Fostering Digital Transformation in the European Union in Digital Times

Carmen SĂVULESCU
National University of Political Studies and Public Administration
30A Bd. Expozitiei, Bucharest, Romania
carmen.savulescu@administratiepublica.eu

Corina-Georgiana ANTONOVICI
National University of Political Studies and Public Administration
30A Bd. Expozitiei, Bucharest, Romania
corina.antonovici@administratiepublica.eu

Abstract
The COVID-19 pandemic has had a profound impact worldwide, as well as on Europe and it has boosted citizens, organizations, societies to adopt faster digital services and technologies, thus accelerating the digital transformation. Digitalization creates value for society in terms of safety, health, employment, environment. Digital innovations (cloud and big data analytics, autonomous vehicles, remote healthcare, advanced robotics, 3D printing, drones to name just a few) play an important role in achieving the UN Sustainable Development Goals. In the current era of digital transformation, it is important to identify its opportunities, barriers, challenges. The overall objective of the paper is to capture a comprehensive and genuine image of digitalization in the EU Member States. The research question is focused on: Is digitalization a main pillar for improving the life quality of citizens? The paper explores the state of the art of digital transformation, the landscape of high impact technologies with a focus on AI, IoT, cloud computing, high-performance computing, the main challenges of digitalization, digital competitiveness as well as the digital transformation in Romania by presenting the realities and main trends. At the same time, the current paper achieves an empirical analysis of key digital technologies in the EU, presenting the statistical connection between business digitization and digital competitiveness in EU countries. The key findings of this paper highlight that the digital transformation has created a powerful EU, a leader worldwide, shaping the digital transformation globally. But the EU should focus on decreasing the urban-rural gap, interoperability of digital technologies, thus enhancing the economic and social environment. At the same time, the EU should develop its high technology ecosystem, a citizen-centric ecosystem, substantiated on enhancing ICT-based innovation for delivering public and private services in all areas, such as education, health, transport, energy, community services, etc. The research methodology comprises bibliographic syntheses, socio-innovative empirical researches, analyses of correlation and regression.

Keywords
Digitalization; digital competitiveness; digital citizen; high impact technologies; innovation.

Introduction

For the time being, the whole world is at a crossroads, as it is still involved in the fight against coronavirus. New technologies are triggering opportunities for economies, reducing inequality, and promoting inclusiveness. The whole planet is resetting. It should be open, more interconnected. Digital transformation refers to the integration

of digital technologies such as the Internet of Things, cloud computing, artificial intelligence, advanced robotics, big data analytics, innovative digital platforms for governments, public organizations, companies and citizens, social media, mobile services, 3D printing, in view to enhance the life quality for citizens. "The ICT-based innovation for digital transformation will be fast, covering data analytics and virtual networks, developing talents and strong partnerships" (Săvulescu, & Antonovici, 2020).

The main objective for optimizing the digital transformation journey will be the development of software-centric networks (network functions virtualization). A successful digital transformation will be based on improving organizational adaptability, a structured approach to digital services development, a holistic approach to analytics and ecosystem engagement, talent management, robotic process automation. Digital citizens should also change their mindset and way of interaction. At the same time, human capital has become a pillar of efficiency and growth, especially based on the premises of digital transformation.

State of the art of digital transformation

"A digital revolution is transforming the world as we know it at unprecedented speed" (European Parliament, 2019). Digital transformation as a notion emerged in 2000, being connected to digitalization. In 2004, Stolterman and Fors have stated that "digital transformation refers to the changes that digital technology entails or influences in all aspects of human life". According to Hess et al. (2016), "digital transformation is concerned with the changes digital technologies can bring about in a company's business model, which result in changed products or organizational structures or the automation of processes. These changes can be observed in the rising demand for Internet-based media, which has led to changes in entire business models". At the same time, digital transformation refers to "the realignment of, or new investment in, technology and business models to more effectively engage digital customers at every touchpoint in the customer experience lifecycle" (Solis et al., 2014). On the other hand, "digital transformation is now commonly interpreted as usage of information and communication technology, when not trivial automation is performed, but fundamentally new capabilities are created in business, public government, and people's and society life" (Martin, 2008).

According to OECD (2017), the digital transformation is "a multifaceted phenomenon that is impacting innovation in all sectors of the economy. New digital technologies, including artificial intelligence, have enabled the creation of completely new digital products and services and the enhancement of traditional ones with digital features". The study published by the University of Oulu (Finland) reveals that digital transformation represents "one of the global megatrends leading to structural and organizational reforms in the public and private sector by adopting ICT solutions in view to optimize operations and provide improved services to customers or citizens" (Lappi et al., 2019). OECD (2020) asserts that "new opportunities are emerging across innovation processes –from research to development and commercialization". "The digital transformation represents the use of new ICT enabling improvements in performance, efficiency, competitiveness with great impact on all aspects of citizens'

life" (Săvulescu, & Antonovici, 2020). "Any digital transformation is not a game of chance, as it requires serious commitment and in the same time bold, sometimes risky, decision-taking" (Pînzaru, Zbuchea, & Viţelar, 2019).

The Government Decision no. 89/2020 regarding the organization and functioning of the Romanian Digitalisation Authority states several characteristics of the digital transformation: "digital transformation is the use by a public or private entity of the solutions offered by information technology for the optimal transformation of the operational flows necessary to achieve specific activities, as well as the use by an ensemble of entities of the solutions offered by information technology for ensuring the technical and semantic interoperability of data and information flows". According to the World Economic Forum (2016), "the combined global value of digital transformation to society and economy will exceed 100 trillion US$ by 2025".

The landscape of high impact technologies

Artificial intelligence is an area of strategic importance, as well as a success factor for boosting economic development, providing solutions to actual challenges. The concept is a complex one, with numerous aspects and implications for organizations (Zbuchea, Vidu, & Pinzaru, 2019).

Sustained investments for digital transformation represent a great challenge for the European Union. As presented by the European Commission, "there is currently a gap in investment in artificial intelligence between the EU and competing economies of more than 10 billion euro per year" (European Commission, 2018). According to the White Paper published in 2020, the European Commission is committed "to foster a European ecosystem of excellence and trust in artificial intelligence by developing a European approach based on three pillars: being ahead of technological developments and encouraging uptake by the public and private sectors, prepare for socio-economic changes, ensure an appropriate ethical and legal framework" (European Commission, 2020).

Internet of Things is increasingly more present in society and economy, consisting of Data collection equipment, communication networks, and servers and equipment to use the data with the role to deliver services/products (Vrabie, 2019). "The IoT market is growing, Germany, France, Italy, Spain, Netherlands are at the forefront of adoption" (Strack et al., 2017). The Digital Europe Programme will strengthen the EU's high-performance computing and data processing capacities, and ensure their wide use in areas such as fighting against climate change, improving healthcare, and security (European Union, 2020).

Cloud computing represents "the quintessential example of integrated application and infrastructure development" (European Union, 2020). Europe is the leader for cloud technology governance and policy development, representing a key trigger for IoT and other ICTs. Taking into consideration the objective of the European digital single market, "the measures taken by the EU towards cloud computing could be the foundation for innovation in areas such as Big Data, IoT, mobility, e-Commerce and open data for digital government services and scientific collaboration" (European

Union, 2020)The European Cloud Initiative acknowledges that "cloud computing technologies will redefine how societies interact, share and benefit from the data generated on, and by, ICT infrastructure" (European Union, 2020).

High-performance computing, emerging quantum computing. The supercomputers provide outstanding computing power, thus solving complex analytical issues, having a high economic impact as well as social impact.

Challenges of digital transformation

The countries are facing several challenges due to digital transformation. The digital divide between the urban and rural environments has started to be reduced but the reality reveals an important gap all over the European Union. At the same time, telecommunication provides services at various prices and quality. The EU should be rapidly involved in actions in view to develop, adopt, defuse the new technologies, aiming to valorize its digital potential for the benefit of its digital citizens.

According to the study of the International Telecommunication Union (2021) in view "to harness opportunities and meet the challenges of digital transformation", international cooperation and solidarity should focus on "the delivery of technical assistance and in the creation, development, and improvement of telecommunication and ICT equipment and networks in developing countries". In this context, the initiatives, projects, and programs should be developed as direct technical assistance to the EU Member States for "capacity development, cyber security, digital inclusion, digital innovation ecosystems, digital services and applications, emergency telecommunications, environment, network and digital infrastructure, policy and regulation, and statistics" (ITU, 2021). Europe is a leader globally for the ICT indicators. "Mobile network coverage is 100 percent, Internet use by individuals is above 80 percent, Internet access at home is near 90 percent and almost 100 percent of 15- to 24-year-olds are using the Internet". At the same time, Europe has the most affordable ICT prices. "While a digital divide persists, rural Internet access by household has increased to 78 percent and the gender gap has decreased, with a five-percentage-point difference remaining between women's and men's Internet use" (ITU, 2021).

An important challenge refers to the lack of cyber security readiness. It is also acknowledged that digital transformation is creating opportunities both for the economy and society. But the European citizens should acquire and develop digital competencies in view to valorize the above opportunities.

Taking into consideration the dynamics of the labor market and the future jobs, the EU has to support lifelong programs in view to up-skill and re-skill its employees, especially those with risk of unemployment, and at the same time to provide targeted programs to all its citizens for acquiring and developing their digital and cognitive skills.

Summarising, the EU should manage effectively the above challenges inclusively and sustainably.

Empirical analysis of key digital technologies in the EU

The Digital Economy and Society Index represents a composite index of the European Commission measuring the progress of the EU countries towards a digital economy and society, based on a set of relevant indicators. According to the Digital Scoreboard 2020, Integration of Digital Technology is calculated as "the weighted average of two sub-dimensions: business digitization (60%) and e-Commerce (40%). Business digitization (BD) comprises the use of business software for electronic information sharing, social media to engage with customers and partners, big data analysis, cloud solutions". The data in Table 1 demonstrate that the Nordic countries have powerful digital economies, being leaders in the adoption of e-business technologies: Finland (47.61), Netherlands (45.41), Belgium (40.40), Denmark (39.34) while Bulgaria (12.33), Hungary (13.07), Poland (15.02), Romania (15.25) are low digital performers. e-Commerce (e-C) comprises "the following indicators: the percentage of SMEs selling online, e-commerce turnover as a percentage of the total turnover of SMEs, percentage of SMEs selling online cross-border" (EC, 2020). Ireland, the Czech Republic, Denmark, Belgium are top performers, while Bulgaria, Greece, Luxembourg, Romania have to improve their performance.

Table 1. Integration of Digital Technology in the EU Member States in 2020

Country	BD	e-C	Country	BD	e-C
Austria	21.45	19.13	Italy	20.47	10.76
Belgium	40.40	25.47	Latvia	18.27	10.04
Bulgaria	12.33	5.54	Lithuania	27.95	21.52
Croatia	23.74	17.73	Luxembourg	29.06	9.15
Cyprus	21.77	12.71	Malta	37.60	17.30
Czech Republic	21.53	28.07	Netherlands	45.41	20.34
Denmark	39.34	25.81	Poland	15.02	11.23
Estonia	24.30	16.85	Portugal	24.30	16.57
Finland	47.61	19.44	Romania	15.25	9.68
France	28.16	13.89	Slovakia	19.95	12.62
Germany	23.37	16.16	Slovenia	23.26	17.69
Greece	20.69	7.51	Spain	26.06	15.15
Hungary	13.07	12.24	Sweden	37.27	24.87
Ireland	38.79	35.53	**EU average**	**26.53**	**16.78803**

Source: European Commission. Digital Scoreboard 2020

Cloud computing refers to purchasing ICT services and incorporating cloud technologies in view to improve operations. As shown by Table 2, the Nordic countries are leaders in using cloud services of medium-high sophistication, such as hosting the database, accounting, software applications, CRM, software, and computing power: Finland, Sweden, Netherlands, Denmark. As revealed by Table 2, by contrast, Bulgaria, Poland, Greece are recording low values. The companies in the EU Member States are developing quickly, keeping pace with new technologies in view to collect, store and analyze big data. Malta, Netherlands, Belgium are leaders, while Cyprus, Hungary, Austria should highly improve their performance.

Table 2. Cloud and Big Data in the EU Member States in 2020 (% of companies)

Country	Cloud	BD	Country	Cloud	BD
Austria	11.39	6.27	Italy	14.68	7.09
Belgium	31.11	20.49	Latvia	10.92	7.71
Bulgaria	5.87	6.66	Lithuania	17.03	13.67
Croatia	21.69	10.33	Luxembourg	16.27	16.38
Cyprus	14.23	4.73	Malta	22.04	24.40
Czech Republic	15.53	8.09	Netherlands	41.74	22.01
Denmark	40.93	13.57	Poland	6.67	7.89
Estonia	25.94	10.82	Portugal	15.71	12.94
Finland	50.24	18.95	Romania	7.30	11.12
France	14.97	16.15	Slovakia	13.93	9.35
Germany	11.98	15.04	Slovenia	17.11	10.21
Greece	7.10	12.59	Spain	16.32	10.72
Hungary	11.47	6.17	Sweden	43.40	9.52
Ireland	32.89	20.26	**EU average**	**19.94**	**12.34**

Source: European Commission. Digital Scoreboard 2020

The empirical analysis of the digital technology integration in the EU countries reveals the need for accelerating both business digitization and e-Commerce.

Digital competitiveness

The pandemic has demonstrated the importance of digitalization in view to increase resilience. In response to the above changing landscape, any economy's capability to adopt new technologies very quickly will influence its recovery speed. The IMD World Digital Competitiveness Ranking measures "the capacity and readiness of economies to adopt and explore digital technologies as a key driver for economic transformation in business, government and wider society" (IMD, 2021). It is based on three factors: Knowledge, Technology, and Future Readiness.

In the 2020 ranking, as presented by Table 3, the Nordic countries are top leaders as Denmark (96.01), Sweden (95.15), Netherlands (92.57), Finland (91.13) are recording the best performance. Those countries represent incontestable leaders for digital competitiveness, having innovative and dynamic economies, offering the best living conditions, health care, and social protection. By contrast, Croatia (52.05), Slovakia (53.26), Romania (53.67), Hungary (55.91) represent low performers. Concerning Romania ranking, the digital competitiveness score of Denmark is 42.34 points higher and the EU average is 18.02 points higher, thus Romania should accelerate the implementation of digital projects in view to increase its score.

Table 3. Digital Competitiveness in the EU 27 in 2020

Country	DC	Country	DC	Country	DC
Austria	83.13	Germany	81.06	Poland	69.23
Belgium	76.98	Greece	56.21	Portugal	66.51
Bulgaria	56.29	Hungary	55.91	Romania	53.67
Croatia	52.05	Ireland	79.23	Slovakia	53.26

Cyprus	61.66	Italy	60.91	Slovenia	69.48
Czech Republic	67.46	Latvia	65.5	Spain	68.98
Denmark	96.01	Lithuania	72.93	Sweden	95.15
Estonia	78.03	Luxembourg	73.27	**EU average**	**71.69**
Finland	91.13	Malta	82.16		
France	76.98	Netherlands	92.57		

Source: IMD World Digital Competitiveness 2020, https://www.imd.org/wcc/world-competitiveness-center-rankings/world-digital-competitiveness-rankings-2020

The paper describes the statistical connection between business digitization and digital competitiveness for the EU countries, presenting the analysis of correlation and the analysis of regression. Table 4 presents the analysis of correlation, capturing a global image at the European Union level, a static one for 2020. Taking into consideration the structure of the statistical database as well as the modality of measuring the indicators, the correlations are powerful for a 0.01 level of significance. The outcomes of Table 4 reflect a high correlation for business digitization, the coefficient being 0.803.

Table 4. Analysis of correlation

		C	BD
C	Pearson Correlation	1	.803**
	Sig. (2-tailed)		.000
	N	28	28
BD	Pearson Correlation	.803**	1
	Sig. (2-tailed)	.000	
	N	28	28

*** Correlation is significant at the 0.01 level (2-tailed)*

As expected, business digitization holds a close relationship to digital competitiveness. According to the outcomes of the statistical analysis, this assertion is supported. The conclusion of the analysis of correlation is also confirmed by an analysis of regression.

Table 5. Analysis of regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	BD[b]	.	Enter
[a] Dependent Variable: DC			
[b] All requested variables entered.			

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.803[a]	.644	.630	7,875
[a] Predictors: (Constant), BD				
[b] Dependent Variable: DC				

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2917,646	1	2917,646	47,048	.000[b]
	Residual	1612,355	26	62,014		

	Total	4530,001	27			

a Dependent Variable: DC

b Predictors: (Constant), BD

Coefficientsa

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	42,970	4,441		9,676	.000
	BD	1,082	,158	,803	6,859	.000

a Dependent Variable: DC

Table 5 presents the analysis of regression for business digitization and digital competitiveness in the EU27 countries in 2020. Within the analysis of regression, the dependency between business digitization (BD) and digital competitiveness (DC) is significant taking into consideration the coefficient from the equation of regression of 1.082. If the value of the independent variable BD increases, the mean of the dependent variable DC also tends to increase. It is worth remarking that digital competitiveness is proportional dependent on business digitization.

This statistical analysis reveals the fact that there is a powerful relationship between business digitization and digital competitiveness, conclusion valid for an overview of the two processes at the EU level while analyzing them for each EU country, sensitive differences could emerge.

Digital transformation in Romania. Present, and future

The pandemic has triggered a radical digital transformation of the public administration and the private sector. In the public sector, we have witnessed the acceleration of digitalization, by the enhancement of the digital behavior and use of successful platforms, such as Ghiseul.ro (https://www.ghiseul.ro/ghiseul/public), National programming platform for vaccination against COVID-19 (https://vaccinare-covid.gov.ro/platforma-programare), Diaspora Hub platform (https://diasporahub.ro), Platform for providing support to hospitals (https://ajutorspitale.ro).

For the time being, 195,989 entities are using the digital platforms, 1,037,764 users, 4.832 procedures in force (Romanian Digitalisation Authority, 2021), values in continuous dynamics.

At the same time, Romania has a competitive advantage: the direct access to UiPath expertise, a leader company in Robotic Process Automation, which has conquered the world, with outstanding experience in implementing automation projects in the public sector in several European countries and more than 60 governmental agencies in the US. For example, in Romania, the National Agency for Payments and Social Inspection received 110,000 requirements at the national level during 1-11 May 2020, and the software robots processed 10,000 requirements daily (one requirement in 36 seconds).

EGOV project "Establishing the framework for the development of e-government tools" has been finalized, providing a roadmap of the digitalization strategies and projects for the next 10 years, namely the public policy in the field of e-government. The main objective of the public policy is "to increase the number and quality of e-services in Romania, by strengthening the capacity of public institutions and authorities to operate in an advanced digital environment and to provide mature e-services by the end of 2030" (Romanian Digitalisation Authority, 2021).

The Romanian Digitalisation Authority has key projects under implementation, thus strengthening the direction of action for the next ten years:
▪ identity management and access to e-services - through the PSCID project, which will be the gateway and the first security point for e-government services and will ensure a unique electronic identity of every citizen;
▪ the development of the interoperability node - the construction of the eIDAS node for Romania, the "common software" of European authentication, and its interconnection with the eIDAS nodes of the other EU Member States;
▪ creation of the national catalog of public services;
▪ developing a framework for public policies on the use of innovative AI or blockchain technologies;
▪ RegInterMed, the computer system with updated databases about patients, applied treatments, and their evolution, which will be able to integrate data from several digital sources, will generate statistics to substantiate policies in the medical system and to make optimal decisions for the benefit of patients.

The Romanian Digitalisation Authority has achieved the analysis on "Barriers to the Digitalization of the Public and Private Sector in Romania", an outstanding document that represents the basis for substantiating and prioritizing projects for the 2021-2027 programming period. This document analyses the challenges of digital transformation in Romania and it is the pillar for public policymaking, priorities for action, and projects accomplished through European funds such as POCIDIF, POCU, and PNRR.

The above document highlighted the following barriers for the public sector:
▪ "Lack of an efficient and effective IT architecture for the general management of e-services.
▪ Lack of information systems necessary for central public institutions for the operationalization of e-services.
▪ Insufficient specialists in e-government and human resources in the IT departments of public institutions and authorities, insufficient competencies to develop and maintain e-services.
▪ Lack of a uniform and effective legislative and procedural framework for supporting e-services" (Romanian Digitalisation Authority, 2021).

For the time being, there is no catalog of all public services that should be e-services with an impact on the evolution of the Single Contact Point towards a genuine bridge of access of administrative procedures for citizens and private legal entities accessing public services.

The non-widespread use of qualified electronic signatures by civil servants is a reality as its use would allow the public administration to issue to the citizen various documents in electronic format with the same legal value as handwritten documents, in conditions of improved efficiency and cost reduction. An important issue that delays the development of e-services in Romania is related to the lack of applying the European "digital by default" principle of e-government in public administration practices.

In general, the size of IT staff in dedicated structures is not sufficiently well-calibrated to the organizational needs for the development of high-performance e-services. Moreover, those employees do not benefit from specialized training programs in view to support them to acquire the minimum set of technical and management skills necessary to implement complex and strategic national IT systems. In fact, there is a lack of human resource strategies aimed at developing the technical IT skills needed for e-government. In the absence of a human resource policy for the IT sector, only a small number of ministries have managed to have a high degree of retention of IT experts. At the governmental level, there is a clear lack of qualified human resources for project management, development, and implementation of organizational architectures, security audit, and design of solutions using Web Design, Big Data Analytics, Data mining, etc. The absence of a body of e-government specialists to ensure the transposition of public policy in the field of e-government, at the level of each institution or public authority generates inconsistencies.

While Romanians use social networks, there is certain reluctance on their behalf concerning online transactions. Despite the progress registered, at the level of Romanian internet users, the share of those who use online banking services or make online purchases is low, as shown also by Table 1. This is a major challenge for Romania, considering that the digital economy is also based on the citizens' confidence in using the Internet for online transactions. Also, IT education in public schools focuses mainly on technical skills and less on practical aspects for ICT use.

Conclusions

Digital technologies are changing the world at a rapid pace. The digital transformation has created a powerful EU, a leader worldwide, shaping the digital transformation globally. But the EU should focus on decreasing the urban-rural gap, interoperability of digital technologies, thus enhancing the economic and social environment. At the same time, the EU should develop its high technology ecosystem, a citizen-centric ecosystem, substantiated on enhancing ICT-based innovation for delivering public and private services in all areas, such as education, health, transport, energy, community services, etc.

The success factors for digital transformation in the public sector substantiate cost savings and meet the requirements, expectations of the digital citizen. The strategies for digital transformation should be flexible, adaptive, based on understanding the complexities behind the factors of change. The digital value of digital transformation for businesses refers to transparency and speed while for government focuses on the provision of guidance in identifying and prioritizing the most effective digital

initiatives and investments, using adequate key performance indicators. In this context, essential enablers of innovation will be analytics, virtualized networks, attracting and developing talented employees. For the time being, the organizations, both public and private should think in a digital way for better online visibility and improved customer experience. All technological transformations imply changing shifts in the dimension of human capital, both from the prospect of creation and development of technologies and users of those new technologies.

As revealed by the current paper, the human capital should acquire new competencies, containing technical ones as well as new skills related to communication in virtual spaces, ethics, and accountability.

In Romania, the key enablers for digital transformation should focus on digital authentication of users, electronic signature, single databases for users, electronic correspondence between authorities and citizens. In Romania, speeding up the digital services triggers improvement of competitiveness, an attractive environment for investments, optimization of the use of human resources. IT ensures transparency, an increase of productivity, a decrease of fiscal evasion, a decrease of corruption, cost reduction in public administration, making more efficient the activity of central and local governments.

The digital transformation is a long process involving several challenges, which should take into consideration the voice of customers, the government should be more connected and responsive to citizens' needs, expectations. Also, it should be an agile approach for a gradual digital transformation by prioritizing the citizens' needs based on mechanisms of consultation. Leadership and innovative governance are essential for a common vision on digital transformation so that this would be continuous. Data interoperability and integration are crucial for decision-making and improvement of efficiency, the effectiveness of central and local governments.

The enhancement of digital competencies both for employees and citizens represent maybe the most important pillar for digital transformation. And of course, the government should demonstrate the will and capability to accelerate a meaningful digital transformation in Romania, by a focus on the development of the digital public sector, using more cloud services, collaborative working, enhancing cyber security.

Romania has infrastructure for digital transformation but it needs progress for implementing the digital projects.

References

European Commission (2018). Artificial Intelligence for Europe. COM (2018) 237 final. https://ec.europa.eu/transparency/regdoc/rep/1/2018/EN/COM-2018-237-F1-EN-MAIN-PART-1.PDF

European Commission (2019). Digital Europe Programme. https://ec.europa.eu/digital-single-market/en/news/digital-europe-programme-proposed-eu92-billion-funding-2021-2027

European Commission (2020). Digital Scoreboard 2020. Retrieved from https://digital-agenda-data.eu

European Commission (2020). White Paper on Artificial Intelligence-A European approach to excellence and trust. https://ec.europa.eu/info/sites/ default/files/commission-white-paper-artificial-intelligence-feb2020_en.pdf

European Parliament (2019). EU Policies-delivering for citizens: Digital Transformation. https://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_BRI(2019)633171

European Union (2020). Shaping Europe's digital future. https://euagenda.eu/publications/shaping-europe-s-digital-future

Government of Romania. Government Decision no. 89/2020, regarding the organization and functioning of the Romanian Digitalisation Authority, Official Journal no. 113/13 Feb. 2020. https://legeaz.net/monitorul-oficial-113-2020/hg-89-2020-organizare-functionare-adr

Hess, T. (2016). Options for formulating a digital transformation strategy. *MIS Quarterly Executive*, *15*(2), pp. 123-139.

IMD World Competitiveness Center (2020). IMD World Digital Competitiveness Ranking 2020. https://www.imd.org/wcc/world-competitiveness-center-rankings/world-digital-competitiveness-rankings-2020/

International Telecommunication Union (2021). Digital Trends in Europe 2021. https://www.itu.int/en/ITU-D/Conferences/WTDC/WTDC21/Documents/RPM/EUR/Digital-Trends_Europe-E.pdf

Lappi, T. M., Aaltonen, K., & Kujala, J. (2019). Project governance and portfolio management in government digitalization, *Transforming Government: People, Process and Policy*, *13*(2), 159-196. https://doi.org/10.1108/TG-11-2018-0068

Martin, A. (2008). Digital Literacy and the "Digital Society". In Lankshear, C., & Knobel, M. (Eds.), *Digital Literacies: Concepts, Policies, and Practices* (pp. 151-176). Peter Lang.

OECD. (2017). Going Digital: Making The Transformation Work for Growth and Well-Being. https://www.oecd.org/mcm/documents/C-MIN-2017-4%20EN.pdf

OECD. (2020). The Digitalisation of Science, Technology and Innovation Key Developments and Policies. OECD Publishing.

Pînzaru, F., Zbuchea, A., & Viţelar, A. (2019). Digital transformation trends reshaping companies. In *Proceedings of the International Conference on Business Excellence* (Vol. 13, No. 1, pp. 635-646).

Romanian Digitalisation Authority. (2021). Barriers to the Digitalization of the Public and Private Sector in Romania. https://www.adr.gov.ro/wp-content/uploads/2021/04/ADR-Barierele-Digitalizarii-mediului-public-si-privat-din-Romania.pdf

Romanian Digitalisation Authority. (2021). EGOV project "Establishing the framework for the development of e-government tools". https://www.adr.gov.ro/stabilirea-cadrului-de-dezvoltare-a-instrumentelor-de-e-guvernare-egov/

Săvulescu, C., & Antonovici, C. G. (2020). *Fostering Innovative Governance by Information Technology Development*, Economica Publishing House.

Solis, B., Lieb, R., & Szymanski, J. (2014). The 2014 State of Digital Transformation. Altimeter Group. https://www.slideshare.net/Altimeter/report-the-2014-state-of-digital-transformation-by-altimeter-group

Stolterman, E., & Fors, A.C. (2004). Information Technology and the Good Life. In Kaplan B., Truex D.P., Wastell D., Wood-Harper A.T., DeGross J.I. (Eds.), *Information Systems Research*. IFIP International Federation for Information Processing, vol. 143. Springer.

Strack, R., Dyrchs, S., Kotsis, Á., & Mingardon, S. (2017). *How to Gain and Develop Digital Talent and Skills*, Boston Consulting Group Publications. https://www.bcg.com/publications/2017/people-organization-technology-how-gain-develop-digital-talent-skills

Vrabie, C. (2019). Technological Infrastructure for Building a Smart Ecosystem. In C. Bratianu et al. (Eds.), *Strategica* (pp. 695-702), Tritonic.

World Economic Forum (2016). Digital Transformation of Industries Demystifying Digital and Securing $100 Trillion for Society and Industry by 2025. https://reports.weforum.org/digital-transformation/wp-content/blogs.dir/94/mp/files/pages/files/wef1601-digitaltransformation-1401.pdf

Zbuchea, A., Vidu, C., & Pinzaru, F. (2019). Is Artificial Intelligence Changing Knowledge Management. In C. Bratianu et al. (Eds.), *Strategica* (pp. 445-452), Tritonic.