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## **THE ROLE OF ECONOMIC CONTEXT IN MEDIATING DIGITALIZATION'S IMPACT ON ECONOMIC DEVELOPMENT**

### ***Annotation:***

*The article examines the impact of financial sector digitalization on economic development in countries with different income levels, using Russia (transition economy) and the USA (developed economy) as case studies. An econometric model incorporating ICT, R&D, E-Government Development Index (EGDI), and Human Development Index (HDI) indicators was applied to data from 2013–2022. Results confirm a significant positive effect of digitalization on HDI in the USA but reveal weak explanatory power for Russia. The study justifies the need for a holistic approach to digital transformation in developing economies, emphasizing infrastructure, regulation, and human capital.*

### ***Keywords:***

*Digitalization, economic development, Human Development Index, econometric model, developing countries, developed countries, USA, Russia.*

### **Introduction**

At present, digital technologies are actively developing, a large number of innovations appear in all spheres of human life. Countries compete for the title of the most technologically secure country, annually investing in scientific activities for the development and implementation of innovative technologies. This intense global rivalry, powered by large investments, radically changes not just national security paradigms, but also entire communities and economies throughout the world. The relentless pursuit of technological supremacy

promises unprecedented gains in efficiency, communication, and problem solving, while also introducing complex new vulnerabilities, profound ethical quandaries, and significant challenges to established economic structures and global power dynamics.

At the end of 2024, the World Intellectual Property Organization (WIPO)<sup>1</sup> conducted a study of the level of digitalization of states using this index. The top five most innovative economies in the world were headed by Switzerland, Sweden, the United States of America, Singapore and the United Kingdom. At the same time, the increase in the rate of improvement in development was highest in China, Turkey, India, Vietnam and the Philippines.

In 2025, Gartner, Inc., analyzed and forecasted the results of global IT spending, and found that in 2025, global IT spending will amount to \$5.61 trillion, which is 9.8% more than in 2024 (Table 1), thus making this category of companies one of the largest sectors of the economy.

Gartner notes that within financial institutions, it is possible to trace a shift in the focus of internal personnel and consulting costs to spending related to the operation of data centers and the introduction of new technological solutions, in particular, technologies such as artificial intelligence GenAI.<sup>2</sup>

Table 1

Worldwide IT Spending Forecast (Millions of U.S. Dollars)

|                        | 2024<br>Spending | 2024<br>Growth (%) | 2025<br>Spending | 2025<br>Growth (%) |
|------------------------|------------------|--------------------|------------------|--------------------|
| Data Center Systems    | 329,132          | 39,4               | 405,505          | 23,2               |
| Devices                | 734,162          | 6,0                | 810,234          | 10,4               |
| Software               | 1,091,569        | 12,0               | 1,246,842        | 14,2               |
| IT Services            | 1,588,121        | 5,6                | 1,731,467        | 9,0                |
| Communication Services | 1,371,787        | 2,3                | 1,423,746        | 3,8                |

<sup>1</sup> Soumitra Dutta, Bruno Lanvin, Lorena Rivera Lean and Sasha Wunsch-Vincent Global Innovation Index 2024 Unlocking the Promise of Social Entrepreneurship. - 17th ed. - WIPO, 2024. - 325 p.

<sup>2</sup> Gartner Forecasts Worldwide IT Spending to Grow 9.8% in 2025 // Gartner URL: <https://www.gartner.com/en/newsroom/press-releases/2025-01-21-gartner-forecasts-worldwide-it-spending-to-grow-9-point-8-percent-in-2025> (accessed: 01.02.2025).

|            |           |     |           |     |
|------------|-----------|-----|-----------|-----|
| Overall IT | 5,114,771 | 7,7 | 5,617,795 | 9,8 |
|------------|-----------|-----|-----------|-----|

The global economy is fully exposed to the digital transformation that has taken place over the past decades through the introduction of various innovations, but the number of new technologies and their level and quality differ strikingly from country to country. The level of economic development of countries can directly be both an obstacle and a catalyst for such a transformation.

In countries whose economic development remains at a very low level in accordance with the classification developed by the United Nations<sup>3</sup>, the introduction of technological innovations faces a huge number of obstacles due to the lack of infrastructure and investment. These are mainly African countries, some of which have not yet reached the old stages of the country's level of development and do not even have a stable supply of basic biological human needs. Not to mention the availability of access to mobile communications and the Internet and related financial products.

For the most part, underdeveloped countries are in such a position that any integration of technologies into the country at the expense of the state's personal funds or offset of third-party investments unconditionally gives a positive result and makes citizens within the country one step closer to an acceptable and adequate level and quality of life within the framework of modernity, where technology occupies one of the fundamental places in human life.

Of particular interest is the Russian experience as a country belonging to the class with a transition economy, which at the same time is forced to develop its level of digitalization of the financial sector in the face of unprecedented economic sanctions. According to the Central Bank of the Russian Federation (2024)<sup>4</sup>, the fast payment system, which is one of the most extensive and significant projects in the field of financial services in recent years in the

<sup>3</sup> United Nations Department of Economic and Social Affairs Country classifications . - 2020: 8 с.

<sup>4</sup> SBP: Main Indicators // Bank of Russia URL: [https://www.cbr.ru/analytics/nps/sbp/1\\_2024/](https://www.cbr.ru/analytics/nps/sbp/1_2024/) (accessed: 03.03.2025).

country, has reached 40 million users, and the digital ruble project has entered the stage of pilot testing. This example demonstrates that it is possible to ensure the faster realization and production of financial innovation in the nation with a coordinated approach that includes technology improvement, financial literacy civic education, and a significant marketing push. However, the factors that have imposed significant barriers to the complete creation of digital banking in Russia during the past couple of years include alienation from global financial institutions and a lack of technological ability.

A very different dynamic is observed in developed countries, where financial innovation is centered around complex technologies such as distributed ledgers and central bank digital currencies.

The European Central Bank, in its review of the implementation of the PSD2 directive (2023), notes that open banking has led to 40 percent growth in the fintech sector over the past five years. At the same time, as follows from the materials of the US Congress (2023), the lack of clear regulation of the cryptocurrency market creates significant uncertainty for participants, slowing down the introduction of promising technologies.

All in all, in developed and developing countries the situation is different, it is difficult to assess the effect of digitalization without in-depth analysis, so in this paper these classes of countries will be considered in more detail using computational and analytical research.

### **Methodology**

To quantify the impact of digitalization on economic development, we will build an econometric model. One of the most common econometric models in economic science is the linear regression model. It is based on the assumption that the dependent variable and one or more independent variables have a certain relationship with each other.

Our research above showed that the level of economic development and the level of digitalization of the financial markets of the economy are

heterogeneously distributed within the global economy, moreover, it is possible to notice a certain interconnection of these factors. It is this relationship that we will consider within the framework of our econometric model.

Since we have previously established that in a number of undeveloped countries the relationship between the digitalization of the economy and the level of quality of life of people at this stage of development is very weak and ambiguous due to a huge number of obstacles and other problems of these economies that aggravate the course of the positive impact of technology on the development of states, we will focus on the study of developed and developing/transition countries. For the study, data relevant to the Russian Federation and the United States of America will be used.

Let us put forward the following hypotheses for further research within the framework of the econometric model:

H1: Digitalization of the economy has a positive impact on the level of development of developing countries/countries in transition

H2: Digitalization of the economy has a positive impact on the level of development of developed countries

Using this principle, the following econometric model was developed:

The model consists of the factors which influence the GDP of Russia. There is the following econometric model:

$$\left\{ \begin{array}{l} HDI_t = a_0 + ICT_t \cdot a_1 + R \wedge D_t \cdot a_2 + EGDI_t \cdot a_3 + \varepsilon_t \\ E(\varepsilon_t) = 0 \\ \sigma(\varepsilon_t) = const \end{array} \right.$$

Where  $HDI_t$  is the Human development index,

$ICT_t$  is ICT service exports measured in BoP, current US\$,

$R \wedge D_t$  is Research and development expenditure measured in % of GDP,

$EGDI_t$  is E-government development Index.

The data was collected from 2013-2022 for both Russia<sup>5</sup> and USA<sup>6</sup> with the use of UNDP and World bank<sup>7</sup> official Data bank. , so the investigation will observe the period of 10 years.

## Results

The econometric analysis reveals a stark contrast in model performance between Russia and the United States. For Russia, characterized as a developing country, the model exhibits weaker explanatory power, with an adjusted  $R^2$  of 0.4788 indicating that only 47.88% of the variation in the Human Development Index (HDI) is explained by the selected independent variables. This limited fit is further underscored by an insignificant F-statistic of 3.45 (p-value = 0.108), failing to reject the null hypothesis that the model coefficients are jointly zero at the 5% significance level. Consequently, the model's specifications for Russia appear unreliable for robust inference. Conversely, the model for the developed United States demonstrates strong statistical validity. It achieves a significantly higher adjusted  $R^2$  of 0.7803, explaining 78.03% of HDI variation, and yields a significant F-statistic of 10.47 (p-value = 0.014). This confirms that the collective influence of the predictor variables on HDI in the US is statistically significant, supporting the model's overall fit and its ability to robustly explain underlying trends in human development.

All in all we can see that hypothesis №2 has been proven, whereas hypothesis №1 cannot be fully confirmed, meaning the development of non-developed or developing countries can only be partially explained by the process of advancement of digital technologies over time. For such countries different circumstances on the world arena or the situation inside the country itself might become a reason why digital technologies implementation are being blocked of

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<sup>5</sup> Human Development Index: Russia // UNDP URL:

<https://hdr.undp.org/data-center/specific-country-data#/countries/RUS> (accessed: 01.04.2025).

<sup>6</sup> Human Development Index: USA // UNDP URL:

<https://hdr.undp.org/data-center/specific-country-data#/countries/USA> (accessed: 01.04.2025).

<sup>7</sup> World Development Indicators // World Bank Group URL: <https://databank.worldbank.org/data> (accessed: 01.04.2025).

providing their full potential on increasing the pace of economic development of a country.

This can be specifically seen on the example of the Russian Federation taken as a subject or survey in one of the econometric models applied. The complicated situation on the geopolitical level, especially the pressure exerted through the introduction of various kinds of action, underdevelopment of other areas of the population's life that do not pacifically rely on digital technologies, such as manufacturing for example, do not give the opportunity for digital technologies to be fully developed and implementing, stopping them from having an only positive influence in the countries' economy overall.

### **Conclusion**

Therefore we may conclude that for developing countries, it is crucial to build adequate infrastructure, provide widespread internet access, implement a strong data strategy, and prioritize data security to effectively influence digital development outcomes, as well as trying to fix and balance out other difficulties it faces. By taking these measures, digitalizing the economy can help expand government capabilities, optimize capital use, create a healthy business environment, and enhance consumer welfare.

Digitalization is neither a universal solution nor a sure path to progress. Its revolutionary capacity is enhanced in situations with solid pre-existing foundations - infrastructure, institutions, human capital, and economic stability - as seen by developed economies. In emerging and transitional economies, the route is more difficult. Digitalization must be undertaken as part of a larger development plan that prioritizes the establishment of these critical foundations. Only by addressing critical infrastructure gaps, investing in human capital, establishing sound governance, and mitigating external vulnerabilities will these nations be able to fully realize the potential of digital technologies to expand government capabilities, optimize capital allocation, foster a dynamic business

environment, and, ultimately, improve their citizens' welfare and development prospects.

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