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EVALUATION OF THE DYNAMICS OF THREATS OF DIGITAL TRANSFORMATION TO OPTIMIZE THE MANAGEMENT OF ECONOMIC SYSTEMS

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ОЦЕНКА ДИНАМИКИ УГРОЗ ЦИФРОВОЙ ТРАНСФОРМАЦИИ ДЛЯ ОПТИМИЗАЦИИ УПРАВЛЕНИЯ ЭКОНОМИЧЕСКИМИ СИСТЕМАМИ

Summary. An analytical review of scientific research of foreign scientists on realization of the digital transformation trend is conducted, a series of regulatory acts concerning digital changes in Ukraine and the experience of modelling individual risks of digital transformation. It is substantiated that the implementation of digitalization into economy creates a number of threats, the main of which is an increase in the level of cybercrime. The main types of cybercrime are defined. The dynamics of the main threat to the digital economy development – cybercrime – are modelled to optimize the management of economic systems. The statistics show that the growth rate of cybercrime will accelerate. The main types of cybercrime that will carry the highest risk are foreseen. It is found that the main violations are crimes in the field of payment systems. Preventive activities are suggested.

Аннотация. Осуществлен аналитический обзор научных исследований зарубежных ученых по реализации тренда цифровой трансформации, ряда нормативно-правовых актов по вопросам цифровых изменений в Украине, наработок по моделированию отдельных рисков цифровой трансформации. Обосновано, что внедрение цифровизации в экономику вызывает ряд угроз, основная из которых является рост уровня киберпреступности. Определены основные виды киберпреступлений. Смоделирован динамику главной угрозы развития цифровой экономики – киберпреступность – для оптимизации управления экономическими системами. На основе статистических данных показано, что темп роста киберпреступности ускорится. Предусмотрены основные виды киберпреступлений, которые будут нести наибольшую опасность. Выявлено, что основными нарушениями со киберпреступлений являются преступления в сфере платежных систем. Предложено превентивные пути деятельности.

Key words: globalization, digital transformation, digitalization, digital economy, digital technologies, cybercrime, cybersecurity, modelling.

Ключевые слова: глобализация, цифровая трансформация, цифровизация, цифровая экономика, цифровые технологии, киберпреступность, кибербезопасность, моделирование.

Introduction. Relevance of the topic. The world has entered a new era of digital globalization which is defined by continuous data flows that contain information, knowledge, ideas and innovations. Developed countries, having completed industrialization, are successfully digitalizing their economies, accelerating the development of innovative technologies where artificial intelligence, automation and digital platforms dominate.

The realization of information and communication opportunities and advantages of the latest technologies, the need to acquire leading positions and strengthen the competitiveness of economic sectors in a globalized digital world require the government's prudent policy on digitalization, liberalization of regulation, adaptation of the regulatory framework, stimulation of investment for the digital economy promotion with account for their own traditions and relying on the scientific basis of theories and concepts of economic development.

Literature review. The issues of the digital economy formation, its implications for the society and state, the realization of the digital transformation trend have become the object of scientific research of foreign scientists, experts of the international digital economy and society index [18-20].

In Ukraine, the issues of digital changes are implemented in the order of the Cabinet of Ministers: "On Approval of the Concept of Development of the Digital Economy and Society of Ukraine for 2018-2020 and Approval of the Plan of Measures for its Implementation" of January 17, 2018 №67-p [13] and the resolution of the Cabinet of Ministers "Some Issues of Digital Development" of January 30, 2019 №56 [4]. The creation of conditions for the digital economy development is enshrined in the draft law "On the Digital Agenda of Ukraine" [17]. In November 2018, the law of Ukraine "On Electronic Trust Services" came into force, aimed at reforming the regulatory framework in the field of digital signatures which makes it possible to accelerate the development of the digital economy with compulsory digital participation [12].

Among domestic scientists, O. Vinnyk [1], N. Kraus, O. Goloborodko and K. Kraus [9], V. Lyashenko [11], M. Rudenko [14], N.Tkachuk [15] paid attention to the investigated problems and threats of digitalization. Modelling of individual risks of digitalization is investigated in the works [1, 3, 6-8, 15-16, 21].

However, we believe that further research on modelling of threats of economy digitalization is needed.

Purpose. The aim of the work is to model problems that may arise in the process of digital transformation of the economy in Ukraine.

Results. Economy digitalization is interpreted by scientists T. Yudina and I.Tushkanov in the narrow and broad sense. In particular, in the narrow sense, it means creating at different levels of economy (global, mega, macro, meso, micro, nano) information and digital platforms and operators, due to which various tasks can be solved, including strategic ones: the development of medicine, science, education, transport, new industrialization, state regulation of the economy; in the broad sense it is a change in the nature of industrial or economic relations, a change of their subjective and objective orientation [18]. During the digital transformation, the productive forces of society and (or) factors of production get changed.

In the research of M.Rudenko the multifaceted nature of the category "digitalization" is interpreted from four positions – of the state, scientists, practitioners (entrepreneurs) and the society, since the definition of the foregoing concept varies greatly depending on the scope of its application, the category of people who suggested the definition and the ultimate aim of suggesting it [14]. Digitalization is saturation of the physical world with electronic and digital devices, means, systems and establishment of electronic communication traffic between them, which actually makes integrated interaction of the virtual and physical possible, i.e. creates cyberphysical space [13].

Society sees digitalization as a completely new paradigm of state development, based on the day-to-day and ubiquitous use of digital technologies with digital competencies being necessarily available, which will bring about revolutionary changes and formation of the digital society.

The analysis of the scientific literature suggests that the specificity of the interpretation of the definition "digitalization" is conditioned by the subject providing the definition, which causes ambiguity in the understanding of the concept under study and emphasizes the controversy of certain provisions and statements.

Economy digitalization provides effective bilateral interaction between the state, society, business and person by means of digital technologies, if all the participants of communication have the appropriate digital competencies.

The digital economy is inextricably linked to the existence of the information society. The term "information society" is based on the statement that quantitative changes in the sphere of information have led to the emergence of a qualitatively new type of social order – the information society.

According to D. Lyon, the main characteristics of the information society are as follows:

- in the technical sphere – implementation of information technologies into all spheres of production, economic and business life, into the system of education and everyday life;
- in the social sphere – under the influence of information a new, information consciousness is formed, the quality of life is changing;
- in the economic sphere – information turns into a major resource, becomes a source of added value and employment;
- in the political sphere – freedom of access to information is the basis of the political process, of the principles of pluralism and democracy;

- in the cultural sphere – formation of appropriate norms and values that meet the requirements of an individual and democracy [10].

Digitalization should be seen as a tool, not a goal in itself. Under a systematic state approach, "digital" technologies will stimulate the development of an open information society as one of the essential factors for increasing productivity, economic growth, job creation, and improving the quality of life of Ukrainian citizens [17].

"Digital" technologies are necessary to increase the efficiency of Ukrainian industry, and in some sectors they are becoming the basis of product and production strategies. Their transformative power changes traditional business models, manufacturing chains and leads to the emergence of new products and innovations.

Digitalization has a positive social character for Ukraine, as it focuses on improving of the quality of social security infrastructure, quality of social services, organizing of transparency and targeting of social assistance, and reducing costs [17].

Digitalization is rapidly penetrating into the daily lives of people as well as providing new opportunities for all sectors of the economy of Ukraine in terms of modernization of working and management methods, changing manufacturing cycles and logistics.

A significant problem that appeared with the onset of digital transformation and will intensify over time is cybercrime. Scientists conditionally divide computer crimes into two main groups according to the classification attribute of the category of access to computer equipment: 1) internal users; 2) external users, where the user is the subject that accesses the information system or the intermediary to obtain the information he needs to use [5].

Simultaneously with the spreading use of Internet technologies, the threat of violations aimed at hacking, theft of personal information, blocking of information services, blackmail, fraud etc. is proportionally increasing. This is due to a number of reasons, including increased trust in electronic data processing tools, expansion of the range of subjects involved in information relations in the global network, increased number of various services, transition to servicing of banking institutions. Various schemes are being spread on the Internet today, aimed at obtaining money from inexperienced and trusting users of online stores, virtual auctions, dating sites and more. Usually, this type of fraud is used by websites that resemble well-known international resources visually and by name. However, unlike well-reputed brands, you can hardly expect to get a product ordered or a refund from them. The reason for using such resources is the desire to get an order at an extremely low price. Sometimes, violators also use the opposite qualities of a person, creating a dummy site for a charitable foundation or boarding school [5].

With the spread of technologies, the nature of crimes has changed. Previously, most of them were plastic card frauds, but now there is a real boom in the field of online payments. The most professional hackers have already turned to thievery through client-banks (remote banking systems). Card fraud takes second place, whereas the number of thefts from company accounts or e-wallets is increasing [17].

Determining the current state of cybercrime in Ukraine, we can note that it, like any other social phenomenon, is subject to the prediction with the help of certain indicators that reflect its quantitative and qualitative characteristics. Such assessment and modelling can be done through the analysis of such indicators of cybercrime prevalence in Ukraine as: its level, geography, structure, dynamics, etc.

Concerning the level of cybercrime and its dynamics it should be noted that in 2009 there were 217 crimes registered in Ukraine in the field of use of electronic computing machines (computers), systems and computer networks, and telecommunication networks, in 2010 – 190, in 2011 – 131, in 2012 – 138, in 2013 – 595, in 2014 – 443, in 2015 – 598, in 2016 – 865, in 2017 – 2573, in January-August of 2018 – 1885 crime cases (Fig.1).

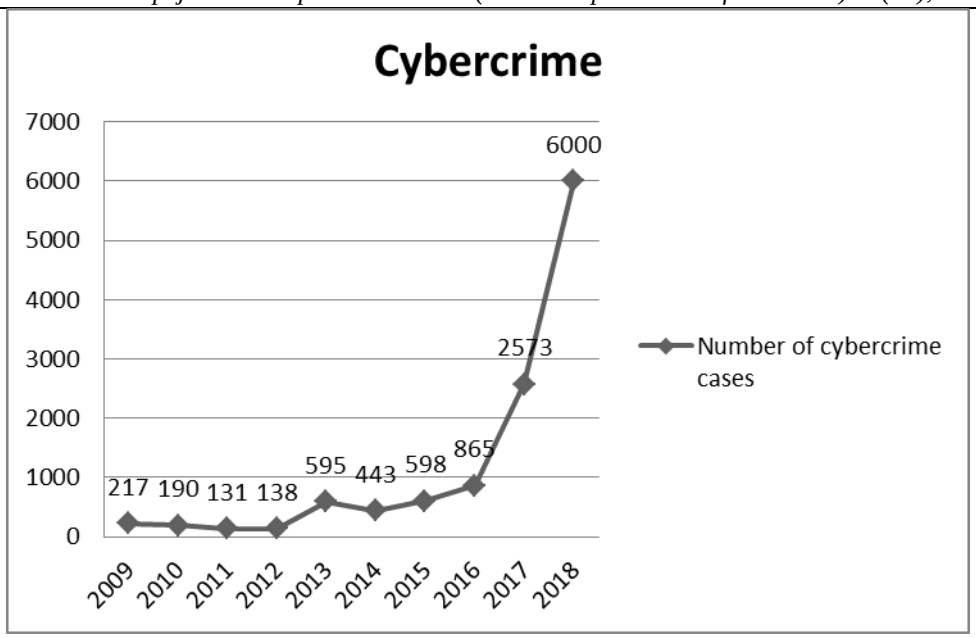

Figure 1 – Cybercrime in Ukraine

The proportion of cybercrime in the total number of registered crimes is 0.05% of the total number of registered crime cases in 2009, 0.04% – in 2010, 0.03% – in 2011, 0.03% – in 2012, 0.11 % – in 2013, 0.08% – in 2014, 0.11% – in 2015, 0.15% – in 2016, 0.49% – in 2017 and 0.51% of crimes reported in January-August of 2018 [8].

A significant increase in the number of cybercrimes registered in 2013 is attributed to the fact that "the increase of this type of crime is caused by the annual growth of the number of Internet resource users in Ukraine" [6].

As we can see from the obtained statistics on crime, theres is a significant positive increase in cybercrime (Fig.2).

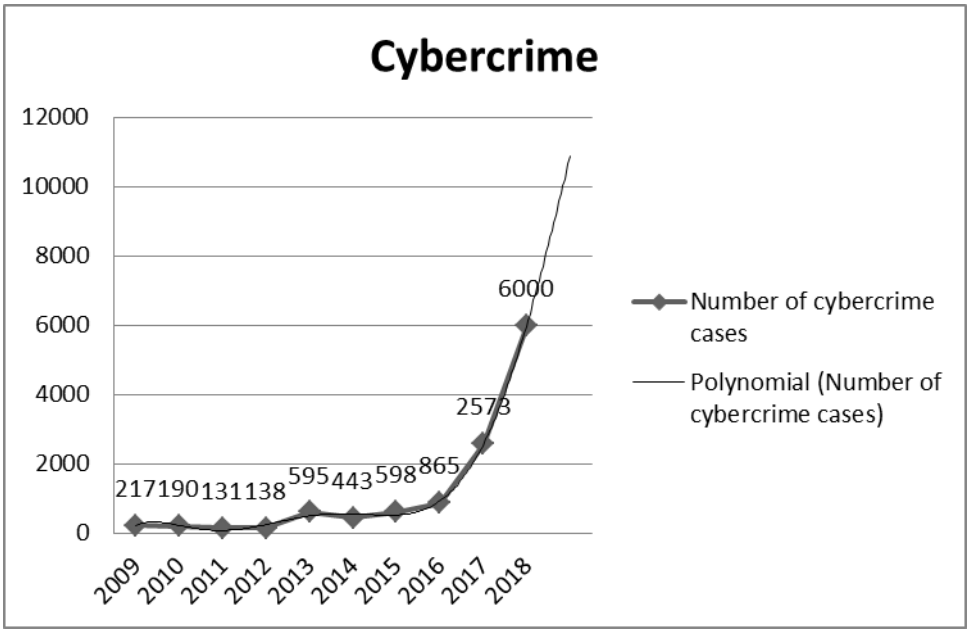

Figure 2 – Cybercrime forecasting in Ukraine

Taking into account the determination coefficient (R^2), we can come to the conclusion that this prediction may be considered reliable.

Another equally important step is to identify the types of cybercrime that will carry the greatest danger. For this the method of ABC analysis is used in the research.

To solve this problem an ABC analysis is conducted by the sum method on the basis of the report of Cyber Police of Ukraine concerning cybercrime cases during 2018. The results are summarized in the table (Fig. 3).

Cybercrime	Number	Factor share in the sum of factor values according to the data [8]	Increasing value of OS*, %	Increasing value of OC*, %	Sum of OS and OC, %	Group
in the field of payment systems	2398	39,96000667	39,9600067	25	64,9600067	A
in the field of e-commerce	1598	26,62889518	66,5889018	50	116,588902	B
in the field of cybersecurity	1325	22,07965339	88,6685552	75	163,668555	B
in the field of illegal content	680	11,33144476	100	100	200	C

Figure 3 – ABC analysis of cybercrime cases

OS* – share of the object from the total number
OC* – contribution of the object to the total result

Figure 4 presents the ABC curve that graphically interprets the division of cybercrimes into groups.

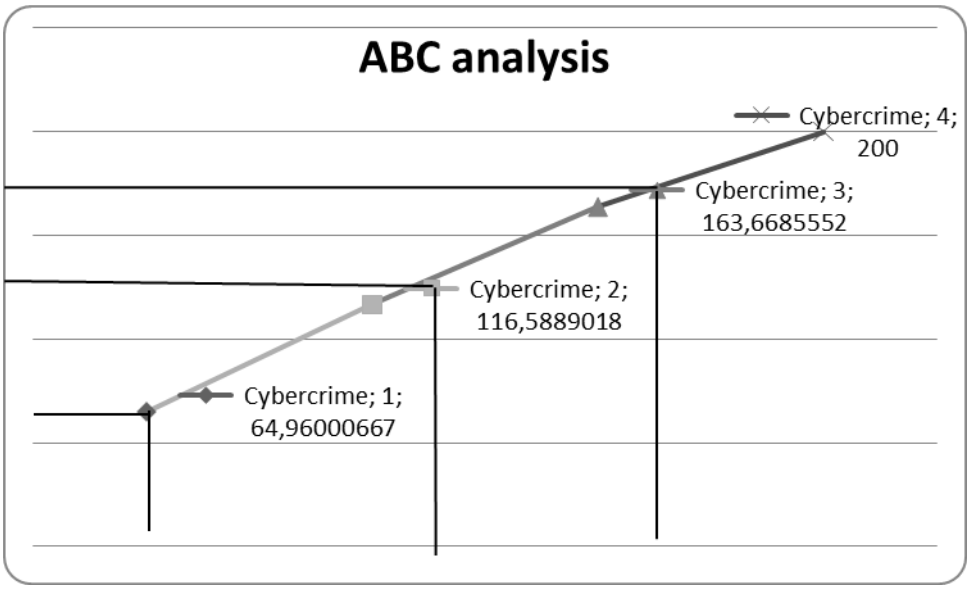

Figure 4 – Graphic result of ABC analysis

Summarizing the obtained results, we can note that the most vulnerable is the field of payment systems. The implementation of countermeasures in it can reduce the number of cybercrimes by almost 40% of all possible.

We believe that digitalization of economy will increase cybercrime growth. After all, most of the population, institutions, companies and organizations will start to switch to full digital support, that is, they will store basic information in the digital space and on servers.

Nowadays Ukraine is actively fighting this problem, an authorized body – the Cyber Police of Ukraine – has been created. At present, it performs such functions as: implementation of state policy in the sphere of countering cybercrime; early informing of the population about the emergence of the latest cybercrimes; implementation of software for systematization and analysis of information concerning cyber incidents, cyber threats and cybercrimes; responding to requests from foreign partners coming through the channels of the national round-the-clock network of contact points; participation in further training of police officers on the use of computer technologies in countering crime; participation in international operations and cooperation in real time; support of the activities of the network of contact points between 90 countries of the world; countering cybercrimes.

For the future we propose to improve Ukraine's national system of cybersecurity, so that it could:

- provide a front line of defence against cyber threats by increasing general situational awareness of incidents, vulnerabilities and threats in public institutions, at critical infrastructure objects and in the public segment;

- prevent intrusion by sharing information and implementing countermeasures that can reduce current vulnerabilities;
- protect against the full range of threats by enhancing counterintelligence and intelligence capabilities;
- strengthen cybersecurity through educational, media civic initiatives;
- encourage and provide cybersecurity trainings, research and development in the field of cybersecurity.

So, having modelled the implementation of digitalization into the economy, we can conclude that Ukraine will suffer from an increase in cybercrime.

With the total economy digitalization, the growth of cybercrime will accelerate, so, according to our forecasts, in 2019 the number of cybercrime cases can reach the mark of 9000. The main violations among them are crimes in the field of payment systems (about 40%). Therefore, security measures have to be improved in this sphere to reduce cybercrime.

Improving of e-commerce security and cybersecurity (countering sellers, coders, stealing databases, etc.) also remains urgent.

Conclusions. The analysis of the scientific literature suggests that the specificity of the interpretation of the definition "digitalization" is conditioned by the subject providing the definition, which causes ambiguity in the understanding of the concept under study and emphasizes the controversy of certain provisions and statements.

Digitalization makes it possible to accelerate innovation, support start-ups, teach the basics of programming to everyone interested, implement digital technology into the branches of economy. The implementation of all conditions mentioned above will increase the productivity of the entire economic system of the state and gain additional competitive advantages in the globalized digital world.

Digitalization of the economy provides effective bilateral interaction between the state, society, business and person by means of digital technologies, if all the participants of communication have the appropriate digital competencies.

In our research we substantiated that the implementation of digitalization into economy causes a number of problems and risks, the main of which, in our opinion, is an increase in the level of cybercrime.

The implementation of digital and information technologies into everyday life and economy causes a gradual increase in cybercrime, as evidenced by the results of our research.

With the total economy digitalization, the growth of cybercrime will accelerate, so, according to our forecasts, in 2019 cybercrime can reach the mark of 9000.

The main violations among cybercrimes are crimes in the field of payment systems (about 40%). Therefore, security measures have to be improved in this sphere to reduce cybercrime.

Improving of e-commerce security and cybersecurity (countering sellers, coders, stealing databases, etc.) also remains urgent.

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CONCEPTUAL DISPLAY OF MARKET EVOLUTION AND CIVILIZATION AS A SINGLE PROCESS

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КОНЦЕПТУАЛЬНОЕ ОТОБРАЖЕНИЕ ЭВОЛЮЦИИ РЫНКА И ЦИВИЛИЗАЦИИ КАК ЕДИНОГО ПРОЦЕССА

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