiss FX Marketplace, Dukascopy ECN proprietary technology solution, and Dukascopy registered trademark (Dukascopy Bank SA, n.d.).

5 Conclusions

The growth of technological innovations in the financial sector and active user demand for financial and technological services have led to the need to develop a regulatory framework for Internet banking in European countries. As a result, the EU seeks to create a single financial space that unites providers and users of Internet banking, so it is constantly improving the regulatory framework. At the EU level, the regulation of online banking is determined by the European Central Bank (ECB) as a single regulator, while payment transactions and the use of e-money require a national license and are supervised by national regulatory authorities. Such nationally licensed and supervised institutions can offer their services in other Member States using the EU passport system. This creates a risk of supervisory fragmentation or even supervisory competition, which increases as the fintech sector focuses on specific services and outsources non-core parts of its business to third parties (including banks). This growing trend has led to a complex network of interconnected financial institutions providing services in Europe, while supervision is fragmented across EU countries. The answer to the above requires harmonization of the regulatory framework, supervision of payments and e-money issuing institutions at the EU level to ensure the responsibility of all actors in the value chain of financial services, identification, management and control of systemic and non-financial risks. The key documents at the EU level for state regulation of online banking are the EU Payment Services Directives (PSD1 2007/64, PSD2 2015/2366, Revised Payment Services Directive PSD2 2021/1230). PSD2 2015/2366 updated the existing regulatory framework for payment services in the EU and introduced enhanced transparency and security requirements. The updated Payment Services Directive PSD2 2021/1230 harmonises business rules for all electronic payment service providers across the EU and creates a tiered authorization regime for non-

TABLE 1 Structure of the Swiss banking sector by the end of 2021

Groups of banks	2020	2021	New banks	Reclassification	Banks that were closed
Cantonal banks	24	24	0	0	0
Large banks	4	4	0	0	0
Regional banks and savings banks	59	59	0	0	0
Raiffeisen banks	1	1	0	0	0
Foreign banks	94	93	2	-2	1
Private banks	5	5	0	0	0
Stock exchange banks	39	36	0	-3	0
Other banking institutions	17	17	0	0	0
Total	243	239	2	-5	1

Source: Executive Summary (2012)

bank payment service providers such as payment institutions. Commission Delegated Regulation (EU) 2018/389 came into force on September 14, 2019, defining mechanisms for electronic payment transactions and online banking to ensure higher levels of security. Examples from the U.K. and Switzerland examine government regulation of online banking.

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Institutional preconditions and genesis of natural gas exchange trading¹

Abstract

Natural gas is one of the world's leading sources of primary energy, and gas exchanges are key players in the natural gas market, which ensure its functioning on a liberal basis. Given the current liberalization trends, exchange trading in natural gas is gaining momentum and importance in this market. *The main objective* of the study was to determine the institutional preconditions and the main stages of the genesis of the exchange segment of natural gas trade. *The study* showed that gas exchanges and gas hubs are the key institutions of natural gas exchange trading, as they ensure openness and transparency of the market. *As a result* of the study, the author identified the following institutional prerequisites for the creation of gas exchanges: the need to form a competitive gas market and ensure its availability to third parties, ensuring transparent pricing and setting the market price for gas, simplification of trade procedures and standardization of products, protection of the execution of agreements and limitation of risks, which is manifested in the security and reliability of supplies and increasing the energy security of the state. Identifying the stages of the evolution of natural gas exchange trading, the author distinguished gas trading on mixed commodity exchanges, gas trading on universal and specialized energy exchanges, which began to emerge slowly in the 1990s, and gas market liberalization, accompanied by a boom in the creation of gas exchanges and gas hubs. The recession of 2008–2009, the shale gas revolution, the process of decarbonization of the economy and the full-scale invasion of Ukraine by Russia have been the main catalysts for the modern transformation of the natural gas market in recent decades. The author concludes that the latter will significantly affect the natural gas market in the coming years, which will lead to a revision of European policy in this area and the struggle for energy security. This paper is an original scientific study of the evolution of natural gas exchange trading and makes a certain contribution to the study of the peculiarities of the gas market functioning.

Keywords

natural gas, gas exchange,
gas hubs, gas market
evolution, Europe

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1 Introduction

Over the past decades, natural gas has become one of the vital resources for the functioning of national economies. Despite the importance of natural gas as a fuel for the economy, the exchange segment of gas trading is relatively new. The boom of gas exchanges started only one or two decades ago. On the European market, this boom is closely linked to the creation of the European natural gas market and the implementation of EU directives and regulations aimed at liberalizing the natural gas market. Exchanges are key players in the natural gas market, which ensure its functioning on a liberal basis. This is evident from

their functions: pricing, price transparency, supply/pricing flexibility, physical balancing and financial risk management (Heather, 2015, p. 31).

In-depth studies are dedicated to the natural gas market foundations and peculiarities (Correljé, 2016) and to revealing the stages and features of its formation and development (Yukhymets, 2021). Some researchers analyze the creation of the stock exchange (Polikeyvych, 2015) and its role (Heather, 2015, p. 31–34). At the same time, there is a lack of research on the evolution of exchange trade in natural gas, which, given the current trends of liberalization, is gaining momentum and importance in this type of energy market.

¹ This paper was prepared within the research project "Determining the institutional conditions for the development of the gas market segment" (No. 0122U002205), conducted at the State Organization "Institute of the Economy and Forecasting of the National Academy of Sciences of Ukraine".

The purpose of this study is to identify the institutional preconditions and main stages of the genesis of the exchange segment of natural gas trade. This goal determined the logic and structure of the work. The main part of the work begins with the definition of historical preconditions of exchange trading in general and institutional preconditions of exchange trading in natural gas in particular. Section 3 is devoted to the analysis of the creation and importance of gas hubs in connection with the functioning of the gas exchange. The following sections describe the genesis of natural gas exchange trading, the establishment and functioning of gas exchanges, as well as the main catalysts of modern transformations of the natural gas market. In the last section, in accordance with the results obtained, conclusions are drawn on the main institutional prerequisites and stages of the evolution of natural gas exchange trading and modern transformations in the gas market.

2 Institutional prerequisites for natural gas exchange trading

The exchange market is the highest form of organized trade and the main form of the wholesale market of mass goods, the key element of which is the stock exchange. On the way to creating a modern exchange market, wholesale trade has undergone significant transformations from traditional markets, fairs, auctions to the stock exchange. Its emergence and development was an objective consequence of the development of large commodity production, the desire of traders to simplify the trade process associated with logistics and price fluctuations in the market. Its history dates back to the 15th century. Since then, the exchange has evolved from an organized place for the immediate purchase and sale of commodities to the sale of forward contracts, futures and options. From a place that did not provide regulation of legal relations regarding concluded contracts to clear, strict rules with guarantees and payment of margin. From the commodity type of exchange to the dominance of trading in financial assets, the creation of stock, currency, futures, cryptocurrency and universal exchanges. With the development of Internet technologies, electronic trading has become a widespread phenomenon. The end of the 20th century is also characterized by the consolidation of exchange trade, acquisitions and the emergence of new exchange associations.

Thus, the emergence of an exchange is a marker of market maturity, and the natural gas market needed more than one and a half hundred years for this. Gas production began in the early 19th century in the United States and in the mid-20th century in Europe. Trading of gas contracts on the exchange began in the 1980s, and gas exchanges started to appear a decade later.

Natural gas is a unique commodity by its physical and chemical properties and importance for the economy. The extraction (production) processes and infrastructure development usually require significant investments, which leads to the formation of monopolies in the supply sector due to the lack of appropriate technologies at the stage of market nucleation. The gas market was not a systemic phenomenon and consisted of several unconnected gas pipelines connected to large consumers. The peculiarity of the gas infrastructure was its dependence on the availability of consumers capable of ensuring stable demand, which was also dictated by the impossibility of stopping gas production. Combined with other possible risks, this led to long-term contracts of 20 to 40 years. One of the conditions was a guarantee that no other gas company would have similar supply rights in a certain territory (Yukhymets, 2021, p. 22). On the one hand, this sphere was not regulated by the state and operated on the principle of "laissez-faire". On the other hand, arbitrary pricing, a limited number of participants, closed access for third parties and limited access to information made it impossible to compete, which is the main market mechanism.

With the development of industry, the demand for natural gas has been increasing. Companies reacted to this by trying to use their monopoly position to make profits, which led to government intervention, regulation of the industry and the formation of national monopolies. Gradually, this type of energy resource has become necessary for many industries and has influenced the structure of the economy, especially in developed countries, which were able to ensure the construction of gas transportation infrastructure and the required number of end users (Yukhymets, 2021, p. 24). Today, unprocessed or raw natural gas is one of the world's leading sources of primary energy, accounting for approximately 1/5 of the world's primary energy. It is used in households for heating, water heating, cooking, as a fuel for vehicles, as well as for industrial purposes (Natural Gas).

The limited number of gas producers and the dominance of state-owned companies in production and exports in one country have created conditions for oligopolistic behaviour on the market and threatened competitiveness (Hulshof et al., 2016). This situation laid the next precondition for the formation of the exchange market – the need to reduce the price of gas, as natural gas has become a basic resource. By price reduction is meant the establishment of a market price, since price reduction is possible to the extent that the price is fair and ensures profit, since gas production and transportation require significant investments. In the absence of profit, the activity in the industry becomes inexpedient.

In the context of gas price formation, an important point was its dependence on oil and other fuel prices. Accordingly, with a sharp increase in oil prices, the gas price according to this formula became unreasonably high. The exchange, as an institution that allows for competitive bidding with a large number of participants, also ensures the formation of prices that actually reflect the market value of goods and resources.

The peculiarity of natural gas is that its consumption increases in winter and decreases in summer. Exchange products create an opportunity to diversify sources and conditions of supply, secure supplies through hedging and due to the complex contractual structure of the gas exchange.

3 Gas hubs and exchange trading

Exchange trading in natural gas is inextricably linked to the functioning of gas hubs. Dubovskiy (2020) consider the exchange to be synonymous with a hub. Some researchers and experts note that exchanges coincide with gas hubs in the wholesale gas market (CEER, 2011, p. 19), Markevych, Omelchenko (2016, p. 18) and Yukhymets (2021, p. 78) characterise virtual gas hubs as particular exchanges.

By definition, a gas hub is a point where several gas pipelines converge, enabling trade and physical

exchange of gas between many buyers and suppliers (Reuters Staff, 2017). Therefore, despite some terminological uncertainty, hubs are necessary for the functioning of the gas exchange. Thus, in the late 1980s, the NYMEX (New York Mercantile Exchange) chose Henry Hub as the place of delivery of futures contracts for natural gas, after which the relevant contracts began to be traded on the exchange.

A gas hub is the central point of pricing for natural gas in the network (Reuters Staff, 2017; Kulikh, 2016, p. 6). It can be physical (typical for the USA) or virtual (typical for the European market). In Europe, the first gas hub appeared in the UK in 1996, and since the early 2000s, the process of their creation has spread to continental Europe (Table 1).

One of the first gas hubs, which belong to the mature type and, at the same time, are the benchmarks for determining gas prices, are Henry Hub in the USA, NBP in the UK and TTF in continental Europe. The birthplace of gas hubs is the USA, where one of the first and largest in the world Henry Hub is located in Louisiana and was launched in the 1950s. The role of Henry Hub in the market began to grow with the beginning of gas market deregulation in the 1970s. NBP (National Balancing Point) was the first gas hub in Europe. Its path to maturity took about ten years. In 2003, the TTF (Title Transfer Facility) was established in

TABLE 1 Establishment of gas hubs in Europe

	Gas hub	Launch	Country
NBP	National Balancing Point	1996	United Kingdom
ZEE/ZTP	Zeebrugge Hub / Zeebrugge Trading Point	2000/2012	Belgium
TTF	Title Transfer Facility	2003	The Netherlands
PSV	Punto di Scambio Virtuale	2003	Italy
AOC/PVB	Almacenamiento Operativo Comercial/Punto Virtual de Balance	2004/2015	Spain
GTF i ETF	Gas Transfer Facility; Exchange Transfer Facility	2004; 2008	Denmark
PEG (N,S,T)/ TRS/TRF	Point d'Echange de Gaz (Nord, Sud, TIGF)/Trading Region South/ Trading Region France	2004/2015/2018	France
CEGH/VTP	Central European Gas Hub / Virtual Trading Point	2005/2013	Austria
GPL	Gaspool	2009	Germany
NCG	NetConnect Germany	2009	Germany
MGP	Magyar Gázkiegymelési Ponton	2010	Hungary
UDN	Ulusal Dengeleme Noktasi	2011	Turkey
VOB	Virtuální Obchodní Bod	2011	Czech Republic
VPGS	Virtual Point Gaz-System	2014	Poland
NIBP	Northern Ireland Balancing Point	2015	United Kingdom
SVOB	Slovenskom Virtualnom Obchodnom Bode	2016	Slovakia
IBP	Irish Balancing Point	2017	Ireland
HTP	Hellenic Trading Point	2018	United Kingdom
PVT	Punctul Virtual de Tranzactionare	2020	Romania
VTT	Virtualna Turgovska Tochka	2020	Bulgaria

Source: compiled according to (Heather, 2015, p. 99, 2021, p. 22)

the Netherlands, where the huge Groningen gas field is located.

4 Genesis and experience of launching natural gas exchanges

Before the advent of energy exchanges, energy resources, including natural gas, were traded on mixed commodity exchanges. Energy exchanges started to be established in the 1990s and specialized mainly in electricity. In the 2000s, two types of energy exchanges emerged: universal exchanges that traded different energy resources (EEX, APX-ENDEX, ICE-INDEX) and specialized exchanges that focused on trading a specific type of energy, such as natural gas (Powernext, Finnish Gas Exchange, GET BALTIC) or electricity (Polikeyvych, 2015). In the 1990s, the small number of exchanges and their territorial limitations led to a lack of competition between them. The situation started to change with the implementation of EU directives and regulations, market liberalization and opening of more exchanges (Table 2), which led to increased competition on the gas market.

The launch of *the Austrian gas exchange* was preceded by the over-the-counter (OTC) trading platform CEGH in October 2005. The CEGH GAS exchange was launched in December 2009. At the same time, the spot market segment was added (together with the Vienna Stock Exchange). A year later, the futures market segment of the CEGH GAS Exchange was added. In December 2013, together with Power Exchange Central Europe (PXE), it launched a platform for trading gas futures contracts. Since 2016 CEGH is the operator of the Austrian virtual trading point (VTP). In December 2016, CEGH launched exchange-traded products on PEGAS (Dickx et al., 2014, p. 71; *SEGH*; Voytiv, 2016).

The launch of *the French gas exchange* was preceded by the creation of a balancing platform with the French TSO. Since December 2006 GRTgaz (the TSO)

and CRE (the regulator) have been consulting on the introduction of market balancing to meet the balancing needs of the operator. In April 2007, Powernext and GRTgaz launched the balancing platform: Powernext developed a platform dedicated exclusively to the TSO's needs; GRTgaz was to participate systematically in trading; 2 auctions per day (intraday at 11:15 and day-ahead at 16:15).

The next step was to launch a gas exchange. For this purpose, in 2007-2008 Powernext conducted an in-depth study on the establishment of a gas exchange in France with the participation of 40 market participants. In November 2008, Powernext launched the physical gas exchange – an organized spot and futures market where standardized products are traded: day-ahead spots, day-ahead futures, months, quarters, seasons and calendar (Dickx et al., 2014, p. 61; Rasmussen et al., 2020).

In 2002, as a result of the two German energy exchanges (the European Energy Exchange in Frankfurt and the LPX Leipzig Power Exchange in Leipzig) merger, EEX (European Energy Exchange AG) was founded. EEX is based in Leipzig and has more than 235 agents from 26 countries. It features a derivatives market and a spot market where electricity, natural gas, CO₂ emissions certificates, coal, and oil are traded (Markevych & Omelchenko, 2016, p. 32). Since July 2007, EEX has become *the German gas exchange platform*. Initially, only futures were traded on the H-gas (high-calorie gas) Open Grid Europe market. Since October 2007, the offer has been expanded to include the spot market (day-ahead). In 2008, gas exchange trading was expanded to include a virtual trading point of the joint high-calorific gas market area of NCG and Gaspool (Dickx et al., 2014, p. 44–45). The result of the joint efforts of EEX and Powernext was PEGAS. In 2012, EEX and Powernext signed a Memorandum of Understanding to combine their natural gas market activities to create a pan-European gas market (*EEX*, n.d.)

TABLE 2 Leading European energy exchanges and their connection with gas hubs

Country	Energy Exchange	Founded	Gas hub
United Kingdom	InterContinental Exchange (ICE)	2000	NBP, TTF
France	Powernext	2008	PEG Nord, TTF
Germany	European Energy Exchange (EEX)	2002	TTF, NCG, GASPOOL
	PEGAS – regional exchange (merger of EEX and Powernext)	2012	NBP, GASPOOL, NCG, PVS, PEG Nord, TRS, TTF, ZTP, ZEE
Austria	Central European Gas Hub GAS Exchange (CEGH GAS Exchange)	2009	CEGH GAS
Denmark	Gas Point Nordic (GPN, formerly Nord Pool Gas)	2008	GTF, NPTF
Italy	Gestore Mercati Exchange (GME)	2000	PVS/PVS fin
Poland	Polish Power Exchange (POLPX)	1999	POLPX

Source: compiled according to (*Europex*; *GAZ-SYSTEM*; *List of Power & Energy Exchanges Worldwide*; *SEGH*; *Dubovskiy*, 2018)

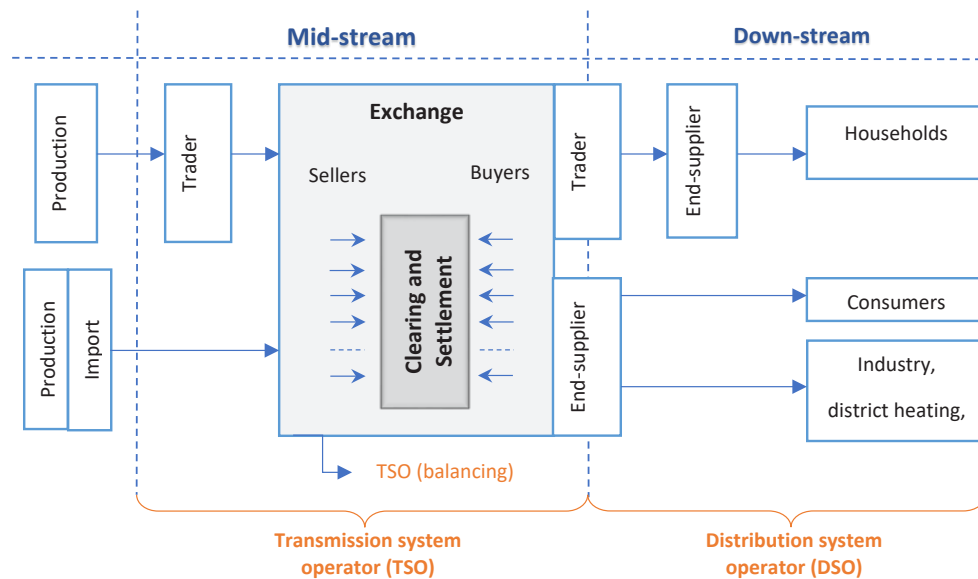


FIGURE 1 Scheme of exchange market functioning

Source: compiled according to (Pozsgai, 2019; Correljé, 2016)

The gas exchange generally works like a regular commodity exchange. This platform allows a shipper or trader to buy or sell gas anonymously. The general scheme of the gas exchange market is shown in Figure 1.

The gas exchange operator is responsible for combining the volumes of gas offered and requested, as well as for facilitating the financial transaction (Pozsgai, 2019). The trading conditions developed by the operator unilaterally apply to the exchange, so different rules may apply to different exchanges.

A significant difference from the OTC market is the charging of fees for trading products, settlements (clearing) and (sometimes) for placing orders, as well as the fact that trading is conducted in clearly defined standardized products (Haizmann et al., 2018, p. 24). These differences may explain the necessity of the OTC market in conditions when not all players can afford to pay transaction and registration fees or wish to buy and sell non-standard product.

On the exchange market, there are physical and financial products (Haizmann et al., 2018, p. 29–30). Products with physical delivery must end with the actual delivery of the product. Although financial products are rarely physically delivered, they are used to hedge financial transactions against price fluctuations or changes in foreign exchange rates. Accordingly, spot market products, futures, forwards and non-standard contracts are physical, while options and swaps are financial.

5 Catalysts for the natural gas market modern transformations

During the recession of 2008–2009, demand for natural gas fell sharply, and the market, particularly

the American one, was flooded with liquefied natural gas. Nevertheless, prices were growing due to oil indexation of gas prices. This prompted a gradual transition from formula to market gas pricing, which has become a trend in recent years (International Gas Union, 2021, p. 6).

A relatively short-lived phenomenon called a *shale revolution* has had significant implications for the energy sector. As a result of shale gas production, the production volume increased several times – from 8 billion cubic meters in 1996 and 57 billion cubic meters in 2008 to 138 billion cubic meters in 2010. This led to a decrease in the price of natural gas from \$200 to \$100 or less per 1000 cubic meters in the United States (Lukianchuk, 2011). The share of shale gas in total US natural gas production increased from 5 to 44% between 2007 and 2014 (Yergin, 2014).

Meanwhile, the demand for natural gas increased sharply from 2010 to 2014, which was caused by: China's becoming the leader of the world economy and the leading importer of hydrocarbons, the accident at the Fukushima nuclear power plant in March 2011, the shutdown of nuclear reactors due to the scandal with components with false certificates in Korea (Sung, 2017). The combination of these factors contributed to the fact that the United States turned from an importer of energy resources into an exporter and achieved energy independence and security. More than 180 million dollars. US dollars were invested in 260 new American projects for the production of chemical products. It is expected that by 2020 they will create more than 400, 000 jobs (Mills, 2018, p. 10). Significant hopes were pinned on the development of new shale gas deposits in the world and on the repetition of the North American

success, which would increase the share of natural gas consumption.

A steady trend in recent years in energy consumption policy is to reduce greenhouse gas emissions and *decarbonize* the economy, which leads to a revision of the above expectations. On the one hand, the threat of global warming, the achievement of sustainable development goals and the goals of the Paris Agreement should increase the demand for natural gas (the cleanest type of fossil fuel and energy resources) and for gases with low or zero carbon content. Accordingly, the importance of gas and gas infrastructure in the energy transition will grow (Rystad Energy et al., 2022). On the other hand, natural gas remains a non-renewable resource. Therefore, modern challenges require a transition to alternative, i.e., renewable energy sources. The development of appropriate technologies and the introduction of the EU countries' policy of reducing dependence on Russian hydrocarbons have led to a decrease in oil prices, slowing down the development of new deposits and shale gas projects (Yukhymets, 2021, p. 171).

It is impossible to overestimate the impact of *Russia's full-scale invasion of Ukraine*, launched on February 24, 2022. Having caused the energy crisis, it has become perhaps the most important catalyst for changes in the European gas market. Sanctions hit not only Russia, but also affect the European market. In March, gas prices reached their historical maximum "The wholesale price of natural gas in Europe increased by more than 40% to 173 euros per megawatt-hour." (Ghilès, 2022, p. 1) The dependence of the European market on Russian gas has led to enormous consequences.

6 Conclusions

The historical overview of the emergence and development of the gas market, the peculiarities of natural gas as an economic good, as well as the fact that natural gas has become one of the key resources that ensure the functioning of national economies, allowed to identify the institutional prerequisites for the creation of gas exchanges, which are: the need to create a competitive gas market and ensure its accessibility for third parties; ensuring transparent pricing and setting the market price for gas (to avoid

a situation when the price will be overstated, fueling consumer dissatisfaction, or underestimated, making the gas industry unattractive for investment); trade facilitation and, accordingly, product standardization; protection of the agreement's implementation and limitation of risks, which is manifested in the security and reliability of supplies; increased energy security. The study showed that gas exchanges and gas hubs are key institutions of exchange trade in natural gas, the gas exchange operates on the same principles as a regular commodity exchange and ensures openness and transparency of the market.

The birth of exchange trading in natural gas began with gas trading on mixed commodity exchanges. It required a gas hub as a place of delivery of futures contracts for natural gas. The peculiarity of exchange trading in natural gas explains the coincidence of the boom in the creation of gas hubs and gas exchanges, especially in the European market. The next step was gas trading on universal and specialized energy exchanges, which started to appear slowly in the 1990s. A further stage of the genesis concerned the liberalisation of the gas market, which was accompanied by the establishment of an increasing number of gas exchanges and, consequently, by an increase in competition on the market. This led, among other things, to a reduction of gas prices, in particular on NBP (UK).

The consequences of the recession of 2008–2009, the emergence of China as a leading importer of hydrocarbons, as well as the shale revolution have led to significant changes and modern transformations. Thus, the United States has turned from an importer of natural gas into an exporter, and there was a refusal from oil indexation of gas prices. In recent years, the impact of the decarbonisation strategy has become increasingly visible. It directly affects the market of natural gas – the cleanest and richest in hydrogen of all hydrocarbon energy carriers, which remains a non-renewable fossil resource. In the coming years, one of the most important catalysts for change will be the energy crisis caused by Russia's full-scale invasion of Ukraine, which will lead to a revision of European policy in this area and the struggle for energy security.

Further research and deeper analysis focused on the relationship between the establishment of gas exchanges and the conditions of European integration.

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Methodological aspects of reporting of enterprises in wartime

Abstract

The *purpose* of the article is to determine the peculiarities and correctness of preparation and submission of reporting information by business entities in difficult conditions, namely during martial law in Ukraine. *Methodology*. The methodological basis of the study is the theory of cognition, a systematic approach to the study and improvement of the organization and methodology of management reporting by business entities under martial law in Ukraine to meet the information needs of stakeholders. The methods of generalization, comparison, analysis, synthesis, induction and deduction were used in the process of substantiating the rules for the formation and submission of management reporting, as well as the reflection of risks in the use of credit resources by business entities in the conditions of war in Ukraine. *Results*. The scientific article reveals the peculiarities of management reporting under martial law, in particular: the importance of creating a management report at the legislative level is revealed; a fragment of the management report on the direction "Liquidity and liabilities", namely in terms of long-term and current credit resources, is proposed; a fragment of the management report in the section "Risks" is presented; the methodology for filling in information about risks is outlined. *Practical implications*. Despite the state of war, the timely submission of information on the financial condition and performance of various business entities remains an important and timely topic. This makes it possible to timely respond to problematic aspects of market participants' activities by amending legislation and regulations. The proposed fragments of the Management Report, as well as the algorithm for filling in the relevant indicators of Section 6 "Risks" of the Management Report, make it possible to develop information support for the management of such risks at enterprises in general. *Value/originality*. The value of the study is the fragments of reporting documents proposed by the authors, namely the management report, the management report in the section "Risks", as well as algorithms for filling them out.

Keywords

reporting, management
report, risks, financial
risks, wartime, enterprise
activity

JEL: E44, E66, G30, G32



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1 Introduction

During the period of martial law in Ukraine, most enterprises did not stop their activities or resumed them after some time. The Ukrainian economy must function, and accordingly, the state budget must be filled. And this gives us the opportunity to defeat the enemy.

The implementation of economic activities by business entities, especially in wartime, in any sphere of economic activity is always accompanied by the probability of various risks, the effect of which adversely affects the financial and economic results of the business entity.

For the financial manager and managers of various branches of the enterprise it is necessary

to clearly build the work aimed at detecting, identifying, assessing and neutralizing financial risks, as well as reflecting this information in the relevant reports.

The level of financial risk is the main indicator of financial security of enterprises, which characterizes the level of protection of its financial activity from various threats (1, p. 189). Hence the need for an objective assessment of the impact of financial risks on the activities of enterprises. Therefore, an important aspect for the study of risks is the timely provision of information in the form of reporting.

The availability of various types of reporting, including financial, management, statistical, tax, etc., provides a powerful array of data for management needs. Internal and external stakeholders need qualitatively new financial reporting that is able to meet their information needs on risks to make appropriate management decisions. Therefore, improving reporting in terms of risk disclosures is an urgent issue.

2 Discussion about legal support

The works of domestic scientists are devoted to the issue of improving the reporting of the enterprise. K. Bezverkhyi (2) improved financial reporting by introducing social indicators of the enterprise. O. Handziuk (3) proposed forms of management reporting: Report on the distribution of costs by centers of responsibility and Report on the efficiency of the logistics system for use by construction companies. S. Korol (4) developed algorithms for the formation of management reporting. O. Moshkovska (5) presents the process of formation of the system of accounting and analytical information for internal management reporting. A. Ozeran (6) developed methodological approaches to the formation of indicators of financial statements of enterprises.

Domestic enterprises have to prepare a large number of reports. Therefore, it is not surprising that at one time the news about the emergence of a new report for entrepreneurs was met in society without enthusiasm. They say that the management report is incomprehensible. But, as it turned out, this is exactly the situation when the interests of the state and the company completely coincide. This is an opportunity at the legislative level to tell about your company not only to Ukrainians, but also to foreigners.

Therefore, the adoption of the Law of Ukraine "On Amendments to the Law of Ukraine "On Accounting and Financial Reporting in Ukraine" on Improvement of Certain Provisions" dated October 5, 2017 No. 2164-VIII (7) at the legislative level created the basis for the introduction of the management report into the national reporting practice, which will inform the management decision-making of trade enterprises at a qualitatively new level.

According to Art. 1 of the Law of Ukraine "On Accounting and Financial Reporting in Ukraine" No. 996 dated 16.07.1999 (7), management reporting is a document containing financial and non-financial information that characterizes the state and prospects of the enterprise and discloses the main risks and uncertainties of its activities.

In accordance with paragraph 11.7 of Article 11 of the Law of Ukraine "On Accounting and Financial Reporting in Ukraine" dated 07.07.1999 No. 11 (7) 11 of the Law of Ukraine "On Accounting and Financial Reporting in Ukraine" No. 996 dated 16.07.1999 (7), the management report shall be submitted together with the financial statements and consolidated financial statements in the manner and within the time limits established by law. Thus, the obligation to prepare and submit the management report is fixed in Ukraine at the legislative level.

In accordance with paragraph 11.4 of Article 11 of the Law of Ukraine "On Accounting and Financial Reporting in Ukraine" No. 996 dated 16.07.1999 (7), the composition and forms of financial statements, consolidated financial statements, management report and report on payments in favor of the state of enterprises (except for banks and economic entities operating in the extractive industries), financial statements on budget execution are approved by the central executive body that ensures the formation and implementation of state policy in the field of accounting, in agreement with the central executive body that implements state policy in the field of statistics. Currently, the form of the report on the activities of the management of the central executive body, which ensures the formation and implementation of state policy in the field of accounting, has not been developed. To date, the developed Methodological Recommendations for the preparation of the report on the activities of the management of the Ministry of Finance of Ukraine, approved by Order No. 982 dated 07.12.2018 (8), can be used by enterprises, organizations and other legal entities of all forms of ownership (except for banks, budgetary institutions, microenterprises and small businesses).

The management report in accordance with clause 2.2 of year 2 of the Methodological recommendations for preparing a management report (8) in order to systematize and correlate information is formed in the following areas:

- 1) organizational structure and description of the enterprise's activities;
- 2) performance results;
- 3) liquidity and liabilities;
- 4) environmental aspects;
- 5) social aspects and personnel policy;
- 6) risks;
- 7) research and innovation;
- 8) financial investments;

9) development prospects;

10) corporate management (consists of enterprises – issuers of securities whose securities are admitted to trading on stock exchanges or whose securities have been publicly offered).

3 Management report: suggestions for its content

Some scientists note that the Ukrainian experience of the Governance Report has certain differences from the European one, even the accuracy of the translation of the title is questionable. But this issue is of more concern to scientists than to practitioners, for whom it is important to understand the requirements of national legislation (9).

When preparing the Management Report, it is possible to limit oneself to the minimum information specified in the Methodological Recommendations No. 982 (8) and not to worry too much about its design, but it is possible to make it not only interesting and useful, but also attractive in appearance.

Here is a fragment of the management report in the section "Liquidity and liabilities". Since the majority of domestic enterprises use borrowed credit resources in their activities, it is necessary to reflect information on long-term and current credit resources of enterprises (Table 1; Table 2).

The proposed section "Liabilities. Information on long-term credit resources" (see Table 1) of the management report will provide all interested users of such reports with information on long-term financial lending instruments for making effective management decisions.

The proposed section "Liabilities. Information on current credit resources" of the management report will provide all interested users of such statements

with information on current financial instruments of lending for making effective management decisions (see Table 2).

Financial risks that are possible when attracting credit resources and affect the activities of enterprises should be given in section 6 "Risks" of the Management Report (Table 3).

The proposed section 6.1 "Financial Risks" of the Management Report will provide all interested users of such reports with information on financial risks affecting the activities of enterprises.

Based on the proposed Section 6.1 "Financial Risks" of the Management Report (see Table 3), an algorithm for filling in the relevant indicators is proposed for its correct completion (see Table 4).

The algorithm for filling in the relevant indicators is specified. The fragment of Section 6 "Risks" of the Management Report on the reflection of financial risks provides data on the correctness of filling in the relevant proposed lines of the financial statements in order to reflect reliable and objective information.

The proposed improved elements of the management report for displaying information about the activities of the enterprise and the developed algorithms for compiling the relevant reports will bring the reporting process of domestic enterprises, especially in wartime, to a qualitatively new level of decision-making on the effective management of the enterprise.

4 Conclusions

Thus, the research conducted in the framework of the study of this issue allowed to outline important changes in accounting legislation that affected the preparation of reports. These changes are very

TABLE 1 Fragment of the Management Report on the reflection of information on long-term credit resources of enterprises

Chapter. Obligations						
Information on long-term credit resources						
Indicators, thousand UAH.						
No. ref.	Credit term	Long-term loans of non-bank financial institutions in national currency	Long-term loans of non-bank financial institutions in foreign currency	Long-term commercial loans in national currency	Long-term commercial loans in foreign currency	Provision for future expenses on repayment of loan debt
1	Up to 12 months	0,00	120,00	0,00	0,00	50,60
2	From 12 to 24 months	0,00	0,00	0,00	45,00	0,00
3	From 24 to 36 months	12,00	0,00	21,00	0,00	65,00
4	From 36 to 48 months	14,00	11,00	12,00	13,00	0,00
5	From 48 to 60 months	10,00	13,00	9,00	15,00	0,00
6	More than 60 months	9,00	8,00	7,00	6,00	0,00
Σ	Total:	45,00	152,00	49,00	79,00	115,6

Source: proposed by the authors

TABLE 2 Fragment of the Report on the management of information on current credit resources of enterprises

Chapter. Obligations								
Information on long-term credit resources								
Indicators, thousand UAH								
No. ref.	Credit term	Short-term loans of non-bank financial institutions in national currency	Short-term loans of non-bank financial institutions in foreign currency	Short-term commercial loans in national currency	Short-term commercial loans in foreign currency	Overdraft	Financing under the factoring agreement was received	Total:
1	0-30 days	102,00	0,00	12,00	14,00	10,00	9,00	147,00
2	31-90 days	0,00	23,00	0,00	11,00	13,00	8,00	55,00
3	61-180 days	0,00	0,00	21,00	12,00	9,00	7,00	49,00
4	181-365 days	0,00	12,00	0,00	13,00	15,00	6,00	46,00
Σ	Total:	102,00	35,00	33,00	50,00	47,00	30,00	297,00

Source: proposed by the authors

TABLE 3 Excerpt of the Management Report from Section 6 "Risks" on the reflection of financial risks

No. ref.	Risk name	Risk characteristics
6.1. Financial risks		
1	Currency risk	Currency fluctuations create a risk in export and import transactions. In the conditions of currency devaluation, this risk becomes significant for importers, especially in the case of long-term transactions, as well as when selling goods on credit.
2	Percentage risk	The risk of an increase in floating interest rates stipulated by the terms of current debt obligations. A significant factor of inflationary dynamics remains the growth of administratively regulated prices. Management is aware that interest rates may change, which will affect both income and fair value of net assets. The possible change in fair value of fixed interest rate debt is calculated as the difference between the discounted cash flows at the current rate and the discounted cash flows if the interest rate on each liability were to change.
3	Liquidity risk	Proper liquidity management involves ensuring that sufficient cash and sufficient funding are available to meet current liabilities as they arise. The Company's objective is to maintain a balance between uninterrupted funding and flexibility in the use of credit terms provided by suppliers and banks. Prepayments are generally used to manage both liquidity risk and credit risk. The Company analyses the maturity profiles of its assets and the maturity profiles of its liabilities and plans liquidity levels based on expected maturity profiles. The Group has capital expenditure programs, which are financed both by current cash flows from operating activities and by borrowings. Borrowings are also used to finance the Group's working capital needs.
4	Credit risk	The probability that the borrower, counterparty or issuer will not fulfill its obligations to the creditor (banking institution) due to internal and external factors affecting the bank. The amount of expected losses on the asset as a result of default of the debtor/counterparty.
5	Price risk	Price risk is the risk that the fair value or future cash flows of a financial instrument will fluctuate as a result of changes in market prices (other than those arising from interest rate or foreign exchange risk), whether those changes are caused by factors specific to the individual financial instrument or its issuer or factors affecting all similar financial instruments traded in the market.

Source: proposed by the authors

relevant in the conditions of martial law in Ukraine, in particular:

- the composition and terms of submission of the report on the management of business entities are disclosed;
- the terms of submission of reports by business entities at the legislative level were determined;
- clarified methodological issues in the part "Liquidity and Liabilities" of the management

report regarding the reflection of long-term and current credit resources;

- outlined changes in the "Risks" part of the management report and the algorithm for filling them in.

Thus, the proposed improved elements of the management report for displaying information on the activities of business entities, as well as the developed algorithms for compiling

TABLE 4 Algorithm for filling in the relevant indicators of the fragment of the Management Report section 6 "Risks" in terms of reflecting financial risks

No. ref.	Risk name	Disclosure Guidelines
6.1. Financial risks		
1	Currency risk	Provides information on the company's policy on currency risk with a description of its impact on the company's activities.
2	Percentage risk	Information is provided on the company's policy on interest rate risk with a description of its impact on the company's activities, in particular, approaches or tools used by the company to reduce the impact of such risks on its activities, etc.
3	Credit risk	Information is provided on the company's policy on credit risks with a description of their impact on the company's activities, including approaches or tools used by the company to reduce the impact of such risks on its activities, etc.
4	Liquidity risk	Information is provided on the company's policy on liquidity risk with a description of its impact on the company's activities, including approaches or tools used by the company to reduce the impact of such risks on its activities, etc.
5	Price risk	Information is provided on the company's policy on price risk with a description of its impact on the company's activities, including approaches or tools used by the company to reduce the impact of such risks on its activities, etc.

Source: proposed by the authors

relevant reports will bring the reporting process of domestic enterprises, especially in wartime, to a qualitatively new level of decision-making on the effective management of the enterprise.

In further research, it is proposed to focus on the formation of financial reporting indicators by large companies and enterprises of public interest under IFRS under martial law.

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Ukrainian labor market in the transition to digitalization

Abstract

The *purpose* of the article is to study the transformations, consequences of automation, new vectors of development of state policy in the field of labor, etc. in the labor market of Ukraine. *Methodology*. The work uses such research methods as systematization and classification of theoretical approaches to the interpretation of the concept of "digital transformation", analysis and synthesis of the positive and negative impact of digital transformation on employment and the labor market, systematization of the main waves of the automation process and its impact on the labor market in the context of digitalization. The survey *results* showed that the formation of the digital economy is a leading trend in the modern world and a key factor in economic growth. Digitalization of society entails the following social consequences: 1) an increase in the number of people employed in the information sphere (producers, processors, distributors of information); 2) intellectualization of many types of work and, as a result, increased requirements for general education and vocational training; the emergence of completely new professions that require qualifications in the digital economy; 3) the extinction of existing professions (especially in connection with the robotization of many working professions and the introduction of artificial intelligence systems). Information technology and robotics have contributed to a radical change in the labor market. Young people are already facing the risk of losing their jobs due to automation. The redistribution of current tasks between people and machines is already happening in companies. Business and government should work together to help people learn how to use new technologies and reduce the negative impact of automation. *Practical implications*. The impact of digital technologies on various sectors of the economy will have a positive impact only if the state is actively involved in preventing the growth of problems in the labor market caused by digitalization. Thus, information systems will contribute to the transformation of educational and cultural institutions into serious information centers. *Value/originality*. The paper provides a justification for the strategic priorities of labor market regulation in terms of strengthening the country's competitive position in the transition to a digital economy.

Keywords

digitalization, labor market, employment, automation

JEL: R23, O15, O33

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DOI: <https://doi.org/10.30525/2500-946X/2022-3-6>**1 Introduction**

The rapid development of digitalization, which transforms the life of society in many aspects, has become a modern reality. These transformations have led to the formation of a new level of quality of life, when people's priorities are changing, the needs for self-realization and intellectual development through higher education, qualification and improvement of their own skills and competencies are becoming a priority. In the context of modern development, scientific knowledge has become a real driving force. This is manifested in scientific and technological progress, which expands human capabilities, develops new activities, reduces production time, etc.

The rapid development of technology has caused a deepening interest in the digital economy and has also influenced the development of the labor market. The digitization era has opened new horizons for the creation of new forms of employment as well as new forms of enterprises. This necessitates research on the significant transformations of the labor market caused by digitalization. Many domestic and foreign scholars have chosen this topic for their own research, including N. A. Azmuk, O. I. Bilyk, O. O. Gerasimenko, O. A. Grishnova, N. M. Dovhanyk, S. A. Dyatlova, S. P. Kalinina, V. I. Kyrylenko, A. M. Kolot, Yu. O. Chaliuk, R. Florid, D. Bell, A. Ross, J. Hawkins, K. Skinner. The impact of digitalization on employment and the labor market is the subject of research by the International Labor Organization,

the European Commission, the World Economic Forum and other international institutions.

Issues related to identifying trends in the transformation of the labor market in a digital society remain insufficiently covered. There is a need to justify the strategic priorities of labor market regulation from the standpoint of strengthening the country's competitive position during the transition to a digital economy.

The aim of the article is (a) to identify the key transformations in the labor market caused by the development of digital technologies, (b) to study the interpretation of the term "digital transformation", (c) to determine the positive and negative consequences of automation, (d) to analyze new vectors of development of state policy in the field of employment, (e) to study the relationship between the development of the digital economy and its impact on the formation of digital employment.

2 Digital transformation in the labor market

At the turn of the 20th and 21st centuries, revolutionary changes took place that (a) accelerated the development of scientific and technological progress and (b) created the conditions in which this progress could be carried out. It is about the emergence of the computer, then the Internet, the introduction of 3G/4G/5G communication standards.

This has increased the importance of digital technologies in increasing the competitiveness of national economies and their impact on the socio-economic stability of countries. Today it is impossible to imagine a comfortable existence without digital technologies. Digitalization of the economy creates the use of artificial intelligence (AI), robotics, cloud computing in the production process and increases the demand for workers with digital skills.

The public administration system, however, is not ready for such changes. The inconsistency of decisions and actions of the authorities at the legislative and executive levels leads to their isolation in the formation of strategies for digital, socio-economic, educational and professional development. The rapid pace of digitalization of management and production processes is increasing the imbalance between the development of the national labor market and the digital economy. The formation of the global digital segment of the labor market is accompanied by economic and social contradictions, which are especially acute in institutionally underdeveloped countries, such as Ukraine. This requires strengthening the orientation of state policy of socio-economic development towards ensuring a balance between the processes of transformation of the national labor market and the formation of a digital economy (Stolterman, 2004).

The transition to a digital economy is a natural process and requires modernization of the employ-

ment sphere. Digital technologies are accompanied by digital transformation, which completely changes the state of affairs in the world, including in the labor market. The COVID-19 pandemic has only accelerated these processes and acted as a catalyst. With most businesses and government organizations switching to remote work, employees had to adapt to the situation or master computer and digital technologies.

Digital transformation is the introduction of digital technologies in all types of business activities that require fundamental changes in operations and in the principles of creating new services and products, in culture and in modern technologies. Digital transformation is directly related to digital technologies and the digital economy. Other interpretations of the term "digital transformation" are given in Table 1.

In relation to digital transformation, countries today are divided into: post-industrial, industrial and agrarian countries. The former are characterized by the predominance of the service sector in the economy, where knowledge and information are becoming the main sources of economic growth. The latter are characterized by labor – in the literal sense of the word. Workers work on machines, farmers cultivate their territories in the field (Kyrylenko, 2020).

The consequences of the COVID-19 pandemic have proven that in conditions of isolation from each other, humanity can produce services and goods that will be in demand in the market. Digital technologies help to produce high-quality and valuable products. Of course, for some specialties, the issue of manual labor, or at least the coordination of industrial and agricultural activities, is relevant, but this issue will become less important than it was before the pandemic.

3 Labor market and automation

Computerization, robotics and new technologies bring to the fore not a person as the basis of labor potential, but other components. Robots and modern machines can better cope with their duties and perform their work faster and better (smart robots). For the employer, it is more profitable because there is no need to establish contact with machines to discuss various aspects. It is just necessary to monitor it and use it skillfully.

The demographic situation in the world shows that the population is constantly growing, and by 2030 its number will reach 8.5 billion people. In order to avoid the problem of unemployment and crime, the population must be employed. In the case when machines replace most of the human labor, it will not be profitable for the employer to pay wages to employees (their work will be completely replaced by robots), because they do practically nothing.

TABLE 1 Definition of the terms "Digital transformation"

Author / Source	Definition of the term
Digital transformation	
What is digital business transformation? The essential guide to DX (Pricewaterhouse Coopers, n.d.; World economic forum, 2020)	Digital transformation is the cultural, organizational and operational change of an organization, industry or ecosystem through the intelligent integration of digital technologies, processes and competencies across all levels and functions in a gradual and strategic manner.
What is Digital Transformation? (Manyika, 2022)	Digital transformation is the strategic implementation of digital technologies.
What Is Digital Transformation? (Grace, 2018)	Digital transformation is the process of using digital technologies to transform existing traditional and non-digital business processes and services, or create new ones, to meet changing market and customer expectations, thereby completely changing the way businesses are managed and run, and the way they deliver value to customers.
What are the Benefits of Digital Transformation? (Kyrylenko, 2020)	Digital transformation is the integration of digital technologies into all areas of business. It leads to fundamental changes in the way businesses operate. Organizations across industries benefit from digital transformation: it allows businesses to modernize legacy processes, accelerate efficient workflows, enhance security and increase profitability.
What Is Digital Transformation? (Novikova, n.d.)	Digital transformation is a key component of an overall business transformation strategy, and while it is not the only factor, it is critical to the success or failure of any transformation effort. The right technology – combined with people, processes and operations – enables organizations to adapt quickly to disruptions and/or opportunities; meet new and evolving customer needs; and drive future growth and innovation, often in unexpected ways.

Digital transformation has both positive and negative consequences. Digital technologies require the transition of countries to post-industrial development, where knowledge and information are the main tools.

PwC (PricewaterhouseCoopers), an international network of companies offering professional services in the field of consulting and auditing, has identified three waves that characterize the possible course of automation in the period up to the 2030s (see Table 2).

The ILO report notes that employed young people (under 24) face the risk of losing their jobs due to automation. At the same time, this risk is greater than that of the older generation. Around the world, young people express fears that new technologies, namely artificial intelligence and robotics, will leave them unemployed. One of the many examples is the automation of cashier jobs in a supermarket.

In its report, McKinsey noted that 400 to 800 workers worldwide could lose their jobs by 2030.

Such professions including sellers, security guards, and receptionists, are at risk (Manyika,2022).

According to research, by 2024, artificial intelligence will have a higher level of ability than foreign language translators (see Figure 1); by 2026, artificial intelligence will be able to independently create written works for schoolchildren; and by 2027, artificial intelligence will be able to independently drive a truck (Grace, 2018).

In recent years, the acceleration of the introduction of new technologies among the surveyed companies has become evident. There is already a redistribution of current tasks between humans and machines. Figure 2 shows the share of current work tasks performed by humans and machines in 2020 and forecasts until 2025.

In the future, machines focused on data processing and retrieval will become increasingly common (see Figure 2). To maintain their comparative advantage, humans must learn to lead, advise, make decisions, reason, communicate and interact.

TABLE 2 Waves of the automation process

Wave	Description and consequences
Wave 1. A wave of algorithms (until the early 2020s)	Automation of basic calculations and analysis of structured data. Affects industries that depend on working with data.
Wave 2. Penetration wave (until the end of the 2020s)	Dynamic interaction with technology in the organization of administrative records and decision-making. This also includes the use of robotics to perform tasks in semi-controlled environments, for example, to move objects in warehouses.
Wave 3. A wave of autonomy (By the mid-2030s)	Automation of physical labor and manual manipulations, as well as problem solving processes in dynamic real-life situations that require an appropriate response, in particular in transport and construction.

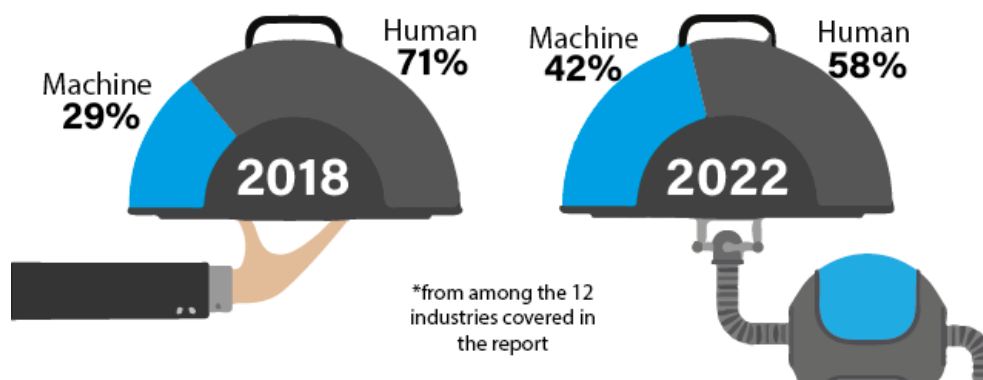


FIGURE 1 Time required to perform a task by a human compared to a machine
 Source: author's development based on sources (The Future of Jobs Report 2018, 2018; Novikova, n.d., Chaliuk, 2021)

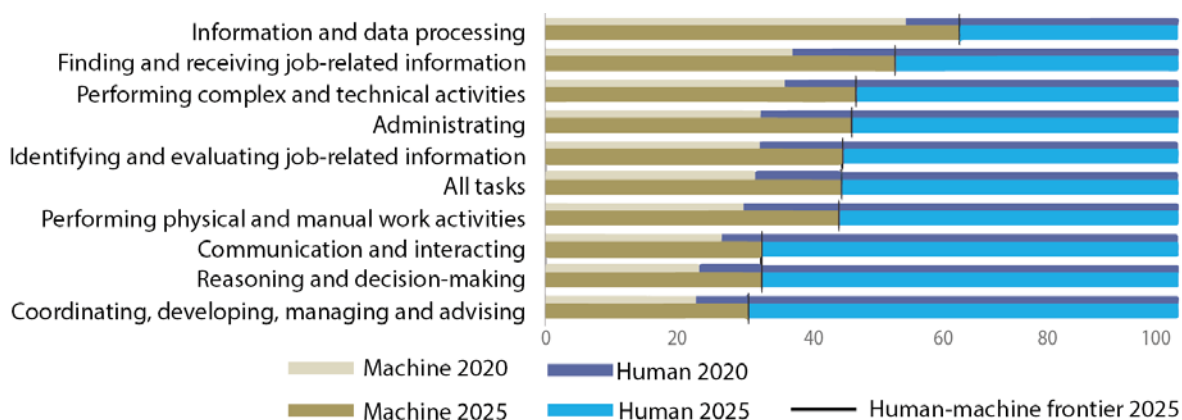


FIGURE 2. Share of tasks performed by humans and machines, 2020 and 2025
 Source: author's development based on sources (World economic forum, 2020; Chaliuk, 2020; Chaliuk, 2021)

The Forbes article talked about the risk of being affected by automation due to job cuts among administrative workers. Quote from Forbes: "You know who answers the phone at three in the morning? A robot. And you know who doesn't answer the phone at three in the morning? A human." (Stewman, 2018)

4 Conclusions

The formation of the digital economy is a leading trend in the modern world and a key factor in economic growth. Information technology and robotics have contributed to a radical change in the labor market. Business and government must work together to help people master and take advantage of new technologies. The positive effects of automation include: reduction of labor costs for companies and the emergence of new jobs and new professions that will be associated with information and communication systems. The negative consequences include the inability to use the benefits of automation, the loss of the country's competitive position in the market of goods and services, and the increase in income asymmetry between the rich and poor.

The main directions of state regulation of labor market problems should be:

1) ensuring working conditions and material equipment of workplaces of employees working with information and communication systems and automated systems (robots, machines, artificial intelligence, etc.);

2) development of a new system of remuneration of employees with non-traditional forms of employment;

3) creation of legislation on social protection of workers with formal and informal forms of employment (social benefits, health and life insurance, insurance in case of temporary disability, in case of job loss during retraining);

4) regulation of the mechanism of new contractual relations regarding traditional and non-traditional forms of employment, working hours, workplace organization, and so on;

5) formation by the Ministry of Education and Science of training programs for innovative specialties and professions related to the use of automated equipment, artificial intelligence and other digital technologies.

The impact of digital technologies on various sectors of the economy will have a positive impact

only if the state is actively involved in preventing the growth of problems in the labor market caused by digitalization. Thus, information systems will contribute to the transformation of educational and cultural institutions into serious information centers. Undoubtedly, humanity and the state will be in constant adaptation to the dynamics of the development of information technology and automated systems – in the permanent training and retraining of specialists with digital skills, as technology is developing much faster than the ability of people to respond to new threats of the digital age.

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Formation of information support system for the management of agricultural enterprises

Vitalii Vakulenko, Liu Xiaowei

Pages 6–11

The *purpose* of the article is to generalize and present the peculiarities of the process of forming a system of information support for the management of agricultural enterprises in Ukraine. *Methodology*. General scientific (generalization, comparison, induction and deduction) and empirical and theoretical methods (analysis, synthesis) were used in the research. The use of system-structural analysis made it possible to identify the main features of the process of forming a system of information support for the management of agricultural enterprises in Ukraine. The *results* of the study showed that with the help of big data analysis in agriculture it is possible to remotely detect problems that can be used to identify nutrient deficiencies, diseases, lack or excess of water, pest and weed infestation, insect damage, etc. It is determined that the use of analytical tools based on the analysis of geographic information systems data is useful in modeling and mapping, which can be used to predict crop yields. *Practical implications*. The results of the study can be used in the management of agricultural enterprises in Ukraine. The obtained results can be directed to further research on the analysis of big data in agriculture in the management of agricultural enterprises. *Value/originality*. The scientific novelty of the results obtained is determined by the solution of an important scientific task, which is to develop theoretical provisions and practical recommendations for the formation of a system of information support for the management of agricultural enterprises in Ukraine. The work has further developed research on the use and analysis of big data in agriculture in the management of agricultural enterprises in Ukraine.

Keywords: agricultural enterprise, information support, management.

JEL Q13, Q14, M11

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Macroeconomic aspects of bank lending to industrial enterprises: current challenges

Alina Herasymenko

Pages 12–19

The *aim* of the article is to highlight the key modern macroeconomic aspects and trends in the development of bank lending to industrial enterprises in highly developed countries of the world and to identify promising areas for its further development. The *methodological basis* of the study is the generalization of the results of applied research in the field of economics, scientific papers, statistical data, which highlight certain aspects of the development of the modern globalized economy, in particular its impact on the macroeconomic features of industrial development and bank lending to industrial enterprises. *Results*. The influence of financialization on the macroeconomic environment and the development of bank lending to industrial enterprises (on the example of the USA, Great Britain, Germany) is investigated. The influence of such unprecedented for the XXI century force majeure factors as the COVID-19 pandemic and the war in Ukraine on the macroeconomic environment and the development of bank lending to industrial enterprises is considered. The key trends in global economic development that stimulate transformations and structural changes in the macroeconomic environment of highly developed countries are highlighted. The role of bank lending to industrial enterprises in these processes is determined, which consists in lending to industrial innovations, as well as in the development of such promising areas as the "green" and "blue" economy. *Practical implications*. The practical results can be the basis for further research: on solving the problems of convergence of the financial and real sectors of the financialized economy, in particular with the participation of bank lending to industrial enterprises; on the role and importance of bank lending to industrial enterprises in overcoming the current macroeconomic consequences of the war in Ukraine; on certain aspects of the integration of bank capital into the development of industrial enterprises that are part of the "green", "blue" economy. *Value/originality*. The results of the study provide a deeper understanding of the role and contribution of bank lending to industrial enterprises in the processes of ensuring positive macroeconomic dynamics and maintaining macroeconomic stability, as well as allow to assess the depth of prospects for the development of bank lending to industrial enterprises.

Keywords: bank lending to industrial enterprises, macroeconomic environment, financialization, COVID-19 pandemic, macroeconomic consequences of the war, "green" and "blue" economy.

JEL: E44, F62, F65, G21, G31

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State regulation of internet banking in European countries

Karina Kapliar

Pages 20–26

The purpose of the study. The purpose of the article is to analyze the state of state regulation of Internet banking in European countries. *The subject of the study* is the legislation and trends of state regulation of online banking in European countries. *The research methodology* is based on a comparative analysis of legislation regulating online banking in the EU countries on the example of Switzerland and the UK. The main methods of research are comparative legal analysis, statistical analysis of the development of online banking in the EU countries. *Conclusion.* The growth of technological innovations in the financial sector and active user demand for financial and technological services have led to the need to develop a regulatory framework for Internet banking in European countries. As a result, the EU seeks to create a single financial space that unites providers and users of Internet banking, so it is constantly improving the regulatory framework. The article defines that the key documents at the EU level for state regulation of online banking are the EU Payment Services Directives (PSD1 2007/64, PSD2 2015/2366, the Reviewed Payment Services Directive PSD2 2021/1230). The main prerequisites for the adoption of the Directive were to create a level playing field for payment service providers, protect consumer rights and increase the provision of payment services by non-banking institutions. It is determined that Directive PSD2 2015/2366 updated the existing legal framework for payment services in the EU and introduced increased requirements for transparency and security. The updated Payment Services Directive PSD2 2021/1230 harmonises business rules for all electronic payment service providers across the EU and creates a tiered authorization regime for non-bank payment service providers such as payment institutions. Commission Delegated Regulation (EU) 2018/389 came into force on September 14, 2019, defining mechanisms for electronic payment transactions and online banking to ensure higher levels of security. The state regulation of online banking is considered on the examples of Great Britain and Switzerland. The Swiss financial sector is one of the most competitive in the world and a leader in cross-border wealth management. It offers a first-class environment for technological innovation and its regulatory system is internationally recognised as exemplary.

Keywords: online banking, regulation of open banking, government regulation of financial and technological services, Internet banking.

JEL: E50, E51, E52, E58

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Institutional preconditions and genesis of natural gas exchange trading

Oleksandra Kurbet

Pages 27–34

Natural gas is one of the world's leading sources of primary energy, and gas exchanges are key players in the natural gas market, which ensure its functioning on a liberal basis. Given the current liberalization trends, exchange trading in natural gas is gaining momentum and importance in this market. *The main objective* of the study was to determine the institutional preconditions and the main stages of the genesis of the exchange segment of natural gas trade. *The study* showed that gas exchanges and gas hubs are the key institutions of natural gas exchange trading, as they ensure openness and transparency of the market. *As a result* of the study, the author identified the following institutional prerequisites for the creation of gas exchanges: the need to form a competitive gas market and ensure its availability to third parties, ensuring transparent pricing and setting the market price for gas, simplification of trade procedures and standardization of products, protection of the execution of agreements and limitation of risks, which is manifested in the security and reliability of supplies and increasing the energy security of the state. Identifying the stages of the evolution of natural gas exchange trading, the author distinguished gas trading on mixed commodity exchanges, gas trading on universal and specialized energy exchanges, which began to emerge slowly in the 1990s, and gas market liberalization, accompanied by a boom in the creation of gas exchanges and gas hubs. The recession of 2008–2009, the shale gas revolution, the process of decarbonization of the economy and the full-scale invasion of Ukraine by Russia have been the main catalysts for the modern transformation of the natural gas market in recent decades. The author concludes that the latter will significantly affect the natural gas market in the coming years, which will lead to a revision of European policy in this area and the struggle for energy security. This paper is an original scientific study of the evolution of natural gas exchange trading and makes a certain contribution to the study of the peculiarities of the gas market functioning.

Keywords: natural gas, gas exchange, gas hubs, gas market evolution, Europe.

JEL: N24, N74

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Methodological aspects of reporting of enterprises in wartime

Yuliia Remyha, Nataliya Pryimak

Pages 35–39

The *purpose* of the article is to determine the peculiarities and correctness of preparation and submission of reporting information by business entities in difficult conditions, namely during martial law in Ukraine. *Methodology*. The methodological basis of the study is the theory of cognition, a systematic approach to the study and improvement of the organization and methodology of management reporting by business entities under martial law in Ukraine to meet the information needs of stakeholders. The methods of generalization, comparison, analysis, synthesis, induction and deduction were used in the process of substantiating the rules for the formation and submission of management reporting, as well as the reflection of risks in the use of credit resources by business entities in the conditions of war in Ukraine. *Results*. The scientific article reveals the peculiarities of management reporting under martial law, in particular: the importance of creating a management report at the legislative level is revealed; a fragment of the management report on the direction "Liquidity and liabilities", namely in terms of long-term and current credit resources, is proposed; a fragment of the management report in the section "Risks" is presented; the methodology for filling in information about risks is outlined. *Practical implications*. Despite the state of war, the timely submission of information on the financial condition and performance of various business entities remains an important and timely topic. This makes it possible to timely respond to problematic aspects of market participants' activities by amending legislation and regulations. The proposed fragments of the Management Report, as well as the algorithm for filling in the relevant indicators of Section 6 "Risks" of the Management Report, make it possible to develop information support for the management of such risks at enterprises in general. *Value/originality*. The value of the study is the fragments of reporting documents proposed by the authors, namely the management report, the management report in the section "Risks", as well as algorithms for filling them out.

Keywords: reporting, management report, risks, financial risks, wartime, enterprise activity.

JEL: E44, E66, G30, G32

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Ukrainian labor market in the transition to digitalization

Olha Cheromukhina

Pages 40–44

The *purpose* of the article is to study the transformations, consequences of automation, new vectors of development of state policy in the field of labor, etc. in the labor market of Ukraine. *Methodology*. The work uses such research methods as systematization and classification of theoretical approaches to the interpretation of the concept of "digital transformation", analysis and synthesis of the positive and negative impact of digital transformation on employment and the labor market, systematization of the main waves of the automation process and its impact on the labor market in the context of digitalization. The survey *results* showed that the formation of the digital economy is a leading trend in the modern world and a key factor in economic growth. Digitalization of society entails the following social consequences: 1) an increase in the number of people employed in the information sphere (producers, processors, distributors of information); 2) intellectualization of many types of work and, as a result, increased requirements for general education and vocational training; the emergence of completely new professions that require qualifications in the digital economy; 3) the extinction of existing professions (especially in connection with the robotization of many working professions and the introduction of artificial intelligence systems). Information technology and robotics have contributed to a radical change in the labor market. Young people are already facing the risk of losing their jobs due to automation. The redistribution of current tasks between people and machines is already happening in companies. Business and government should work together to help people learn how to use new technologies and reduce the negative impact of automation. *Practical implications*. The impact of digital technologies on various sectors of the economy will have a positive impact only if the state is actively involved in preventing the growth of problems in the labor market caused by digitalization. Thus, information systems will contribute to the transformation of educational and cultural institutions into serious information centers. *Value/originality*. The paper provides a justification for the strategic priorities of labor market regulation in terms of strengthening the country's competitive position in the transition to a digital economy.

Keywords: digitalization, labor market, employment, automation.

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