The Main Problems of Building the Digital Economy of Azerbaijan

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Abstract: - In the article, the essence and main determinants of the digital economy, the methods of evaluating the level of digitalization, and the cross-country comparison of digitalization were made. The problems of creating a digital economy in Azerbaijan, and the current state of the main determinants of the digital economy in Azerbaijan were analyzed, and the role of ICT in the economy of Azerbaijan was evaluated in comparison with the countries of the region. The main result of the study is that the "production component" of the digital economy dominates in developed countries, while the "consumption component" dominates in developing countries. The increase in the share of both the "consumption component" and the "production component" of the digital economy promotes the economic development of the country and the improvement of the welfare of the population. In Azerbaijan, the "consumer component" of the digital economy plays an important role in the development of the economy and in increasing the well-being of the population. However, there is a serious need to increase the necessary potential for the development of the "production component" of the share of the necessary potential for the development of the "production component" and the "production component" of the "production. However, there is a serious need to increase the share of the digital economy in the country's economy at the expense of the "production component".

Key-Words: - digital technology, digital economy, ICT, internet, mobile phone, GDP, investment.

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1 Introduction

In recent decades, the development of digital technology has significantly changed the modern economy, both in form and content. World trade, financial and banking operations, transactions, and other economic relations have already taken on a new character. In addition to reducing production costs and speeding up decision-making, digital technology has also led to the emergence of new types of digital goods and services. Since these products are innovative, they are more competitive in the world market. Considering the challenges of the modern era, every country is trying to acquire, adopt and apply digital technology. But the transition to a digital economy requires both a high level of investment and the cultivation of human capital with new knowledge and skills. Studies show that such expenses pay for themselves very quickly and ensure sustainable economic development in the future.

After gaining independence, Azerbaijan ensured the attraction of foreign direct investments to the country by attracting transnational companies and international financial institutions to cooperate. Azerbaijan, like most countries in the Middle East, is a country rich in oil. General trends related to the impact of oil revenues on economic development, [17], in those countries are typical for Azerbaijan. One of these features is the consumption of oil revenues for digital infrastructure.

It also made it possible to apply new technology, especially digital technology, to the country's economy. The activities of transnational companies in the country accelerated the wide application of ICT in the country's economy. Currently, Azerbaijan ranks among the world's leading countries in terms of the share of internet users in the total population. But in Azerbaijan, the second of the two components of the digital economy, that is, the "producer" and "consumer" components, prevails. By importing ICT goods and services to the country, Azerbaijan increases the share of the digital economy in the overall economy and accelerates economic development with digital technology, ensuring the improvement of the population's well-being. However, the second component of the digital economy, i.e. the "productive component" has not yet developed in the country. Therefore, there is a need for effective use of the country's financial and human potential in this field.

The objectives of this research are to assess the current state of the digital economy in Azerbaijan through a comparative analysis of existing research on the digital economy. The object of this research has been taken from the ICT sector of Azerbaijan. The tasks include conducting a comparative analysis of the nature of the digital economy and its effects on economic development. As a methodology, there comparative were choose analysis, and econometrics, including panel analysis and time series analyses. The results obtained in the study can help to assess the current state of the ICT sector in Azerbaijan, compare it with developed countries, and development of the ICT sector in the country from the "consumer component of the economy" to the "producer component of the economy" in the future.

2 Prerequisites for the Emergence of a Digital Economy

The Internet, big data, 5G, and artificial intelligence play an important role in the integration of the world economy and lead to the formation of the digital economy. Undoubtedly, the remarkable value and importance of any invention or discovery are determined by its contribution to economic growth and human welfare. In this regard, the value of digital technologies is undeniable. In any economic cycle, digital technology is important because it increases the quality and speed of activity. Digital technology has not only introduced completely new and innovative consumer goods to the economy but also created new means of production. This is why the modern economy is different from the economy of a few decades ago. Figure 1 presents the dynamics of real GDP p.c. volume (\$) in the countries with different incomes (the base year is 2015).



Fig. 1: Dynamics of real GDP p.c. volume (\$) in the countries with different incomes (the base year is 2015) Source: [30]

As a result, the total GDP of the world has increased dramatically in recent decades. However, in this growth, the GDP of countries that use digital technology more widely, that is, developed countries, differed more sharply than developing countries. According to the report of the World Economic Forum, as a result of the development of digital technology, the countries of the Global North are developing faster, [13]. After 1990, the introduction of new products, such as mobile phones and notebooks, to the world market, and the creation of smartphones, plane tablets, and 3D printers in the following years, dramatically increased labor productivity. The presence of new consumer goods and means of production in the economy, as well as the emergence of new service sectors along with these goods, changed the nature of the economy, as well as the intersectoral ratio. In the last 30 years, the share of the service sector has increased dramatically not only in developed countries but also in developing countries (Figure 2).



Fig. 2: Dynamics of the share of the service sector in GDP in countries with different incomes (%), [30]

The share of the service sector in upper-middleincome countries increased by 12% in a short time in the 90s of the last century and was over 50%. Of course, this indicator is much lower than the indicators of high-income countries. But despite this, the increase in the share of the service sector in the GDP volume in all countries is related to the increase in labor productivity in the economy and the improvement of the well-being of the population. The digital economy has increased aggregate demand on a global scale with the creation of new types of services, along with increasing labor productivity in industrial production and the agricultural sector. Today, in most countries of the world, they know Uber taxi, Amazon book sale, Facebook media service, Alibaba sales company or companies that resemble them to one degree or another. Digital technology has dramatically increased the scale of tourism and study-abroad services. Buying tickets via the Internet, booking rooms in hotels, choosing universities for studying abroad or participating in grant competitions, distance education, and other services have brought the countries and peoples of the world much closer to each other. As a result of the COVID-19 pandemic, the "work from home" and "distance education" regimes have proven how wide possibilities digital technology has. Digital technology allows rapid collection, reliable storage, in-depth analysis, and easy exchange of primary information necessary for strategic decision-making both at the macro level and at the micro level. As a result, it is possible to increase the creation and production of innovative products, the expansion of international trade, the pocket of direct foreign investments, and increase management efficiency.

Thus, the application of digital technology to various areas of the economy indicates the growing strength of a new economic model - the "digital economy" model. The "Digital Economy" model is a product of the modern era when the "Green economy" model is on the agenda, and it differs from other economic models. At the heart of this model is the provision of economic growth and improvement of public welfare by applying digital technology to the economy. Therefore, the development of the digital economy is important for every country. However, it should be taken into account that in modern times there is no such country where the Internet and mobile phones are not used to one degree or another. However, the main goal is to digitize the country's economy at a high level and turn digital technology into a leading means of production. This problem is highly dependent on the role of the state in managing the country's economy. Thus, as a result of an in-depth analysis conducted by [13], it was determined that the level of economic use of technological development is determined by the market, but state support for technological development is also possible. However, the scope and limits of this support should be known.

3 Definition of the Digital Economy and Development of the Idea of the Digital Economy

The definitions given to the concept of "digital economy" are meaningless. Let's get acquainted with some of these parties. According to the European Commission, [10], the definition of the concept of "digital economy", "digital economy" is an economy based on digital technology. The European Commission, [9], also calls this economy the Internet economy. In such an economic model, a) venture capital is directed to the creation of innovations, b) the role of intangible assets is over; c) new business models based on network effect are formed; d) international e-commerce relations are expanding. EC, [10], believes that the digital economy broader Information is than Communication Technologies and covers all areas of the economy as well as social life. The mobility of the digital economy, playing the role of information and database, as well as the nature of the network, distinguishes it from other economic models.

According to the definition of the digital economy by the British Computer Society, [6], "although we increasingly think of the digital economy as the conduct of business through Internet and World Wide Web-based markets, it should be understood more as an economy based on digital technologies." According to this definition, the main features of the digital economy are related to innovation, cyber security, and digital education. According to the European Parliament's, [7], [21], definition of the digital economy, the digital economy is characterized by digital services and is a unique economic model characterized by network effects that promote the concentration of markets. The digital economy has multiple routes to deliver digital services to end users and is easier and faster than more traditional areas of the economy. The definition of the digital economy by the House of Commons, [28], considers digital access to goods and services as well as the possibility of digital assistance to businesses. In this definition, it is emphasized that the digital economy is a digital method for the development of the traditional economy. Thus, among economic sectors and even sub-sectors of these sectors, the digital economy is not mentioned separately. The contribution of the digital economy, for example, the reduction of transaction costs as a result of digitization, or time savings as a result of activities via the Internet, etc., are not separately mentioned in the calculation of the GDP volume. We cannot get any statistical measure of the exact benefit of using home or business software or Internet data collection or any software package, such as the eViews econometric calculation package. In this sense, it is understandable that the House of Commons, [28], accepts the digital economy as a method for action. Some countries, for example, Great Britain, the USA, and Japan use this method in their economy on a larger scale than others. Therefore, from the point of view of the digital economy model, the comparison of countries should be made based on which country is more digitized.

The G20 DETF, [14], defines the digital economy as a broad spectrum of economic activity, including all areas where digital technology is used, such as areas where information and knowledge are used as a factor of production, as well as areas where information and communication technologies are used. The G20 DETF, [14], believes that the following principles should be defined for the expansion of cooperation among the G20 countries in the direction of the development of the digital economy: a) innovation; b) cooperation; c) synergy; d) flexibility; e) inclusiveness; f) formation of an open and favorable business environment; g) ensuring the flow of information for economic growth, security, and mutual trust. For this purpose, it is necessary to invest in the ICT sector, support the development of entrepreneurship for the transition to the digital economy, strengthen cooperation in the field of e-commerce, expand digital inclusion, and support small and mediumsized businesses. [18], in the definition of the digital economy, the digital economy is separated from the aggregate economy. They argue that the digital economy is the added value created by various types of "digital" spending in total production. Such costs include digital knowledge and skills, digital hardware and devices, software, communications, and digital goods and services. Such a definition of the digital economy means that it is an important tool for economic growth at both the macro- and micro-level. Knickrehm et al. The method proposed by [18], allows us to determine the share of the digital economy in the total economy based on these "costs". Based on calculations with this method in 13 industrial sectors of 11 countries, they claim that the share of digitalization in the total production

volume is higher, i.e. 28%, instead of 5.2% calculated by the traditional method.

The study, [3], notes that 300 companies in Asia and the Pacific have generated \$660 billion in revenue from digital technology and that the digital economy is becoming a leading area. The companies involved in the study confirm that they have digitized every aspect of their business. 97% of these companies first started as regular companies and then went digital. Noting the important role of digitization in the development of companies, [3], mentions the existence of a "digital dichotomy" in the digital economy. He notes that Asia and the Pacific are investing more in the digital economy than other regional companies, and their profits are high. [25], [8], [12], [4], and numerous other studies have focused on the role of digital technology in the development of the economy in the definitions given to the digital economy. [26], in their research, comparing the definitions given to the digital economy, conclude that this concept has not been unambiguously defined in the economic literature, and there is no unified approach to its measurement. On the other hand, the authors argue that the core of the digital economy is the "digital sector". This sector includes the ICT sector, which produces digital goods and services. The authors argue that the digital economy is that part of the total economy in which products are produced exclusively or mainly based on digital technology. According to their calculations, in 2016, 3% of the world's gross domestic product and 5% of employment fell into the digital economy. In this volume, developed countries take the leading place. That is an important part of the 3% share that falls on the share of developed countries. However, the speed of development of the digital economy in developing countries is increasing.

4 Methods of Assessing the Level of Digitalization of the Economy (Digital Economy Index)

As we mentioned above, digital technology, which is the basis of the digital economy, including the Internet, e-commerce, ICT, mobile phones, the electronification of public administration, etc., is applied to one degree or another in all countries of the world. Therefore, the main question is not whether there is a digital economy in any country, but at what level. Therefore, it is important to measure the level of the digital economy in any country. Of course, today's level of digital technology is not the last, and this technology will continue to develop and improve. Therefore, when we say "level of the digital economy" in any country, we are measuring such level in comparison with other countries and any period. The difficulty of comparative measurement of the digital economy is also confirmed in various studies (for example, OECD, [19]). The main challenge is the lack of imprecise data for most countries, especially developing countries.

Table 1. The countries ranked in the first 30 places according to the NRI index

	Countri	Scor		Countri	Scor		Countri	Scor
	es	e		es	e		es	e
1	Nath autor d		1.1			0.1		
1	Netherland	82.06	11	Canada	76.48	21	Estonia	71.62
	5	02,00		Cunada	70,40		Lotonia	71,02
2			12	South		22		
-	Sweden	81,57		Korea	75,56		Israel	71,51
3			13			23		
	Denmark	81,24		Australia	74,96		Spain	69,94
4	United		14			24		
	States	81,09		France	74,79		Czech	68,11
5		00.45	15			25		1 1 1
	Finland	80,47		Austria	74,37		Iceland	67,69
6	a 1 1	00.00	16	Ŧ	72.02	26	G1 ·	(7.00
	Switzerland	80,20		Japan	73,92		Slovenia	67,30
-	C:		17	T 1		27		
/	Singapor	80.01	1/	d d c	73 79	27	Malta	66 30
0	C	00,01	10	5	15,17	20	Ividita	00,50
8	Germany	78.95	18	Belgium	72.57	28	Italy	66.25
9	y	,	10		,0 /	20		,20
2	Norway	78,49	19	Ireland	72,26	29	China	65,62
	ž							
10			20	New		30		
	UK	76,60		Zealand	72,00		Lithuania	65,32

Source, [22]

There are various methods for benchmarking the digital economy. One of these methods is the Networked Readiness Index (NRI) developed by the World Economic Forum. The NRI index measures the level of use of the available information and communication technologies in the country. The latest report includes the status of ICT use in 139 countries. NRI index has 4 pillars, i.e. 1) technology; 2) population; 3) government; 4) effects; 12 sub-pillars, i.e. 1) input; 2) content; 3) future technologies; 4) individuals; 5) business; 6) government; 7) confidence; 8) regulation; 9) inclusiveness; 10) economy; 11) quality of life; 12) contributions to sustainable development goals. All sub-pillars are based on 60 indicators. Of these, 16 indicators belong to the technology pillars, 15 indicators to the population pillars, 14 indicators to the government pillars, and 15 indicators to the effect pillars. The indicators included in each pillar are normalized between (0-100). Here, "0" is considered the lowest indicator, and "100" is the highest indicator.

Azerbaijan ranked 76th among 130 countries in the ranking of NRI for 2021 with 47.56 points. Note, from the former Soviet republics Estonia (71.62), Lithuania (65.32), Lithuania (62.16), Russia (57.74), Ukraine (55.70), Armenia (52.51), Kazakhstan (52.17), Georgia (49.10) and Moldova (49.07) have a better position than Azerbaijan on the NRI index.



Fig. 3: Dependence of NRI on the logarithm of GDP volume (cross-country analysis)

Table 2. Dependence of the logarithm of the GDP volume on the NRI (cross-country analysis)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NRI C	0.085025 4.550412	0.002868 0.155780	29.64493 29.21053	0.0000 0.0000
R-squared Adjusted R-squared S.E. of regression Sum squared resid Log likelihood F-statistic Prob(F-statistic)	0.876349 0.875352 0.507239 31.90408 -92.25273 878.8218 0.000000	Mean depend S.D. depende Akaike info cri Schwarz criter Hannan-Quin Durbin-Watso	ent var nt var terion ion n criter. n stat	8.969930 1.436710 1.496075 1.541095 1.514365 1.946638

The significant impact of the NRI index on the logarithm of GDP suggests that as the level of digitization in countries increases, the volume of GDP also increases. Of course, feedback is also powerful. Thus, as the economic development of the country increases, the opportunities for digitalization of the economy also increase.

Since NRI covers technology, governance, inclusion, and economy as a composite index, it's the level of economic development as well as NRI effects level of economic development are possible. Taking into account the existence of a two-way causal relationship, it can be considered that highincome countries have higher financial opportunities for the development of digital technology. It can also be argued that in countries with a high level of development of digital technology, opportunities for faster growth of GDP per capita are expanding. Figure 3 shows the dependence of the NRI index on the logarithm of GDP per capita in 126 countries in 2021, and Table 2 shows the regression analysis of the logarithm of GDP per capita on the NRI index. The high level of interdependence of both indicators confirms the importance of digital technology in economic development.

One of the methods for benchmarking the digital economy is the Digitalization Index (DiGiX). This index allows the evaluation of the factors and the behavior of agents for the implementation and use of ICT in the country, [23]. DiGiX is a composite index calculated based on six sub-indices with a total of 21 indicators. These sub-indices are 1) infrastructure; 2) acceptance by households; 3) acceptance by enterprises; 4) expenses; 5) adjustment; 6) content.

The DiGiX index is calculated by [23], for 100 countries and is based on supply and demand. Here, the demand component includes output indicators, i.e. user adoption (mobile broadband subscription, fixed (wired) - broadband subscription, virtual social networks, internet households, differences in internet users), enterprise adoption (B2B, B2C, Firm-level technology adoption), covers digital content (government online service index). The supply component includes infrastructure (3G coverage, bandwidth per Internet user (bit/s), secure internet services, Bandwidth (bit/s), cost (Fixed Broadband rates. Internet and telephone competition), and regulation (ICT laws, Software piracy rate, Efficiency of legislative bodies, Judicial independence, Efficiency of the legal system in resolving disputes, Efficiency of the legal system in solving regulatory difficulties) sub-indices. The indicators included in this index are normalized between (0-1). Here, "0" is considered the lowest indicator, and "1" is the highest indicator.

A comparison of the level of digitization of countries based on the DiGiX index suggests that the level of digitization is also high in high-income countries, especially in developing countries (Table 3).

A comparison of Table 2 with Table 1 suggests that developed countries are in the first ranks both in terms of the level of digitalization and in terms of the Network Readiness Index. It should be noted that the high-ranking countries in the industrial sector, but with high incomes, such as Qatar, Oman, and the UAE, indicate that digitization is important not only for economic importance but also for social well-being. There is no doubt that there is a strong correlation between the DiGiX index and the volume of GDP per capita or its logarithm.

Table 3. The countries ranked in the first 30 places according to the DiGiX index

	decording to the DIGIA index									
	Countrie	Scor			Countri	Scor			Countri	Scor
	S	e			es	e			es	e
1										
	Denmark	1.00		11	Estonia	0.82		21	Ireland	0.76
2	Hong				N.					
	Kong	0.97		12	Zealand	0.81		22	Korea, R.	0.74
3										
	Singapore	0.94		13	Iceland	0.81		23	Malaysia	0.73
4										
	USA	0.92		14	Germany	0.81		24	Austria	0.73
5	Netherland									
	s	0.91		15	Japan	0.80		25	France	0.73
6	Luxembou				U.					
	rg	0.90		16	Kingdom	0.80		26	S. Arabia	0.68
7										
	Finland	0.88		17	Canada	0.78		27	Qatar	0.67
8	Switzerlan									
	d	0.87		18	Norway	0.77		28	China	0.67
9										
	UAE	0.84		19	Australia	0.77		29	Belgium	0.67
10										
	Sweden	0.83		20	Israel	0.77		30	Oman	0.65
Source [23]										

Source, [23]

One of the methods for comparative evaluation of the digital economy is the Digital Economy and Society Index, [10]. The DESI index is used to evaluate the level of digitization of the economy and society in European countries. This composite index is also calculated based on five dimensions such as 1) connection; 2) human capital; 3) use of internet services; 4) integration into digital technology; 5) digital public services. Each measure consists of a different number of sub-indices, that have a different number of sub-indicators. For example, the "connection" dimension has some sub-indices such as a) stable broadband reception; b) stable broadband coverage; c) mobile broadband; d) a broadband price index. The "Human capital" dimension consists of two sub-indices namely a) Internet user skills; b) It Advanced Skills and Development. The "Use of Internet services" dimension consists of three sub-indexes such as a) use of the Internet; b) online activity; c) transactions. The "Integration to digital technology" dimension includes two sub-indexes such as a) digitization of business; b) e-commerce. The last dimension, i.e. "digital public services" dimension consists of only one sub-index, i.e. "e-government" sub-index. It should be noted that when calculating the DESI composite index are given weights as follows: 25% to the "connection" dimension, 25% to the "Human capital" dimension, 15% to the "Usage of Internet services" dimension, 20% to the "Digital technology integration" dimension and 15% to the "digital public services". The weights given to the sub-indices included in each dimension are also different. First, DESI considers the weights given to the sub-indices and then to the dimensions.

$$DESI = \sum_{i=1}^{5} a_i * w_i$$

It is calculated based on the same. Here a_i are dimensions, w_i is the corresponding weight. Calculations by [27], show that Denmark, Sweden, Finland, the Netherlands, Luxembourg, Ireland, Great Britain, Belgium, and Estonia have higher scores than other European countries. Indicators of Spain, Austria, Malta, Lithuania, Germany, Slovenia, Portugal, the Czech Republic, France, and Latvia are considered average indicators. Indicators of other European countries are lower. Note that this result is consistent with the results of the other methods for measuring the digital economy that we considered above.

In addition to the NRI, DiGiX, and DESI indices that we reviewed above, other indices are also used to quantitatively measure the digital economy or the level of digitization of the economy. For example, the Adobe Digital Economy Index, [11], was developed to study inflation in the United States, Great Britain, and Japan, and the Arab Digital Economy Index (Arab Federation for Digital Economy, [2]) was developed to assess the level of digitalization and the economic effects of digitalization in Arab countries. In our study, we used several indicators that indicate the level of development of digital technology: a) export of ICT services (in current US dollars); b) share of ICT services export in total service export (%); c) share of ICT product import in total product import (%); d) share of export of ICT products in total product export (%); e) the amount of investment directed to the ICT sector with the participation of the private sector; f) the share of internet users in the total population (%) and other indicators.

5 Assessment of the Role of ICT in the Economy of Azerbaijan

Digitalization has made a significant contribution to Azerbaijan's integration into the world market, as well as to the expansion of Azerbaijan's bilateral economic relations with other countries. As a result of the expansion of the country's foreign trade, household incomes have increased, [23].

Digitalization has had direct or indirect effects on the increase in the number of tourists coming to the country in recent years. Thus, as a result of digitization, the ease of hotel reservations and the availability of high-speed Internet for tourists are important factors. Studies show that a significant part of the tourists who have come to Azerbaijan in recent years are from high-income Arab countries, [23]. Tourists from these countries choose cities with more digital infrastructure for recreation.

Undoubtedly, the role of ICT, along with other factors, is the basis of economic development both in Azerbaijan and in other countries of the region. We will use two methods to assess the impact of ICT on economic development. The first method is the panel analysis method. Here, as a dependent variable, we will take the growth percentage of the GDP of the countries of the region compared to 1991, and as an independent variable, we will take the number of internet users and mobile phone subscribers in these countries. The effects of both indicators on economic development are not direct. so, these indicators affect the production function through the channel of human capital development. The second method is the time series method. With this method, we will try to study the effects of ICT on the economy of Azerbaijan.

To determine the dependence of economic development on ICT, it is necessary to determine indicators that more adequately characterize both systems. For this purpose, different indicators are used in different campaigns. Some studies use normalized composite indices to characterize ICT, such as the Network Readiness Index or DESI index, and some studies use the DIGiX index. Some researchers, by building a new composite index based on several indicators related to ICT, present the obtained results as an adequate indicator of ICT. In our research, we will use the "share of the number of internet users in the total population" *İnternet*_{it} indicator as the main indicator of ICT. The indicator "increase of GDP per capita compared to 1993" will be GDPPCG_{it}. Given these indicators, the regression equations we will use for panel analysis and time series analysis can be expressed as (1) and (2), respectively:

$$GDPPCG_{it} = \beta_1 + \beta_2 * \text{internet}_{it} + \varepsilon_t \quad (1)$$

$$GDPPCG_t = \beta_1 + \beta_2 * \text{Internet}_t + \varepsilon_t \qquad (2)$$

Table 4 shows the results of the panel analysis based on data for the period 1993-2020 for 6 regional countries. The panel analysis of the dependence of the indicator "increase in GDP per capita compared to 1993" on the indicator "share of the number of Internet users in the total population" suggests that there is a positive relationship between these indicators. However, the model of the relationship between these two indicators is not in the form of a simple pair regression dependence and is more complex. This is also shown by the fact that the Durbin-Watson coefficient is very small in table 4. Thus, it is possible to make the model more adequate by eliminating the existing autocorrelation.

Table 4. Dependence of GDP p.c. growth (compared to 1993) on the "share of the number of Internet users in the total population"

users in the total population									
Periods included: 28 Cross-sections included: 6 Total panel (balanced) observations: 168									
Variable Coefficient Std. Error t-Statistic Prob.									
INTERNET C	12.43050 142.7677	1.691526 66.26427	7.348688 2.154520	0.0000 0.0326					
R-squared Adjusted R-squared S.E. of regression Sum squared resid Log likelihood F-statistic Prob(F-statistic)	ared0.245466Mean dependent vared R-squared0.240920S.D. dependent varregression628.6699Akaike info criterionquared resid65607499Schwarz criterionelihood-1319.902Hannan-Quinn criter.stic54.00322Durbin-Watson stat-statistic)0.000000		474.5525 721.5708 15.73692 15.77411 15.75202 0.079798						

Note: calculated by the authors

The results of the time series analysis performed based on the data of the individual countries included in the study (Table 5) show that there is a strong correlation between the number of Internet users and the level of public welfare in these countries.

Table 5. Dependence of the GDP growth compared to 1993 on the "share of the number of Internet users in the total population"

in the total population									
	Azerbaij	Georgi	İran	Russi	Turke	Armen			
	an	а		а	у	ia			
r^2	0.630130	0.831503	0.14725	0.76295	0.676650	0.713367			
			0	5					
Number of	28	28	28	28	28	28			
observatio									
ns									
β_1									
coefficient	477.4383	108.3519	196.8670	1.208061	33.96598	227.5764			
Std. error	205.6645	31.91827	48.10714	22.19650	18.22685	59.74400			
t-Statistic	2.321442	3.394669	4.092261	0.054426	1.863513	3.809193			
Prob.	0.0284	0.0022	0.0004	0.9570	0.0737	0.0008			
β_2									
coefficient	29.95423	10.90744	3.048168	4.364495	3.484280	13.59683			
Std. error	4.500709	0.962942	1.438585	0.477104	0.472368	1.690276			
t-Statistic	6.655447	11.32720	2.118866	9.147886	7.376198	8.044147			
Prob.	0.0000	0.0000	0.0438	0.0000	0.0000	0.0000			

Note: calculated by the authors

The results obtained in both Table 4 and Table 5 prove that the development of the Internet, which is one of the main determinants of the digital economy in the country, and the increase in the number of people using it, have a positive effect on economic development.

6 Current Situation of the Main Determinants of the Digital Economy in Azerbaijan (Comparative Analysis)

After Azerbaijan gained independence, the process of faster integration into the globalization process began. As a subject of international law, our country began to integrate with other countries and international organizations in political, economic, and cultural fields, as well as in the field of information exchange. In the first years of independence, a legislative network began to be formed to ensure information security and the right of the population to receive information. In 1998, "The Law of the Republic of Azerbaijan on Information, Informatization, and Protection of Information", "The Law of the Republic of Azerbaijan on Freedom of Information", in 1999 "On Approval of the Agreement on Cooperation in the Development and Use of Cellular Mobile Communication Systems" of the Republic of Azerbaijan Law", 2000 "Law of the Republic of Azerbaijan on acceding to the Charter and Convention of the International Telecommunication Union, as well as amending documents", Law of the Republic of Azerbaijan on acceding to the Statute and the Rules of Procedure of the said Conference to establish the Pan-European Conference of Postal and Telecommunications Administrations". "Television and "Law of the Republic of Azerbaijan on Radio Broadcasting" and other important laws played an important role in regulating the activity of distributing receiving and information in Azerbaijan, [20]. The development of digital technology on an international scale and the creation of new digital goods and services immediately found its consumer in our country. In September 1994, the signing of the "Agreement of the Century" and the attraction of large-scale investments to Azerbaijan allowed new technologies and management methods to enter our country. The use the latest technology, of including digital technology, by transnational companies in their activities, has encouraged the spread of such technology in other areas of the economy and social life.

The expansion of Information Communication services, including mobile phone and Internet services in Azerbaijan, created new opportunities for the development of the economy. To regulate the spread and application of digital technology in

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Azerbaijan, the "Law of the Republic of Azerbaijan on electronic signature and electronic document" was adopted in 2004, the "Law of the Republic of Azerbaijan on Electronic Commerce" and the "Law the Republic of Azerbaijan of on Telecommunications" and other laws were adopted in 2005. The extensive activity of Transnational Companies and International Financial Institutions in Azerbaijan, as well as the creation and development of a favorable environment for the activity of small and medium-sized businesses, made it possible for the wide application of digital technology in the country. In the last 20 years, as a result of the increase in the income of the population and the deepening of the globalization process, the expansion of international relations has increased the possibilities of using digital technology in the country, especially the Internet (Figure 4) and mobile communication (Figure 5). It should be noted that according to the level of internet usage, Azerbaijan is the leader among the countries of the region. According to this indicator, Azerbaijan is almost at the same level as developed countries. In a short period, that is, in just 12 years, this indicator of Azerbaijan rose from 14.5% to 84%. Armenia and Georgia lag far behind Azerbaijan on this indicator. The level of internet usage in Azerbaijan and the region as a whole has increased sharply in the last 10 years. Of course, the main reason for this is the increase in technological possibilities for digitization and the increase in the income of the population.



Fig. 4: Share of the number of Internet users in the population in Azerbaijan (%), [30]



Fig. 5: Number of mobile phone subscribers per 100 people, [30]

The level of use of mobile phones has also developed with approximately the same scenario. However, according to this indicator, Azerbaijan and Turkey are slightly behind the countries of the region. This indicator is around 100 for both countries, that is, the number of mobile phone subscribers is 100 for every 100 people. This could mean that one in every hundred people, almost everyone, uses a mobile phone. The interesting thing about this indicator is the occurrence of a "saturation level" after 2010. So, except for Iran, the increase in mobile phone subscriptions after 2010 in each of the countries of the region is negligible.

However, despite this, the level of use of digital technology and the level of digitization of the economy and society in Azerbaijan lags far behind developed countries. On the other hand, the weak process of importing digital technology and creating new digital goods and services in Azerbaijan indicates that the share of the digital economy in the country is still not at the desired level.

The GDP per capita volume dynamics (in US dollars) is presented in Figure 6. It should be noted that the volume of GDP per capita of the countries of the region has also increased sharply compared to 1991 (Figure 7). In the first years of independence, Azerbaijan's GDP per capita was the smallest among the countries of the region. The transfer of the planned economy of the former Soviet system seriously affected not only the oil economy but also agriculture in Azerbaijan. Since a significant part of the products produced in the agricultural sector in Azerbaijan were sent to the Soviet republics, the breakdown of economic relations with these countries hurt the sale of products. Despite this, the economy of Azerbaijan revived and developed rapidly in the following years. In the early 2000s, Azerbaijan left other countries of the region behind due to the speed of economic development. In 2014

in Azerbaijan per capita. The volume of GDP was 3667% more than in 1991. Despite a certain reduction in economic growth during the devaluation of 2015, high growth was maintained in the following years.



Fig. 6: GDP per capita volume dynamics (in US dollars), [30]



Fig. 7: Growth of the volume of GDP p.c. compared to 1991 (%), [30]

As we mentioned above, the digital economy is characterized by the production of digital technology and new digital goods and services (the "production component" of the digital economy), as well as the import and consumption of these technologies, goods, and services ("the consumption component" of the digital economy). Most of the world's countries, especially industrially less developed countries, are more engaged in the "consumption component" of the digital economy. Such countries import computers, tablets, mobile phones, and other digital goods, devices, and equipment required for the Internet, various ICT equipment, and software. Such imported digital technology and goods are used in the country through various channels to create added value at one level or another. The main role of such products in the creation of added value is related to the development of human capital. However, maintenance of digital goods during their use in the country of importation, software upgrade or hardware repair, and other services also make an

additional contribution to the economy. However, it should be taken into account that the production potential of such products is extremely low in developing countries, as digital technology and digital goods and software are rapidly becoming "obsolete". Therefore, the difference between imports and exports in these countries is quite large and continues to grow. Unfortunately, the difference between the shares of the import and export volume of ICT products in Azerbaijan, respectively, in the total import and export volume is very large.

7 Discussion

A comparative analysis of a large number of studies devoted to the digital economy suggests that the digital economy has two distinct aspects. The first aspect is related to the application of digital technology. Almost every country in the world uses digital technology at one level or another, such as the Internet, mobile phones, e-commerce, egovernment, e-transportation management, and so on. In some countries, the level of such use is high. while in others it is low (Figure 8). Internet users made up 90% of the population in 2020 in highincome countries. This means practically anyone of any age who can read and write. In just 30 years, 60% of the world's population has gained access to Internet services. Developed countries export ICT services to developing countries, increasing the level of use of digital technology in those countries. Based on the statistics of the World Bank, it can be noted that middle and upper-middle-income countries prefer ICT products in their imports. Therefore, as a result of the application of digital technology in these countries, GDP growth has accelerated (Figure 9)



Fig. 8: Share of Internet users in the population (%) in countries with different incomes, [30]



Fig. 9: Imports of ICT products in different income countries (% of total imports), [30].

The impact of digital technology on economic development and the level of well-being was felt more prominently during the COVID-19 pandemic. The pandemic has dramatically increased the demand for digital technology. Digital technology, in turn, prevented a sharp weakening of the economy. In the "stay at home" mode, the education system was almost able to continue its activities. The application of digital technology to various areas of economic activity before and after the COVID-19 pandemic undoubtedly increases labor productivity. On the other hand, the digital economy is accompanied by the creation of new goods and services. The production of such products means the creation of new added value, jobs, and new incomes. Although the creation of new digital products, such as computers, telephones, software, etc., is mainly the share of technologically developed countries, during the use of these products, service areas for them allow the creation of new jobs and the formation of additional income in developing countries. In this sense, developing countries can not only import digital technologies but also create added value by providing services to them. Thousands of people who master digital technology in developing countries work in developing countries and their financial transfers to their own countries also have an important share in the economic development of developing countries. That is why the quantitative assessment of the effects of the digital economy and its various aspects on the level of economic development and well-being is of great scientific and practical importance.

Scientific studies devoted to the effects of the digital economy on economic development are often found in the economic literature in recent years. For example, [31], studied the effects of the digital economy on economic development in the post-

Covid-19 era using the Belt and Road countries. Based on the method proposed in the study, the development dynamics of the digital economy in 31 countries on the "Belt and Road" project in the period between 2009 and 2019 were calculated. Then, the impact of the digital economy on economic development was studied through a panel analysis until the COVID-19 pandemic. Then, the effects of the COVID-19 pandemic on the digital economy in these countries were calculated based on the GTAP (Global Trade Analyzes Project) model. The researchers conclude that, firstly, the level of development of the digital economy in the countries on the "Belt and Road" project is very different. The level of development of the digital economy is high in the countries of East Asia, and Southeast Asia, as well as in the countries of Central and Eastern Europe. Except for Israel, the digital economy is poorly developed in West Asian countries, as well as in Central and South Asian countries. Secondly, in these countries, the digital economy has a significant impact on economic development, stimulates the development of industry, and increases the level of employment. Third, COVID-19 has increased the demand for digital technology in these countries relative to the supply. In some of the countries involved in the study, including Israel, Latvia, Estonia, and Armenia, it was found that the potential for the development of the digital industry is great. COVID-19 has negatively affected the development of the digital economy in some countries, such as Ukraine, Egypt, Turkey, and the Philippines.

In their study, [21], analyzed the economic effects of digitization in Sub-Saharan African countries about OECD countries. Making such a comparison made it possible to determine the differences between the effects of digitalization depending on the level of development. According to the results of the research, digitalization has a positive effect in all countries, regardless of the level of development. However, the use of the Internet in developed countries and mobile telecommunications in developing African countries is at a higher level, the main conclusion is that lower levels of digital technology create greater opportunities in developing countries. Based on the results of the study, it is recommended to the decision-makers that to achieve economic development, a larger amount of investment should be focused on digitalization.

The study, [24], analyzed the impact of the innovative digital economy on production factors using the example of the Chinese economy. The obtained results prove that digital technology has a

positive effect on the sustainable development of production factors.

In their research, [1], ask why some countries are rich and others are poor. A panel analysis of 123 countries shows that poor countries benefit more from ICT development and their economic development level rises faster.

[29], studied the impact channels of ICT on economic development in his research. The researcher claims that the impact of ICT on the economy occurs mainly through three channels. First, ICT facilitates the faster diffusion of technologies and innovations. Second, ICT provides a more optimal option in decision-making. Thirdly, demand increases and production costs decrease.

8 Conclusion

- 1. The "production component" of the digital economy dominates in developed countries, while the "consumption component" dominates in developing countries.
- 2. The increase in the share of both the "consumption component" and the "production component" of the digital economy in the total economy promotes the economic development of the country and the improvement of the welfare of the population.
- 3. The "consumer component" of the digital economy in Azerbaijan plays an important role in the development of the economy and in increasing the well-being of the population. However, there is a serious need to increase the necessary potential for the development of the "production component" of digital technologies and to increase the share of the digital economy in the country's economy at the expense of the "production component".
- The main finding of the study is that the digital economy consists of two aspects, namely 1) the aspect of consuming digital knowledgeintensive products and 2) the aspect of producing digital knowledge-intensive products. Both aspects play an important role in modern economic development. But the long-term competitiveness of the country depends more on the second aspect.

References:

[1] Appiah-Otoo I, Song N., 2020. The impact of ICT on economic growth comparing rich and poor countries. *Telecomm Policy*. 45 (2) 2020. doi: 10.1016/j.telpol.2020.102082

- [2] Arab Digital Economy Index Report, 2022, pp. 154. https://arab-digitaleconomy.org/language/en/arab-digitaleconomy-index
- [3] Bahl, M., 2016. The Work Ahead: The Future of Businesses and Jobs in Asia Pacific's Digital Economy, Cognizant, Chennai. The Work Ahead, 2016. pp.25
- [4] Barefoot K, Curtis D, Jolliff W, Nicholson JR, Omohundro R. Defining and Measuring the Digital Economy. Washington, DC: US Department of Commerce Bureau of Economic Analysis. 2018. p. 15.
- [5] BBVA Research, Electron resource: https://www.bbvaresearch.com/en/publicacion es/digix-2020-update-a-multidimensionalindex-of-digitization
- [6] British Computer Society., 2014. *The Digital Economy, British Computer Society,* London, 2014. pp.37.
- [7] Challenges for Competition Policy in a Digitalised Economy, European Parliament, *European Parliament*. Brussels, 2015, pp.84. <u>http://www.europarl.europa.eu/RegData/etude</u> <u>s/STUD/2015/542235/IPOL_STU(2015)5422</u> <u>35_EN.pdf</u>
- [8] Dahlman, C., Mealy, S. & Wermelinger, M. (2016). Harnessing the Digital Economy for Developing Countries, OECD, Paris. Working Paper No. 334, 2016, pp.80 <u>http://www.oecdilibrary.org/docserver/download/4adffb24en.pdf</u>
- [9] Digital Economy Facts & Figures. Expert Group on Taxation of the Digital Economy, European Commission, Brussels. 4 March 2014, pp.22 <u>https://taxationcustoms.ec.europa.eu/system/files/2016-09/2014-03-13_fact_figures.pdf</u>
- [10] Digital Economy and Society Index (DESI) 2020, European Commission 2022, pp.14.
- [11] Digital Economy Index Report. (2021). Adobe. All rights reserved, Electron resource: <u>https://business.adobe.com/resources/reports/a</u> <u>dobe-digital-economic-index-april-2021.html</u>
- [12] Digital Economy, Oxford Dictionary, Oxford University Press, Oxford, UK, 2017.. <u>https://en.oxforddictionaries.com/definition/di</u> <u>gital_economy</u>
- [13] Expanding Participation and Boosting Growth: The Infrastructure Needs of the Digital Economy, *World Economic Forum*, Geneva. 2015, pp.44. <u>www3.weforum.org/docs/WEFUSA_DigitalI</u> <u>nfrastructure_Report2015.pdf</u>

WSEAS TRANSACTIONS on BUSINESS and ECONOMICS DOI: 10.37394/23207.2023.20.123

- [14] G20 Digital Economy Development and Cooperation Initiative, G20 China, 2016, pp.9
- [15] Gulaliyev G.M, Bayramov V. S., Guliyeva T. S, Alikhanli J. Y, Orujova S. M., Granger Causality Analysi s of Foreign Trade İmpact Economi с Growth and Some on Socioeconomic Indicators: Case of Azerbaijan. WSEAS Transactions on Business and Economics, Volume 18, 2021.pp.276-283.
- [16] Gulaliyev G.M., Guliyeva T.S., Hajiyeva A.L., Muradova R.H., Mammadova I.U., Estimation of Tourism Demand and Supply Functions for Azerbaijan: 2SLS Approach. WSEAS Transactions on business and economics, Volume 18, 2021. DOI: 10.37394/23207.2021.18.119
- [17] Gülaliyev G.M., Nuraliyeva N.R., Huseynova A.R., Hatamov E.F., Alikhanli S. Y., Abdullayev S.E., Assessing the Impact of the Oil Price Shocks on Economic Growth in Oil-Exporting Arab Countries. WSEAS Transactions on business and economics. Volume 19, 2022. DOI: 10.37394/23207.2022.19.42
- [18] Knickrehm, M., Berthon, B. & Daugherty, P., 2016. Digital Disruption: *The Growth Multiplier, Accenture*, Dublin. 2016, <u>https://www.anupartha.com/wp-</u> <u>content/uploads/2016/01/Accenture-Strategy-</u> <u>Digital-Disruption-Growth-Multiplier.pdf</u>
- [19] Measuring the Digital Economy, A New Perspective. OECD, Paris, 08 Dec 2014, p.160
- [20] MTCHTRA. Ministry of Digital Development and Transport OF THE Azerbaijan Republic official site Electron resource: https://mincom.gov.az/az/view/files/4/
- [21] Myovella G, Karacuka M, Haucap J. Digitalization and economic growth: A comparative analysis of Sub-Saharan Africa and OECD economies. *Telecomm Policy*. 44
 (2), 2019, pp. 101856. doi: 10.1016/j.telpol.2019.101856
- [22] Network Readiness Index 2022, Benchmarking the Future of the Network Economy, Portulans Institute, 2022, pp.262.
- [23] Noelia Cámara and David Tuesta, DiGiX: the Digitization Index. 17/03 Working Paper, February 2017, pp. 17
- [24] Pan WR, Xie T, Wang ZW, Ma LS. Digital economy: an innovation driver for total factor productivity. *J Bus Res.* 139, 2022, pp. 303– 11. doi: 10.1016/j.jbusres.2021.09.061
- [25] Rouse, M. Digital Economy, *Techtarget*, Newton, MA. 2020. pp.7

- [26] Rumana Bukht & Richard Heeks. Defining, Conceptualising and Measuring the Digital Economy. Manchester Centre for Development Informatics, Working Paper 68. 2017
- [27] Stavytskyy, Andriy, Kharlamova Ganna, Alexandru Eduard Stoica, The Analysis of the Digital Economy and Society Index in the EU. Baltic Journal of European Studies Tallinn University of Technology, Vol. 9, No. 3 (28), 2019 doi: 10.1515/bjes-2019-0032
- [28] The Digital Economy, House of Commons Business, Innovation and Skills Committee, House of Commons. London, 18 July, 2016, pp.37 <u>https://www.publications.parliament.uk/pa/cm</u> 201617/cmselect/cmbis/87/87.pdf
- [29] Vu MK, ICT as a source of economic growth in the information age: empirical evidence from the 1996–2005 period. *Telecomm Policy*. 35, 2011, pp. 357–72. doi: 10.1016/j.telpol.2011.02.008
- [30] World Bank. Open Data Electron resurs: https://data.worldbank.org/
- [31] Zhang J, Zhao W, Cheng B, Li A, Wang Y, Yang N. and Tian Y. The Impact of Digital Economy on the Economic Growth and the Development Strategies in the post-COVID-19 Era: Evidence From Countries Along the "Belt and Road". *Front. Public Health*, 09 May 2022, vol 10, p.17 doi: 10.3389/fpubh.2022.856142

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