DOI: http://doi.org/10.31617/1.2025(163)02
UDC 004:330.3=111

SOROKINA Alyona
https://orcid.org/0000-0002-6512-2776
Postgraduate Student
at the Department of Economics
and Competition Policy
State University of Trade and Economics
19, Kyoto St., Kyiv, 02156, Ukraine
a.sorokina@knute.edu.ua

DIGITALISATION AS A FACTOR OF INCREASING ECONOMIC RESILIENCE IN THE PUBLIC SECTOR

The increase in the frequency of crisis phenomena caused by both internal and external shock influences intensifies the need for the formation of a resilient public sector of the national economy. The digitalization of the public sector is considered as one of the factors capable of enhancing adaptability, flexibility, and ability to recover in response to shock influences. In this context, there is a need for a deeper study of the role of digital technologies in strengthening the functional efficiency of the public sector. The research is based on the assumption that digitalization positively affects the level of public sector resilience, and that countries with a higher level of digitalization are able to cope more effectively with current shock impacts. To verify the hypothesis, the countries of the European Union are studied for comparative analysis, 27 EU countries are grouped according to their level of digitalization based on the E-Government Development Index (EGDI). In addition, the research uses correlation and regression analysis to determine the relationship between the indicators of digitalization and the public sector resilience. The obtained results indicate that a positive relationship between digitalization and the public sector resilience indeed exists, however, its significance is small (for countries with a low level of digitalization, the relationship is even weaker). The research suggests that the public sector digitalization can have a greater impact on the resilience of the household sector, which is confirmed by further results. Since households are direct consumers of public services, the digital transformation of the public sector has an impact on their social and economic resilience, particularly due to the increased adaptability to

СОРОКІНА Альона
https://orcid.org/0000-0002-6512-2776
аспірант кафедри економічної теорії
та конкурентної політики
Державного торговельно-економічного
університету
вул. Кіото, 19, м. Київ, 02156, Україна
a.sorokina@knute.edu.ua

ЦИФРОВІЗАЦІЯ ЯК ФАКТОР ПІДВИЩЕННЯ ЕКОНОМІЧНОЇ СТІЙКОСТІ ДЕРЖАВНОГО СЕКТОРУ

Зростання частоти кризових явищ, спричинених як внутрішніми, так і зовнішніми шоковими впливами, посилює потребу у формуванні стійкого державного сектору національної економіки. Цифровізація державного сектору розглядається як один із факторів, спроможних підвищити адаптивність, гнучкість і здатність до відновлення у відповідь на шокові впливи. У цьому контексті постає необхідність глибшого дослідження ролі цифрових технологій у зміцненні функціональної ефективності державного сектору. Дослідження ґрунтується на припущенні, що цифровізація позитивно впливає на рівень стійкості державного сектору, а країни з вищим рівнем цифровізації здатні ефективніше справлятись із сучасними шоковими впливами. Для перевірки гіпотези розглянуто країни Європейського Союзу: для порівняльного аналізу 27 країн ЄС згруповано відповідно до їх рівня цифровізації за Індексом розвитку електронного врядування (EGDI). Окрім цього, в дослідженні використовується кореляційно-регресійний аналіз – з метою визначення взаємозв'язку між показниками цифровізації та стійкості державного сектору. Отримані результати свідчать про те, що позитивний взаємозв'язок між цифровізацією та стійкістю державного сектору дійсно існує, проте його значення невелике (для країн, що мають низький рівень цифровізації, взаємозв'язок є ще слабшим). У ході дослідження припускається, що цифровізація державного сектору здатна мати більший вплив на стійкість сектору домогосподарств, що і підтверджується подальшими результатами. Оскільки домогосподарства є прямими споживачами державних послуг, цифрова трансформація

sudden economic shock effects. The results of the research can be used to improve digital transformation strategies in the public sector, especially in addressing issues related to digital inequality (both age and geographical), social resi-lience, and digital inclusion.

Keywords: economic resilience, resilience of the public sector, digitalisation, digital transformation.

державного сектору має вплив на їх соціальну й економічну стійкість, зокрема внаслідок збільшення адаптивності до раптових економічних шокових впливів. Результати дослідження можуть бути використані для вдосконалення стратегій цифрової трансформації державного сектору, особливо в роботі над питаннями, що стосуються цифрової нерівності (як вікової, так і географічної), соціальної стійкості та цифрової інклюзії.

Ключові слова: економічна стійкість, стійкість державного сектору, цифровізація, цифрова трансформація.

JEL Classification: O33, O52, C50.

Introduction

The resilience of the public sector, like organizational resilience, is determined by its ability to absorb shocks (minimize disruptions to public services), adapt (adjust the functioning of the entire apparatus to new conditions), and recover (e nsure full functionality at the pre-shock level). In fact, the public sector is capable of cross-sectoral resilience, as it must not only adapt, but also guarantee the provision of quality services to the household and business sectors, and develop policies for all sectors of the economy affected by the shock (Profiroiu & Nastacă, 2021). Therefore, the main challenges in ensuring public sector resilience are maintaining a balance between flexibility and adaptability and stable, predictable functioning of the sector (Leite & Hodgkinson, 2021; Duit, 2016).

The economic resilience of the public sector is determined by its level of financial liabilities. It is widely believed that countries with lower liabilities, such as a low debt-to-GDP ratio, a stable domestic budget, and low external debt, will be able to regulate the economy and respond effectively to economic shocks when they arise. At the same time, there is a wider list of indicators of the economic sustainability of the public sector. In particular, within the framework of the integrated approach, the following indicators are distinguished:

- the level of GDP redistribution through the consolidated budget;
- the ratio of the deficit (surplus) of the state budget to GDP;
- coverage of the deficit of the consolidated budget by external borrowing;
- the volume of transfers from the state budget;
- the share of the public sector in current revenues;
- the level of state and state-guaranteed external and internal debt;
- the adequacy ratio of international reserves to service external debt;
- the level of implementation of the plan for revenues of the consolidated budget;
- the level of implementation of the consolidated budget expenditure plan (Shkuropadska, 2017).

However, ensuring economic sustainability requires not only control over key macro indicators, but also the ability to flexibly respond to changes in the economic environment (Geets et al., 2020). In this case, it is the use of digital tools that helps to increase flexibility, ensuring more effective management of public resources and better coordination of actions in conditions of shock impact. Digitalization is already one of the key factors of change at the macroeconomic level and at the level of individual economic agents (Grytsenko & Burlay, 2020; Novikova & Azmuk, 2023).

The aim of the reseach is to identify the relationship between the level of digitalization of the public sector and its resilience to shock impacts using the example of the European Union countries. To achieve this aim, the following tasks were set: to conduct a quantitative assessment of the level of digitalization of the public sector of the EU countries using statistical and mathematical methods; to conduct a correlation-regression analysis to identify the relationship between digitalization indicators and the level of resilience of the public sector; to formulate practical conclusions on the possibilities of strengthening the resilience of the public sector through digital transformation.

The research is based on the hypothesis that, firstly, the digitalization of the public sector can positively affect its economic sustainability; secondly, countries with a higher level of digitalization of the public sector are able to demonstrate greater sustainability, unlike countries with a lower level of digitalization. Mathematical and statistical research methods were used to test the hypothesis.

The quantitative distribution of countries by their level of digital development of the public sector was carried out on the basis of the quartile distribution of the values of the Digital Governance Development Index (as discussed in the first section of the main part of the article). The second section presents the results of the study of the impact of digitalization on the sustainability of the public sector of the EU countries, for which correlation and regression analysis is used, in particular, the construction of a paired linear model. The results of the research indicate that the relationship between digitalization and the sustainability of the public sector exists, but its significance is small, and economic factors still influence the sustainability of the sector to a greater extent. It is assumed that the digitalization of the public sector can have a greater impact on the household sector; therefore the third section contains a deeper study using the mathematical modeling method, the purpose of which is to establish the impact of the use of digital public services on the readiness of the household sector to sudden shocks.

1. Identification of digital development level of the public sector in EU countries

When assessing the effects of the use of digital technologies in the public sector, we can divide them into two categories: effects from practical

activities and effects from normative activities. In the first case, the digitalization of the government sector makes it possible to promote the development of digital infrastructure (in turn, this affects the equal access of all other sectors to digital technologies), implement digital technologies (thereby reducing public sector costs and increasing productivity) and digitize public services (which increases their efficiency and accessibility for other sectors). As for the second, the legal competences of the public sector provide the opportunity to disseminate the regulatory rules for the development of digitalization, form a strategic vision and stimulate innovative activity. We can determine the impact of digitalization on economic sustainability by applying a pair correlation-regression model and analyzing the development of digitalization of the public sector. Since statistical data on the national economy are limited and do not sufficiently reflect the manifestation of digitalization processes, we will consider EU countries to test the hypothesis.

It is worth identifying EU countries with a high level of public sector digitalization and those with a low level. One of the most convenient methods to establish the level of each of the 27 European Union countries is to refer to the already developed integrated indices. This has its advantages, since such indices usually contain data on each country and create a rating system. Currently, there are three global indices that measure the level of public sector digitalization: the e-Government Development Index proposed by the UN (World Bank Data, n. d.), the Digital Economy and Society Index (DESI), developed by the European Commission (The Digital Economy and Society Index, n. d.) – its purpose is not to directly assess the digitalization of the public sector, but the index contains a separate component "Digital Public Services" – the Digital Government Index (proposed by the OECD) (2023 OECD Digital Government Index, 2024, January 30). As we can see, only two of them specialize in assessing the public sector, but the OECD Digital Government Index does not cover all EU countries (data is available only for key ones – France, Germany, Spain, etc.). Given that using the European Commission's Digital Economy and Society Index will require additional quantitative methods of processing and collecting statistical data, we will use the e-Government Development Index. This Index contains information on all EU countries, specializes in assessing the public sector, and is updated every two years.

The index measures the level of development of digital governance by assessing three components: the volume of electronic services provided and their quality (Online Services Index); the state of telecommunications infrastructure (Telecommunication Infrastructure Index); and human capital (Human Capital Index). *Table 1* presents the results of calculating the Index for the 27 EU countries, from the worst to the best (which is close to 1).

Table 1

Classification of EU countries based on the results of calculating their e-Government development index, 2022 and 2024

Country	2022	2024	Level of development of governance digitalization
Romania	0.7619	0.7636	Low
Bulgaria	0.7766	0.8145	
Hungary	0.7827	0.8043	
Slovakia	0.8008	0.8021	
Czech Republic	0.8088	0.8239	
Croatia	0.8106	0.8818	
Belgium	0.8269	0.8121	Below average
Portugal	0.8273	0.8415	
Italy	0.8375	0.8356	
Poland	0.8437	0.8648	
Greece	0.8455	0.8674	
Ireland	0.8567	0.9138	
Latvia	0.8599	0.8852	
Cyprus	0.866	0.8619	
Luxembourg	0.8675	0.8466	
Lithuania	0.8745	0.9110	Above average
Germany	0.877	0.9382	
Slovenia	0.8781	0.8759	
Austria	0.8801	0.9065	
France	0.8832	0.8744	
Spain	0.8842	0.9206	
Malta	0.8943	0.8886	
Netherlands	0.9384	0.9538	
Estonia	0.9393	0.9727	High
Sweden	0.941	0.9326	
Finland	0.9533	0.9575	
Denmark	0.9717	0.9847	

Source: compiled by the author based on (Regional e-Government development and the performance of country groupings, September, 2024).

We can group countries by their level of digitalization, using quartiles as a measure of location. First, we should determine the median, which will divide the data set "in half". Since we have 27 observations in total, we can assume that the median value is between 14 and 15. Accordingly, we have:

$$\frac{0.866 + 0.8675}{2} = 0.8667.$$

Therefore, the level of all values less than 0.8667 is below the average. However, in order to divide the countries into more equal groups, it is also

worth defining quartiles 1 (Q_1) and 3 (Q_3) (with the median being quartile 2 (Q_2). Accordingly, Q_1 is the average value of the lower half of the data and is equal to 0.8218 (the values of all countries less than 0.8218 belong to the low level). Q_3 is the average value of the upper half of the data, which is 0.9096. As we can see, the countries with a low level of digitalization of governance are Romania, Bulgaria, Hungary, Slovakia, the Czech Republic, and Croatia. On the other hand, the group with a high level includes Estonia, Sweden, Finland, and Denmark.

2. The correlation between digitalization and the level of sustainability of the public sector

In order to determine the relationship between digitalization and the economic sustainability of the public sector, we will use regression mathematical modeling. When building the model, we will consider the following form of the quation:

$$Y = a + bX, \quad (1)$$

where: Y – is the dependent variable that reflects the economic sustainability of the public sector (gross value added (GVA) indicator in the field of public administration, defense, education, healthcare and social work);

X – is the independent variable that characterizes the level of digitalization of the public sector (the percentage of people who used digital public services (website or application) during the last 12 months);

a – is the expected value of Y at a zero value of X (regression constant);

bX – is the deterministic part of the model that reflects the change in Y depending on X.

As a dependent variable expressing the economic sustainability of the public sector, we will consider the indicator of gross value added (GVA) in the sphere of public administration, defense, education, health care and social work. As already noted, the most common indicators expressing the purely economic sustainability of the public sector are public sector GDP (as a % of total GDP), budget deficit/surplus, government spending, and employment level in the public sector. However, unlike the indicated indicators, GVA in the sphere of public administration is sensitive to changes in productivity in the public sector, namely productivity – what is most affected by digitalization (for example, automation of public services, optimization of management and costs). In addition, attempts to determine the correlation-regression relationship between budget deficit/surplus indicators, government spending and public sector GDP (as a share of total GDP) and digitalization factors have revealed that such mathematical models are not statistically significant, and therefore, there is no relationship between the data.

As an independent variable, we will consider the percentage of people who used digital government services (website or application) during the last

12 months. The availability and use of digital government services is an indicator that reflects the optimization of government processes, in particular, reducing operating costs (for example, by replacing physical branches with an online application/website), accelerating the provision of administrative services and reducing the level of corruption. It would be quite logical to also investigate the impact of the number of digital government services provided (depending on the EU country), but currently there is no statistical measurement of this indicator.

The proposed study also contains a number of limitations. In particular, the biggest drawback at the moment is the time period used. Digitalization is a dynamic phenomenon, the development of which intensifies over the years, so the logical choice is a medium-term time period (5–7 years) or a long-term one (10–15 years). But, unfortunately, in addition to dynamism as one of the main characteristics of the digitalization process, it is also characterized by the complexity of its assessment and measurement by specific indicators (which are due to the lack of a clear and stable system for collecting statistics). Therefore, the study covers only a comparison of the impact of the digitalization factor on the sustainability of the public sector in 2022 and 2023. The data that will be used in the future are given in *Table 2*.

Table 2

Input data for building a regression model of the impact of the public sector digitalization factor on GDP in the field of public administration in EU countries, 2022–2023

EU country	2022		2023	
	GDP*, % of total	Share of users**, %	Share of users**, %	Share of users **, %
	Y	*X*	*Y*	*X*
Belgium	21.3	83.27	21.8	81.78
Bulgaria	15.2	26.38	16.1	29.72
Czech Republic	15.8	78.81	15.6	71.12
Denmark	18.7	96.98	19.4	97.68
Germany	19.6	51.24	19.4	58.07
Estonia	15.1	85.83	16.6	88.74
Ireland	8.7	80.83	9.9	85.56
Greece	18.2	67.64	17.6	68.69
Spain	17.7	79.75	17.4	79.68
France	21.9	82.64	21.2	85.17
Croatia	16.4	56.98	17.0	74.62
Italy	16.1	65.69	15.4	60.11
Cyprus	18.2	89.74	18.2	66.12
Latvia	18.2	70.98	18.7	73.18
Lithuania	14.9	73.49	15.5	71.82
Luxembourg	17.3	89.40	18.7	88.90
Hungary	16.6	72.68	15.9	75.63

End of Table 2

EU country	2022		2023	
	GDP*, % of total	Share of users**, %	Share of users**, %	Share of users **, %
	Y	*X*	*Y*	*X*
Malta	15.6	76.41	14.8	81.34
Netherlands	20.5	92.50	20.5	94.78
Austria	17.9	73.88	18.1	75.60
Poland	14.6	55.38	15.3	58.54
Portugal	18.8	68.72	18.3	69.63
Romania	13.2	20.93	13.2	22.56
Slovenia	17.1	73.09	16.5	71.14
Slovakia	16.5	73.58	15.7	71.69
Finland	20.3	94.78	21.1	95.49
Sweden	20.1	93.07	20.5	94.58

* Gross value added in public administration, defense, education, health care, and social work;

** people who used digital public services (website or app) in the last 12 months.

Source: compiled by the author based on (Eurostat, n. d. a, Eurostat, n. d. b).

To determine the parameters of equation (1), we will use the method of least squares. Let x_i and y_i be the corresponding values of the independent (X) and dependent (Y) variables for the i-th observation (i = 1, 2, …, n). In this case, the esti-mates of the parameters a and b are calculated using formulas (2), (3).

$$a = \frac{n \cdot \sum_{i=1}^{n} x_i y_i - (\sum_{i=1}^{n} x_i) \cdot (\sum_{i=1}^{n} y_i)}{n \cdot \sum_{i=1}^{n} x_i^2 - (\sum_{i=1}^{n} x_i)^2}, \quad (2)$$

$$b = \frac{1}{n} \cdot \sum_{i=1}^{n} y_i - a \cdot \frac{1}{n} \cdot \sum_{i=1}^{n} x_i . \quad (3)$$

Accordingly, the parameters for 2022 will be as follows:

$$a = \frac{(27 \cdot 34500.75) - (1974.67 \cdot 464.5)}{(27 \cdot 153347.08) - 1974.67^2},$$

$$a = 0.0593,$$

$$b = \frac{464.5}{27} - 0.0593 \frac{1974.67}{27},$$

$$b = 12.8692.$$

We have the function Y="12.8692"+"0.0593" X, with the standard error of the model (E) being 2.582, the coefficient of determination (R^2) being 0.158, and the F-criterion being 4.702.

When constructing the primary regression model, a low coefficient of determination ($R^2 = 0.158$) was found, which indicates a weak explanatory power of the model. To check its stability, an analysis of residuals and influential points was performed. In particular, several observations were found that deviated significantly from the general trend. In order to increase the adequacy of the model, these observations were excluded from further analysis. In this case, the model parameters will be:

$$a = \frac{(18 \cdot 22763.451) - (1303.55 \cdot 308.6)}{(18 \cdot 99487.09) - 1303.55^2},$$

$$a = 0.08157,$$

$$b = \frac{308.6}{18} - 0.0815\frac{1303.55}{18},$$

$$b = 11.2365.$$

In order to increase the adequacy of the model, these observations were excluded from further analysis. In this case, the model parameters will be:

Taking into account the updated sample, it was found that the coefficient of determination increased to 0.568, and the standard error of the model decreased to 1.2669, which indicates a significant improvement in the accuracy and reliability of the regression model (*Table 3*).

Table 3

Parameters of the impact of digitalization on the GVA of the public sector in EU countries, 2022

a_1	0.0815798	11.236484	a_0
S_{a1}	0.0177681	1.3209532	S_{a0}
R^2	0.5685082	1.2669922	E
F	21.080659	16	$n\text{-}k$
$S_{2reg.}$	33.840135	25.684309	$S_{2gener.}$

Source: calculation results generated using the LINEST function in Excel.

Therefore, the standard error of the model is 1.27, which in percentage terms is 7.4% of the mean value of the dependent variable. This indicates sufficient accuracy of the model, since the error value does not exceed 10%. The F-test was used to check the statistical significance of the model. With the number of observations n = 18 and the number of model parameters k = 2, the degrees of freedom are: m_1="1" and m_2="16". The calculated value of F is 21.04, which exceeds the tabular value F_table="4.49" at the significance level α="0.05". Therefore, the model is considered statistically reliable (*Table 4*).

Parameters for the 2023 model:

$$a = \frac{(18 \cdot 23157.963) - (1319.95 \cdot 309.3)}{(18 \cdot 101613.106) - 1319.95^2},$$

$$a = 0.0989,$$

$$b = \frac{309.3}{18} \cdot 0.0989 \frac{1319.95}{18},$$

$$b = 9.9297.$$

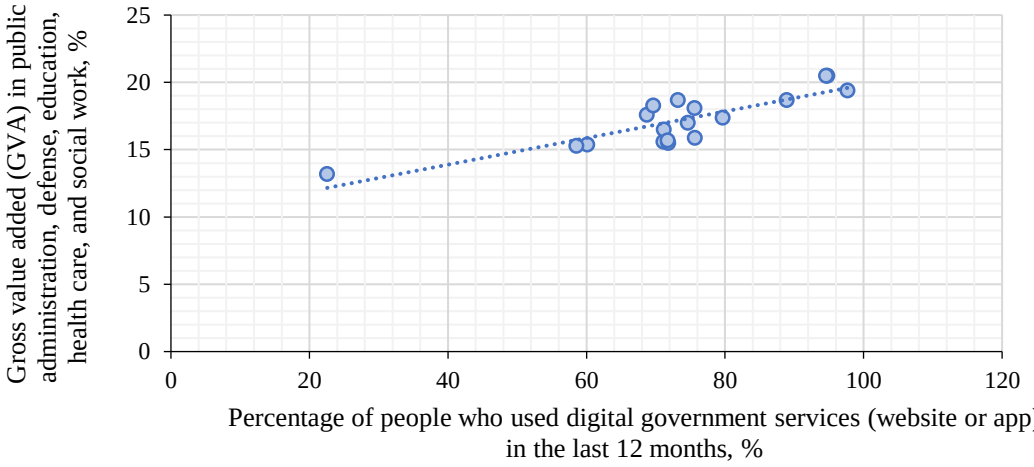
Table 4

Parameters of the regression model of the impact of the digitalization factor of the public sector of EU countries on its sustainability (2023)

a_1	0.09891675	9.92971344	a_0
S_{a1}	0.01567035	1.17738177	S_{a0}
R^2	0.71349666	1.08798274	E
F	39.8457718	16	$n\text{-}k$
$S_{2reg.}$	47.1656969	18.9393031	$S_{2gener.}$

Source: calculation results generated by the author using the LINEST function in Excel.

The standard error of the model E = 1.09, which is 6.32% as a percentage of the mean value of the dependent variable, indicates a fairly high quality of the model. The value of the coefficient of determination R^2 is 0.7, which indicates that most of the variation in the dependent variable is explained by changes in the independent variable (*Figure*). This is a significant improvement compared to the model of the previous year. The value of the Fisher test F = 39.85 exceeds the table value F_{table}="4.49" so the model is considered statistically adequate and significant.



Correlation between digitalization and the sustainability of the public sector in EU countries, 2023

Source: compiled by the author.

We can draw the following conclusions:

- a higher level of digitalization does indeed strengthen the correlation between the economic sustainability of the public sector (in this case directly with the GVA of the sector), but this correlation is quite low;
- in countries with a low level of digitalization, the connection is even weaker (virtually imperceptible);
- accordingly, digitalization may be one of the factors contributing to the economic sustainability of the public sector, but we assume that economic factors have a greater impact.

Thus, the economic sustainability of the public sector largely depends on budget policy, the level of debt burden, tax revenues and external economic factors, while the digitalization of the sector should be considered as a tool used to increase operational efficiency, increase the productivity of the work of state bodies themselves and speed up decision-making processes. All of the above digitalization processes are observed at the micro-level of each state body separately, which significantly complicates quantitative modeling and mathematical measurement of its impact on the economic sustainability of the sector.

3. Impact of public sector digitalization on the sustainability of the household sector

At the same time, the digitalization of the public sector is not limited to internal management processes, but also encompasses the transformation of mechanisms for providing public services, which has a broader macroeconomic impact: in particular, its impact is indirectly manifested through ensuring the sustainability of other sectors – the household sector and the business sector – as a result of the implementation of digital public services. Moreover, if the public sector thus performs administrative and regulatory functions in relation to the business sector, we assume that the impact on the sustainability of the household sector is greater. This can be explained by the fact that the digitalization of public services directly affects the social and economic security and adaptability of households, since they are the main consumers of such services. In addition to faster access to medical services, social payments, and other administrative services, the public sector, thanks to digitalization, is also able to ensure the social sustainability of vulnerable segments of the population – such as people on the verge of poverty, IDPs, people with disabilities, the elderly, or veterans. Unlike the business sector, for which the digitalization of public services manifests itself mainly in the form of simplification of permitting procedures, tax administration, and registration processes, for households it is a factor of social resilience that directly affects the quality of life, well-being, and the ability to adapt to economic shocks.

In order to clarify the impact of the digitalization of public services on the household sector, we can also use a linear correlation-regression model.

The dependent variable is the share of individuals who may face unforeseen financial costs. The chosen indicator characterizes the ability of the household sector to adapt during a shock, which is a characteristic feature of

resilience. Under the independent variable, we will consider the share of individuals who used digital public services (website or application) during the last 12 months, i. e. those who performed the following actions: interacting with government authorities, submitting tax returns online, submitting requests for financial benefits or rights, obtaining information about services, benefits, rights and laws. The model hypothesis is based on the assumption that all of the above actions and online access to them can improve the adaptability of the household sector: in the event of a shock, the use of digital public services allows for faster receipt of financial assistance (benefits or other social support), provides access to transparent and clear information, and reduces the time gap in communication and interaction with government agencies. The statistical data that will be used are given in *Table 5*.

Table 5

Statistical data for creating a regression model of the impact of the digitalization factor of public services on the sustainability of the household sector in EU countries, 2023

EU country	Share of persons, %	
	who may face unexpected financial expenses	who have used digital public services (website or app) in the last 12 months
	Y	*X*
Belgium	78.6	81.78
Bulgaria	53.3	29.72
Czech Republic	80.3	71.12
Denmark	76.9	97.68
Germany	65.0	58.07
Estonia	69.6	88.74
Ireland	65.7	85.56
Greece	55.7	68.69
Spain	62.8	79.68
France	70.6	85.17
Croatia	58.6	74.62
Italy	71.2	60.11
Cyprus	62.4	66.12
Latvia	55.2	73.18
Lithuania	59.5	71.82
Luxembourg	75.9	88.90
Hungary	65.8	75.63
Malta	84.1	81.34
Netherlands	84.1	94.78
Austria	77.2	75.60
Poland	74.3	58.54
Portugal	69.5	69.63
Romania	53.6	22.56
Slovenia	77.3	71.14
Slovakia	70.7	71.69
Finland	74.0	95.49
Sweden	78.2	94.58

Source: (Eurostat, n. d. a; Eurostat, n. d. c).

We will use the same pairwise linear regression model and the least squares method as a way to calculate the coefficients. Assuming that outliers are discarded, the results of the calculations are as follows:

$$a = \frac{(15 \cdot 88588.558) - (1105.41 \cdot 1007.7)}{(15 \cdot 88588.558) - (1105.41)^2},$$

$$a = 0.3016,$$

$$b = \frac{1007.7}{15} - 0.3016\frac{1105.41}{15},$$

$$b = 44.954.$$

We have the function Y = 44.954 + 0.3016X. In order to determine the quality of the model, we will pay attention to the value of its error (E). In our case, it is equal to 4, which is 6% as a percentage of Y_c, therefore, the constructed model is qualitative.

We will find the table value of F at a significance level of 0.95 and degrees of freedom m_1=1 and m_2=13 to check the model for reliability. F (40.02) > F_{table}(4.67), therefore, we can consider the model reliable.

The coefficient of determination of the model (R^2) is 0.75 (or 75%). This indicates that 75% of the variation of the dependent variable is explained by changes in the independent variable. This means that the constructed model has high explanatory power and quite effectively describes the relationship between digitalization and the economic sustainability of the household sector.

As we can see, the hypothesis was partially confirmed: the digitalization of the public sector does have an impact on the sustainability of the household sector and helps to improve its adaptability. Moreover, the impact of digitalization on the household sector is greater than the direct impact on the sustainability of the public sector itself (75% compared to 71%). However, the impact is still not significant. It should be noted that the impact of digitalization usually manifests itself with a certain delay, which creates a lag effect. Therefore, even with a high level of digitalization of the public sector, its real impact on the economic sustainability of households may only manifest itself after a few years.

Conclusions

The research results showed a statistically significant relationship between the level of digitalization of the public sector (quantitative measurement – the percentage of people who used digital public services (website or application) in the last 12 months) and its economic resilience in the face of shocks. In particular, in European Union countries with high indicators of digital transformation of public administration, a higher level of adaptability and resilience is observed. At the same time, in countries with a low level of digitalization of the public sector, such a relationship is weak.

In addition to the direct impact of digitalization on the public sector, it also has an indirect effect through ensuring digital inclusion of the household sector. This indicates the systemic and intersectoral nature of digital transformation as a tool for increasing overall economic resilience.

The scientific novelty of the research lies in the combination of cluster analysis (through quartile grouping) with correlation-regression estimation to determine the relationship between digitalization and economic sustainability of the public sector based on a comparison of EU countries. The proposed approach can be adapted to other sectors of the economy and used to develop strategic directions for digital development in conditions of shock impacts.

The practical significance of the results obtained lies in the possibility of using the identified patterns to form recommendations for the digital transformation of the national economy. Further research should be directed at studying the role of digitalization in ensuring the sustainability of the household sector: to analyze the possible digital vulnerabilities of the sector (digital inequality, level of digital skills, cybersecurity), as well as its level of digital transformation.

REFERENCE / СПИСОК ВИКОРИСТАНИХ ДЖЕРЕЛ

2023 OECD Digital Government Index. (2024, January 30). OECD. https://www.oecd.org/en/publications/2023-oecd-digital-government-index_1a89ed5e-en.html

Duit, A. (2016). Resilience thinking: Lessons for public administration. *Public Administration*, *94*(2), 364–380. https://doi.org/10.1111/padm.12182

Eurostat. (n. d. a). *Gross value added and income by main industry.* https://ec.europa.eu/eurostat/databrowser/view/NAMA_10_A10__custom_2584492/bookmark/table?lang=en&bookmarkId=397c5a53-0d6c-4381-854b-7d7c0cb04f0d

Eurostat. (n. d. b). *E-government activities of individuals via websites.* https://ec.europa.eu/eurostat/databrowser/view/isoc_ciegi_ac/default/table?lang=en&category=isoc.isoc_i.isoc_ci_egi

Eurostat. (n. d. c). *Inability to face unexpected financial expenses.* https://ec.europa.eu/eurostat/databrowser/view/ilc_mdes04/default/table?lang=en&category=livcon.ilc.ilc_md.ilc_mdes

Heyets, V., Skrypnychenko, M., & Shumska, S. (2020). Macroeconomic imbalances in Ukraine: MIP SCOREBOARD monitoring and model estimates of their impact on growth and stability. *Financial and credit activity: problems of theory and practice*, *2*(33), 296–305. https://doi.org/10.18371/fcaptp.v2i33.206956	Геєць, В., Скрипниченко, М., & Шумська, С. (2020). Макроекономічні дисбаланси в Україні: моніторинг на основі MIP SCOREBOARD та модельні оцінки їхнього впливу на зростання і стабільність. *Фінансово-кредитна діяльність: проблеми теорії та практики*, *2*(33), 296–305. https://doi.org/10.18371/fcaptp.v2i33.206956

Leite, H., & Hodgkinson, I. R. (2021). Examining resilience across a service ecosystem under crisis. *Public Management Review*, *23*(9), 1340–1357. https://doi.org/10.1080/14719037.2021.2012375

Novikova, O., & Azmuk, N. (2023). Digitalization as a factor for strengthening resilience in social and labor sphere and the post-war recovery of Ukraine. *Economy and Society*, (53). https://doi.org/10.32782/2524-0072/2023-53-27	Новікова, О., & Азьмук, Н. (2023). Цифровізація – чинник посилення резільєнтності соціально-трудової сфери та повоєнного відновлення України. *Економіка та суспільство*, (53). https://doi.org/10.32782/2524-0072/2023-53-27

Profiroiu, A. G., & Nastacă, C. (2021). What strengthens resilience in public administration institutions? *Eastern Journal of European Studies*, *12* (Special issue), 100–125. https://doi.org/10.47743/ejes-2021-si05

Regional E-Government development and the performance of country groupings. (2024, September). In *United Nations e-government survey*, 91–134. https://doi.org/10.18356/9789211067286c008

Shkuropadska, D. (2017). Resilience of the sector of state government. *Herald of Kyiv National University of Trade and Economics*, (6), 42–51.

The Digital Economy and Society Index (DESI). (n. d.). Shaping Europe's Digital Future. https://digital-strategy.ec.europa.eu/en/policies/desi

World Bank Data. (n. d.). *E-Government Development Index.* https://data360.worldbank.org/en/indicator/UN_EGDI_EGDI

Hrytsenko, A., & Burlai, T. (2020). The impact of digitalization on social development. *Economic theory*, (3), 24–51. https://doi.org/10.15407/etet2020.03.024

Гриценко, А., & Бурлай, Т. (2020). Вплив цифровізації на соціальний розвиток. *Економічна теорія*, (3), 24–51. https://doi.org/10.15407/etet2020.03.024

Conflict of interest. The author certify that doesn't have financial or non-financial interest in the subject matter or materials discussed in this manuscript; the authors have no association with state bodies, any organizations or commercial entities having a financial interest in or financial conflict with the subject matter or research presented in the manuscript. Given that the author is affiliated with the institution that publishes this journal, which may cause potential conflict or suspicion of bias and therefore the final decision to publish this article (including the reviewers and editors) is made by the members of the Editorial Board who are not the employees of this institution.

The author did not receive direct funding for this research.

Sorokina, A. (2025). Digitalisation as a factor of increasing economic resilience in the public sector. *Scientia fructuosa, 5*(163), 24–38. http://doi.org/10.31617/1.2025(163)02

Received by the editorial office 14.05.2025.
Accepted for printing 27.06.2025.
Published online 21.10.2025.