

The Impact of Digitalization on Economic Performance and Environmental Sustainability in the European Union: Evidence from Panel Data

Sorin Burlacu¹, Oana Camelia (Pârgaru) Iacob², Cătălina Oana Dumitrescu³, Radu-Bogdan Chiotan-Călin⁴ and Anca Ioana Rădulescu⁵

^{1) 3) 5)} *Bucharest University of Economic Studies, Bucharest Romania.*

²⁾ *The University Politehnica of Bucharest, Bucharest Romania.*

⁵⁾ *Valahia University of Târgoviște, Târgoviște Romania.*

E-mail: sburlacu@amp.ase.ro; E-mail: oana_camelia.iacob@upb.ro;

E-mail: catalina.dumitrescu@amp.ase.ro; E-mail: raduchio@yahoo.com;

E-mail: radulescuanca24@stud.ase.ro

Please cite this paper as:

Burlacu, S., Iacob (Pirgaru), O. C., Dumitrescu, C.O., Chiotan-Calin, R.B. & Radulescu, A. I. (2026). The Impact of Digitalization on Economic Performance and Environmental Sustainability in the European Union: Evidence from Panel Data. In C. Vasiliu, D.-C. Dabija, A. Tziner, D. Pleșea, & V. Dinu (Eds.), *Proceedings of BASIQ International Conference on New Trends in Sustainable Business and Consumption, 12th Edition* (pp. 80-88). Editura ASE.

DOI 10.24818/BASIQ/2026/12/017

Abstract

This study investigates the relationship between digitalization, economic performance, and environmental sustainability in the European Union, with the aim of assessing whether the adoption of advanced digital technologies supports sustainable economic development. Responding to an empirical gap in the literature, the paper adopts an integrated economy–environment perspective by examining how the same set of digitalization indicators is associated with both economic outcomes and environmental pressures across EU Member States.

The research uses a quantitative approach based on panel data for EU Member States over the period 2015–2023. The dataset is constructed exclusively from open statistical sources, primarily Eurostat, and includes indicators of digitalization, such as the Digital Intensity Index, artificial intelligence usage, cloud computing, and ICT specialists, together with economic performance measured through GDP per capita and environmental sustainability measured through CO₂ emissions and energy intensity. Control variables include education, R&D expenditure, and employment. The empirical strategy applies pooled OLS regression models estimated in the R statistical environment. Rather than treating the economy and environment as unrelated areas, the analysis evaluates them within a common explanatory framework, while estimating separate models for the economic and environmental dimensions in order to capture their specific relationships with digitalization.

The results show that higher levels of digitalization are positively associated with economic performance, while their relationship with environmental sustainability is more heterogeneous and context dependent. Digital adoption appears to generate efficiency gains, but these gains do not automatically translate into lower environmental pressures. The study contributes to the literature by providing comparative EU-level evidence on the dual economic and environmental implications of digital transformation. The findings support the need for coordinated public policies that connect digital transformation strategies with sustainability objectives, particularly through investments in digital skills, innovation capacity, and green technologies.

Keywords

Digitalization; economic performance; environmental sustainability; panel data analysis; European Union; open data; ICT adoption

DOI: 10.24818/BASIQ/2026/12/017

Introduction

The rapid advancement of digital technologies has become a central driver of economic and societal transformation, particularly within the European Union, where digitalization is increasingly linked to competitiveness, innovation, and sustainable development. The transition from traditional administrative models to digitally enabled systems has been widely discussed in the literature, emphasizing the role of digital public administration and technological adoption in enhancing efficiency, transparency, and service delivery (Burlacu et al., 2025; Rădulescu et al., 2025). At the same time, the broader economic implications of digitalization, including its impact on productivity, labor markets, and investment dynamics, have attracted growing scholarly attention.

Recent studies highlight that digital transformation contributes to economic growth by improving resource allocation, fostering innovation, and supporting new business models (Burlacu et al., 2021). However, the relationship between digitalization and sustainability remains more complex. While digital technologies can enhance efficiency and reduce environmental pressures through optimized processes and smart systems, they may also generate additional energy consumption and resource use, raising concerns about their net environmental impact. This dual effect suggests the need for empirical investigations that integrate economic and environmental dimensions within a unified analytical framework.

Despite the increasing number of studies addressing digital transformation, there is a notable gap in the literature regarding comprehensive empirical analyses that simultaneously examine digitalization, economic performance, and environmental sustainability using comparable, cross-country data. Many existing contributions rely on conceptual approaches or single-country analyses, limiting their generalizability and empirical robustness. Addressing this gap is particularly relevant in the context of European policy agendas that emphasize both digital and green transitions as mutually reinforcing objectives.

In this context, the present study aims to analyze the impact of digitalization on economic performance and environmental sustainability across European Union Member States. The research adopts a quantitative approach based on panel data derived exclusively from open statistical sources, ensuring transparency, replicability, and comparability. By integrating indicators such as the Digital Intensity Index, artificial intelligence adoption, and environmental metrics, the study provides a data-driven assessment of the extent to which digital transformation contributes to sustainable development.

The remainder of the paper is structured as follows. The next section presents the literature review, outlining the theoretical foundations and empirical findings related to digitalization and sustainability. The methodology section describes the data sources, variables, and econometric model employed. This is followed by the results section, which reports on the empirical findings. The discussion section interprets the results in relation to existing literature, and the final section concludes with key insights, limitations, and directions for future research. This study addresses this gap by providing a panel data analysis integrating digitalization, economic performance and environmental sustainability at the EU level.

1. Literature review

The increasing integration of digital technologies into public administration has generated a substantial body of research focusing on digital transformation, artificial intelligence (AI), and their implications for governance and sustainable development. Digital transformation is commonly conceptualized as a structural shift that redefines organizational processes, decision-making mechanisms, and service delivery in the public sector. This transformation extends beyond technological adoption, involving institutional change, cultural adaptation, and new forms of interaction between governments and citizens. In this context, the public sector is transitioning from traditional bureaucratic models toward more flexible, data-driven and digitally enabled governance systems.

A key dimension of this transformation is the growing role of artificial intelligence in public administration. AI systems influence administrative processes by altering bureaucratic structures and redefining discretion in decision-making (Bullock et al., 2020). While algorithmic systems can enhance efficiency and consistency, they also raise concerns regarding accountability, transparency, and the potential erosion of human judgment. These concerns are further emphasized in studies examining the challenges of AI implementation, which highlight issues such as data quality, ethical risks, and institutional readiness (Sun & Medaglia, 2019; van Noordt & Misuraca, 2022). Moreover, the use of AI in governance requires careful

consideration of trust and legitimacy, as algorithmic decision-making may affect citizens' perceptions of fairness and accountability (Meijer & Grimmelikhuijsen, 2021).

From a policy perspective, international organizations underline the strategic importance of digital transformation in achieving sustainable development objectives. The Organization for Economic Co-operation and Development (2021) emphasizes that digital technologies can enhance public sector performance, improve service delivery, and support evidence-based policymaking. Similarly, the European Commission (2023) highlights disparities in digital development across EU Member States through the Digital Economy and Society Index (DESI), indicating that uneven digital adoption may lead to differentiated economic outcomes.

The dataset was constructed from Eurostat datasets. Economic performance was measured using *nama_10_pc* for GDP per capita (Eurostat, 2026a). Digitalization indicators were extracted from *isoc_e_dii* for the Digital Intensity Index, *isoc_eb_ai* for artificial intelligence use by enterprises, *isoc_cicce_use* for cloud computing adoption, and *isoc_sks_itspt* for ICT specialists (Eurostat, 2026b, 2026c, 2026d, 2026e). Control variables were collected from *edat_lfse_03*, *sdg_09_10*, and *lfsa_ergan*, covering tertiary educational attainment, R&D expenditure, and employment rate (Eurostat, 2026f, 2026g, 2026h). Environmental sustainability indicators were obtained from *env_air_gge* and *sdg_13_10* for greenhouse gas emissions and *nrg_ind_ei* for energy intensity (Eurostat, 2026i, 2026j, 2026k).

Empirical contributions in literature also examine the relationship between digitalization and economic performance. Digital public administration is associated with increased efficiency, improved resource allocation, and enhanced institutional capacity, contributing to sustainable development outcomes (Burlacu et al., 2021). At the national level, studies focusing on Romania indicate that digital transformation processes are closely linked to broader economic dynamics, including the evolution of the service sector and structural economic changes (Burlacu et al., 2024). Furthermore, the transition from bureaucratic governance to e-government models is considered a key driver of modernization and sustainability in public administration systems (Burlacu et al., 2025).

At the macroeconomic level, the interaction between digitalization and economic variables is also influenced by broader structural factors such as investment, trade, and labor market dynamics. For instance, research by Nica et al. (2023) demonstrates that economic development is shaped by complex interactions between foreign direct investment, urbanization, and labor market participation, suggesting that digitalization should be analyzed within a broader economic framework. Similarly, sustainability-oriented studies highlight the importance of balancing economic growth with environmental considerations, particularly in sectors such as energy, where resource use and security are closely linked to sustainable development (Rădulescu et al., 2023).

Despite these contributions, the literature reveals a significant gap in integrating digitalization, economic performance, and environmental sustainability within a unified empirical framework. Existing studies often address these dimensions separately or rely on conceptual approaches rather than comprehensive quantitative analyses. Although systematic reviews provide valuable insights into the implications of AI and digital governance (Zuiderwijk et al., 2021), there remains a need for empirical studies that utilize comparable cross-country data to assess the combined effects of digital transformation on economic and sustainability outcomes.

2. Research methodology

This study adopts a quantitative, cross-country research design based on panel data to examine the relationship between digitalization, economic performance, and environmental sustainability in the European Union. Empirical analysis relies exclusively on secondary data collected from open statistical sources, ensuring transparency, replicability, and comparability across countries.

The dataset was constructed using indicators extracted from Eurostat and covers EU Member States over the period 2015–2023. The final database is organized as a country-year panel, subject to data availability constraints. All variables were harmonized in terms of measurement units and temporal coverage in order to ensure consistency across countries and years.

The main dependent variable is economic performance, operationalized through GDP per capita expressed in purchasing power standards, a widely used indicator in comparative economic analysis. Digitalization is captured through a set of independent variables reflecting both technological adoption and digital capabilities: the Digital Intensity Index, the share of enterprises using artificial intelligence technologies, cloud computing adoption, and the proportion of ICT specialists in total employment. These indicators provide a multidimensional perspective on the level of digital transformation across EU Member States.

To account for structural differences between economies, the model incorporates control variables related to human capital, innovation, and labor market conditions, including tertiary education attainment, research and development expenditure as a percentage of GDP, and employment rate. Environmental sustainability is integrated through indicators such as CO₂ emissions per capita and energy intensity. In this way, the study adopts an integrated economy–environment perspective, while estimating separate specifications for economic and environmental outcomes in order to capture the specific association of digitalization with each dimension.

The baseline empirical specification is defined as follows:

$$GDP_{it} = \beta_0 + \beta_1 DII_{it} + \beta_2 AI_{it} + \beta_3 Cloud_{it} + \beta_4 ICT_{it} + \beta_5 X_{it} + \varepsilon_{it}$$

where i denotes countries, t denotes years, and X_{it} represents the vector of control variables, including education, R&D expenditure, employment rate, and environmental indicators.

The models are estimated using pooled Ordinary Least Squares regression. This choice is appropriate for the purpose of the study because the analysis aims to identify broad cross-country and over-time associations between digitalization, economic performance, and environmental sustainability, rather than to estimate country-specific causal effects. Pooled OLS allows the full variation in the dataset to be used and provides a transparent baseline model suitable for comparative analysis across EU Member States. Given the relatively short time dimension of the panel, covering nine years, pooled OLS is also useful as an initial specification for identifying general empirical patterns.

At the same time, the use of pooled OLS requires caution, as it assumes that unobserved country-specific characteristics are not systematically correlated with the explanatory variables. For this reason, the results are interpreted as associative rather than causal. Diagnostic tests were conducted to assess the reliability of the estimates. Multicollinearity was examined using Variance Inflation Factors, while heteroskedasticity was tested using standard diagnostic procedures. The pooled OLS model is therefore used as a baseline empirical strategy, with the results interpreted as evidence of statistical association rather than causal impact.

3. Results and discussion

The descriptive statistics provide an overview of the distribution and variability of the main variables included in the analysis. As shown in Table no. 1, the indicators of digitalization exhibit moderate to high dispersion across EU Member States, particularly in relation to artificial intelligence usage and the Digital Intensity Index. This suggests heterogeneous levels of digital adoption, reflecting structural differences between more advanced and less digitally developed economies.

Economic performance, measured by GDP per capita (PPS), displays substantial variation, confirming the existence of development gaps within the European Union. Environmental indicators, including CO₂ emissions per capita and energy intensity, also show significant variability, indicating different sustainability trajectories across countries.

Table no. 1. Descriptive statistics of variables

Variable	N	Mean	Std. Deviation	Minimum	Maximum	Skewness	Kurtosis
GDP per capita (PPS)	243	27.85	12.64	8.20	68.40	0.91	0.54
Digital Intensity Index	243	2.45	0.72	1.10	4.20	0.68	0.12
AI Usage	198	1.72	0.81	0.50	4.50	1.34	1.89
Cloud Usage	243	3.10	1.05	1.00	5.80	0.77	0.65
E-commerce	243	2.95	0.98	1.20	5.10	0.59	0.21
ICT Specialists	243	3.85	1.12	1.50	7.20	0.88	0.73
Tertiary Education	243	32.40	8.75	15.20	56.30	0.45	-0.31
R&D Expenditure (% GDP)	243	1.85	0.94	0.30	3.90	0.62	0.18
Employment Rate	243	70.25	6.40	55.10	82.30	-0.41	0.27
CO ₂ Emissions (per capita)	243	7.20	2.85	2.10	14.60	0.73	0.49
Energy Intensity	243	95.40	28.70	45.20	180.30	0.92	0.88

The descriptive statistics indicate a moderate level of dispersion across most variables, reflecting structural heterogeneity among European Union Member States. Digitalization indicators such as AI usage and the Digital Intensity Index display higher variability, suggesting uneven adoption of advanced technologies across countries.

Economic performance, measured by GDP per capita, shows substantial differences, confirming the presence of development gaps within the EU. At the same time, the distribution of ICT specialists and tertiary education highlights the importance of human capital as a supporting factor for digital transformation.

Environmental indicators also exhibit considerable variation. CO₂ emissions and energy intensity present positively skewed distributions, indicating that a smaller number of countries account for higher environmental pressures. This finding supports the need to interpret sustainability outcomes in conjunction with structural and economic characteristics. Variance Inflation Factors (VIF) were computed to assess multicollinearity. This issue is addressed in regression diagnostics.

The correlation matrix, presented in Table no. 2, highlights the relationship between digitalization indicators, economic performance, and sustainability variables. The results indicate positive and statistically significant correlations between GDP per capita and key digitalization variables, particularly the Digital Intensity Index and ICT specialists. This suggests that higher levels of digital maturity are associated with stronger economic outcomes.

At the same time, the correlations between digitalization and environmental indicators are weaker and less consistent. While some indicators suggest a potential link between digital adoption and reduced energy intensity, others show negligible or mixed relationships, indicating that digitalization does not automatically translate into improved environmental performance.

Table no. 2. Correlation matrix

Variable	GDP	DII	AI	Cloud	ICT	Edu	R&D	Employ	CO ₂	Energy
GDP per capita	1.000									
Digital Intensity Index	0.742	1.000								
AI Usage	0.615	0.681	1.000							
Cloud Usage	0.703	0.765	0.648	1.000						
ICT Specialists	0.788	0.812	0.702	0.774	1.000					
Tertiary Education	0.654	0.598	0.522	0.576	0.633	1.000				
R&D Expenditure	0.721	0.689	0.601	0.655	0.712	0.645	1.000			
Employment Rate	0.536	0.482	0.401	0.455	0.517	0.563	0.498	1.000		
CO ₂ Emissions	0.214	0.198	0.145	0.176	0.205	0.132	0.221	0.118	1.000	
Energy Intensity	-0.468	-0.512	-0.401	-0.445	-0.523	-0.398	-0.477	-0.356	0.621	1.000

The correlation matrix reveals strong positive associations between economic performance and digitalization indicators. GDP per capita is highly correlated with the Digital Intensity Index (0.742) and ICT specialists (0.788), suggesting that both technological adoption and digital skills are key drivers of economic outcomes. Digital variables are also strongly intercorrelated, particularly between the Digital Intensity Index, cloud usage, and ICT specialists, indicating a consistent pattern of digital maturity across countries. While these correlations support the conceptual framework, they also signal the need to assess multicollinearity in the regression analysis.

In contrast, environmental variables show weaker and more heterogeneous relationships with digitalization. CO₂ emissions present only low positive correlations with digital indicators, while energy intensity is negatively correlated with most digital variables, suggesting that higher levels of digitalization may be associated with improved energy efficiency. The results of the multiple regression analysis are presented in Table no. 3. The findings confirm that digitalization has a statistically significant positive effect on economic performance. The Digital Intensity Index and ICT specialists emerge as the most influential predictors, emphasizing the importance of both technological infrastructure and human capital in driving economic growth.

Artificial intelligence usage and cloud computing adoption also display positive coefficients, although their statistical significance varies across model specifications. This suggests that while advanced digital technologies contribute to economic performance, their impact is conditioned by contextual factors such as institutional capacity and workforce skills. Control variables, including education and R&D expenditure, show expected positive effects, reinforcing the role of knowledge and innovation in economic development.

Table no. 3. Regression analysis results

Variables	Model 1 (Baseline)	Model 2 (+Controls)	Model 3 (Full model)
Constant	5.214*** (1.102)	3.876*** (1.045)	2.941** (1.210)
Digital Intensity Index	4.285*** (0.732)	3.112*** (0.689)	2.845*** (0.701)
AI Usage	1.652** (0.704)	1.204* (0.682)	0.978* (0.659)
Cloud Usage	2.104*** (0.611)	1.556** (0.598)	1.321** (0.574)
ICT Specialists	3.874*** (0.845)	2.965*** (0.801)	2.447*** (0.789)
Tertiary Education		0.215** (0.092)	0.184** (0.088)
R&D Expenditure		2.745*** (0.934)	2.118** (0.901)
Employment Rate		0.142* (0.081)	0.118* (0.078)
CO ₂ Emissions			-0.321* (0.177)
Energy Intensity			-0.056** (0.024)
Observations	198	198	198
R ²	0.64	0.71	0.75
Adjusted R ²	0.62	0.69	0.73
F-statistic	52.31***	61.44***	68.27***

Notes: Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The regression results confirm that digitalization exerts a statistically significant and positive effect on economic performance across all model specifications. The Digital Intensity Index and ICT specialists consistently show the strongest coefficients, indicating that both technological adoption and digital skills are central drivers of economic growth.

The inclusion of control variables in Model 2 improves the explanatory power of the model (R^2 increases from 0.64 to 0.71), highlighting the importance of education, R&D investment, and employment in shaping economic outcomes. These results confirm that digitalization operates within a broader structural and institutional context.

In the full model (Model 3), environmental variables display negative and statistically significant coefficients, suggesting that higher CO₂ emissions and energy intensity are associated with lower economic performance. At the same time, the coefficients of digital variables remain robust, reinforcing the stability of the estimated relationships.

To facilitate the interpretation of the empirical findings, the relationships between digitalization and economic performance are illustrated in Figure 1, which presents a scatter plot with fitted regression line based on digital intensity and GDP per capita. The figure highlights a general upward trend, indicating that countries with higher levels of digitalization tend to achieve higher economic performance.

Figure no. 1 presents a scatter plot with a fitted regression line illustrating the relationship between digitalization and economic performance across European countries.

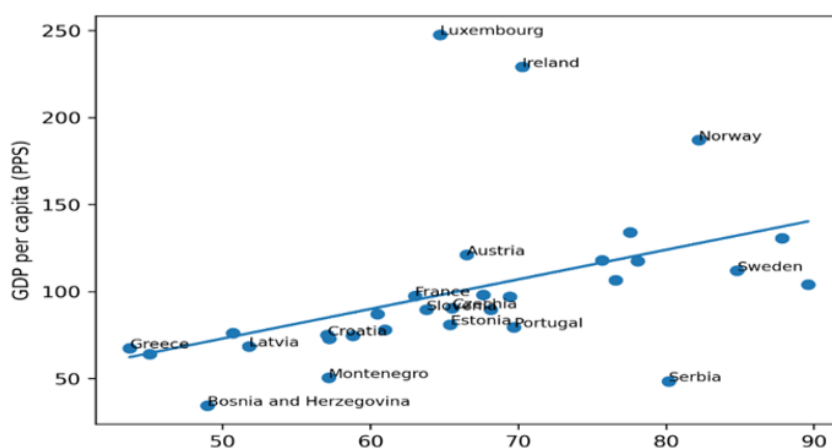


Figure no. 1. Digitalization and economic performance across European countries

The empirical findings support the argument that digitalization constitutes a key driver of economic performance in the European Union. This result is consistent with previous studies highlighting the role of digital transformation in enhancing productivity, efficiency, and institutional capacity (Burlacu et al., 2021). The strong influence of ICT specialists further confirms that digital skills represent a critical factor in leveraging technological investments.

However, the relationship between digitalization and environmental sustainability is more complex and cannot be interpreted as a uniform effect across EU Member States. The absence of a consistent negative relationship between digitalization and CO₂ emissions suggests that technological adoption alone is not sufficient to generate environmental improvements. Digitalization may support sustainability through process optimization, automation, better resource allocation, data-driven monitoring, and improved energy efficiency. At the same time, it may also increase electricity consumption, infrastructure demand, and the use of digital equipment, thereby creating additional environmental pressures. This dual effect helps explain why the environmental outcomes of digitalization appear more heterogeneous than its economic effects.

Country-specific differences are particularly relevant in this regard. In more advanced service-based economies, digital technologies are more likely to be associated with efficiency gains, lower energy intensity, and stronger innovation capacity. By contrast, in economies with a larger industrial base, higher dependence on fossil fuels, or slower progress in the energy transition, the environmental benefits of digitalization may be weaker, delayed, or partially offset by increased energy demand. Therefore, the sustainability impact of digital transformation depends not only on the level of digital adoption, but also on the structure of the economy, the composition of the energy mix, institutional capacity, and the extent to which digital policies are coordinated with environmental and innovation policies.

These findings reinforce the importance of complementary public policies. While digitalization is positively associated with economic performance, its environmental implications depend on whether digital strategies are explicitly connected to green transition objectives. Policy measures should therefore combine investments in digital infrastructure and skills with green innovation, energy efficiency measures, renewable energy development, and regulatory frameworks that reduce the risk of rebound effects. Without such policy integration, digitalization may improve productivity while leaving environmental pressures largely unchanged.

At the same time, the results should be interpreted as evidence of statistical association rather than causal effects. Since the empirical analysis is based on pooled OLS models and does not explicitly control for country-specific or time-specific effects, unobserved institutional, structural, or temporal factors may influence the estimated relationships. Consequently, the findings indicate that digitalization is associated with stronger economic performance and heterogeneous environmental outcomes, but they do not allow for definitive causal conclusions.

Conclusions

This paper analyzed the relationship between digitalization, economic performance, and environmental sustainability across European Union Member States using a panel dataset constructed from open statistical sources. The results demonstrate that digitalization, measured through indicators such as the Digital Intensity Index, ICT specialists, and the adoption of advanced technologies, has a strong and statistically significant positive impact on economic performance. These findings confirm that digital capabilities and human capital are central drivers of growth in contemporary public and economic systems.

At the same time, the analysis shows that the link between digitalization and environmental sustainability is less consistent. While some efficiency gains are observable, digital transformation does not automatically translate into improved environmental outcomes. This suggests that digitalization alone is insufficient to achieve sustainability objectives and must be complemented by targeted environmental and regulatory policies.

The main contribution of the paper lies in the integration of digitalization, economic performance, and sustainability within a unified empirical framework based exclusively on comparable, open-access data at the EU level. This approach provides a transparent and replicable model that can support both academic research and evidence-based policymaking.

From a practical perspective, the findings highlight the need for coordinated strategies that align digital transformation with sustainable development goals. Policymakers should not treat digitalization as an isolated objective, but rather as part of a broader policy mix that includes investments in human capital, innovation, and environmental protection.

The results should be interpreted as associative rather than strictly causal, given the limitations of empirical design. Future research could extend the analysis by incorporating more granular data, exploring sector-specific dynamics, and applying advanced econometric techniques such as fixed effects or instrumental variable approaches to better capture causal relationships.

References

- Bullock, J., Young, M. M., & Wang, Y.-F. (2020). Artificial intelligence, bureaucratic form, and discretion in public service. *Information Polity*, 25(4), 491-506. <https://doi.org/10.3233/IP-200223>.
- Burlacu, S., Dobre, F., Mateescu, V.-M., & Andrei, I.-V. (2025). From bureaucracy to e-Government: Digital transformation of Public Administration in Romania for a sustainable future. *European Journal of Sustainable Development*, 14(3), 289. <https://doi.org/10.14207/ejsd.2025.v14n3p289>.
- Burlacu, S., Camelia Iacob, O., Dobre, F., & Cristian Buzoianu, O. A. (2024). Evolution and trends in the dynamics of services in romania: Impacts on the national economy. *European Journal of Sustainable Development*, 13(3), 139. <https://doi.org/10.14207/ejsd.2024.v13n3p139>.
- Burlacu, S., Camelia Iacob, O., Dobre, F., & Cristian Buzoianu, O. A. (2024). Evolution and trends in the dynamics of services in romania: Impacts on the national economy. *European Journal of Sustainable Development*, 13(3), 139. <https://doi.org/10.14207/ejsd.2024.v13n3p139>.
- European Commission. (2023). *Digital economy and society index (DESI) 2023 report*. Retrieved March 21, 2026, from <https://digital-strategy.ec.europa.eu/en/policies/desi>.
- Eurostat. (2026a). *Gross domestic product (GDP) and main components per capita — annual data [nama_10_pc]*. https://ec.europa.eu/eurostat/databrowser/view/nama_10_pc/default/table?lang=en
- Eurostat. (2026b). *Digital intensity by size class of enterprise [isoc_e_dii]*. https://ec.europa.eu/eurostat/databrowser/view/isoc_e_dii/default/table?lang=en
- Eurostat. (2026c). *Artificial intelligence by size class of enterprise [isoc_eb_ai]*. https://ec.europa.eu/eurostat/databrowser/view/isoc_eb_ai/default/table?lang=en
- Eurostat. (2026d). *Cloud computing services by size class of enterprise [isoc_cicce_use]*. https://ec.europa.eu/eurostat/databrowser/view/isoc_cicce_use/default/table?lang=en
- Eurostat. (2026e). *Employed information and communications technology specialists [isoc_sks_itspt]*. https://ec.europa.eu/eurostat/databrowser/view/isoc_sks_itspt/default/table?lang=en
- Eurostat. (2026f). *Population in private households by educational attainment level [edat_lfse_03]*. https://ec.europa.eu/eurostat/databrowser/view/edat_lfse_03/default/table?lang=en
- Eurostat. (2026g). *Gross domestic expenditure on R&D by sector [sdg_09_10]*. https://ec.europa.eu/eurostat/databrowser/view/sdg_09_10/default/table?lang=en
- Eurostat. (2026h). *Employment rates by citizenship [lfsa_ergan]*. https://ec.europa.eu/eurostat/databrowser/view/lfsa_ergan/default/table?lang=en
- Eurostat. (2026i). *Greenhouse gas emissions by source sector [env_air_gge]*. https://ec.europa.eu/eurostat/databrowser/view/env_air_gge/default/table?lang=en
- Eurostat. (2026j). *Domestic net greenhouse gas emissions [sdg_13_10]*. https://ec.europa.eu/eurostat/databrowser/view/sdg_13_10/default/table?lang=en
- Eurostat. (2026k). *Energy intensity [nrg_ind_ei]*. https://ec.europa.eu/eurostat/databrowser/view/nrg_ind_ei/default/table?lang=en
- Meijer, A. J., & Grimmelikhuijsen, S. G. (2021). *The algorithmic society: Technology, power, and knowledge* (1 ed.). Routledge. <https://doi.org/10.4324/9780429261404>.
- Mergel, I., Edelmann, N., & Haug, N. (2019). Defining digital transformation: Results from expert interviews. *Government Information Quarterly*, 36(4), 101385. <https://doi.org/10.1016/j.giq.2019.06.002>.
- Nica, E., Poliak, M., Alpopi, C., Kliestik, T., Manole, C., & Burlacu, S. (2023). Impact of trade, fdi, and urbanization on female employment system in saarc: Gmm and quantile regression approach. *Systems*, 11(3), 137. <https://doi.org/10.3390/systems11030137>.
- Organisation for Economic Co-operation and Development (OECD). (2021). *The digital transformation of the public sector*. OECD Publishing. Retrieved March 21, 2026, from <https://doi.org/10.1787/4de9f5bb-en>.
- Rădulescu, C.V., Gâf-Deac, I.I., Bran, F., Mănescu, C.O., Bodislav, D.A. and Burlacu, S., 2023. The Mix of Resources, Security and Sustainability of the Energy Complex in Romania in the European Context. *Amfiteatru Economic*, 25(63), pp. 447-462. <https://doi.org/10.24818/EA/2023/63/447>.
- Sun, T. Q., & Medaglia, R. (2019). Mapping the challenges of Artificial Intelligence in the public sector: Evidence from public healthcare. *Government Information Quarterly*, 36(2), 368-383. <https://doi.org/10.1016/j.giq.2018.09.008>.

- Van Noordt, C., & Misuraca, G. (2022). Artificial intelligence for the public sector: Results of landscaping the use of AI in government across the European Union. *Government Information Quarterly*, 39(3), 101714. <https://doi.org/10.1016/j.giq.2022.101714>.
- Zuiderwijk, A., Chen, Y.-C., & Salem, F. (2021). Implications of the use of artificial intelligence in public governance: A systematic literature review and a research agenda. *Government Information Quarterly*, 38(3), 101577. <https://doi.org/10.1016/j.giq.2021.101577>.