

## ARTICLE

**INFORMATION & COMMUNICATION TECHNOLOGIES (ICT) AND ECONOMIC DEVELOPMENT OF THE AZERBAIJAN REPUBLIC**

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**ABSTRACT**

*Nowadays, the Republic of Azerbaijan is one of the most developed countries in the Caucasus region. The country's development is associated with hydrocarbon production; but in recent years, the country's authorities have taken a course towards the IT sector development. This is an extremely interesting phenomenon, especially considering the low base's effect and the high growth rate of the main indicators which characterize a digital society. Within the article, the authors identify the relationship between the indicators of the digital society development and IT and the growth rate of the country's economy and then the authors characterize the trends which are characteristic for Azerbaijan's IT sector. The major challenge of the article is the preparation of the statistics for research, as they are scarce and segmented. There are two main elements of the research novelty: first, the methodology proposed by the authors for assessing the investments' effectiveness in IT by comparing them with the ITU index and, second, the identifying the shortcomings of the IT development system with the use of the digitalization efficiency analysis (from the below). The major contribution of the article is the development of the econometric methods for the estimation of the ICT investments' effectiveness on the example of the Azerbaijan economy and the proof of the high importance of the sphere for the future of the country economy.*

**KEYWORDS**

Azerbaijan, Digitalization, ICT, Internet Access, Development

## 1. INTRODUCTION

The economy of the Caucasus region's countries is one of the most interesting and important topics in the context of ensuring sustainable development of neighbouring regions. Today, the economy of Azerbaijan is almost 70% of the total economy of the countries, situated in the South Caucasus. This is the only economy in the Caucasus where information and communication technologies are the second most significant industry. This is not surprising, as the country's rapid Gross Domestic Product (GDP) growth and massive investments in ICTs assisted that the industry received drivers for its development (Ng, Tan, 2018). The ICT industry includes such areas of the economy as computer equipment production and assembly, the development of Internet networks and other types of communications and software development. Information transfer and acquisition technologies, information technologies are not only a fast-growing industry; in some ways, these technologies are some kind of the economy's flagship. Their implementation in the field of education leads to its quality increase, and their use in public administration significantly improves the administration quality. The public administration transparency, which should ensure the ICT technologies development, is also among the main priorities of the Azerbaijani authorities.

Within the research, the authors focus on comparing the country's economy' growth as a whole and the ICT sector growth; the authors also reveal the ICT sector dependence on state support, demonstrating this situation inefficiency in the context of Azerbaijan's market economy. The authors also show the relatively weak participation of the corporate sector and small and medium enterprises in the ICT sector development.

## 2. LITERATURE REVIEW

Azerbaijan is one of the most developed countries of the Caucasus region. It can boast rich natural resources and relatively developed infrastructure. At the same time, the country pursues the model of high-tech development and seeks for ways of innovative development. According to the Asian Development Bank (ADB) report (Yoon, 2019), ICT is the major and the most prospective way of achieving the goal of innovative development. Taking into account the pursue of the country for new technologies, ICT can provide synergetic and fast effect on the country economy (Sharafat, Lehr, 2017). The methodology used in this paper was offered in (Karayev, 2012) as a promising method of ICT potential estimation. The Article concentrated on forecasting the future of ICT development on the dawn of its development in Azerbaijan and needs to be reviewed. For instance, the mentioned article concentrated on the potential of software production, missing out the effects of fin-tech, the significance of data storage for global economy and for the economies of countries, providing such services, especially considering the recent experience of COVID-2019 pandemics and growing demand for sustainable information architecture. Technology leapfrogging today is a highly discussed term and partially it refers to Azerbaijan, according to (Tan, Ng, Jiang, 2018). Still, the authors of the paper cannot quite agree with this point of view due to the fact, that Azerbaijan has a significant scientific base, inherited from the USSR. But the commonly acknowledged idea is that Azerbaijan follows the track of leapfrogging (Ng, Tan, 2018). At the same time, we cannot miss out the interconnection of technology development, education and information covered in (Agayev, Mammadova, Melikova, 2019). Several other papers concentrate on specific industries, while missing out the fundamental significance of ICT development in the country (for

instance, Veliyeva Y. (2021) concentrates on new financial technologies, and Babayev E. (2018) puts forward a specific topic of electronic government as an element of ICT development of the Republic). The mentioned articles miss fundamental analysis of ICT on the economy of the country in whole. All the spheres in Azerbaijan need to be developed, so the authors of the paper concentrate on the potential for their growth.

### 3. METHODOLOGY

The authors examine the ICT topic in the viewpoint of identifying the sector's impact on the country's GDP; the authors also analyse weaknesses in the sector's development. The authors pay special attention to "digitalization from below", it means, to the consumer aspect of ICT development. This is due to the fact that in Azerbaijan, "digitalization from above" is rather chaotic and it does not allow the formation of reliable data series in the long term.

To solve these problems, the authors predict GDP, the share of Internet users in the country and the share of users using mobile Internet as the main way to access the network using linear models. Further, the authors conduct a correlation indicators analysis using Excel tools to prove the close relationship between the considered indicators.

To prove the uneven effectiveness of investments in ICT in Azerbaijan, the authors use the delta index, developed by them:

$$DeltaIndex = \frac{(ITU_t - ITU_{t-1})}{(\sum\{SI, EI\}_t - \sum\{SI, EI\}_{t-1})} * 100$$

where *ITU* is the index developed by International Telecommunication Union (ITU), *SI* is an investment in science in million Manats, *EI* is an investment in education in million Manats, *t* is the current period, *t-1* is the past period.

Using the proposed tools, the authors identify weaknesses in the ICT development in Azerbaijan; using this basis we propose measures for a more successful industry's development.

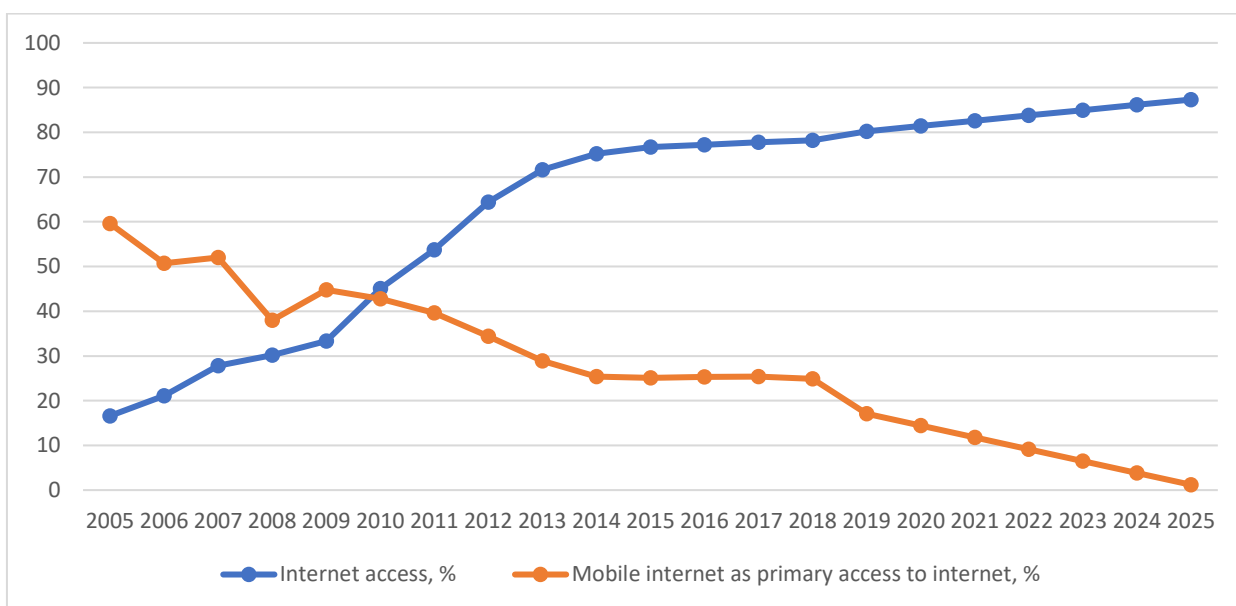
### 4. RESULTS

As it was mentioned earlier, Azerbaijan is one of the most technologically advanced states in the Caucasus region. The republic's government sees the ICT sector as the second priority for the economy's development; that's why the ICT sector is the second sector for receiving state support after the oil and gas sector. In this regard, a number of state programs are being realized in the Republic in the field of the information and communication technologies development; but these programs are not systematic. Nevertheless, the level of the sector's state support is high; in the whole, the general level of society's informatization and the ICT's technological base are also quite high.

Azerbaijan constantly emphasizes the information technology importance not only for the country's economic development but also for the democratic institutions' development. That's why, separate goals such

as the sector’s development, a society’s informatization increase and an increase in Internet access for all population’s segments are set. In the context of this goal, it is necessary to notice the country has a very high proportion of the population with access to high-speed and mobile Internet, which is shown in the Figure 1, compiled by the authors based on the data from the Azerbaijan Statistical Information Service ([ASIS, 2021](#)).

**Figure 1:** Internet Access in Azerbaijan, in % of Households



As the Figure 1 demonstrates, “digitalization from below” is being successfully realized in the Republic; moreover, its significant coverage contributes to the sustainable social institutions' development in the digital environment. This is one of the positive trends in the situation development in Azerbaijan. On the other hand, the corporate sector has a low interest in investing in ICT without the foreign investors support ([Patricolo, 2017](#); [Lloyd bank, 2021](#)), also this conclusion is indirectly confirmed by the fact that in the Ease of Doing Business Azerbaijan takes the first place in access to credit: this attracts foreign investors ([The World Bank, 2021](#)); this fact assists a decrease in the ICT development results, despite the claims that the ICT industry revenues will soon be equal to the oil and gas sector’s revenues. This is so because the IT industry is actively stimulated by the state and it is not adapted to competition; that’s why the IT industry needs a constant finances influx within realized state programs.

The authors carried out a correlation analysis of the “digitalization from below” main indicators; we speak about such indicators as Internet access, Internet access using a mobile phone, the number of university graduates as the main digital institutes carriers ([Saykili, 2019](#); [Metilda, Neena, 2017](#)) and as the main indicator of the digitalization effectiveness such as the country's GDP. The data, calculated by the authors has been presented in the Table 1.

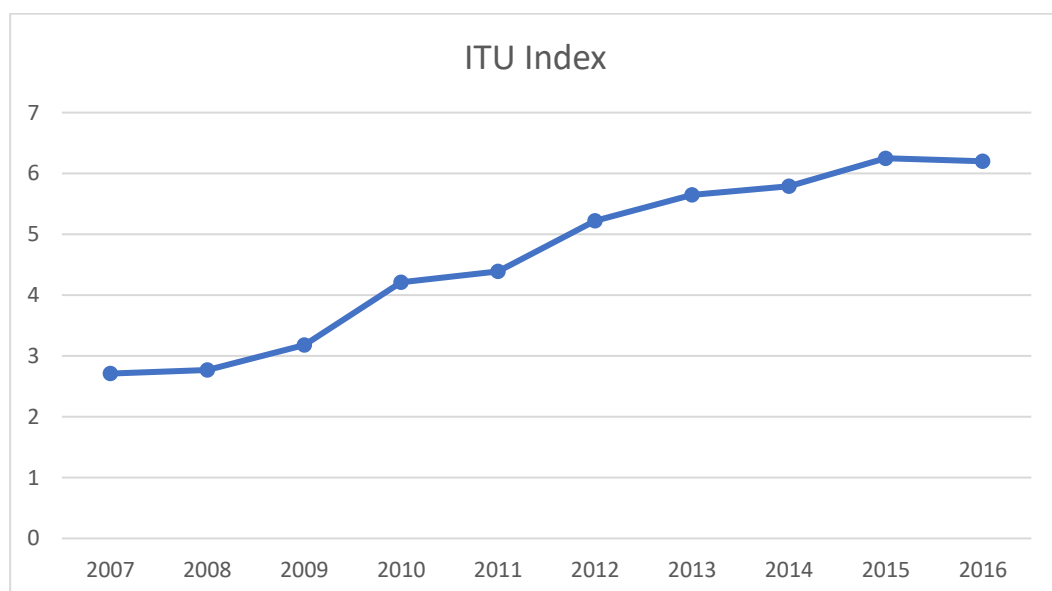
**Table 1:** The Correlation Analysis Results

Internet Access/Graduates	0,81167993
Internet Access/GDP	0,91560578
Graduates/GDP	0,89693602
Internet access/ mobile internet as primary access to internet	-0,9261183

The presented data in the Table 1 shows a close positive relationship between the first three pairs of indicators, while the last pair shows a close negative relationship. This is not typical for developed countries, but in Azerbaijan, this is due to path dependence and the complexity of communications infrastructure forming.

In general, it can be said that “digitalization from below” or consumer ICTs in Azerbaijan are developing rapidly and successfully. At the same time, ICT in the corporate sector is still at a rather low level, and “digitalization from above” is slowing down due to the lack of a clear development strategy at the state level (Yoon, 2019). And if in the historical perspective the absence of a clear strategy slightly worsened the situation in the ICT sector, which was due to the low base effect: Azerbaijan began transforming the economic development system into the catching-up way of the high technologies development recently, but today this situation is already a serious barrier to further successful development, which is shown in the Figure 2, based on the (ITU, 2021).

**Figure 2.** ITU Index for Azerbaijan



As Figure 2 shows, despite the indicator’s growth, Azerbaijan has reached its extensive development peak, which does not require the realization of a clear growth strategy; thus, today Azerbaijan needs to develop an effective development strategy for the country. Obviously, such a development strategy seems to be a difficult

task, in this case, the authors propose a method for continuous monitoring of the investments' effectiveness in ICT. The results for the available years range, calculated by the authors, are presented in the Table 2.

**Table 2.** Delta index results

	2008	2009	2010	2011	2012	2013	2014	2015	2016
<b>Delta index</b>	0,0218	0,2164	2,4292	0,1782	0,424	-2,828	0,1134	1,1442	-0,034

As the delta index shows, one of the main problems in the Azerbaijanian ICT sector is the lack of a clear correlation between the investments volume and their effectiveness; even if we consider them with a time lag. To create a predictable ICT sector in the country, the authors propose a comprehensive institutional approach.

## 5. DISCUSSION

A high level of government participation in ICT development plays a dual role in ensuring sustainable sector growth. On the one hand, the state revenues redistribution from the hydrocarbon production sector to the high technology sector plays a positive role in the economy's development and balancing as a whole.

But this state participation level in ICT development has drawbacks. By the time state priorities will have changed and programs will have been realized, the ICT industry should be ready for the full self-sufficiency, but this is impossible without other industries uniform development. These other industries must become the main ICT services buyers. Today, the main client is the public sector.

ICT development in a country with a low base for the high-tech institutions and infrastructure development is impossible without the new ways' formation of interacting with economic actors and other areas, in particular, with science and education. In Azerbaijan, projects such as the University of Information Technologies, the High Technology Park and the Information Technology Development Fund have been launched. The fund was created to offer potential investors in the ICT industry a convenient state structure to support investments, which, according to the government, will have been for about \$ 3.5 billion by 2020 ([Orujova, 2013](#)). However, this is not enough for the sustainable sector's functioning. It is necessary to create international development institutions; for example, the formation of a joint scientific centre with the Eurasian Economic Union - EAEU countries may be a good idea.

Azerbaijan realizes a policy of the accelerated oil and refining sectors' industrialization; they can become the main source for independent ICT development. The financial resources attracted and generated by this sector in the redistribution process are already going to the ICT sector, but with the state's mechanisms help. It is necessary to formulate public-private partnership mechanisms at the first transition stages to the formation of a more competitive and marketable ICT sector; after that, it is necessary to create conditions for investment in the ICT sector at the legislative level. For example, we can propose preferential taxation or interest-free lending to small and medium enterprises investing in ICT development.

Besides, it is planned to turn Azerbaijan into a regional ICT centre through the republic's participation in the global projects TASIM (Trans-Eurasian High-Speed Information Highway), EuraCA (Eurasian Connection Alliance) and EPEG (International Cable System Europe-Persia Express Gateway). At the present time, only the state is involved in this work, there is no voice of a private investor in this project.

From the foregoing, it is obvious that in the last few years the ICT development provides a relative economy's growth of the republic. Such growth rates are associated with purely state support and a large volume of government contracts in the overall industry's sales. However, it can be supposed that reached tempo will be supported by foreign investment, sales in the private sector and access to foreign markets. It must be realized that without the private initiative manifestation, the industry's development potential will cease along with the solution of state tasks, directed for the administrative apparatus and social sphere digitalization. There are no specific steps to attract investors; for example, in Azerbaijan, there is no individual enterprises' capitalization and their securities withdrawal to foreign markets. This trend is not positive and may lead to a rapid decline in the industry's enterprises after the state funding cessation.

The practical significance of the article encompasses the potential of the paper to improve the contemporary strategy of Azerbaijan in the sphere of ICT development and the given recommendations are to be introduced in the country strategic development plan for the long-term.

The paper is also important for business, as it reveals the under-financed sphere of economy of the country and in this regard points out the new investment-attractive industry, especially for the foreign companies, which quite often don't consider Azerbaijan as a country with high potential in ICT.

The theoretical implications for the research are based on the scarce literature on Azerbaijan ICT development and the provided analysis allows to significantly widen the research gap for future researches on the theme, especially in the field of general influence of ICT on the economy of Azerbaijan, and provide firm ground for future industry-specific researches.

## 6. CONCLUSION

The authors revealed the close dependence between the information and Azerbaijan's communication technology sector on the public sector and its support. The almost complete absence of a private initiative for the sector development, taking into account the successful "digitalization from below", speaks about problems which take place not only in the country's economy but also in the state's legislative and planned activities.

The most effective measures to solve the identified problems are:

- 1) Attracting foreign investors to Azerbaijan's ICT sector
- 2) Attracting domestic Small and Medium-sized Enterprises (SMEs) to innovation activity through tax incentives and subsidies
- 3) Involvement in the sector's development corporations from the oil and gas sector
- 4) Development of a unified and transparent state planning system at least in the ICT sector
- 5) Encouraging the entry of domestic innovative enterprises into the world market



All foregoing measures will lead not only to an increase in the ICT sector, but also to an increase in the education quality, the Internet access level, and an increase in the country's GDP due to these indicators direct correlation and their high impact on Azerbaijan's GDP.

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