



# MODELING AND TECHNOLOGY OF PUBLIC ADMINISTRATION OF SOCIO-ECONOMIC SECURITY FOR DIGITALIZATION

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## ABSTRACT

*The article explores the development prospects of the socio-economic security management considering the potential of digitalization as well as the elaborated strategies of public administration for the coming years. The definitions of digitization, social and economic security are systematized in the article. At the same time, the hierarchy of legal regulation is shown. This makes it possible to assess what legislation regulates economic and social security. It is substantiated that social and economic growth is possible not only under conditions of society development in a whole, but also under conditions of the national economy growth that includes the growth of gross domestic product and remuneration level along with the digitalization of the economy. The article examines the interdependence of various indicators, in particular, the impact of information and communication technologies on social and economic indicators of Ukraine's development level. The study of the dependence of socio-economic development level on the level of digitalization was also carried out. In particular, a correlation and regression analysis was conducted, which confirmed the high dependence between the above indicators. As a consequence, a model for forecasting the development of socio-economic status depending on the level of expenses on innovation of industrial enterprises was created. This model allows*

*predicting the level of minimum wages in the country in line with changes in GDP and the costs of digitization. In order to promote the digitalization in Ukraine, the main strengths and risks the country may face during the implementation of these measures were identified. The article presents the main risks that can arise in the economy of the country during the transition to digitalization.*

**Keywords:** Digitalization of Economy, GDP, Poverty Alleviation, Socio-economic Security

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## 1. INTRODUCTION

The digital age requires digitalization in all areas of human activity, taking into account the priorities on which the economy is being built. Nowadays, the socio-economic security in Ukraine is the basis for constructing the economy of the future. Crises and negative processes that have affected not only the economy of Ukraine but many other countries as well, led to the aggravation of both property and digital inequality, the increase in the number of people living beyond poverty line and the decline in moral and creative potential.

All this contributes greatly to the emergence of social conflicts, which creates a real threat to the national security in the situation when a uniting national idea is absent [1].

Developments in the global economy require continuous, comprehensive and objective monitoring of the economy conditions using the key indicators of economic and social security. This involves analyzing and forecasting important economic indicators, as well as implementing the developed mechanisms to counteract security threats and achieve economic stabilization. In recent years, the development of the world economy moves towards digitalization. At the moment, the digital economy of the world accounts for 15.5% of the global GDP, but this figure is expected to be 24.3% by 2030 [2].

Digitalization is considered one of the most important drivers of the global economic growth for the coming decade. The most obvious gain of digitalization is the direct improvement of the company's productivity. However, there is also a set of indirect benefits as follows:

- saving time;
- creating a new demand for new products and services;
- new quality and value of goods and services.

Of course, digitalization has both advantages and disadvantages. All experts agree that the main risk of digital transformation of the economy is the possible rise of unemployment rate. In Ukraine, total digitalization may lead to the loss of jobs by the citizens in certain industries and sectors. At the same time, it is the digitalization that hides an enormous potential of creating new directions, which in a few years or even months will promote a new demand for 'hands and brains', thus becoming the basis of the industrial revolution.

The main purpose of the study is to determine the impact of digitalization on the conditions of economic and social security of the country and define the main directions of state policy regarding socio-economic security in terms of digitalization.

## 2. LITERATURE REVIEW

Digitalization is of particular relevance at the present stage of development of the Ukrainian economy. In general, the issue attracts much attention in the scientific community. The various aspects of digital economy were explored [3]-[7].

The very term ‘digital economy’ was first introduced in 1995 by the American scientist [8]. However, the concept has no unambiguous interpretation. Many researchers in Ukraine believe, that knowledge, information or network represent the basis for digitalization. The authors who consider digitalization as the automation of knowledge volumes and data exploration, which leads to changes in management practices, are also correct [9]. Conceptual foundations of the digital economy were explored [10], prospects of the digital economy and its impact on innovative growth were described in [11] and [12] dealt with the applied problems.

The analysis of these sources makes it possible to conclude on the ambiguous interpretation of the principles of digital economy in the period of socio-economic transformations which relate to the informatization of society. However, there is an awareness of the issues in the scientific and expert circles that contributes to the development of digital infrastructure tools.

According to the Ukrainian Institute of the Future [2], digitalization should be considered as an instrument and not a goal in itself. The scientists and experts of this institute have developed the basic principles of digitalization, which must be followed.

The first principle is based on overcoming digital inequalities, i.e. the situation when only certain individuals have access to knowledge or information. The second principle refers to the introduction of digitalization in all spheres of life, including health care, education, jobs creation, business development, agriculture, transport system, environmental protection, overcoming poverty, etc. The third principle concerns the development of digitalization in order to increase the competitiveness of products, industries and the country as a whole. The fourth principle is devoted to the development of the information society and the media, in particular the creation and dissemination of the Ukrainian content. The fifth principle deals with focusing on Ukraine's international cooperation and its integration with the EU and entering the world markets. Standardization is the sixth principle that allows to create standards and platforms for infrastructure that can be used by citizens, businesses and the state. Another important principle is to increase public confidence and security. Thus, digitization can become a key focus of public administration aimed at the improvement of the entire socio-economic sphere.

As for the formation of socio-economic security, such issues were studied in [13]-[18]. As for the influence of state policy and the level of social development, it is reflected in the works of domestic and foreign scholars. In [19], [20] was explored the importance of powerful globalization processes in developed countries and the mechanisms of interaction between the state and society, as well as the concept of interaction between the state and society in the conditions of state functioning.

Constructive elements of legal support for economic and social security are legal means of administrative and legal influence on public relations, which arise in connection with the organization and implementation of this activity. Legislative acts and regulations will be shown in the order of the force of influence.

The Constitution of Ukraine provides for the formation of economic and social security. The same issues are governed by the principles and norms of international law, international treaties of Ukraine, laws, and regulations of the President of Ukraine, the Cabinet of Ministers, etc. Legislation has a vertical structure that has arisen because of the different legal force of acts created by different institutions. However, the legal integrity of the structure is formed by the Constitution of Ukraine, which harmonizes these normative legal acts. The

basic norms of the constitution have the greatest influence and are the highest level of the system of legislation.

The essence of socio-economic security is being researched by many Ukrainian scientists. Apart from this, the issue is regulated by the Ministry of Economic Development and Trade. In particular, this body defines social security as a level of development at which the state can provide a decent and quality standard of living for its citizens, regardless of the influence of internal factors and threats. When it comes to economic security, the same body defines it as a state of the national economy, which maintains resistance to internal and external threats and ability to meet the needs of both the population and the state.

Some scientists consider, that social security is a reliable protection of vital interests of the population [21]. At the same time in [22] was considered, that economic security is a state of economy that provides stability and ability to adapt to adverse consequences of internal and external processes. A broader definition is given in [23], where is noted, that economic security is a complex category comprising multiple factors that characterizes the ability of the national economy to expand in order to meet the needs of both its population and the state and to counteract the destabilizing effects of the factors that threaten a sustainable competitiveness of the national economy in the global economic system.

Having analyzed various views of scientists on the essence of socio-economic security, we can draw the following conclusions on its key features:

- economic security – resistance to threats, economic independence and stability, economic progress (self-reproduction and self-development), protection of economic interests;
- social sphere – resistance to threats, protection of social interests, effective social policy, quality of life.

### 3. HYPOTHESIS

Experience of the developed countries shows that digitization is capable of delivering economic growth, while simultaneously creating conditions for its own development at the expense of numerous factors that exert a direct impact on the economy, social system, technology and intellectual component of development.

The relationship between information and communication technologies and socio-economic development has been explored by various scientists [24]. In particular, mathematical models have been developed that determine a GDP-related impact of digitalization [25]. Economists began to conduct such type of research since 1987, when a sharp increase in sales of computers happened, affecting positively the economic growth [26].

When it comes to Ukraine, it is difficult to talk about the impact of digitalization on the socio-economic conditions, since the main factors that characterize both the level of digitalization and the socio-economic state of the country are pretty unclear.

We assume that the development of digitalization has a really important impact on the socio-economic state of the country. Therefore, we put forward a hypothesis that is based on the improvement of socio-economic state depending on the level of digitalization costs.

### 4. METHODOLOGY

This paper makes use of a set of general scientific and special research methods. General scientific and special methods have been used to study the nature and characteristics of economic security, social security and digitalization. Structural and functional method was applied while studying the contradictory nature between the relationships and parameters of the mechanism of the socio-economic component of the state's economic security. Methods of system and comparative analysis were used when considering the legal framework and the references covering the issues under study.

Synthesis was used to study the economic and social development as well as the level of digitalization, while index and factor analysis – when determining the influence of various factors on the security situation in the country. Economic and statistical analysis proved its efficiency when studying the state of social and economic security within a certain period, identifying the link between the level of digitalization and socio-economic state of the country [27].

The use of correlation analysis is also tightly associated with the regression analysis. The main objectives of this analysis are to determine the correlation form, measure the density of correlation and identify the influence of factors on the resulting indicator.

Correlation analysis is carried out in several stages. In the first stage, causal relationships between the indicators are defined. In the second stage, the correlation-regression model is formed. The third stage is aimed at determining correlation characteristics. In the fourth stage, a statistical evaluation of the correlation parameters is carried out.

## 5. RESULTS

According to the estimates provided by the EU, its members would lose €600 billion annually, if the digital transformation were halted [28]. At the same time, scientists have examined the relationship between the digitalization level and the social development level [25]. The results are provided in Table 1.

**Table1.** Dependence of the country's development on the digitization of the economy [24]

Country's digitalization stage / Percentage of digitalization			
Constrained development	Emerging	Transitional stage	Advanced stage
0-30	30-40	40-50	More than 50
65 countries (Afghanistan, most of African countries, Moldova, Nepal, India, Uzbekistan, Vietnam, etc.)	19 countries (Albania, Armenia, Brazil, Georgia, China, etc.)	28 countries (Argentina, Estonia, Latvia Iran, Serbia, Turkey, Ukraine, etc.)	37 countries (Australia, Austria, Belarus, Scandinavian countries, France, Germany, Poland, Hong Kong, Japan, the USA, Great Britain, etc.)

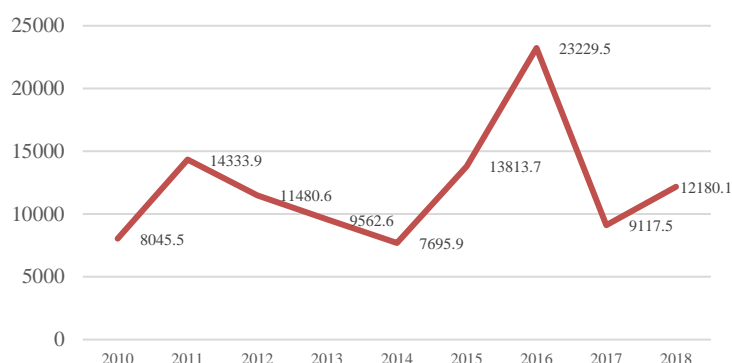
Ranking the countries by the digitalization level of their economy allows to determine four groups of countries. The first group includes countries with a digitalization rate from 0 to 30%. These are the least developed countries characterized by the lowest GDP and the worst positions in international human development indices. The second group represents countries that develop due to a cheap labor and a large amount of natural resources. The third group includes countries that are characterized by an average level of digitalization [24]. Ukraine is among these countries, implementing a strategy of entering the number of countries experiencing the 4<sup>th</sup> stage of digitalization. The year 2030 is defined as the deadline.

The main criterion for determining the level of innovative development is the global innovation index, which forms an annual rating. According to this rating, Ukraine occupies the 47<sup>th</sup> place in 2019 with the index value of 37.40 out of 100 [29]. The average level is 33.86 for 2019. A special DCR indicator (Digital Competitiveness Ranking) is used to determine the country's place in the world ranking. Ukraine has a score of 55,255 out of 100 and is ranked 60<sup>th</sup> in the world ranking [30].

In order to improve their state of digitalization, Ukrainian enterprises must switch to computerized technological processes that allow to automate not only technological but also financial processes. Currently, there is no separate data on the level of enterprises' digitalization in Ukraine.

However, due to the public statistics, it is possible to obtain information on the expenses of enterprises on innovative development, which largely happens due to the digitalization. Figure 1 shows that spending on innovations is not uniform and the highest level of these expenses was recorded in 2016. Ukrainian enterprises invested UAH 23.2 billion in production innovations. In 2017, there was a significant decline in investments in innovation development to the level of UAH 9 billion, but as of 2018, the volume of investments increased to UAH 12.1 billion.

Let’s examine how these costs affect the formation of socio-economic security of Ukraine. The socio-economic security of a country is determined by various indicators. The indicator of gross domestic product provides a notion about the development of the economy as a whole. Inflation rate and public debt are also bright indicators that are frequently used for assessing the level of economic security. However, unlike GDP, public debt and inflation do not have close correlation with investments in digitalization.



**Figure 1.** Volume of investments in innovative activity by Ukrainian industrial enterprises [31]

According to the reports of the Ministry of Finance of Ukraine, the level of consumer inflation decreased from 113.77% to 109.8% during 2017-2018. It can be argued that after the economic crisis of 2014-2015, which was accompanied by high inflation, monetary market stabilized (Table 2). The dollar exchange rate in 2018 decreased by 1.35% compared to 2017 and amounted to UAH27.68 per \$1 in 2018. When it comes to GDP, this indicator grew by 26% during 2018, which is a good value. Nominal GDP increased by 19% during 2017-2018. Real GDP growth was mainly driven by household consumption, which increased significantly due to the rising incomes and relatively high consumption expectations. In turn, income growth was driven by higher wages as well as the increase in the volume of money transfers from abroad made by migrant workers. According to the State Statistics Service of Ukraine, real wages increased by 12.5% in 2018. Agriculture is also of great importance for GDP growth, as record harvests of oil and grain crops have taken place over the last year. However, despite the strong growth of gross domestic product in the first half of the year, production and export volumes were moderate in the second half and the performance indicators even deteriorated, which generally led to a slowdown in investment activity.

**Table 2.** Comparative analysis of monetary policy performance [31]

Indicator	2014	2015	2016	2017	2018
Inflation index, %	124,9	143,3	112,4	113,77	109,8
US dollar exchange rate, %	15,856	24,001	27,191	28,067	27,688
Real GDP, UAH million	1365123	1430290	2034430	2445587	3083409
Nominal GDP, UAH million	1586915	1988544	2385367	2983882	3558706
M2, UAH million	908994	956728	1102317	1208557	1285736,4
Level of economy monetization, %	57,3	48,1	46,2	40,5	36,1

Undoubtedly, the main indicator of measuring the social development is the minimum wage, which indicates the overall poverty level in the country. In addition, there is a set of non-monetary indicators like average standard of living, unemployment, morbidity, mortality, fertility, etc. Since wage is the main monetary indicator measuring social security, it is possible to examine the correlation between the minimum wage rate and GDP.

Let's provide statistical information on the level of minimum wage, expenses on innovations and GDP in Table 3.

**Table 3.** Minimum wage, expenses on innovations and GDP of Ukraine in 2010-2018 [31]

Year	Minimum wage, UAH	GDP, UAH million	Volume of Innovations, UAH million
	Y1	X1	X2
2010	1218	1082569	8045,5
2011	1218	1316600	14333,9
2012	1218	1408889	11480,6
2013	1378	1454931	9562,6
2014	1378	1566728	7695,9
2015	1450	1979458	13813,7
2016	1600	2383182	23229,5
2017	3200	2982920	9117,5
2018	3723	3558706	12180,1

Correlation between GDP and the minimum wage for nine years is 0.94, which indicates there is a fairly tight relationship between the indicators and proves that these indicators can be used to build a model of dependence of socio-economic indicators on innovation spendings (Table 4).

**Table 4.** Indicators of regression statistics

Multiple R	0,98
R Square	0,96
Adjusted R Square	0,95
Standard Error	205,6
Observations	9

Therefore, the main task of the study is to show the impact of digitalization on the indicators of socio-economic development of the country. The main indicator that determines the impact of digitalization is the expenses on innovative development of industrial enterprises. The main indicator of economic development of the country is its GDP. The main indicator of socio-economic development is the minimum wage.

Let's determine the closeness of relationship between the expenses on innovation development, GDP and minimum wage. The calculations will be made in Table 5. According to the table's data, there is a very tight relationship between the indicators amounting to 0.98. In addition, it's obvious that the minimum wage is influenced by GDP and the expenses on innovative development by 96%. The remaining 4% are represented by other factors that also affect the minimum wage. The period of study is nine years. According to the regression analysis results, the relationship between the studied indicators exists and the error in determining the resulting indicator (minimum wage) is 205.6 UAH. Let's study the statistical coefficients that will help determine the level of dependence. Calculations are made using Excel software (Table 6, Figure 2).

According to the table's data, it is possible to make a formula of dependence between the studied indicators:

$$Y = 0.01X_1 - 0.0587X_2 + 304.18 \quad \text{F.1}$$

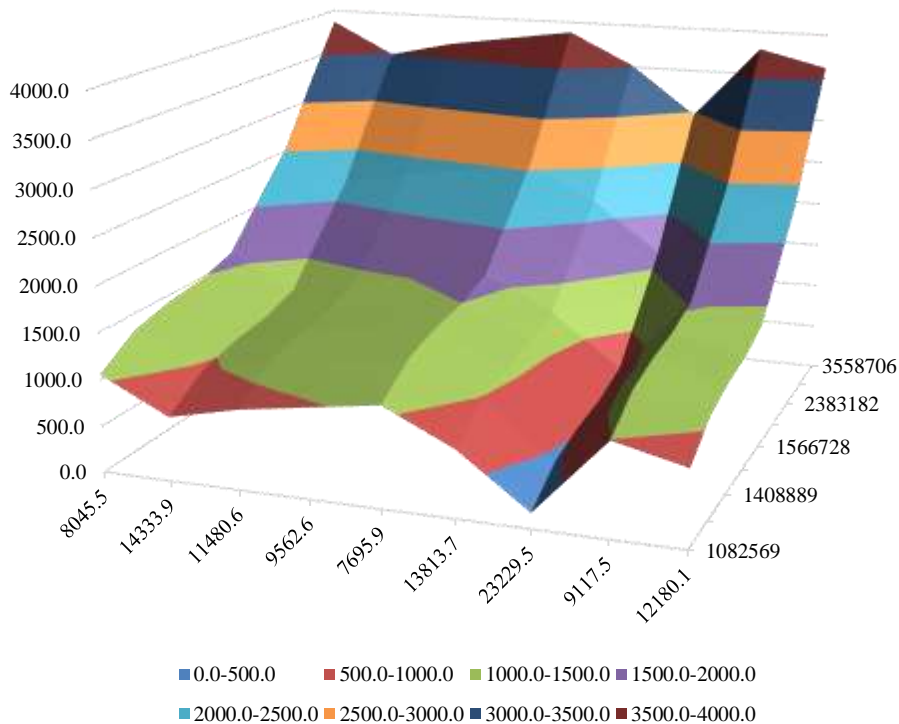
where: Y – minimum wage; X<sub>1</sub> – GDP; X<sub>2</sub> – expenses on innovative development of enterprises.

**Table 5.** Calculation of statistical indicators of correlation and regression analysis

	Coef.	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%
Intercept	304,18	237,07	1,28	0,247	-275,87	884,2	-275,85
X Variable 1	0,001	8,867	12,8	1,417	0,00097	0,001	0,0009
X Variable 2	-0,0587	0,016	-3,76	0,0097	-0,096	-0,02	-0,0968

**Table 6.** Model of dependence of the minimum wage level on GDP and expenses on innovative development of the enterprises

	8046	14334	11481	9563	7696	13814	23230	9118	12180
1082569	1058	688,1	855,5	968,1	1077,6	718,6	166,0	994,2	814,5
1316600	1322	952,9	1120,4	1232,9	1342,5	983,4	430,8	1259,1	1079,3
1408889	1426	1057,4	1224,8	1337,4	1446,9	1087,9	535,3	1363,5	1183,8
1454931	1478	1109,5	1276,9	1389,5	1499,1	1140,0	587,4	1415,6	1235,9
1566728	1605	1236,0	1403,4	1516,0	1625,6	1266,5	713,9	1542,1	1362,4
1979458	2072	1703,1	1870,5	1983,1	2092,7	1733,6	1181,0	2009,2	1829,5
2383182	2529	2160,0	2327,4	2440,0	2549,6	2190,5	1637,9	2466,1	2286,4
2982920	3208	2838,7	3006,2	3118,7	3228,3	2869,2	2316,6	3144,8	2965,1
3558706	3859	3490,3	3657,8	3770,3	3879,9	3520,8	2968,2	3796,5	3616,7



**Figure 2.** Graphic depiction of the dependence of minimum wage level on GDP and expenses on innovative development of enterprises



According to the results of the research, it is proved that digitalization really influences the level of socio-economic security of the country. Considering the aforementioned model, with the increase in the level of digitalization, the standard of living of the population will improve.

## 6. DISCUSSION

The issue of digitalization of the economy is quite debatable in scientific and expert circles. Despite the fact that a set of measures is planned to be implemented to improve the level of digitalization of the Ukrainian economy by 2030, there are still many challenges that may destroy all the plans for strategic development regarding digitization. On the one hand, when the state officials aren't involved in certain administrative actions, such management becomes corruption-free and transparent. On the other hand, cyber threats are emerging being a key challenge for the digital economy. Over the last ten years, the number of hacking attacks has been steadily increasing, that made public authorities increase their spendings on ensuring safety in digital environment.

Most goods and services are now available online. Undoubtedly, the main advantages are the reduced costs of running business and a broader geographical access to the potential clients. At the same time, online shopping attracts the attention of criminals who, through the trust of Internet users, can engage in theft and fraud. In order to maintain order in the digital economy, it is necessary to set up surveillance services that will not only control but also solve the problems that users encounter.

Generation Z tends to choose the sharing economy, which will increase the number of companies providing the appropriate services. In this case, a social imbalance in a society becomes a challenge, which will eventually lead to the spread of fraud.

The development of artificial intelligence and automation of processes will reduce the cost of production. At the same time, the products may lose their quality and millions of people will find themselves out of work. It will take at least five years for people to master the new professions that a new market needs.

Regarding poverty, it should be noted that the development of computer technologies increases the number of people able to create digital products. In the long run, this will result in higher wages, increasing cash flows in various sectors of the economy.

The impact of digitalization on the informatization of society will also be specific, since there is already a large quantity of sources spreading fake information, which is almost indistinguishable from the true one. Information technologies will only expand. Therefore, in the age of digitalization, there will be constant information wars over the commitment of the people to a particular political party, which can cause permanent destabilization and create socio-economic risks. However, it's necessary to understand that all events relevant to any scenario are not linear and do not take into account the impact of factors that may arise in the future. So, the only right path of Ukraine is to be prepared for the future and not only follow blindly the trends in the world of technology, but also create its own technologies, thus influencing the state, regional and world order and considering the social and economic security of the population as a top priority [2].

## 7. CONCLUSIONS

Management of socio-economic security involves creating such conditions in the country under which the population will feel socially and economically protected and the country will be sufficiently resistant to the challenges provided by external and internal factors. Nowadays, in the era of rapid digitalization, many countries increase the share of digital economy in their GDP every year. Presently, the share of the digital economy in the world's GDP is 15%,

although it is planned to increase it to 24% by 2030. When it comes to the general development of digitalization, the studies conducted in this paper show a clear dependence of the level of the country's development and its socio-economic security on the level of digitalization. In particular, if the share of digitalization is up to 30%, the countries have the lowest development index. As for Ukraine, it is undergoing a transformation stage in terms of the digitalization's share in the economy. However, it should be noted that digitalization is one of the key challenges the current Ukrainian government is trying to cope with. Various measures are constantly being developed to improve the administration at the state level. It is planned to implement the program "State in Smartphone", aimed at reducing the level of corruption and improving the transparency of the document flows in the country.

The paper proves that digital technologies are really important in building national security. For this purpose, a study of the dependence of socio-economic development on digitalization was conducted. The hypothesis was put forward that the minimum wage and GDP depend on the level of expenses on innovative development and implementation of digital technologies. According to the results of the correlation and regression analysis, tight relationship between these indicators was established. GDP and expenses on innovative development of industrial enterprises affect the level of minimum wages by 96%, the other 4% represent the influence of other factors. The simulation results allow to predict the level of socio-economic development depending on the expenses on innovative development of industrial enterprises.

However, the problem of digitalization development remains quite debatable both among economists and experts. On the one hand, there is a set of advantages related to the country's digitalization, which include the increase in the country's development level and improvement of economic and social security. On the other hand, the country has to be completely reformed, as the use of automated production lines and automated management processes releases a large number of workers who will not be able to find jobs until they are retrained. As a result, the process of digitalization at the stage of a full penetration to all sectors of the economy can be a threat to the social development, since a stratification of the population by income may come into effect. But it may also become a driving force of the country's development, if the population is ready for the changes. When it comes to the country's economy, the introduction of digitalization in all sectors of the economy will reduce the price of finished products and simultaneously increase their quality, thus allowing to improve the country's competitiveness.

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