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Review Paper

Reconstruction of the Real Estate the Territorial Communities in the Digital Space of Anti-Crisis Management

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ABSTRACT

It has been proven that the artificial environment of the economic system of territorial communities for the reconstruction of industrial facilities after their damage must be recreated with the help of anti-crisis management with the use of BI-technologies in business processes. Digital tools and platforms of anti-crisis management of territorial communities are grouped under projects of reconstruction of production facilities. The Information Modeling Strategy of Anti-Crisis Management of Territorial Communities for Targeted Investment of Real Estate Reconstruction Projects is presented. The field of information modelling of anti-crisis management based on the description of business processes supported by investments has been studied. The national investment program of projects for the reconstruction of production facilities of Ukraine and the implementation of a large-scale energy efficiency program in the country in the post-war period is presented. Planned indicators of the riskiness of investing funds for the reconstruction of industrial facilities of territorial communities located of Zaporizhzhia and Kherson regions, whose modernization is planned to be started by intermediaries of the Western region of Ukraine in the post-war period, are presented. The efficiency of the method of agglomerative hierarchical clustering for territorial communities is substantiated that will have a mixed type of introduction of BI-technologies in the anti-crisis management of territorial communities aimed at serving the needs of consumers in the post-war period. Leader clusters have been determined by the effectiveness of using digital tools of CRM-systems and ERP-systems in anti-crisis management of territorial communities.

HIGHLIGHTS

- The article substantiates practical provisions regarding the development of reconstruction projects of real estate of territorial communities, which at the expense of information models of digitalization of anti-crisis management, to accumulate resources for the reconstruction of production facilities, to provide digital diagnostics of business processes under the guarantee of obtaining future benefits for the investor.

Keywords: Artificial environment, digital tools, digital technologies, investment, projects

The world economy has undergone deep changes due to the presence of diverse external influences on the multi-element internal structure. European countries are systematically introducing information and digital technologies into their economies as the influence of advanced technologies in the

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world grows and the return on investment in e-commerce increases. The current realities of global development determine certain conditions for the economy, in which the process of modernisation and introduction of innovative technologies takes place. The gradual digitalisation of business processes and the adaptation of companies to the use of new technologies are now an important tool in addressing the challenges and requirements of the global market. In addition, informatisation of territorial communities can help change their own business model, integrate innovations into crisis management and prevent threats to the competitive environment.

The modernization of the Ukrainian economy after the invasion of the aggressor country on the territory of the state and the destruction of residential, industrial and non-industrial objects of territorial communities requires their large-scale restoration. Territorial communities that are entrusted with production processes need digitization of anti-crisis management to invest resources for the restoration and reconstruction of real estate objects under programs to support the economic development of the state. These conditions are actualized under the influence of the inflow of foreign investments, which have targeted areas of use, taking into account the financing of digital technologies, which are necessary for the protection of resources for the reconstruction of real estate objects. Digital technologies eliminate the risks of fluctuations in the cost of production facilities, and in conditions of limited budget financing of business structure projects and ensure changes in existing communication models in a dynamic investment environment.

The work of V. Kovtun *et al.* (2020) is devoted to the systematisation of economic factors of enterprise development in the context of digitalisation, who emphasised the importance of developing a new type of intellectual value chain, producing individual goods at affordable prices, and improving the skills of employees. The adoption of information technologies for the integration of business processes as an innovative opportunity to increase productivity was considered by Canadian scientists L. Raymond *et al.* (2009), who substantiated the importance of the type of innovation to achieve this goal, as well as the importance of technological intensity of small and medium-sized enterprises.

However, despite the significant contribution of scientists to the study of the digitalisation of Ukraine's economy and the application of innovative solutions based on information technology in production and industry, the use of information models in crisis management remains insufficiently studied, which is especially relevant for the post-war restoration of destroyed real estate in territorial communities. At the same time, the innovative activity in the post-war stage should develop in a single digital field of anti-crisis management, which is based on business activators of intellectual property and digital technologies, with the vector of updating state regulators investment of territorial communities that have lost objects of real estate due to terrorist actions of the aggressor country. The priority research is the substantiation of practical provisions regarding the development of reconstruction projects of real estate of territorial communities, which allow, at the expense of information models of digitalization of anti-crisis management, to accumulate resources for the reconstruction of production facilities, to provide digital diagnostics of business processes under the guarantee of receiving future benefits for the investor.

MATERIALS AND METHODS

The basis of the methodological approach in this paper is a combination of the method of statistical data analysis, which allowed to study the number of destroyed real estate objects; the method of agglomerative hierarchical clustering; correlation, graphical and information generalisation methods. The theoretical basis of this research paper is based on the works of Ukrainian, Canadian, Azerbaijani and other scholars who have considered the digitalisation of the economy through the prism of crisis management. The application of the method of statistical data analysis allowed to study the information on the number of destroyed real estate objects during the period of hostilities in Ukraine based on the data of the Office of the United Nations High Commissioner for Refugees (UNHCR) (Project of the Recovery…, 2022).

As a formalised digital tool for innovative development of territorial communities, the strategy of information modelling in crisis management, based on the synthesis of concepts and methods of its implementation, is used. For a general assessment of the strategy of digital transformation

of crisis management, the formulas are used (Theory of Constraints, 2019):

$$\Delta F_{systems} = (G', P', D') = F(\Delta G, P, D) + (G, \Delta P, D) + (G, P, \Delta D) \quad \ldots(1)$$

$$\Delta F_{synergy} = (G', P', D') = F(\Delta G, P, D) + (G, \Delta P, D) + (G, P, \Delta D) + (\Delta G, \Delta P, \Delta D) \quad \ldots(2)$$

where, (G', P', D') – time synergy effect arising from changes in digital platforms for crisis management of territorial communities for the implementation of real estate reconstruction projects.

From the standpoint of analysing the systemic, adaptive, and synergistic properties of the strategy of information modelling in anti-crisis management of territorial communities, authors highlight the components of the increase in the total effect of their application for the investor, for the probability of investment risks in the reconstruction of production facilities.

The strategy of information modelling in the anti-crisis management of territorial communities for the purposes of investing in real estate reconstruction projects has limited microeconomic uncertainty, which, through situational analysis, allows predicting sudden qualitative changes (bifurcations) in the digital economic system. The effectiveness of the result in the presence of modern digital tools for crisis management used in the situational analysis of dynamic systems takes into account time functions, strategic decisions and measures to restore real estate objects of territorial communities affected by the risks of the external investment environment (Theory of Constraints, 2019):

$$\begin{cases} x = f_1(\rho)x + f_2(\rho)y + f_3(\rho)q \to G(x, y, q, \rho) \\ y = f_1(\rho)y - e^{-\alpha y}y - e^{-\beta x}x - e^{-yz}q \to P(x, y, q, \rho) \\ q = f_3(\rho)q - e^{-\alpha y}y - e^{-\beta x}xe^{-yz}q \to D(x, y, q, \rho) \end{cases} \quad \ldots(3)$$

where, $x(t)$, $y(t)$, $q(t)$ – dynamic curves; $\rho \in [-\rho_0, \rho_0]$, $0 \le \rho_0 \le \infty$ – is a parameter that characterises the ratio of investment costs in the digital space of crisis management to the total volume of products, services and works in territorial communities in the presence of a rebuilt property; $\varphi_i(\mu)$, $i = \overline{1,3}$ – functions of crisis management of the economic system of territorial communities; $\alpha \ge 0$, $\beta \ge 0$, $\gamma \ge 0$ – parameters reflecting the level of investment risks for the reconstruction of real estate objects when changing the digital crisis management platform and making coordinated decisions affected by factors of the external investment environment; $A_1 = e^{-\alpha}, A_2 = e^{-\beta}, A_3 = e^{-\gamma}, 0 \le \alpha, \beta, \gamma \le \infty, A_i \in [0,1], i = \overline{1,3}$ – speed of adaptation; $A = A_1, A_2, A_3 = e^{-(\alpha+\beta+\gamma)}, A \in [0,1]$ – multiplier of the full amplitude of uncertainty factors of the external investment environment.

The use of the method of agglomerative hierarchical clustering allowed to analyse the use of digital tools in crisis management by business entities located in territorial communities. Using the graphical method, the data obtained in the course of the study on the effectiveness of the use of digital SEO and SMM tools, digital advertising tools on Facebook and Google Ads, communication and receiving feedback from customers, CRM systems and ERP systems in the crisis management of business entities of territorial communities are presented in the form of diagrams. The correlation between the level of use of digital tools and the level of digital literacy of people in territorial communities is determined using the correlation method. The application of the generalisation method made it possible to summarise the information obtained in the course of the study on the effectiveness of the use of digital tools in crisis management, indicators of the riskiness of investing in the reconstruction of real estate and other data necessary for formulating conclusions and proposals on this issue.

RESULTS

The economic space of the countries of the world gained access to new markets and entered the phase of long-term economic development after investing in the creation of a modern IT infrastructure. Digital technologies, services and systems ensure the growth and creation of the latest high-tech industries, which are among the top priorities of the European Union for the abolition of regulatory barriers and the creation of a Single Digital Market (Trusova *et al*. 2021). The artificial environment of the economic system of business structures for the reconstruction of industrial facilities after their

damage must be recreated with the use of anti-crisis management, with the use of BI-technologies (information modelling of real estate objects) in business processes.

The methodological basis of the digital transformation of the anti-crisis management of territorial communities at the formation of requests for investment projects is carried out by a synergistic combination of the following methodological components: the methods of the theory of stability and bifurcations to the analysis of partial cases of a model that investigates the dynamics of qualitative microeconomic systems in the conditions of the application of mixed anti-crisis management strategies; synergistic, objective and situational approaches to the assessment of investment risks; assessment of target indicators of break-even production and efficiency of implementation of investment projects; construction of sensitivity clusters for anti-crisis management objects in the case of specified deviations of the investment cost of the project (IT-Enterprise, 2019). Digitization of anti-crisis management of territorial communities takes place through the introduction of system models.

The use of modern technologies and management automation can ensure smooth operation and simplification of the production process (Blix, 2015). The ERP-system is used as the methodology of effective planning and management of all resources. The system in addition to the kernel that implements the MRP II standard, contains the following component modules (Brettel *et al.* 2014; BAS solutions, 2019): logistics, including SCM systems; sales and customer relationship management system (CRM); Internet components providing access to databases and other information resources and services; a system for modelling business processes; automation and workflow management systems in the company (Work-Flow); analytical systems for information processing, in particular, expert systems, decision support systems and others that operate on the basis of data warehouses, OLAP technologies, and data mining; management information systems that provide data presentation for the company's management (MIC); software and hardware used for security systems; information and communication programmes (remote access, e-mail); corporate portals and systems for electronic commerce (e-commerce); software used for office tasks (text editors, spreadsheets, database management systems); special purpose systems, e.g.: CAD/CAM (computer-aided design), ACSTP (computer-aided process control); project management systems; specialised digital products or systems used to perform specific tasks (geographic information systems) (Tokmakova *et al*. 2018; Trusova *et al*. 2022).

The strategy of information modelling in anti-crisis management of territorial communities, which acts as a formalized digital tool of their innovative development for the reconstruction of production facilities, is based on the synthesis of the concept and methods of its implementation.

The complex process of balanced development of territorial communities in all regions of Ukraine creates an investment environment that is socially oriented to the reproduction of business processes that combine the most modern global approaches to digitalization of anti-crisis management according to UN programs. These programs include people-centeredness, rational spatial planning, ensuring the balance of population resettlement and providing jobs in the destination of territorial communities, resistant to digital mobility, inclusiveness, energy efficiency in dynamic systems of reconstruction of settlements of territorial communities, in particular rural areas. The introduction of BI-technologies made it possible to automate the assessment of alternative projects for investing in energy-efficient facilities with a more advanced quality system for analysing business processes such as logistics, procurement, marketing, and end-user service. This ensured a reduction in electricity consumption by 30% and by 29% – costs for maintaining environmental sustainability of products (DTEK will spend…, 2019).

For the period 2018-2021, authors investigated the area of information modelling of anti-crisis management. Respondents to the survey were representatives of almost 1000 registered business subjects located in territorial communities of Ukraine (Project of the Recovery…, 2022). A description of the main business processes that require digitization is made: the need to minimize risks to preserve resources by reducing investment costs and (or) increasing productivity (69%); the increasing the level of meeting customer needs, with the aim of stabilizing competitive positions on the

market (38%); the need to improve coordination of anti-crisis management of business processes (37%); the need to improve production and financial operations aimed at creating new brands for products, business models of (35%); improving the efficiency of management in anti-crisis conditions using Fintech technologies; implementation of an ERP resource planning system (31%); reducing opposition to changing production business processes to energy efficient ones (24%); measures to prepare businesses for international certification according to ISO 9000 and other standards (20%); measures to prepare for business acquisition or merger (7%), and others (Business intelligence: The missing link to your ERP strategy, 2016; Raymond *et al.* 2009).

It should be noted that the full-scale armed invasion of Ukraine by the Russian Federation and the temporary occupation of its part have deepened inequality in the development of territorial communities, caused the destruction of real estate infrastructure adjacent to the temporarily occupied territories, and increased the risks of business entities and their investment risks. According to the UNHCR, as of the end of June 2022, 12900 residential buildings (approximately 13.5 million square metres) and 107.71 private houses (approximately 1.9 million square metres) were destroyed or damaged. Overall, the production facilities of business entities located in the territorial communities of Ukraine account for about 40% of total energy consumption and the corresponding share of greenhouse gas emissions. More than 80% of existing industrial buildings of business entities were built before 1994, have a high level of physical deterioration and low energy efficiency in relation to modern requirements for the construction of industrial facilities. It should be noted that 80-90% of the buildings of business entities that exist in Ukraine today and have not suffered significant damage will be in use in 2050. However, the pace of modernisation of these buildings in Ukraine remains extremely low compared to European countries, at 0.4-1.2% per year (in 2021, the European Commission has set a target of increasing the rate to 3%). At the same time, the needs of heating and cooling of premises and water supply account for about 70% of the energy supplied to business entities located in territorial communities (Project of the Recovery…, 2022).

Modernization of the infrastructure of production facilities of business subjects located in territorial communities requires significant financial, human and time resources to combine business processes of consumption (building sector, sources of heat and water supply, networks, water treatment facilities) and supply (products, works and services). The scale of recovery of large, medium and small businesses in Ukraine, taking into account modern approaches of digitization of anti-crisis management of territorial communities in the post-war period, should change the principles of state and local investment planning of real estate objects. It should be noted that in 2020-2021, the volume of construction work on the reconstruction of real estate objects located in the territorial communities of Ukraine increased. In 2021, it amounted to 9.83 billion USD (+5.1%) due to the construction of production facilities (+16.8%), non-production facilities (+3.2%), changes in the infrastructure of industrial facilities (+3.1%) (Project of the Recovery…, 2022).

At the beginning of 2022, among 463 available planning schemes for the construction of real estate objects in territorial communities, only 56.3% were provided with urban planning documentation at the regional level. The plan for the spatial development of territorial communities in rural areas consisted of only 6.3% (93 comprehensive plans with 1469). Among 1469 newly formed territorial communities, only 2.2% (33 territorial communities) had an up-to-date map plan in the USK-2000 digital geodetic system. Current general construction plans provided 397 settlements of territorial communities with the status of cities; however, 168 of these cities do not meet the requirements for their use as objects of activity the newly formed territorial communities; only 229 (57.7%) existing master plans of cities are relevant. At the same time, 89.2% with 675 urban-type settlements had master plans, however 291 of them did not meet the requirements of UN legislation.

It should be noted that out of 26.77 thousand rural settlements, only 19.33 thousand settlements have master plans, of which 62.2% do not meet updated UN requirements. Accordingly, the number of current general plans for the reconstruction of rural areas is only 37.8%. The total number of constructions plans for industrial facilities for business subjects located in territorial communities

is about 30 thousand copies. However, they cover approximately 2.2% territory of the country as a whole, at the same time, about 40% will not meet the updated UN requirements and will lose their validity. At the same time, digital platforms of anti-crisis management of territorial communities when integrated into the state information system of geo-data and services have prerequisites for automating registration procedures, removing obstacles to the introduction of innovative and progressive technologies according to the parameters of regulation (Project of the Recovery…, 2022).

Large, medium and small businesses located in the territorial communities of Ukraine solve three strategic tasks to ensure competitive positions: first, establishing close ties with suppliers of goods (service providers) and customers (customer relations department, increasing sales); second, increasing the level of efficiency of operating activities (enterprise operating activities department); third, increasing the competitiveness of production (mergers and consolidation of individual sectors into business models). To achieve all these goals, it is necessary to integrate information systems and technologies into the business. In the EU countries, business subjects located in territorial communities have a high level of the Index of digital intensity of anti-crisis management in business processes, provided that energy-efficient production facilities are used (Schwab, 2016). However, these results are diversified. Thus, in Denmark, half of the business structures have a high digital intensity of preventing threats and risks in business processes, in Bulgaria and Romania – less than every tenth business subjects works on digital protection and its transformation into anti-crisis management (Apalkova, 2015; Ibragimov *et al.* 2019). Table 1 presents the level of speed of penetration of digital technologies into the territorial communities of the EU countries.

Thus, social media, email accounts, mobile phone applications and high-speed broadband connections are driving digital transformation in local communities across Europe. The successful experience of individual countries, such as South Korea, Sweden, Estonia, Ireland, and Israel, suggests that the effectiveness of the overall digitalisation of anti-crisis management of territorial communities in the economies of countries is up to 20% of GDP. In 2018, Ukraine implemented the Digital Economy Development Strategy in various spheres of activity, and, in particular, the implementation of digital tools in the information network of territorial communities. This made it possible to expand production, logistics, marketing, and financial business processes between large, medium and small business structures and in 2021 increase the country's GDP by 5%. According to the forecasts of

Table 1: The speed of implementation of digital technologies in crisis management in territorial communities in European countries

Key indicators for reflecting digital transformation processes	% of business of territorial communities of EU countries	
	Large	Small
Having a website or home page	98	76
The website has some interactive features	76	60
They use social networks	74	49
>50% of the employed use computers and the Internet	52	42
Highest broadband connection speeds of more than 30 Mbps	71	39
They use ERP software (business structure resource planning)	78	35
Use an information system for customer relationship management (CRM)	64	34
>20% of employees have portable devices for work use	40	34
They use the services of specialists in BI technologies	77	20
Online sales (at least 1% of turnover)	41	19
Exchange of electronic supply chain management data	49	19
Electronic sales in the (B2C) business-to-consumer sector	11	9

***Source**: V.V. Apalkova (2015), DTEK will spend UAH 350 million on digital transformation (2019), Z. Ibragimov et al. (2019).*

the World Bank, digitization as a tool for achieving the strategic goals of information modelling of anti-crisis management of business structures of Ukraine in the post-war period will allow to increase the country's GDP by 8 times (up to 1 trillion USD) in 2030 and ensure the quality execution and realization of business processes for consumer needs, higher than the average indicator in Europe (Table 2).

In order to determine the potential risk zone during the reconstruction of the industrial facilities of business subjects located in the territorial communities of Zaporizhzhia and Kherson regions that suffered from the military invasion of the aggressor country and the subsequent restoration of BI technologies in their business, authors proposed a system of risk indicators of investment in real estate objects. These indicators define the limit and outline the economic consequences of certain risk events for intermediaries and investors. From the perspective of direct relations between the investor, business entities and intermediaries, the investor bears the majority of investment risks (in particular, the risks of untimely commissioning of the facility). Therefore, more important in this case are the indicators of the actual frequency of risk events that occur in business entities, as well as indicators of the scale of occurrence of these events in investors associated with certain intermediaries. In order to evaluate such indicators based on a sample of intermediaries, a sample of contracting intermediaries of the Western region of Ukraine was formed in the study. 40 of such organizations engaged in the construction of industrial facilities were selected.

Thus, the calculations demonstrate the widespread riskiness of events in case of untimely commissioning of production facilities. In particular, these events in 2023 may occur in 56 of 60 subcontractors, which will be considered in 38 of them; 30-40% of the total area of production facilities will be commissioned later than planned. As for the other two risk events, they will occur much less frequently, in particular, the deterioration of the consumer properties of the production facilities compared to their specified level.

Assessing the level of scale of risk events in the course of investors' activities that will interact with the relevant subcontractors, the most significant risk event will be "untimely commissioning of production facilities". This is due to its high frequency of risky situations. The profitability index ranged from 1 to 1.4 for the majority of industrial premises intended for operation by business subjects located in the territorial communities of Zaporizhzhia and Kherson regions, which must be rebuilt in the post-war period. At the same time, for 22.5% area of objects of this type, this index was less than one. Investing in such facilities is too risky, as the initial cost of such premises is quite high. This is evidenced by the high level of the average ratio between the initial planned cost and the minimum cost of reconstruction of production facilities acceptable to the investor. For many industrial facilities used by businesses in the regions studied, whose premises were assessed for investment in their refurbishment, the risk of investment is quite acceptable. That is, it is necessary to reduce its price (Table 3).

Table 2: Forecast consumption level of digitalization of anti-crisis management in the economic system of territorial communities and its share in the GDP of Ukraine for 2023-2030

Indicators	2023	2024	2025	2026	2027	2028	2029	2030
Domestic market (consumption of digitalization of anti-crisis management), billion dollars USA	3.0	4.5	6.0	8.0	10.0	12.0	14.0	16.0
Impact on GDP, % of growth	+2.0	+3.5	+4.5	+6.0	+7.5	+9.0	+11.0	+14.0
The share of consumption of digitization of anti-crisis management in the economic system of territorial communities, %	42.0	45.5	49.0	54.0	62.0	74.0	82.0	85.0
The share of consumption of digitalization of anti-crisis management of territorial communities in the total GDP, %	8	11	15	20	28	40	52	65

***Source**: World Economic Forum: Global Information Technology Report (2015).*

Table 3: Planned indicators of the riskiness of investing funds for the reconstruction of industrial facilities of business subjects located in the territorial communities of Zaporizhzhia and Kherson regions, the modernization of which is planned to be started by intermediaries of the Western region of Ukraine in the post-war period

Indicators	Values of indicators for production facilities, according to which the profitability index (5) is:				
	<1	1-1.2	1.2-1.4	1.4-1.6	>1.6
The share of the total area of industrial premises in the total area of real estate of this type, %	22.5	40.6	24.9	8.1	3.9
The average profitability index of operations for the reconstruction of industrial premises, %	0.91	1.08	1.28	1.41	1.70
The average value of the ratio between the forecast coefficient of variation of the future benefit from the reconstruction of production facilities and the maximum possible value of the coefficient of variation, share of units.	0.49	0.32	0.24	0.17	0.13
Average value of the ratio between the initial planned cost and the minimum cost of reconstruction of production facilities acceptable to the investor, times	1.45	1.26	1.09	0.97	0.93

Thus, it is advisable for investor's business subjects located in the territorial communities and other participants in the investment process for the reconstruction of industrial real estate to use the probability distribution functions of the expected future benefit from their construction and the implementation of digital anti-crisis management tools for the future. It is experimentally proved that the method of agglomerative hierarchical clustering has demonstrated its effectiveness for business entities located in territorial communities that will have a mixed type of implementation of BI technologies in crisis management aimed at serving the needs of consumers in a time of war. Based on the results of the survey, five clusters were identified that differ from each other and have a high degree of similarity among the cluster elements (about 60-100% depending on the question). Certain features that characterise the clusters were identified (use of social media, analytics tools, advertising offices and services, search engine optimisation of websites) "Centroids" of clusters when displaying the relationship between "advanced" SMM and SEO are presented in Fig. 1.

Therefore, the first cluster uses SEO and SMM tools at a low level. The respondents in cluster 4 will use these tools below average. Representatives of cluster 2, located in the territorial communities will implement marketing tools (SMM) above average, but SEO tools at a very low level. Business structures located in the territorial communities of the third and fifth clusters will work with these tools effectively.

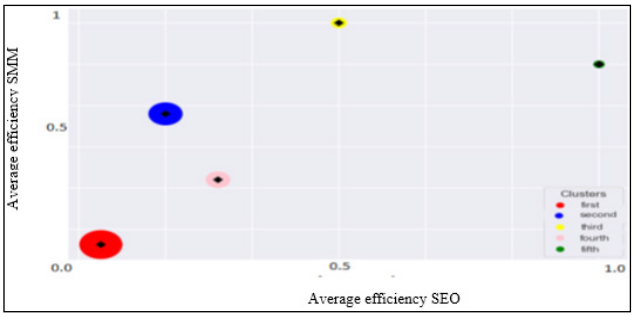

Fig. 1: Effectiveness of using SEO and SMM digital tools in anti-crisis management of business subjects located in the territorial communities

Subjects located in the territorial communities of the fifth cluster will use the transformation tools of anti-crisis management as efficiently as possible; representatives belonging to cluster 3 will use SMM tools at a very high level, and SEO tools at an average level. When comparing the parameters of the use of marketing communications through Facebook and Google Ads, the study obtained the following results (Fig. 2).

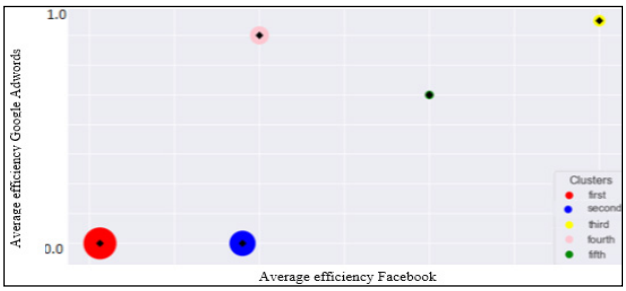

Fig. 2: Effectiveness of using digital advertising tools in Facebook and Google Ads in anti-crisis management of business subjects located in the territorial communities

Representatives of the first cluster use both tools at a low level, so they have not used them to advertise their business on the Internet. The respondents in cluster 4 use Google Ads effectively, but Facebook advertising tools are used at a low level. Representatives of cluster 3 will use two tools as efficiently as possible. Representatives of the second cluster will work more, but with little efficiency, with advertising on Facebook, and will not use advertising on Google Ads. Enterprises included in the fifth cluster will effectively (above the average level) use two tools of transformation (advertising on Facebook and Google Ads). As for the methods of communication with employees and maintaining relationships with customers, the following results were obtained (Fig. 3).

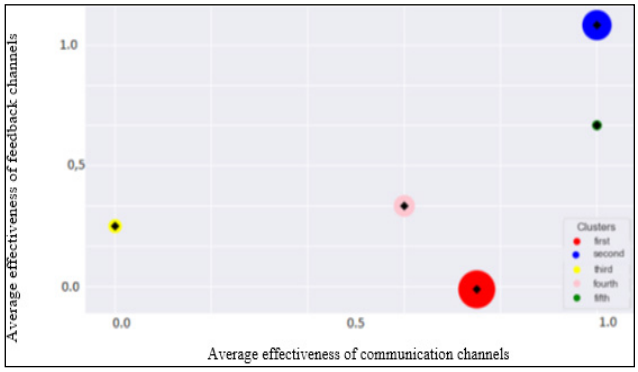

Fig. 3: Effectiveness of electronic communication tools and customer feedback in anti-crisis management of business subjects located in the territorial communities

Businesses located in the territorial communities of the first cluster will use the means of communication between employees and customers; however, they will not try to receive feedback from customers. The fourth cluster will use simple and medium-complex means of communication with customers. Representatives of the third cluster will not be interested in effective communication and receiving feedback from customers. Instead, representatives of the second cluster will be interested in effective communication and receiving feedback from customers using modern digital tools. The use of ERP-system and CRM-system by entrepreneurial business subjects located in the territorial communities is presented in Fig. 4.

Therefore, businesses in the second cluster will not use ERP and CRM systems. Those in the first cluster will use only ERP systems, while those in the fourth cluster will partially use CRM systems. Representatives of the third and fifth clusters aim to use digital tools effectively. Business subjects located in the territorial communities included in the fifth cluster will be leaders in the use of CRM-systems and ERP-systems.

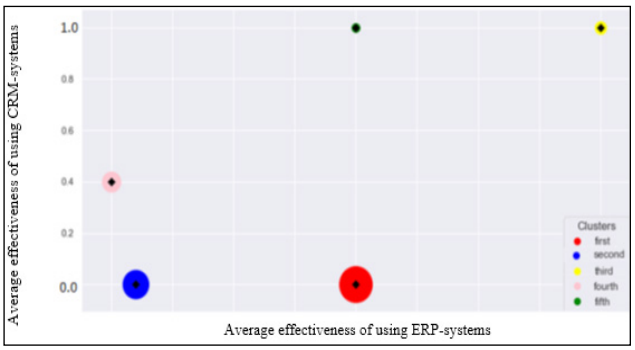

Fig. 4: Effectiveness of using digital tools of CRM-systems and ERP-systems in anti-crisis management of business subjects located in the territorial communities

Summing up, authors note that the adequacy of the calculations is confirmed by the correlation between the level of use of digital tools and the level of digital literacy of the human capital located in the territorial communities, the characteristics of which are confirmed by the complexity of using digital platforms of anti-crisis management.

DISCUSSION

The results obtained in the course of the study on the digitalisation of the processes of anti-crisis management of territorial communities should be compared with the results of the works of other scholars who have considered the benefits of using information technology in economic processes. The paper emphasises the positive impact of digitalisation of the economy on the country's development. A similar statement is made in the work of M.V. Rudenko (2018), who substantiates the benefits of digitalisation of the production process, as it leads to strengthening the competitive position of enterprises by increasing labour productivity, accelerating the automation of production processes, improving production safety, management efficiency and investment attractiveness.

The study emphasised that the transition to a circular model of the economic system of territorial communities is a key element of the green economy and achieving energy independence. The point of view on improving the environmental friendliness

of production processes and compliance with social and environmental responsibility by companies is confirmed in the work of Armenian scientists N. Hakobyan *et al*. (2019), who identified the role of corporate social and environmental responsibility in increasing the competitiveness of enterprises and substantiated the methodology for integrated assessment of corporate social and environmental responsibility. In addition, in order to assess the effectiveness of implementing the principles of corporate social and environmental responsibility in the competitive strategy of an enterprise, the researchers proved the feasibility of using an integrated index of corporate social and environmental responsibility.

The issue of environmental friendliness of production and improvement of the environmental situation of territorial communities was studied by R. Oleksenko *et al.* (2021), who appropriately argued that the problem of improving the environmental friendliness of territories should be addressed, in addition to special organisations, by central and local authorities.

Confirmation of this point of view is also reflected in the work of N. Trusova *et al*. (2022), whose purpose was to study the conditions for attracting investment from foreign entities in the context of cyclical imbalances observed in the modern world economy. The authors used the method of correlation and regression analysis to identify the impact of financial imbalances in the economy as a whole, as well as in the context of certain additional indices. As a result, the authors identified such imbalances as monetary, fiscal, related to the national currency exchange rate, debt growth, trade, investment and savings that arise in the context of the financial and economic crisis. Agreeing with the conclusions of scientists, it is worth noting that one of the priority areas for attracting foreign investment is real estate.

When discussing the importance of investment for the development of modern business and territorial communities, it should be noted in this direction the research conducted by N.V. Trusova *et al.* (2021) in terms of developing a system-integrated methodology and practical recommendations for building a model of digitalisation of investment and innovation activities of business entities by transforming the architecture of the business system into an information system that represents the improvement of network interaction of entities in a competitive environment. The authors present a flowchart for activating a digital strategy for investment and innovation business development and propose a block system for assessing the level of digitalisation in the investment and innovation activities of business entities in a network information system.

The article proves that the use of the agglomerative hierarchical clustering method is appropriate for analysing the efficiency of digital tools, for which purpose 5 clusters have been allocated, characterised by the use of different types of digital tools. This point of view on the effectiveness of using cluster analysis tools is confirmed by a study conducted by P. Rubanov *et al.* (2019), who investigated alternative models of financing different markets. The authors examined the factors influencing the formation of clusters, such as the volume of consumer lending, business lending and trade volumes, and also proved the need to identify other factors that affect the ratio in the development of certain types of alternative financing in different countries.

Thus, an analysis of the results of research by scientists on the role of digitalisation of business processes in order to increase business competitiveness and the effectiveness of crisis management indicates a high level of their interest in this issue. The measures proposed in this paper on the use of information technology in the development of projects for the reconstruction of real estate of territorial communities are in line with the proposals of other scholars to expand digitalisation processes in the economy in order to improve the ecological status of regions, investment attractiveness and sustainable development.

CONCLUSION

Thus, the transition of anti-crisis management of territorial communities to the "digital" economy and the transformation of technologies in business processes is rapidly taking place all over the world after crisis cycles associated with terrorist and military aggression of certain countries. It includes changing the business strategy and organisation of its business processes, identifying new goals and means of achieving them, and adapting the company's business model to global trends in

increasing the impact of information technology. However, in Ukraine, such processes take place quite slowly due to the periods of the post-war state and the post-war restoration of industrial facilities destroyed by the aggressor country on a significant territory of the state. In addition, another problem is the insufficient level of knowledge of entrepreneurs about the potential opportunities and ways to integrate digitalisation into their business processes, which is especially true for small and medium-sized businesses located in territorial communities that are far from agglomerations with industrial cities and developed regions of the country. The lack of available technologies, such as various services, platforms, portals or applications, is becoming an obstacle to the rapid implementation of innovations at Ukrainian enterprises. In turn, this hinders business integration into global trends and access to the international trade arena.

Acceleration of the digital transformation of the anti-crisis management of territorial communities in Ukraine should be ensured by developing roadmaps for the digitalisation of companies, which would include recommendations on the application of protective functions in digital technologies for any business sector. The consistency and efficiency of the transformation is necessary in the presence of a vector of development, a clear toolkit for making changes, as well as the availability of sources of information regarding the acceleration of Ukraine's transition to the information society and the "digital" economy. Given the differences in the spheres of activity of Ukrainian entrepreneurs, it is important to have an individual approach when using applied tools and solving issues related to the prevention of threats and risks in the business environment.

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