REPUBLIC OF AZERBAIJAN

On the rights of the manuscript

ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

Assessment of the relationship between digitalization of the economy and employment in the Republic of Azerbaijan

Speciality: 5308.01 – "General economy"

Field of science: 53 – Economic sciences

Applicant: **Nusrat Kamal Ibrahimov**

BAKU – 2024

The dissertation work was performed at the "Demography and employment problems" department of the Institute of Economics of the Ministry of Science and Education of the Republic of Azerbaijan.

Scientific supervisor:	Doctor of philosophy in economics, associate professor **Rufat Jahangir Efendiyev**
Official opponents:	doctor of economic sciences, professor **Pari Amirahmed Hasanova**
	Doctor of philosophy in economics, associate professor **Samira Ragif Ahmadova**
	Doctor of philosophy in economics, associate professor **Allahyar Niyaz Muradov**

ED 1.10 Dissertation Council operating under the AR ETN Institute of Economics of the Higher Attestation Commission under the President of the Republic of Azerbaijan

Chairman of the Dissertation council:	Doctor of Economic Sciences, Professor **Nazim Muzaffarli (Imanov)**
Scientific secretary of dissertation council:	Doctor of Philosophy in Economics **Sevda Mammad Seyidova**
Chairman of the scientific seminar:	Doctor of Economic Sciences, Professor **Elshad Yagub Mammadov**

GENERAL CHARACTERISTICS OF THE RESEARCH WORK

Relevance of the topic and level of development. Countries around the world, especially developed countries, are constantly monitoring the innovations that have occurred in industrial sectors. Over time, innovations and revolutions in this field have not only simplified the work done with human labor, but also increased the productivity of production. Naturally, the main mission of the world economy in this direction has been to effectively meet the demands of society members using the most efficient methods.

In the 21st century, the countries of the world have become more familiar with the new industrial revolution than with previous revolutions. This period is also called the digital era. Thus, in the postmodern society, everything from production areas to people's daily activities has been affected by digitalization today. The increasing scope of digitalization has put an end to the limitations of domestic activities and provided their access to the global market.

In the modern era, the economic effects of digitalization have become a topic of global discussion. This is due to the fact that technologies that were once a dependent factor have now improved and become the main factor in the world market. Digital technologies have had a serious impact on the structure of public administration and business sectors, forming new strategic directions. As a result, the world market is constantly getting acquainted with new products and service areas.

In order to catch the “pulse” of the new revolution, it is necessary to meet the requirements of innovation. Information flows, which are considered the “driver” of digitalization, are considered the main capital of the new era. Through this information, new criteria have been set in the economic, social, cultural and environmental spheres of countries, efficient activities have been organized in public administration, and people's lifestyles have changed. Of course, the impact of digitalization is not limited to this. In the modern era, the effects of digitalization on the labor market are more complex. The deep penetration of its new macro trends into

the economy has led to both positive and negative changes in employment areas.

Thus, the revolution in the field of technologies has given impetus to the creation of new jobs. The development of software, e-commerce, digital marketing and other areas has increased the demand for qualified workers. At the same time, digitalization has increased productivity in many industrial sectors, reduced budget expenditures, and led to economic growth by offering more competitive products and services to the market.

On the other hand, it has reduced the need for a number of traditional employment areas and has led to a reduction in the workforce. It is no coincidence that economic concepts such as "structural unemployment" and "technological unemployment" have become more common in recent times. In this context, the main issue is how digitalization will affect the employment level, the work environment, the existing knowledge and skills in the workforce, and what initiatives and challenges it will create in the future.

The integration of the labor market into the digital environment reduces distortions in the authenticity of official data by increasing transparency in the economy. On the other hand, the lack of legal regulations in new areas emerging on digital platforms is among the indicators that increase informality. Digital transformation also has the power to analyze and evaluate gaps in the labor market through new trends. This is essential in identifying and solving problems that will arise in the labor market in advance.

The economy of the Republic of Azerbaijan, which is classified as a "Third World Country" group according to its level of development, has also been affected by digitalization. In order to benefit from the opportunities created by digitalization in our country, various projects are being implemented by state-owned programs and private companies. The Strategic Roadmap for the country's economic prospects sets goals for stimulating the workforce, implementing active employment measures, and integrating into a new business model.

In the modern era, our country is transitioning to a phase of digitalization penetrating traditional economic sectors, changes in

the quality of the workforce, and the creation of new sectors that respond to modern trends. Considering the short-term effects of digitalization on the national economy, it is reasonable to say that there will be major changes in the employment sphere in the near future.

Digitalization has promising opportunities in our country to solve the employment problem of workers, develop areas of the labor market that meet modern requirements, improve skills and habits, strengthen the role of vulnerable segments of the population in employment, and increase productivity and inclusion.

Among the studies on the nature, effects, means and other issues of digitalization, the approaches of Klaus Schwab, Joseph Schumpeter, Claude Shannon, Jeremy Rifkin, Nicholas Negroponte, Don Tapscott should be especially emphasized. The studies of Nikolai Kondratiev, Thomas Mesenburg, Mindel David and Michel Debchak on the impact of technology on the economy, in particular on the labor market, are of great importance. F. Roman, A. Koster, A. Gillis, B. Yovanovitch, E. Brinkolfson, D. Maurice, A. Regalado, M. Marangoz, T. Husyainov and M. Monia have made profound contributions to science with their studies on new trends in digitalization and their impact on the economy. There are approaches by K. Peterson, K. Gelengul, E. Darvich, L. M. Bobbitt, F. Terry, B. Neumann, S. Johnson regarding the analysis of innovations and challenges created by digitalization in the field of employment.

Employment and unemployment problems have been extensively studied by both classics and domestic economists. Examples of foreign scholars include D. Ricardo, A. Pigou, K. Marx, C. M. Keynes, and others. Azerbaijani economists also have extensive research on employment, socio-economic factors, and macrotrends of the new era. Thus, studies on employment, demography, human capital, and socio-economic problems have been conducted by M. M. Allahverdiyev, Z. A. Samadzadeh, Sh. M. Muradov, A. T. Ahmadov, S. S. Mehbaliyev, R. K. Isgandarov, T. A. Guliyev, V. M. Niftullayev, G. A. Azizova, R. Sh. Muradov, N. R. Aliyeva, A. Q. Gozalova, R. S. Abdullayeva, C. B. Guliyev, T. A. Sardarov, R. C. Efendiyev, S. M. Seyidova, S. S. Rzayeva, F. G.

Musayeva and others. Among Russian scientists, there are studies by A. E. Kotlyar, L. A. Kostin, V. I. Kostakov, I. S. Maslov and others. Research on the digital economy is reflected in the works of Vusal Gasimli, Leyli Allahverdiyeva, Allahyar Muradov, Masuma Talibova, Gulnara Fataliyeva, Gunay Guliyeva, Ayaz Museyibov and others.

At the same time, various aspects related to the dissertation work were analyzed in the works of Nazim Muzaffarli (Imanov), Zahid Mammadov, Elshad Mammadov, Safar Purkhani, Terbiz Aliyev, Aziz Alakbarov, Yashar Mammadov, Parviz Hasanov, Mahir Zeynalov.

The object and subject of the research. The object of the study is the digitization of the economy in the Republic of Azerbaijan. This includes various aspects such as the size and growth of digitization in the national economy, the types of industries and sectors involved in this context, and the policy framework that supports the digitization of the economy in the country.

The subject of the study covers the impact of digital transformation in the Republic of Azerbaijan on various sectors of the labor market, including job creation, displacement, skill requirements and productivity. The study also examines the challenges and opportunities arising from the relationship between digitalization of the economy and employment in Azerbaijan.

Research goals and objectives. The purpose of the dissertation work is to analyze the impact of digital technologies on the level of employment, work environment and knowledge and skills required in the workforce in the Republic of Azerbaijan, and to prepare recommendations for expanding opportunities in this context. In order to achieve the stated goal, the following tasks have been set:

- Analyze the content and essence of the concept of employment, as well as theories in the field of employment;
- To analyze the current scale of digitization in the economic sectors of Azerbaijan;
- Identify employment areas affected by digital technologies;

- To assess the compatibility of the skills required in the labor market with the capabilities of the workforce during the new industrial revolution;

- Investigate international practices on expanding employment opportunities in the context of digitalization of the economy;

- To analyze the impact of digital technologies on the social sphere;

- To determine effective indicators for quantitative assessment of the relationship between digitization and employment in the Republic of Azerbaijan;

- Based on the results of the research, make suggestions for the formation of new initiatives.

Research methods. Systematization, induction and deduction, comparative economic statistical analysis, generalization, and graphic methods were used in the research work. Also, an econometric model was applied to identify and quantify the relationship between bivariate and multivariate data.

The main provisions defended:

- Digitization of the economy in the Republic of Azerbaijan has simplified administrative management, increased transparency, efficiency and citizens' activity, thereby contributing to the general modernization of public services.

- Digitization has led to the automation of repetitive (routine) tasks, which has resulted in the reduction of jobs in certain sectors. At the same time, the effects of digitalization have led to the emergence of new professional fields that contribute to the diversification of the labor market.

- The digitalization of the national economy has faced changes in the knowledge and skills required in the labor market. During the new industrial revolution, there was a need to increase the necessary skills of the workforce and the ability to adapt to changing dynamics.

- Digitization has given rise to gig economy by providing flexible work opportunities to individuals in our country. Digital platforms have influenced freelancers (independent contractors) to build relationships with employers in a new environment and reshape traditional employment structures.

- In our country, the relationship between digitization and employment has been quantitatively evaluated and the weakness of the relationship between these two factors has been observed.

- Digital technologies have strengthened the role of the vulnerable population in the labor market, increased the inclusion of work opportunities, supported individuals to participate in the global economy and provide high material well-being regardless of the geographical environment. This means the creation of new opportunities for the elimination of a number of socio-economic problems.

- In recent years, the development of the digital ecosystem in the Republic of Azerbaijan has led to the formation of new opportunities in the field of employment.

Scientific novelty of the research - it is possible to group the scientific novelty of the research work in the following form:

- The relationship between the added value of ICT and GDP in Azerbaijan has been quantified.

- Using socio-economic factors on the impact of digitization on employment in Azerbaijan, the dependence relationship between multivariable data was determined.

- The knowledge and skills required in the national labor market during the Fourth Industrial Revolution were analyzed and gaps in this field were identified.

- The impact of ICT on the labor market in our country was quantitatively evaluated through the Structural Equation Model (SEM).

- The ICT Development Index in Azerbaijan and the average annual indicator of added value per 1 employed person in the labor market were quantified.

- Superior and weak positions of "Gig" economy, a new employment area of the economy in the Republic of Azerbaijan, have been revealed.

Theoretical and practical significance of research. The theoretical importance of the research work - the proposals and recommendations reflected in the dissertation work can be

considered important in effectively providing the workforce with employment fields through digital technologies.

The practical importance of the dissertation work - the empirical approaches and analyzes reflected in the research work can be important in increasing efficiency when using digital technologies, reducing the weight of informal employment, ensuring qualification standards in the labor market and reducing the "brain drain" to developed countries. The results obtained in the research can be effective in increasing the income of the country's economy in the non-oil sector, solving employment problems through digital technologies, and developing new areas of employment.

Approval and application. The propositions and theoretical approaches analyzed in the dissertation were reflected in the Collection of Scientific Research Theses and discussed at the First International Conference on Basics of Science and Education of the Azerbaijan Science Center, the 10th Republican Scientific Resources Conference, the 11th Republican Scientific Resources Conference, and the International Scientific-Practical Conference held in Uzgorod, Ukraine. . 8 scientific articles related to the research work were published in the country (6 of them are included in the list of periodical scientific publications recommended for the publication of articles by the Supreme Attestation Commission under the President of the Republic of Azerbaijan), and 1 scientific article was published abroad.

The name of the organization where the dissertation work was performed - Institute of Economics of the Ministry of Science and Education of the Republic of Azerbaijan.

Dissertation structure and volume - The research work consists of a total of 176 pages, including 3 chapters, 8 subchapters, introduction, conclusion, proposals and appendices. The introduction is 12420, the first chapter is 70348, the second chapter is 99802, and the third chapter is 54072, so the total volume of the dissertation work (excluding gaps in the text, 29 tables, 13 graphs, 6 images) is 236642 characters.

DISSERTATION CONTENTS

BASIC SCIENTIFIC PROVISIONS SUBMITTED TO THE DEFENSE

The introductory part of the dissertation work explains the relevance and degree of development of the topic, emphasizes the object, subject, goals and objectives of the research, as well as research methods, notes the main provisions put forward for defense and the scientific novelty of the research, reflects the relevant information in the subheadings entitled Theoretical and practical significance of the research, approval and application, name of the organization where the dissertation work was performed, and the structure and volume of the dissertation work.

The first chapter of the dissertation work, entitled **"Theoretical issues of labor market development in the conditions of digitalization of the economy"** explains the essence of digitalization, analyzes its positive (techno-optimistic approach) and destructive (techno-pessimistic approach) effects on the economy, including the labor market, and reflects a personal approach. In addition, the mobility of digitalization, which is at the heart of the Fourth Industrial Revolution, is explained, provides detailed information about its new trends, compares physical and mental labor, and shows the differences in a number of indicators arising in the labor market as a result of the impact of digitalization. In addition, the main problems arising in the labor market during the new industrial revolution were highlighted and the impact of digital transformation on the development of new areas of employment was explained in detail.

It should be noted that at the beginning of the 21st century, the emergence of macrotrends of digitalization, which are considered new generation technologies, and their rapid penetration into the economy have given impetus to the digitization of information and the development of applications, leading to the transition of humanity to the Fourth Industrial Revolution, which is considered a new industrial revolution. Professor Klaus Schwab, founder of the World Economic Forum, noted in his book *"The Fourth Industrial Revolution"* that *"During the new industrial revolution, the use of*

human labor in enterprises was limited, while the productivity of organizations increased as a result of the application of technological tools in production."[1]

Digitalization has become a widely used concept in recent times. As a result of the development of ICT, the global environment faces innovations every year. As a result, the number of internet users in the world is increasing day by day. Thus, while the number of internet users in 2005 partially exceeded 1 billion, this figure reached 5.3 billion in 2022[2]. This trend indicates the rapid development of digitalization.

Since the changes created by digitalization in industrial sectors, as well as innovations in service sectors, directly affect the economy, the concept of *"Digital Economy"*, which is considered a new field, has emerged. This manifests itself as a new form of economy that fulfills the mission of meeting the endless needs of society with limited resources through ICT.

In our opinion, the macro trends of digitalization confront the global economy with different impacts in the *short and long term*. Thus, in the short term, structural and technological unemployment, income inequality, cybercrimes and other problems arise as a result of the weakness of the population's knowledge and skills in digital technologies. In the long term, adopting these trends opens up new opportunities such as increased efficiency and flexibility, the creation of new professional fields, higher wages, etc.

ICT is a field where technological innovations are constantly observed. Naturally, this process also has an impact on employment. The transformation of employment areas as a result of the impact of digitalization during the Fourth Industrial Revolution is reflected in Figure 1:

[1] Klaus Schwab. World Economic Forum. The Fourth Industrial Revolution: What it means, how to respond. 2016.

[2] Qlobal Statistika Hesabatı

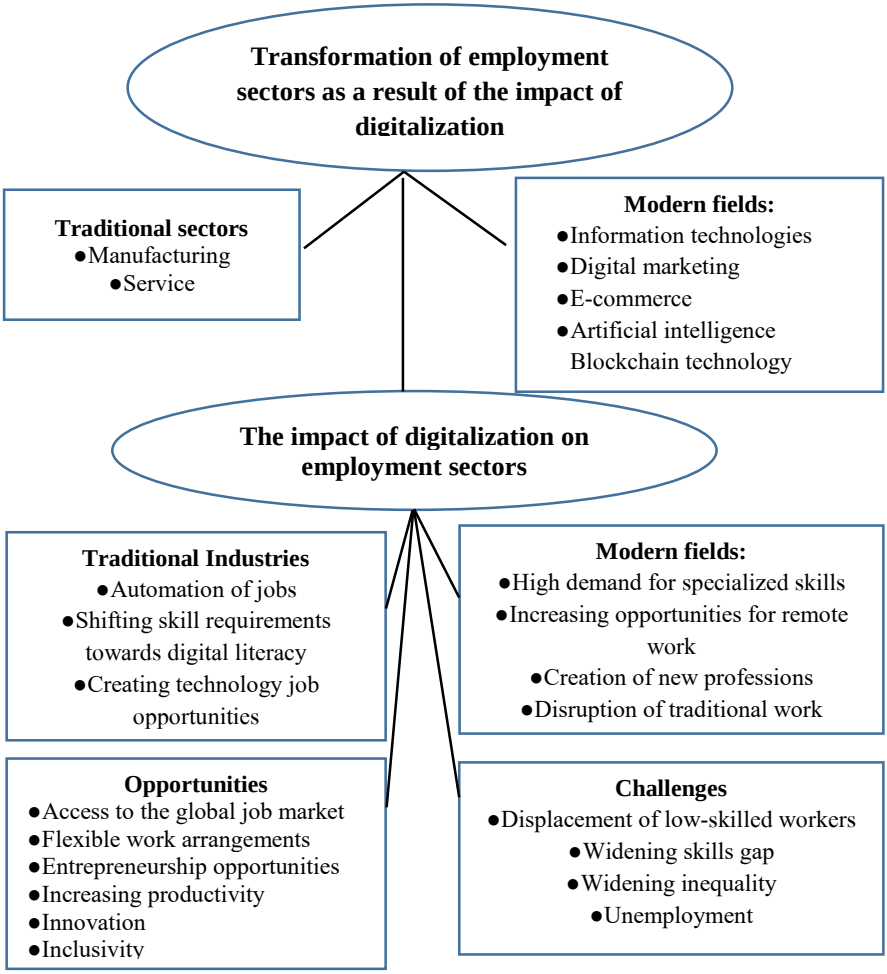

Figure 1. Transformation of employment sectors as a result of the impact of digitalization

Source: Image compiled by the author

In our opinion, digitalization, along with positive opportunities, has also presented the labor market with a number of problems. These problems include the following:

● The first problem is related to *unemployment* arising from the automation of repetitive tasks. In the modern era, when the rules of

competition have changed, the mismatch between the skills required in the labor market and the existing skills of the workforce has increased. As a result, individuals with lower knowledge and skills are leaving the labor market under high pressure. In order to prevent such risky situations in the labor market during the innovation era, there is a need for upskilling of the workforce.

● The labor market requires *special knowledge and skills* in new areas such as artificial intelligence, cybersecurity, data analytics, and electronic marketing. Certain programs are needed to increase the expertise in the listed areas in the workforce. In addition, as digital technologies penetrate enterprises and organizations, workplaces are undergoing transformation. In this situation, employees must master new tasks, be able to communicate with robots, and continuously benefit from digital education.

● The digital divide has created differences in access to technologies, internet connectivity and digital literacy between different socio-economic groups in the economy. Those who lack modern knowledge and skills face a number of obstacles in the labor market. *Income inequality* is at the forefront of these. Under the influence of digitalization in the economy, middle-income employment sectors are disappearing. During this period, the number of jobs in the labor market that are either low-paid or require high professionalism and bring more income is increasing. Economists characterize the current situation as "polarization in the labor market".

● Although *platform work* has quite a few advantages, it also has a number of difficulties. These include the lack of job benefits and security, stable incomes for employees, as well as concerns about their social protection and rights.

● The effects of digitalization vary depending on the knowledge and skills of labor market participants. In this area, a great burden falls on the *education system*. The transition to an innovation-oriented educational process and the formation of experiences in technological fields play a major role in preventing both the shortage of worker skills and the mismatch between educational knowledge and labor market activity in the labor market.

● During the Fourth Industrial Revolution, the collection of personal data on digital platforms has increased, which creates threats to data privacy, as well as *cybersecurity*. Protecting the rights of each individual and ensuring the security of confidential information comes first. In our opinion, in order to eliminate this concern, it is first necessary to implement measures that support the transition to a digital workforce.

Digitalization replaces some professional fields and limits their scope. Examples of newly emerging professional fields during this period include data analysts, digital marketing specialists, process automation specialists, business developers, and others. Professional fields that are prone to decline include secretaries, personal service workers, lawyers, accountants, operators, sales specialists, etc[3].

The following conclusions can be highlighted in connection with the conclusion of the first chapter:

►Artificial intelligence, big data technology, 3D printing technology and other digital macrotrends constitute the "backbone" of the development of the modern economy.

►Technological achievements have significantly weakened the dependence relationship between productivity and employment, labor income and productivity, and enterprises and labor in the labor market, while increasing income inequality and "polarization" in the labor market.

►As a result of the impact of digitalization, access to the global labor market, flexible work opportunities, productivity growth, innovation, inclusiveness and the emergence of new entrepreneurial opportunities in the employment sector have also been formed, along with challenges such as skills problems, unemployment of low-skilled people, and increasing inequality.

►Despite the increase in new employment opportunities such as freelance work, remote work, and the "Gig" economy as a result of the impact of digital transformation in the labor market, legal regulation and violations of labor rights are observed in these areas.

[3] Dünya İqtisadi Forumunun "İş Yerlərinin Gələcəyi (2020)" hesabatı

In the second chapter of the dissertation entitled **"Analysis of the current state of digitalization of the economy and its impact on the labor market of Azerbaijan"**, the current state of digitalization and the labor market in the Republic of Azerbaijan was analyzed and the shortcomings and problems that have arisen in this area were commented on. At the same time, effective indicators were determined during the impact of digitalization on the labor market in the national economy and the dependence relationship was quantitatively assessed using the "Amos" and "SPSS statistics" programs offered by the prestigious IBM company specializing in technology. However, the country's international position in the digitalization of the economy was compared using a number of current indices (Global Innovation Index, Artificial Intelligence Readiness Index, E-Government Index, ICT Development Index, Network Readiness Index, Global Cybersecurity Index) and the existing shortcomings were highlighted.

In addition to the above, the impact of digitalization on employment, especially in the business sphere, as well as newly emerging employment areas in the regions of our country were analyzed, and relevant proposals were put forward to eliminate existing problems.

When analyzing the current state of digitalization in the country, it is necessary to pay attention to its positive aspects and the reasons that delay the development of digitalization. This characteristic is reflected in detail in Table 1:

There is a direct proportional relationship between scientific and technological progress and the growth of the country's economy. However, its share in GDP continues to be significantly low. Thus, in 2010, the specific weight of the added value of ICT in GDP (42.47 billion manat) and in the non-oil sector (19.179 billion manat) was 1.7% and 3.73%, respectively. In 2022, the corresponding indicators (GDP 133.8 billion manat) were 1.4% and (non-oil sector 61.509 billion manat) were 2.97%, which is a very small share[4].

[4] "Azərbaycanda telekommunikasiya və poçt 2024" statistik məcmuə

Table 1.

The positive aspects of the digitization of the economy in the Republic of Azerbaijan and the reasons for delaying it

Positive features of digitalization of the economy in the Republic of Azerbaijan	Reasons delaying the digitization of the economy in the Republic of Azerbaijan
The country has a favorable economic-geographical position, as well as its location on an international highway (at the junction of Europe and Asia)	Failure to define a specific state policy in the ICT sector
Formation of innovative educational level in the Republic of Azerbaijan	Insufficient funding for the ICT sector compared to other sectors
High level of accessibility when using internet networks in the country	Educated people in the country go to foreign countries in order to get high wages and high quality living conditions
Sustainable development of "Aztelecom", "Baktelecom" telecommunications operators	Weakness of the level of awareness of the ICT sector in the specific weight of the population, acute shortage of personnel in this field
Creating the interest of the world countries in the ICT sector formed in Azerbaijan, attracting foreign investments to this field	The large differences in ICT development between cities and regions in the country
Opportunities for economic growth through ICT tools	Poor provision of resources in the mother tongue in information networks
Applying modern computers to industries	Weakness of participation in many international prestigious ICT projects

Source: *Compiled by the author based on data from the "National Strategy on Information and Communication Technologies" and the "State Program on Expanding the Volume of Digital Payments".*

The added value of information technology products and services also affects the growth of GDP in the country. The graph

below shows the relationship between the added value created by ICT in our country and GDP for 2010-2021[5]:

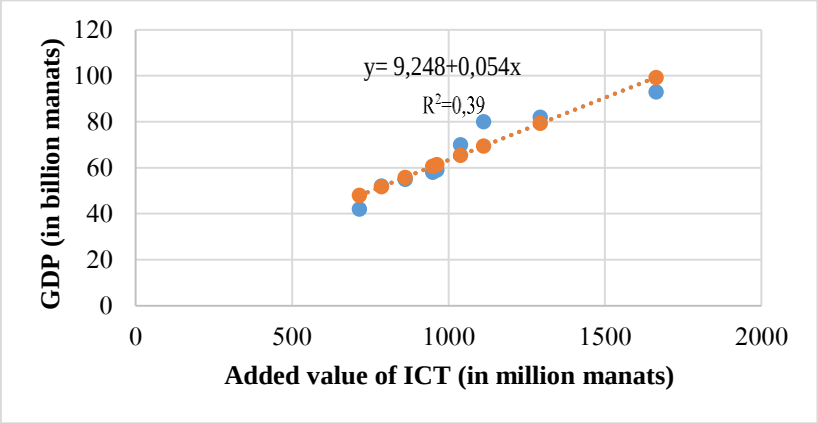

Chart 1. Relationship between GDP and added value created by ICT in the Republic of Azerbaijan (for 2010-2021)

Source: *The table was obtained as a result of calculations by the author*

Despite our country's rich natural resources and strategic location, it is possible to encounter a number of employment problems. These include informal employment, lack of knowledge and skills, "Brain drain", regional inequality, gender inequality, youth unemployment, and re-employment.

It can be observed that the share of people with higher and complete secondary education is relatively higher among those with unemployed status in our country. In 2010, out of 38,966 thousand people with unemployed status, the largest share by education level was 16,689 thousand people with higher education (42.8%). In 2019, this ratio changed due to 31,258 thousand people (38.5%) among 81,272 thousand people with unemployed status[6].

[5] Azərbaycan Respublikası Dövlət Statistika Komitəsinin "Milli hesablar sistemi" və "İnformasiya və kommunikasiyanın əsas göstəriciləri" əsasında müəllif tərəfindən hesablama nəticəsində tərtib olunmuşdur

[6] Dövlət Statistika Komitəsinin "Əmək bazarı" haqqında məlumatı

The number of students studying in higher education institutions of the Republic of Azerbaijan in the 2009-2010 academic year was 139.1 thousand people. Of these students, 6.6 thousand were studying in technical and technological specialty groups. In the 2022-2023 academic year, the corresponding indicators were 222.8 thousand people and 49.7 thousand people. The increase in the share of students studying in the mentioned specialty group from 4.7% to 22.3% over 13 years is considered a commendable fact[7].

The development strategy of the transition to a digital economy in the Republic of Azerbaijan and the directions of its impact on employment are described in the form of a block diagram in Figure 2:

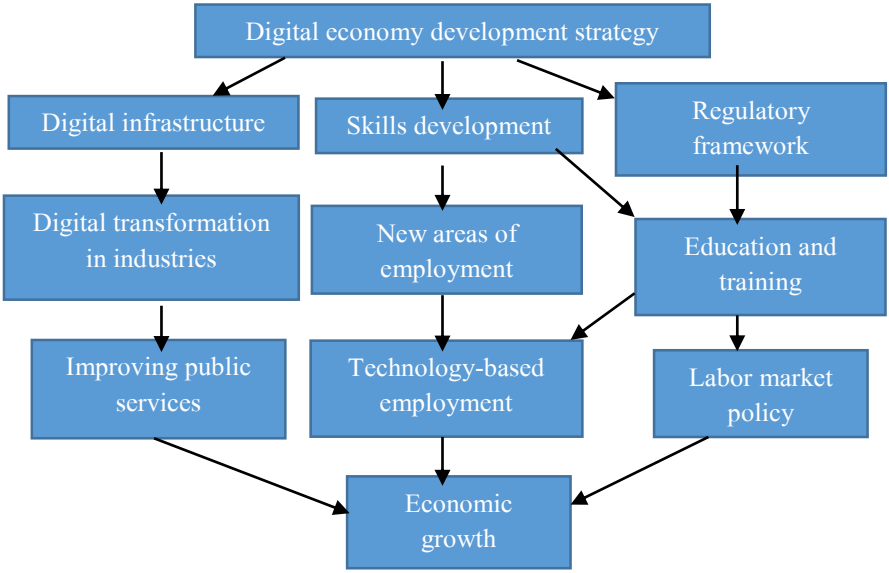

Figure 2. A block diagram reflecting the development strategy of the transition to a digital economy in the Republic of Azerbaijan and its impact on employment.

Source: *Image compiled by the author*

[7] Dövlət Statistika Komitəsi, "Təhsil" üzrə məlumat

The “Gig” economy, which reflects economic relations in the labor market through digital information and digital platforms, is considered a new manifestation of self-employment.

In general, the “Gig” economy has a number of differences compared to the traditional economy. These include the absence of a minimum wage and additional work, non-standard work regimes, the absence of vacation, and the payment of insurance premiums only by the person engaged in this work.

There are also a number of shortcomings related to the social security of individuals engaged in the “Gig” economy. Thus, the absence of legislative acts in this area leads to the employee acting as a contractor and the violation of employee rights.

Another negative aspect of the “Gig” economy is related to the distortion of competition in the labor market. Thus, there are more taxes and insurance payments for the same type of activity in the traditional field. The conclusion of a service contract between participants in the “Gig” economy creates an obligation for them to pay lower amounts of state payments.

To quantitatively assess the relationship between the digitalization of the economy and employment in the Republic of Azerbaijan, indicators of 8 socio-economic factors covering the years 2010-2022 were used. The independent variables used in the assessment were investments in fixed capital in the ICT sector, the average annual number of employees in the ICT sector, the number of students studying in technical and technological specialty groups, and the dependent variables were GDP, added value in ICT, average monthly nominal wage, ICT product output and service provision, and the number of unemployed population. The corresponding indicators of the listed factors by year are reflected in Table 2:

Table 2.
Dynamics of socio-economic indicators used in regression analysis over the years

By years	GDP, in billion manats	Investments directed to capital in the ICT sector, in million manats	ICT added value, million manats	Average monthly nominal salary, in manats	Product release and provision services in the ICT sector, billion manats	Average annual number of employees in the ICT sector, in thousands	The number of students studying in technical and technological specialty groups, in thousand people	The number of unemployed people, in thousands
2010	42,5	212	791,6	331,5	1,147	24,8	12,9	258
2011	52,1	310,8	828,9	364,2	1,236	25,1	20,9	251
2012	54,7	319	945,1	398,4	1,42	26,1	28,9	243
2013	58,2	200,7	1012	425,1	1,528	26,9	32,7	237
2014	59	157,5	1071	444,5	1,578	27,7	34,9	238
2015	54,4	335,3	1088	466,9	1,589	27,2	35,9	244
2016	60,4	199,4	1058	499,8	1,556	26,1	34,5	253
2017	70,3	171,9	1144	528,5	1,688	25,7	36,3	252
2018	80,1	441,5	1255	544,6	1,827	26,4	38,3	254
2019	81,9	547,1	1472	635,1	2,083	28,4	40,5	252
2020	72,6	185,5	1539	707,7	2,158	29,2	42,4	369
2021	93,2	152,4	1644	732,1	2,25	30,6	46,6	311
2022	133,8	400	1886	840	2,525	30,6	49,7	293

Source: *The table was compiled by the author based on data from the State Statistics Committee.*

Multivariate regression analysis is calculated using the model $Y_n= a_0+a_1X_1+a_2X_2+a_3X_3+U$. Here, Y_n is the dependent variable, a_0 is the value of the dependent variable when the independent variables are equal to 0, a1 is the increase or decrease in the dependent variable due to the influence of the independent variables, and X is the independent variable. U is the difference between the true and estimated values. The coefficient of each variable based on the calculations in multivariate regression analysis is shown in Table 3:

:

Table 3.
Regression weights on the 8 socio-economic components mentioned in the period covering the years 2010-2022

Data		Estimated value	Standard Error	Critical Ratio	P (probability)
İMK	**Sd**	1,000	-	-	-
TS	**Sd**	4,410	7,640	0,577	0,04
IAG	**Sd**	0,899	1,554	0,578	0,03
IAD	**Ad**	1,000	-	-	-
ANV	**Ad**	1,062	0,042	25,499	***
UNP	**Ad**	0,314	0,106	2,950	0,003
IOT	**Ad**	0,883	0,020	43,074	***
GDP	**Ad**	1,059	0,115	9,239	***

Source: *The table was obtained as a result of calculations by the author*

Here:

- sd and ad – independent and dependent variables, \respectively;

- Estimated value – estimated coefficients assigned to each independent variable in the regression parameter.

- Standard Error – reflects the uncertainty in the regression parameter, in other words, the difference between the true and estimated values;

- Critical ratio – is the ratio of the estimated value to its standard error and is used to assess the significance of the estimated parameter.

- P (probability) – is used to assess statistical significance during observation. Thus, if the p value ≤ 0.05, it indicates that the assessment is statistically significant.

- *** - indicates that the indicators are very close to 0.

Based on the regression analysis conducted, it can be noted that the listed components are distinguished by their effects in increasing the degree of impact of digitalization on employment.

In our analysis, the RMSEA (Rough Mean Square Error) index for the Structural Equation Model (SEM) was used. This index reflects the assessment of the observation according to the degree of

freedom of the model. As a result of the calculations, the value of this index in the standard and independent models, as well as the minimum and maximum limits and p-value, were determined. The main indicators of the index are listed in Table 4:

Table 4.

RMSEA Index for standard and independent models of the 8 socio-economic components mentioned in the period covering the years 2010-2022

Model	RMSEA Index	Min.	Max.	P value
Standard model	0,393	0,273	0,518	0,000
Independent model	0,781	0,690	0,875	0,000

Source: *The table was obtained as a result of calculations by the author*

Here:

RMSEA is equal to 0.393 for the standard model and 0.781 for the independent model. In general, a value of the RMSEA Index (for the standard and independent models) below 0.05 indicates a strong dependence relationship between the data, a value between 0.05 and 0.1 indicates a moderate relationship, and a value above 0.1 indicates a weak relationship between the data. Since the corresponding indicators in our model are greater than 0.1, we can conclude that the relationship between the data is weak.

Our research suggests that achievements in digitalization have continued to increase in our country in recent years. At the same time, there is a need to implement a number of measures to expand employment opportunities by using the existing potential:

► Improvement of the legal framework for digitalization.

► Investing in education and skills development: Strengthening the education system in science, technology, engineering and mathematics with modern methods and preparing the workforce for the digital economy in a flexible labor market environment is needed;

►Promoting Innovation and Entrepreneurship: Creating an environment that supports unique business ideas and the activities of SMEs. This may include providing access to financial resources, mentoring and incubation spaces for technology startups and small businesses;

►Conducting research and monitoring: Given the rapid changes observed in the ICT sector, the impact of digitalization on the labor market should be regularly analyzed. This is of great importance for implementing the right employment policy.

In the third chapter of the dissertation titled **"Development strategy of transition to digital economy in the Republic of Azerbaijan and directions of its impact on employment",** the results of the changes that occurred during the Fourth Industrial Revolution were analyzed, the knowledge and skills required in the modern era were commented on, the prospects for the development of employment in the context of the digitalization of the economy in Azerbaijan were examined, and relevant recommendations were given.

The laws adopted and practical measures implemented on the development of digitalization in our country formed the fundamental basis for the development of the information society.

In general, the digital economy requires the modernization of the management system. In order to reveal the potential force of digitalization in our country, the Azerbaijan 2030: Vision Concept, the main strategic directions for economic sectors in 2017-2025, the Strategic Roadmap for the development of ICT covering those years, and other state-important documents and legal acts were adopted.

As a result of the impact of digitalization on employment, it can be concluded that the knowledge and skills required in the modern era are divided into two groups: First, *conceptual skills*, which are skills based on the individual's own formation, way of thinking and worldview. These include operability, problem solving, critical thinking, information management, communication, cooperation, creativity. The knowledge and skills formed in the second group are *digital skills* that cover modern trends in technological progress.

These include computer operations, programming, technological knowledge, etc.

Within the framework of digital transformation, the large-scale *"Smart City"* and *"Smart Village"* concepts implemented in our country, especially in the liberated territories, will be of great importance against the background of increasing employment in the regions. The positive aspects of this concept include regulating the population distribution in cities and villages, building modern infrastructure, regulating the route line, and reducing damage to the ecological environment. In addition, there are also reasons that slow down the implementation of the mentioned concept. These include the weakness of digital knowledge and skills in our country, the unsatisfactory level of electronic payments in financial services, the weakness of innovative management, and the difficulties in preventing the concentration of the population in large cities.

In the context of digitalization, employment sectors are constantly facing innovations. Sometimes difficulties arise when adapting to these innovations in the labor market. Therefore, there is a serious need to take the following measures to improve employment sectors in the country:

- Adapting the education system to modern labor market standards;
- Carrying out deep structural reforms in the employment sector;
- Making the most of the potential development level of human capital;
- Creating favorable conditions for the youth, women, and vulnerable groups in the labor market;
- Creating a competitive environment for the unemployed segment of the economically active population;
- Improving the protection of the rights of employers and employees;
- Optimizing insurance services for workers' labor safety;
- Organizing courses and seminars on creating new business models;
- Supporting business activities adapted to innovative technologies.

In order to increase the impact of digitalization on the business sector in our country, it is necessary to pay attention to a number of nuances. *The first of these* is the development of the entrepreneurial environment and the human factor. This requires the implementation of a number of financial support programs. In particular, the involvement of talented young people in this direction is considered important for stimulating employment areas.

The second issue is to form mutual cooperation between educational institutions and business activities. In particular, familiarizing the young generation with experiences in business areas related to the ICT sector, providing them with practical information about these areas in advance and applying them in their future activities will give impetus to the dynamic development of the country.

The third issue is to create interest for entrepreneurs in sharing business experience with young people. That is, providing a number of tax breaks by the state to enterprises that create conditions for young people's business experience will ensure that more young people benefit from these opportunities.

CONCLUSION

The analyses conducted in the dissertation work provide the basis for obtaining the following conclusions on the impact of the digitalization of the economy on employment in the Republic of Azerbaijan:

1. Although great attention has been paid to the development of the non-oil sector in the Republic of Azerbaijan in recent years, the specific weight of the added value created by ICT in the GDP and in the non-oil sector is quite small (in 2022, this share is 1.4% and 2.97%, respectively did).
2. The impact of digitization on employment varies depending on the economic activity areas. In today's era, there are areas that cannot exist without ICT infrastructure. At the same time, the impact

of digitalization on the economy has reduced the demand for a number of traditional occupations (especially performing repetitive tasks), resulting in structural and technological unemployment.

3. The large gap between the rapid development of digital technologies and the adoption of these technologies by members of society has left the labor market with a serious shortage of knowledge and skills. The existence of staff gaps in the field of technology is a clear example of this.

4. Scientific and technical progress has increased income inequality. Thus, those who benefited from the opportunities of technology were provided with a higher income, while those who could not take advantage of these opportunities or those who worked in fields more sensitive to the impact of digitalization were satisfied with a low salary.

5. In the Republic of Azerbaijan, there are sharp differences in the field of employment in the ICT sector between the capital city and the regions. Thus, the occupation of the population in the regions is mainly traditional economic activities such as agriculture, forestry, fishing. In the capital city and nearby areas, it is possible to observe a considerable advantage of those engaged in fields requiring intellectual labor, such as information and communication, financial and insurance services, compared to the regions.

6. The participation of young people in employment in the labor market of our country - the prevailing instability between demand and supply, the weakness of the competition of young people compared to the population belonging to the middle age group, the training of young personnel without analyzing the conditions of the modern labor market, the weakness of professional fields in accordance with the requirements of the digital age, the theoretical in the education system factors such as the transition from approaches directly to the practical environment and lack of sufficient professionalism.

7. A number of disadvantages can be found regarding the social security of individuals engaged in the gig economy. Thus, the absence of legislative acts in this area causes them to act as contractors rather than as employees in the labor market. This leads

to the non-regularization of the labor contract of the parties, which is characterized as a violation of their rights.

8. The development of platform work has led to a violation of competition in the labor market. Thus, a labor contract is concluded between employees and employers in the traditional field for the same type of activity. This means more taxes and insurance payments compared to the participants of the platform business. Among the participants of the platform work, the conclusion of the service contract creates an obligation for them to pay a lower amount of state payments. This difference has resulted in lower prices for products and services in the platform business and, as a result, in the formation of unfair competition.

9. Based on the regression weights obtained during the quantitative assessment of the impact of digitalization on employment and the RMSEA coefficient in the Structural Equation Model (0.393 for the standard model, 0.781 for the independent model), it can be noted that this dependence is weak in the Republic of Azerbaijan.

10. In the modern era, there are areas in which digitization is difficult to penetrate. Even, according to experts, digitalization is not expected to affect these professions in the near future. These are professions where there are high emotional feelings. This includes nurses, midwives, teachers, psychologists, psychiatrists and other fields. In addition, weak effects of digitalization are observed in professions that require creativity (artists, artists, poets, writers, etc.).

PROPOSALS

1. In order to take advantage of digital opportunities during the new industrial revolution, it is necessary to pay attention to the development of potential personnel. A favorable environment for acquiring digital knowledge and skills should be created in the education system of the country, and the number of innovation-oriented specialties should be increased. These include such specialties as information technologies, programming, information

security, digital marketing, machine learning, and innovative project management. This process can be considered important in preventing structural and technological forms of unemployment in the future.

2. Cooperation of universities with ICT-oriented companies should be strengthened. As a result, the students will more easily master the acquired theoretical knowledge in a practical way. At the same time, this cooperation will be considered useful for finding potential workforce for enterprises operating in the direction of high technologies. The state can also apply certain tax incentives to increase the interest of innovative companies in this field.

3. Pilot training and mentoring programs should be developed that include high demand digital literacy in the field of ICT in order to eliminate the knowledge and skill gap that hinders the adaptation of the labor force to the labor market requirements in the period of technological development.

4. In order to prevent the "brain drain", certain privileges should be given to specialized personnel, and social and household conditions should be improved.

5. In order to promote digital infrastructure in small and medium enterprises, access to financial institutions and incubation centers should be provided for those who want to start a new business. It can also lead to the development of an ecosystem that includes innovation, collaboration and knowledge sharing – driving economic growth and creating new jobs.

6. In order to prevent the problems hindering the development of startups, it is required to involve scientists along with business experts. Scientists can contribute to the development of a successful business by analyzing theoretical knowledge, research opportunities and problem identification, and business professionals by analyzing market dynamics, customer potential and business plan factors.

7. Stimulating measures should be taken in this area in order to reduce the amount of informal employment and establish formal labor relations between the parties. Thus, simplifying the registration process for entrepreneurial activity (developing and launching an online registration portal with clear instructions, reducing the

number of documents required for registration), increasing access to financial resources, and launching auxiliary applications for managing processes can distract individuals from informal employment.

8. The presence of persons who are not registered as taxpayers in social networks and who receive income from it has led to the growth of informal economic relations, indicating the existence of legal gaps in this area. In order to prevent such cases of tax evasion, it should be required to confirm access to personal accounts with an identity card and obtain income from bank accounts by paying taxes.

9. The participants of the gig economy cannot benefit from the privileges granted by the state (mainly labor rights and social protection) because they do not have an unemployed status (contractor, independent agent, etc.). In this sphere, there is a need to protect the rights of contractors and create a regulatory mechanism. In particular, the minimum labor standards should be defined (for example: the number of rendered services, duration of activity, etc.).

10. Increasing cooperation initiatives with international organizations can help exchange knowledge and develop skills. Becoming a member of global partnerships will allow Azerbaijan to take advantage of technological advances and advanced practices, and increase the competitiveness of its workforce in the international arena.

List of published scientific works

1. Ibrahimov N.K. Digital economy and the main indicators taken into account during its analysis // "Elmi ish" international scientific journal. Baku: Scientific publication. 2021 // 5th release. p. 65-68.

2. Ibrahimov N.K. Digitization and its impact on the labor market // Collection of scientific research theses. 2021 // 2nd release. p. 30-32.

3. Ibrahimov N.K. Digital economy and the structural change it creates in the labor market // Journal of Economic Growth and Public Welfare. Baku.: Scientific publication. 2022 // 3rd release. p. 146 -155.

4. Ibrahimov N.K. Analysis of threats and shortcomings in the period of scientific and technical innovation // Geostrategiya International socio-political, scientific theoretical journal. Baku: Scientific publication. 2022 // 6th release. p. 109-112.

5. Ibrahimov N.K. Analysis of the effects of the digital economy on the tax system // Journal of Economic Growth and Public Welfare. Baku.: Scientific publication. 2022 // 4th release. p. 123 -130.

6. Ibrahimov N.K. Labor market characteristics in Azerbaijan during the Fourth Industrial Revolution // Nakhchivan University, Journal of Scientific Works. Scientific publication. 2022 // 4th release. p. 49-53.

7. Ibrahimov N.K. Analysis of the modern state of development of the digital economy in the Republic of Azerbaijan // Scientific-Research international scientific journal. Baku: Scientific publication. 2022 // 6th release. p. 7-10.

8. Ibragimov N.K. Issues of the impact of the digital economy on the economic development of the country. Ukraine. 2022 // No. 24. p. 53-57.

9. Ibrahimov N.K. Analysis of the positive and negative effects of the digital economy on the labor market // I International Conference on Basics of Science and Education. 2022 // 1st release. p. 38-39.

10. Ibrahimov N.K. Nuances to be considered during the transition to the Fourth Industrial Revolution // X Republican Scientific Resources Conference. 2022 // 10th release. etc. 43-45.

11. Ibragimov N.K. The role of the tax system in the development of the digital economy. International scientific -practical conference, Uzhhorod. 2022 // p. 127-129.

12. Ibrahimov N.K. Perspectives of the labor market in the era of digitization // XI Republican Scientific Resources Conference. 2023 // 10th release. p. 30-32.

13. Ibrahimov N.K. Analysis of the impact of digitization on the economy during the Covid-19 pandemic // Scientific News of Azerbaijan State University of Economics, Baku: Scientific publication. 2023

14. Efendiyev R. C., Ibrahimov N.K. Prospective influence possibilities of artificial intelligence on the employment sector in Azerbaijan // Ipek Yolu magazine. 2023 // 3rd release. p. 24-34.

The defense will be held on January 17, 2025 at 11:^{00} AM at the meeting of the ED 1.10 Dissertation Council operating under the Institute of Economics of the Ministry of Science and Education of the Republic of Azerbaijan.

Address: AZ1143, Baku city, H.Javid ave., 115

The dissertation can be reviewed at the library of the Institute of Economics of the Ministry of Science and Education of the Republic of Azerbaijan.

Electronic versions of dissertation and its abstract are available on the official website of the Institute of Economics of the Ministry of Science and Education of the Republic of Azerbaijan.

Abstract was sent to the required addresses on 16 December 2024

Anchor signed: 10.12. 2024
Paper format: A5
Volume:38 863
Circulation: 20