



Importance of the Information Environment Factor in Assessing a Country's Economic Security in the Digital Economy

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<https://doi.org/10.18280/ijssse.120604>

ABSTRACT

Received: 13 October 2022

Accepted: 9 November 2022

Keywords:

digital economy, digital methods, economic management, economic security, flexible economy

The purpose of the article is to analyze the influence of the information environment factor on the assessment of a country's economic security in the digital economy. This work is devoted to the actual problem of managing a country's economic security. The methodology proposed in the paper for assessing the level of economic security is based on a comprehensive analysis and assessment of the main factors affecting economic security. In this context, proposals are developed for the use of digital methods for assessing the impact of various factors on a country's economic security, which will allow for obtaining various simulated data on an automated basis. Based on the data obtained, artificial intelligence develops solutions to improve the efficiency of economic security. The results of the study show that there is a strong correlation between the set of selected factors of economic security and the factor of the information environment. As a result, an increase in the influence of factors causes an increase in the level of security of the information environment, and a decrease in threats to the information environment of a country has a positive effect on its development.

1. INTRODUCTION

All states should pursue a balanced economic policy in the modern market economy, where ensuring the security, independence, and flexibility of the national economy is a key component. A country's economic security is a necessary condition under which it is possible to ensure the achievement of the national interests of the state, in particular, improving the living standards of the population, comprehensive modernization of the economy, cooperation, and increasing the competitiveness of the national economy in various international markets [1-6].

In general, economic security is a state of the economy that ensures a sufficiently high and steady growth of economic indicators, as well as the ability to effectively meet the economic needs of the population [4, 5, 7].

Most processes are being transferred to the digital or virtual world in the modern world, against the background of the industrial revolution 4.0 [8-10]. This is because countries find a lot of advantages in using digital technologies to solve pressing problems of society in various spheres of social, economic, and political development. Thus, companies are increasing sales volumes and developing customer bases, which contributes to obtaining super profits due to the spread of the Internet of Things and online trading platforms. The

introduction of systems such as electronic administration allows for reducing the time and money spent on servicing citizens and improving the quality of administrative services.

Thus, civilization has entered the era of the information society, in which information becomes a decisive factor in many spheres of life. The information environment has become a system-forming factor in the life of society and actively influences the state of a country's economic security. Today it is almost impossible to find a plane of social activity that would not be influenced by information technology: politics, law, economy, medicine, education, culture, religion, services, and entertainment.

The purpose of the article is to analyze the influence of the information environment factor on the assessment of a country's economic security in the digital economy.

The article consists of an introduction, a review of the literature on the research problem, a description of the research methodology, research results, a discussion of the results, and a conclusion.

We conclude that economic security is a key basis for the long-term development of a country, which must be assessed and managed using modern digital methods that allow making timely decisions regarding the factors affecting its level. The factors affecting the economic security of a country are of complex importance, including various market and non-

market processes. There is a strong correlation between many socio-economic and political factors of economic security and the information environment factor. As a result, an increase in the influence of socio-economic and political factors causes an increase in the level of security of the information environment, and a reduction of threats to the information environment of the country has a positive effect on its socio-economic and political development.

Literature review

The issues of economic security in the context of the information environment are considered by many scholars. We note works [1, 11-14], paying considerable attention to this problem. The issues of solving security problems in the information environment at the macro level, namely the development of the protection of the critical infrastructure of the state, are covered in studies [15, 16]. It is also possible to distinguish scholars who are engaged in the development of a system for a comprehensive assessment of the level of security culture in the information environment at the level of individual business entities [17-19], integrated approaches to combating information threats, and ensuring an appropriate level of security [20, 21].

Along with this, in the context of the information environment, issues of ensuring state economic security are of particular importance. A significant number of scientific works are devoted to the study of the problem of economic security, in particular, [22-25].

Scholars study economic security at different levels of socio-economic systems, in particular, at the state, regional, and individual enterprise levels. They consider various types of state economic security and its components, in particular, economic, financial, food, etc. security is considered.

Sources studying economic security in the information environment can be classified into three basic groups:

1) sources considering economic security in the information environment mainly from the perspective of information and communications (computer) technologies and highlighting the dangers of a purely technical order. Thus, in the study [26], security in the information environment is discussed as the protection of the infrastructure from harmful accidental/intentional impacts.

2) sources presenting a doctrinal-political and legal understanding of security in the information environment in its connection with national and state security. Supporters of this point of view believe that economic security in the information environment is the state of security of society, the state, the information and technical infrastructure, and the economy, in which their normal functioning is achieved regardless of internal and external information influences [6, 27-29].

In the context of a sociological understanding of economic security in the information environment, one considers the correct alignment of social perception to build an adequate picture of the social world [1].

Some authors, in understanding state economic security in the information environment, tend to interpret it in an information-military way, using the criminological and military field thesaurus to describe the threats that may arise as components of this type of security (special information operations, acts of foreign information aggression, information terrorism, illegal removal of information using special technical means, computer crimes, and other destructive information influence) [5].

3) sources presenting a sociological understanding of economic security in the information environment as a

component of cultural and social security. Thus, in publications on the theory of social security [17, 18], economic security is interpreted along with political, military, religious, ideological, and cultural security as a system of tools for minimizing social macro stress.

The authors of [17] rely on the theory of social macro stress, in which social macro stress is considered a generalized indicator of a certain number of synchronized stimuli in the information space, the spread of which leads to disruption of the normal functioning of social institutions. This indicator is considered in connection with the process of globalization, which carries with it the corresponding information risks due to the circumstances of the emergence and spread of electronic communications and virtual infrastructure [18].

Since globalization becomes possible as a process that unfolds in the context of the information society [30], this direction of research is associated with the sociology of globalization and the sociology of the information society with the corresponding paradigms and theoretical schemes for the connection between economic security, the information society, and globalization shifts in the architectonics of the information environment against the backdrop of the activities of the media and electronic communications.

The issues of analyzing the specific features and modern context for the formation of state economic security in the information environment and determining the factors affecting state economic security and ensuring its level remain important. Separately, we should note the definition of the transformation of threats in the modern context of the information environment [31]. Therefore, the problem of the information environment factor in assessing a country's economic security in the digital economy requires research.

2. METHODS

The effective use of static standard methods is insufficient to assess a country's economic security in modern conditions. It is necessary to analyze and evaluate the significance of various factors on a continuous and automated basis to effectively assess a country's economic security. Factors affecting a country's economic security are usually dynamic and correlated. Thus, it is necessary to analyze big data, which is possible using digital methods, to obtain comprehensive information about the level of a country's economic security [17, 26].

In our research, we proceed from the fact that a country's economic security is influenced by market and non-market factors, which should be considered in the following main directions [18, 32]:

1. Production;
2. Energetics;
3. Finance;
4. Personnel;
5. Internal political situation;
6. Foreign policy situation;
7. Ecological environment;
8. Information environment.

The factors that we identified that affect economic security were evaluated on a 100-point scale. The more points a particular factor has, the higher the level of security for the economy.

The influence of economic security factors must be considered in a complex [22, 33, 34].

The functional dependence of economic security on the level of security of the listed factors is as follows:

$$ES = F(PS, ENS, FS, ISS, PLS, ILS, EcoS) \quad (1)$$

where, PS – process safety; ENS – energy security, FS – financial security, ISS – intellectual and personnel security, PLS – internal political security, ILS – foreign policy security, EcoS – ecological security, INS – information security.

The presented factors of economic security are mutually dependent and complementary; therefore, we considered them in complex and keep in mind that the impact on one component will directly or indirectly lead to some changes in other factors.

We carried out a correlation of economic security factors.

We applied methods of big data analysis and forecasting in MySQL and Python to assess a country’s economic security. We assessed the state of economic security, analyzed the mutual influence of factors, and managed them based on the set goals with the help of these groups of digital tools [13, 23].

Next, we used the data obtained as a result of correlation analysis by a Python-based program. This made it possible to assess the level of economic security according to the 100-point system. Each factor, in turn, was reflected based on the level of security for the economy. Thus, the level of economic security directly depends on the levels of security for the economy of each factor. A graphical representation of the security level is shown in Figure 1.

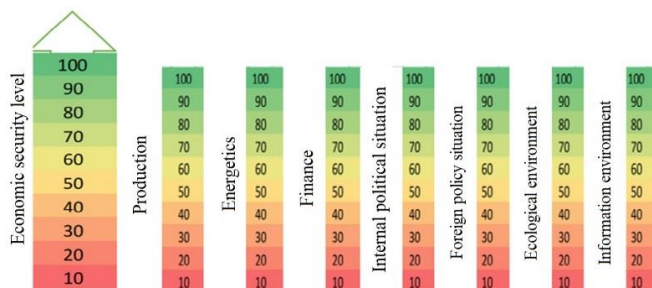


Figure 1. Security levels of economic security factors

If the indicator is below 30, then a country's economic security is at a chaotic level.

If the indicator is from 30 to 50, then a country's economic security is at the pre-crisis level.

If the indicator is from 50 to 70, then a country's economic security is at a controlled level.

If the indicator is above 70, then a country's economic security is at a stable level.

3. RESULTS

The results of calculating the correlation of economic security factors are presented in Table 1.

Table 1. Correlation between economic security factors

	Production	Energetics	Finance	Personnel	Internal political situation;	Foreign policy situation	Ecological environment	Information environment
Production		0.768	0.843	0.675	0.543	0.458	0.249	0.712
Energetics	0.768		0.539	0.124	0.321	0.142	0.078	0.547
Finance	0.843	0.539		0.165	0.633	0.614	0.489	0.776
Personnel	0.675	0.124	0.165		0.435	0.545	0.117	0.495
Internal political situation;	0.543	0.321	0.633	0.435		0.573	0.597	0.864
Foreign policy situation	0.458	0.142	0.614	0.545	0.573		0.538	0.832
Ecological environment	0.249	0.078	0.489	0.117	0.597	0.538		0.521
Information environment	0.712	0.547	0.776	0.495	0.864	0.832	0.521	

Correlation analysis of the mutual influence of various socio-economic and political factors of economic security (Table 1) shows the presence of positive relationships between them, which indicates a significant increase in the values of some factors with a corresponding increase in the values of other factors. Thus, the “production” factor has numerous close correlations with such socio-economic and political factors as finance (0.843), energy industry (0.768), information environment (0.712), personnel (0.675), and internal political situation (0.543), i.e. with an increase in the values of the listed factors, the real economy (production) grows.

Close correlations were also noted between the “finance” factor and such factors as the information environment (0.776), domestic political situation (0.633), foreign political situation (0.614), and energy industry (0.539), which indicates the mutual influence of the financial situation of a country with the development of the information environment and energy

industry, as well as favorable domestic and foreign political processes.

In terms of the problem under study, there is a strong correlation between the information environment factor and most of the selected socio-economic and political factors of economic security (Table 1). Thus, the closest correlations were obtained between the factor of the information environment, on the one hand, and such market factors as finance (0.776) and production (0.712) and such non-market factors as domestic political situation (0.864) and foreign political situation (0.832).

As a result, an increase in the influence of socio-economic and political factors causes an increase in the level of security of the information environment. A reduction of threats to the information environment of a country has a positive effect on its socio-economic and political development in terms of such indicators as production, finance, and energy industry and also favorably affects the state of the ecological environment and

internal and external political situation.

The results of the assessment of the level of economic security factors are presented in Table 2.

Table 2. Assessment of the level of economic security factors

Factor	Assessment of the security level	Level Characteristics
Production	64	controlled level
Energetics	88	stable level
Finance	57	stable level
Personnel	63	controlled level
Internal political situation;	79	stable level
Foreign policy situation	59	controlled level
Ecological environment	61	controlled level
Information environment	66	controlled level

4. DISCUSSION

As the results of the study show, the factor of the information environment occupies a special place in the system of economic security. Therefore, information threats can be directed to any structural components of economic security, but their negative impact will always be mediated by the task of harming the economic security of the state as a whole. In particular, as research confirms [26], economic security in modern conditions of the information and network economy directly depends on information security because the main resource for the development of production is the information product.

Under the influence of information attacks, the worldview and morality of both individuals and society as a whole can change; other people's interests, motives, and lifestyles are imposed. The analysis of the essence and forms of modern methods and actions of hidden aggressive influence, contradicting the interests of national security, comes to the fore.

Consequently, the system of threats to the information environment has a complex character and generally includes threats to the security of information and information infrastructure; threats to the security of subjects of the information environment and social relations between them from information influences; threats to the proper procedure for the implementation of the rights and interests of subjects of the information sphere. Thus, threats to the information environment of the state are a set of conditions and factors that pose a danger to the vital interests of the state, society, and the individual in connection with the possibility of a negative information impact on the consciousness and behavior of citizens, as well as information resources and information technology infrastructure [32].

Since there is a fairly close relationship between the constituent factors of economic security and the factor of the information environment, the level of security of the information environment, in turn, depends on the level of development of a country's economic security as a whole.

Countries with high economic potential have increased opportunities to resist various threats to the information environment; their financial capacity to organize additional measures and attract more modern technologies and qualified

specialists is growing. However, in these countries the risk of cyberattacks, information terrorism, and cyber fraud increases. Thus, it is necessary to conduct an additional study of the impact of the level of threats on the information environment in different countries.

The developed algorithm in the program also made it possible to assess the level of economic security on an automated basis and identify those factors that are of low importance. Then, using the program, it is possible to find out which specific component in the factor of economic security is problematic.

The developed algorithm for assessing economic security should assess the impact of all factors both on the overall level of economic security and on other factors on an automated basis, which will make it possible to make strategic decisions to improve the level of a country's economic security.

It is necessary to consider all factors and, influencing one factor, monitor changes in other factors to assess the level of economic security. The relationship between different factors can be very dynamic. Consequently, it is advisable to assess a country's economic security using digital methods [24, 25]. Each factor is evaluated according to the same principle.

The results of the study (Table 2) show that a country's economic security is at a stable level due to the state of factors such as energy and the internal political situation. A country's economic security is at a controlled level according to the state of factors such as production, finance, personnel, foreign policy situation, and ecological and information environment.

If the security level of an individual factor for the economy falls below 50, efforts should be directed to balance the influence in the market environment. Since all the factors of economic security are interdependent and mutually complementary, it is possible to assume a low level of one factor while compensating with a high level of another. In this context, it is necessary to develop an additional tool that will also assess the importance of each factor for a country's economy.

Summing up the study, it should be noted that the digitalization of economic processes is one of such global trends in the development of modern society. Today, the dynamic impact of digital technologies is felt everywhere in almost all sectors of economic activity at different levels of the national economy. In recent years, the information and communication industry has acquired a dynamic level of development. The economies of the developed countries of the world are already at a more progressive level of development, which is characterized by the dominance of information technology and computers and can significantly improve the efficiency of business processes in all areas of economic activity.

Thus, the intensive informatization of economic processes has led to the fact that the issues of economic security are increasingly intertwined with information security. In turn, information security acquires a significant economic aspect. This is due to the transformation of information into a commodity and the most important resource for the development of the economy, the dynamic development of the information market, and the growth in the share of information and communications sectors of the economy.

Given the foregoing, it is proposed to understand economic security in the information environment as a complex system that ensures the protection of the vital interests of citizens, society, and the state in the economic sphere from internal and external information threats [35]. The latter in this definition

acquire the status of information and economic threats – a set of conditions, factors, and events that determines the effectiveness of internal and external destructive information impacts on the economic condition of a country, thereby creating a danger to the economically important interests of the individual, society, and the state.

The most characteristic examples of such threats are theft (modification, distortion, etc.) of economic information; theft of information products [28] that ensure the economic growth of a country; violation of the functioning of information and communications systems and the destruction of information infrastructure; information attacks against subjects of economic relations; unforeseen economic problems due to socio-political turbulence; changing the worldview of the leadership of a country and/or key economic structures through information and psychological impact [36].

Considering the views of researchers in this area and based on our results, it can be argued that the solution to the problems of ensuring economic security in the information environment should be focused on the most important and acute problems affecting the economic state:

1. The development of scientifically based views on the interpenetration of economic and information processes at a new stage in the development of society, which will improve the legal framework regarding the regulation of issues of the benefits of informatization in the development of a country's economy.

2. Study of the essence of prospective economic threats and risks in the information environment, which will make it possible to timely and objectively predict the deterioration of the information and economic situation and possible losses to the vital interests of the individual, society, and the state.

3. Construction of effective concepts of information counteraction in the economic sphere, which will create prerequisites for preventing political destabilization due to public dissatisfaction with the economic situation and quality of life.

4. Creation of promising information products, information technologies, and automation tools, which eliminates the dependence of economic growth on foreign manufacturers.

5. The possibility of violating the modes of state functioning and public information and communications systems and the destruction of the information infrastructure of a country or its main components.

The solutions to these problems require the formation of a new interdisciplinary field of scientific knowledge, the main purpose of which will be the development of methods and means of using the information environment to solve problems of economic security. The main goal of the theory of economic security in the information environment should be not just a description of information relationships in the economy, but also the substantiation of their relationship and interdependence with the state of national security. Among the main tasks of the theory of economic security in the information environment are:

- the study of the impact of changes in society on the pace of economic development in a country, regions, corporations, and individual economic entities;

- the identification of mechanisms for the formation and development of internal and external economic threats in the information environment and methods of information warfare in the economic sphere;

- the study of patterns of information impact on the worldview of the economic elite.

To conduct scientific research in this area, joint efforts of various specialists (economists, information systems specialists, lawyers, etc.) will be required.

5. CONCLUSION

1. Economic security is a key basis for the long-term development of a country, which needs to be assessed and managed using modern, digital methods that make it possible to take timely decisions regarding factors affecting its level.

2. Factors affecting a country's economic security have a complex meaning, including various market and non-market processes. It is proposed to evaluate all factors of economic security according to a 100-point system, based on their significance for a country's economy. In this context, it is necessary to take into account that a change in one factor will lead to a change in other factors.

3. Modern digital analysis tools can be used, which will allow obtaining various simulated data on an automated basis to assess the impact on a country's economic security of the factors under consideration. Artificial intelligence develops solutions to improve the efficiency of economic security based on the set goals of economic development based on the data obtained.

4. There is a strong correlation between the set of selected socio-economic and political factors of economic security and the factor of the information environment. As a consequence, an increase in the influence of socio-economic and political factors causes an increase in the level of security of the information environment, and a decrease in threats to the information environment of a country has a positive effect on its socio-economic and political development. Therewith, a country's economic security is at a stable level due to the state of factors such as energy and the internal political situation. A country's economic security is at a controlled level according to the state of factors such as production, finance, personnel, foreign policy situation, and ecological and information environment.

The limitations of the study include the limited access to data characterizing food, energy, financial, intellectual (personnel), environmental, domestic, and foreign political security, as well as the functional limitations of the digital tools used in the study, through which the assessment of the state of economic security and analysis of the mutual influence of economic security factors were carried out.

The prospect of further research may concern a deeper study of the stated research problem using new data, constantly changing in today's volatile economic environment, and more effective analytical tools.

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