The Effect of Digital Transformation on the Development of E-Governance in Cyprus and Greece. A Critical Review Through the Analysis of the Digital Economy and Society Index

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Abstract

The need for ever-increasing administrative and socio-economic results combined with the demand for a more productive public administration has led to an ever-greater focus on the utilisation of IT and communication technologies through the implementation of integrated e-governance programs. By systematically measuring the implementation of e-governance strategies, their efficiency and quality are enhanced, and the wide use of services is achieved, creating value for society as a whole. The development of commonly accepted indicators provides the possibility of cross-national comparisons. The European Commission has established the Digital Economy and Society Index (DESI) to record the digital performance of the EU Member States, illustrating the quality and quantity of their development in digital technology. The present study will focus on the analysis of the DESI index for Cyprus and Greece through their comparison to the average of the corresponding indicators of the rest of the EU Member States. Ultimately, the digital maturity of the countries will be assessed by identifying problems and gaps as well as opportunities for improvement.

Keywords: E-Governance, Public Administration, Digital Economy and Society Index, digital transformation

Introduction

The use of Information and Communication Technologies (ICT) has changed the way businesses and organisations operate.[5] The prospect of exploiting contemporary

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[5] Richard Mancini, 'Raising the Bar for E-Government' (2012) 72(6) *Public Administration Review* 822-829.

technologies is now one of the most important administrative goals for public organisations claiming ever higher efficiency and effectiveness.[6] In this light, public administrations around the world are adapting their operation, introducing digital reforms that will allow for an upgrade and thus help them better serve their role.[7]

This new management model refers to the transition to the 'information society', utilising modern information and communication technologies.[8] Having recognised this fact, the European Union (EU) identified as a top priority the process of introduction, implementation, and continuous development of e-governance in public administrations of all Member States with the aim of their gradual digital transformation.[9] In order to achieve this goal, specialized policies and individual action plans are structured while sophisticated administrative mechanisms and targeted monitoring indicators are monitoring their performance.[10]

The development of commonly accepted indicators provides the possibility of cross-national comparisons. To measure the digital performance, the EU has established the Digital Economy and Society Index (DESI), which illustrates the quality and quantity of the development of the EU Member States in digital technology.[11] This study compares the average of the corresponding DESI indicators of the EU Member States to Greece and Cyprus, in order to assess the digital maturity of the countries, and to identify deficiencies and possibilities for improvement.

Focusing on E-Governance

The need for administrative and socio-economic results combined with the demand

[6] Qian Hu. 'Preparing Public Managers for the Digital Era: Incorporating Information Management, Use, and Technology into Public Affairs Graduate Curricula' (2018) 20(5) *Public Management Review* 766-787

[7] Marijn Janssen, Nripendra Rana, Emma Louise Slade, Yogesh Kumar Dwivedi, 'Trustworthiness of Digital Government Services: Deriving a Comprehensive Theory Through Interpretive Structural Modelling' (2018) 20(5) *Public Management Review.*

[8] Maxat Kassen, 'Globalization of E-Government: Open Government as a Global Agenda; Benefits, Limitations and Ways Forward' (2014) 30(1) *Information Development* 51–58.

[9] Liang Ma, Yueping Zheng, 'Does E-Governance Performance Actually Boost Citizen Use? Evidence from European Countries' (2018) 20(10) *Public Management Review* 1513-1532.

[10] Ramon Gil-Garcia, Sharon Dawes, Theresa Pardo, 'Digital Government and Public Management Research: Finding the Crossroads' (2018) 20(5) *Public Management Review* 633-646.

Ibrahim Osman, Abdel Latef Anouze, Zahir Irani, Baydaa Al-Ayoubi, Habin Lee, Asım Balci, Tunc Medeni, Vishanth Weerakkody, 'COBRA Framework to Evaluate E-governance Services: A Citizen-Centric Perspective' (2014) 31(2) *Government Information Quarterly* 243-256.

[11] Ekaterina Dolgikh, Tatiana Pershina, 'Analysis of the Development of the Digital Economy in Europe' (2022) 84 *E-management*.

for a more functional public administration[12] has led to a greater-than-before utilisation of Information Technologies (IT) and communication technologies through the implementation of integrated e-governance programs.[13] The factors that contributed to the development of E-Governance (EG) are:[14]

- Electronic innovations and the overall development of information technology and telecommunications, which led to a new administrative environment, thus changing the ways of economic and administrative management.
- The transition to the information society, with information and data being key factors in the implementation of the strategic goals of businesses and organisations.
- The growing demand of citizens and businesses for faster and better service.
- The globalised environment, which imposes the cooperation of national administrations with other States' administrations to achieve synergies and collaborations in the context of the new administrative process.
- The perspective of European policies in the direction of a single European Public Administration through the expansion of the Public Administration in all Member States.
- The promotion of 'Good Governance' (effectiveness and efficiency in the implementation of public policies and programs, transparency and open access of citizens, coherence in the planning of public policies and programs, etc.)

E-governance refers to the use of information and communication technologies in public administration together with organisational changes, and new staff skills to improve public service, strengthen democracy, and support public policies.[15] It is, in other words, a term used to identify the use of ICT in governance systems and processes with the aim of forming more functional, efficient, and economical admin-

[12] World Bank 'The E-Governance Handbook for Developing Countries' (Washington: Centre for Democracy and Technology,2002).

[13] Joydeep Guha, Bhaskar Chakrabarti, 'Making E-Governance Work: Adopting the Network Approach' (2014) 31 (2) *Government Information Quarterly* 327–336.

Andreas Pomportsis, 'Introduction to Electronic Governance' (Ηλεκτρονική Διακυβέρνηση) (Athens: Tziolas publications, 2017) (in Greek)

[14] Ioannis Apostolakis, Eyripidis Loukis, Ioannis Chalaris, 'Electronic Public Administration' (Ηλεκτρονική Δημόσια Διοίκηση) (Athens: Papazisi publications, 2008) (in Greek).

[15] Dimitrios Belias, Efstathios Velissariou, Stefanos Papailias, Foteini Manta, Ioannis Rossidis, 'Change Management – Obstacles and Perspectives for the Integration of Changes in Greek Public Hospitals' (2019) 9(2) *Advances in Management & Applied Economics* 37-50;

Ioannis Rossidis, Dimitrios Belias, Georgios Aspridis, 'Change Management and Leadership' (Διαχείριση Αλλαγών και Ηγεσία) (Athens: Tziolas publications, 2020c) (in Greek).

istrative systems.[16] Many definitions of EG can be found in literature. According to the World Bank (2002), 'e-governance is the use of information and communication technologies (ICTs) to change administration, to make it more accessible, efficient and accountable'. Modern approaches state that EG contributes to more efficient functioning of public administration, to better quality services to citizens and businesses, and to better governance.[17] E-governance is evolving into a field of reforming the public's relationship with the administration,[18] and it can bring multifaceted benefits both to the State and other interested parties.[19]

E-governance is considered to be the most important tool for the modernisation of public administration.[20] Its effective integration and comprehensive utilisation by State administrations present a strong administrative and socio-economic interest.[21] The European Commission actively supports e-governance by promoting unified policies and strategies[22] (despite the different rates of technological development between Member States), looking forward to achieving administrative convergence in all areas between EU Member States.[23]

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[16] Jeremy Rose, John Stouby Persson, Lise Tordrup Heeager, Zahir Irani, 'Managing E-Government: Value Positions and Relationships' (2014) 25(5) *Information Systems Journal* 531-571.

Anna Kochanova, Zahid Hasnain, Bradley Larson, 'Does E-governance Improve Government Capacity? Evidence from Tax Compliance Costs, Tax Revenue, and Public Procurement Competitiveness' (2020) 34(1) *The World Bank Economic Review* 101–120

[17] Gerrit Rooks, Uwe Matzat, Bert Sadowski 'An Empirical Test of Stage Models of E-governance Development: Evidence from Dutch Municipalities' (2017) 33(4) *The Information Society* 215–225.

Mitja Decman, Janez Stare, Maja Klun, 'E-Governance and Cost-Effectiveness: E-Taxation in Slovenia' (2010) 31 *Transylvanian Review of Administrative Sciences* 48-57.

[18] Maxat Kassen, 'Globalization of E-Government: Open Government as a Global Agenda; Benefits, Limitations and Ways Forward' (2014) 30(1) *Information Development* 51–58.

[19] OECD 'OECD E-governance Flagship Report "The E-governance Imperative"' (Paris: Public Management Committee, 2003)

[20] Andreas Pomportsis, 'Introduction to Electronic Government' (Ηλεκτρονική Διακυβέρνηση) (Athens: Tziolas publications, 2017) (in Greek)

[21] Jeremy Rose, John Stouby Persson, Lise Tordrup Heeager, Zahir Irani, 'Managing E-Government: Value Positions and Relationships' (2014) 25(5) Information Systems Journal 531-571.

Michail Paraskevas, 'Public Administration in the Information Society' (Η Δημόσια Διοίκηση στην Κοινωνία της Πληροφορίας) in Paraskevas, M., Asimakopoulos, G., Triantafillou, B. (eds), *Information Society* (Athens: Association of Greek Academic Libraries, 2015), available at http://hdl.handle.net/11419/412 (in Greek); https://www.dianeosis.org/wp-content/uploads/2018/03/EGov_Upd_090318.pdf (in Greek) (last accessed 2 September 2022).

[22] Neil Nugent, 'Politics and Governance in the European Union' (Πολιτική και Διακυβέρνηση στην Ευρωπαϊκή Ένωση) (Athens: Savvalas publications, 2009) (in Greek).

[23] Argyris Passas, Theodoros Tsekos, 'National Administration and European Integration' (Εθνική Διοίκηση και Ευρωπαϊκή Ολοκλήρωση) (Athens: Papazisis publications, 2009) (in Greek).

According to Osman et al.,[24] the benefits of e-services could be grouped into two categories: tangible and intangible benefits. Tangible benefits include saving time and money, while intangible benefits include the quality of information and services provided. It also contributes to improving citizens' trust[25] and fighting corruption.[26] As Porumbescu[27] reports, the use of social media by public administration agencies is positively related to satisfaction and perceptions of the credibility of the public sector.

The intention to move to an electronic public administration is a high priority goal for all public administrations internationally.[28] Nevertheless, according to literature, the achievement of this specific goal is a particularly demanding process that requires the fulfillment of specific conditions:[29]

- Administrative conditions (formulation of the appropriate institutional framework, development of new organisational structures, readjustment of human resources management at the level of education/training/performance/ leadership/motivation/communication, management of technological change, etc.)
- Social conditions (informing and training citizens in the use of ICT, adoption of digital technologies by businesses, reduction of the educational and social gap in the use of technology, etc.)
- Technological conditions (creation of conditions for access to EG channels by all citizens, development of a high and secure technological level in the public sector, existence of the required technological infrastructures, implementation of digital services by public services, etc.)

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[24] Ibrahim Osman, Abdel Latef Anouze, Zahir Irani, Baydaa Al-Ayoubi, Habin Lee, Asım Balci, Tunc Medeni, Vishanth Weerakkody, 'COBRA Framework to Evaluate E-governance Services: A Citizen-Centric Perspective' (2014) 31(2) Government Information Quarterly 243-256.

[25] Soonhee Kim, Jooho Lee, 'E-Participation, Transparency, and Trust in Local Government' (2012) 72 (6) *Public Administration Review* 819–828.

[26] Thomas Anderson, 'E-Governance as an Anti-Corruption Strategy' (2009) 21(3) *Information Economics and Policy* 201-210.

[27] Gregory Porumbescu, 'Linking Public Sector Social Media and E-governance Website Use to Trust in Government' (2016) 33(2) *Government Information Quarterly* 291–304.

[28] Dyah Setyaningrum, 'E-Governance as an Anti-Corruption Tool: Experience from Indonesia' (2020) *Accounting and Finance Review*, available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3129311 (last accessed 09 August 2022).

Maxat Kassen, 'Globalization of E-Government: Open Government as a Global Agenda; Benefits, Limitations and Ways Forward' (2014) 30(1) *Information Development* 51–58.

[29] Indihar Štemberger, Jurij Jaklič, 'Towards E-Governance by Business Process Change – A Methodology for Public Sector' (2007) 27(4) *International Journal of Information Management*, 221-232.

Dave Griffin, Amanda Foster, Edward Halpin, 'Joined up E-Government: an Exploratory Study of UK Local Government Progress' (2004) *Journal of Information Science and Technology* 5883.

Evolution of E-Governance in Cyprus

The development of public administration in Cyprus is an extremely important goal, which, combined with the arrival of information technologies, has led to a large number of reforms over the last decades. At the end of the 70s, an early process of computerisation of public services in individual sectors was attempted (e.g. payrolls, budget, etc.). In 1980, the IT Services Department of the Ministry of Finance was created in the context of technological development and it took over the entire computerisation project, having completed it by 2003.

A particularly important contribution to the reform process was the passing of Law 158(I)/1999 on general administrative principles, promoting the principles of equality, transparent administration, good administration, and accountability, which shaped the necessity for utilising the principles of e- governance. At the same time, the accession of Cyprus to the EU in 2004 and consequently the obligation to endorse the *acquis communautaire* led to the widespread dissemination of ICT, aiming at the administrative convergence with advanced Europe (Department of Electronic Communications, 2012). This new administrative and political reality triggered the implementation of important e-governance programs, such as the Government Internet Portal, the Electronic Procurement System (eProcurement), the System of the Registrar of Companies and Official Receiver, the pilot Office Automation System (eOASIS), etc. In 2012, for the first time, a digital strategy was adopted, incorporating a dynamic and holistic approach. In 2014, all public tenders had to go through mandatory electronic submission through the Public Contracts System, followed by the creation of TaxisNet for the electronic registration of tax returns for individuals and companies. Then the National Open Data Portal 'Ariadni' was initiated. In June 2015, the Council of Ministers decided to replace the Computerisation Executive Council with the Electronic Government Council (GEC) with the aim of accelerating decision-making for project approval and rapid problem solving, as well as the implementation of the Unit's three-year Action Plan Administrative Reform (Administrative Reform Unit, 2015).

The next digital reforms are part of the 'Digital Strategy 2014-2020' which aimed to gradually upgrade e-governance in Cyprus, contributing to better services for citizens and businesses and promoting the better functioning of public administration. In recent years, the existing e-governance projects have been increasingly expanded, and other new and innovative projects have been added to the e-history of Cyprus. Among the existing projects, it is worth noting that the Ariadni System was expanded from 33 services to 40, the remarkable project of the Online Land Registry Portal was

upgraded, (operational since early 2016) offering a variety of services and the ability to navigate spatial maps, the eOASIS System was expanded, increasing its users to more than 1,100, the possibility of electronic payments was given to almost all government departments, etc. Other important innovations in the e-governance level are the Ippodamos Information System, which was upgraded by the Department of Urban Planning and Housing (TPO) (Informatics Services Department, 2020c) and the Land Registry Online Platform (DLS Portal).

Evolution of E-Governance in Greece

The development and evolution of e-governance in Greece was a challenging mission. The complexity of the multi-level hierarchical administrative model and the deficiencies in computerisation, as well as the limited technological infrastructures and the limited costs for ICT contributed to the challenge.[30] A stimulating factor for the development of e-governance in Greece was the European funding through the Community Support Frameworks (CSF), namely the second CSF for the period 1994-1999 and the third CSF for the period 2000-2006.[31] In particular, the programs developed during the second CSF concerned the provision of the Public Administration with technological infrastructures and the familiarisation of employees in their use, as well as the development of government web portals for the provision of information, while through the third CSF provided some transactional electronic services.[32]

In addition to the above, the 'Kleisthenis' program (1994-1999) holds a prominent place, as it marks the beginning of the functional and organisational modernisation of the Public Administration in Greece, introducing new technologies to the public sector: the supply of computers and network infrastructures combined with the training of civil servants, important actions from the 'Kleisthenis' program directed towards the development of the 'TaxisNet' web portal for the provision of information and tax services, as well as the first phase of the National Public Administration Network called 'Syzeuxis'.

In the period 2000-2006, the operational program 'Information Society', which was financed by the 3rd CSF, aimed for a horizontal development program for the

[30] Demetrios Sarantis, Dimitris Askounis, 'Electronic Government Interoperability Framework in Greece: Project Management Approach and Lessons Learned in Public Administration' (2010) 7(3) *Journal of US-China Public Administration* 39-49.

[31] Konstantinos Markellos, Penelope Markellou, Angeliki Panayiotaki, Eirini Stergianeli,'Current State of Greek E-Governance Initiatives' (2007) 2(3) *Journal of Law and Governance* 67-88.

[32] Panagiotis Hahamis, J., Iles, Mike Healy, 'E-Governance in Greece: Bridging the Gap Between Need and Reality' (2005) 3(4) *The Electronic Journal of e-Government* 185-192.

public administration with an emphasis on improving the quality of the services provided by the Administration through the utilisation of ICT, emphasising on e-learning and e-business. In the following years, the development of e-governance took on a more strategic character and digital strategies were developed. [33]

Regarding the historical development of the government strategy in general for e-governance, the 'White Paper', drawn up in 1995, marks its beginning[34] focusing on the transition of Greece to an information society. Subsequently, the 'Digital Strategy 2006-2013', accompanied by the operational program "Digital Convergence 2007-2013", constituted the transition from the utilisation of ICT to a comprehensive strategic proposal for improving the productivity of the economy and the quality of life of citizens. The 'E-governance Strategy 2014-2020' focuses on the modernisation of the Administration through IT tools, as well as policies to reconnect the citizen with the Administration. In conclusion, the 'National Digital Strategy 2016-2021' is a guide for the digital development of the country, promoting its harmonisation with the practices applied in Europe.[35] For the current period, the 'National Digital Strategy 2020-2025', as described in the 'Digital Transformation Book 2020-2025', refers to the strategy and the individual ways of implementation through an action plan and with a vision of creating 'Digital Greece'.

The course of digital reforms in Greece can be traced through important e-governance projects such as 'Syzefxis', 'Diavgeia', the integrated information system 'TaxisNet', the 'National Government Portal HERMIS', the online portal of the OAED (for job hunting in the public sector), the electronic services of the Municipal and KEP Registries, the consolidated Insurance Funds (e-EFKA), the 'Ergani' system for employees, 'Pothen', as well as the recent e-governance services, such as vaccination management for the Covid-19 pandemic, etc.[36]

Overview of the DESI Index

Cyprus and Greece have made significant progress regarding the implementation of

[33] Markellos, K., et al. (no 31).

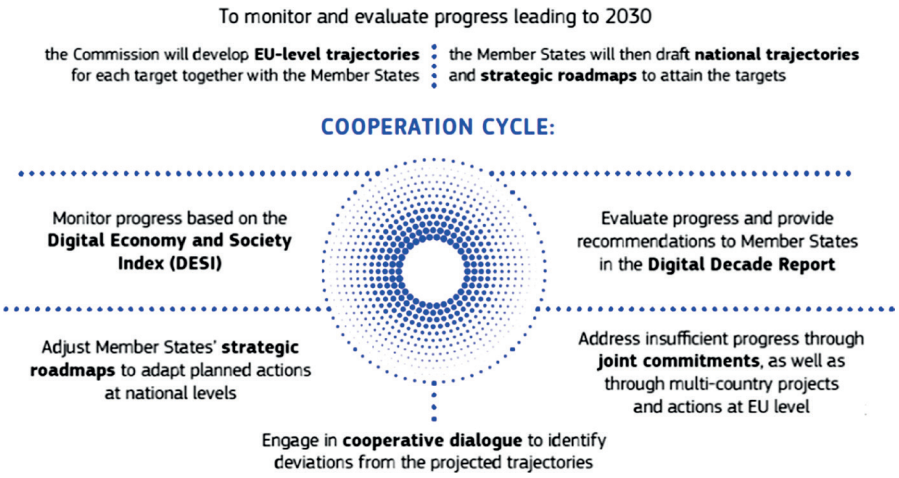
[34] Apostolakis, I., Loukis, E., Chalaris, I. (no 14).

[35] Dianeosis, 'The Internet in Greece. EKKE research' (Το διαδίκτυο στην Ελλάδα. Έρευνα ΕΚΚΕ) (2020), available at https://www.dianeosis.org/wp-content/uploads/2020/05/WIP_greece.pdf (last accessed 12 August 2022) (in Greek).

[36] Michalis Skordoulis, Panteleimon Alasonas, Victoria Pekka Economou, 'E-Governance Services Quality and Citizens' Satisfaction: A Multi-Criteria Satisfaction Analysis of TAXISnet Information System in Greece' (2017) 22(1) *International Journal of Productivity and Quality Management*.

e-governance policies.[37] Nevertheless, they fall significantly short of the European average, occupying low positions in international rankings. An extremely important indicator is the Digital Economy and Society Index (DESI), which describes the digital performance of European countries in specific categories. The DESI index characterises the progress of the EU Member States in the development of the digital economy and society, while the European Commission oversees the digital improvement of Member States with the help of index reports.[38] On an annual basis, reports are drawn up for each Member State, identifying the area of their digitisation, highlighting the sectors that need immediate intervention and the thematic chapters that provide an evaluation at EU level to key digital sectors, which are elements of essential importance for the formulation of strategic and political positions.[39] From 2021 on, the DESI index has been adjusted to reflect the two important policy initiatives that will contribute to the EU's digital transformation in the coming years. The first regards the Recovery and Resilience Mechanism, through which recovery and resilience plans of the Member States are financed. The second concerns the Digital Compass for the Digital Decade, which includes setting EU-level targets and

Figure: 1



Source: https://digital-strategy.ec.europa.eu/en/policies/europes-digital-decade

[37] Ioannis Rossidis, Dimitrios Belias, D., 'Evolution of E-Governance in the Era of the Pandemic. May the Crisis Become an Opportunity. The Cases of Cyprus and Greece' (2021) 33(1) *The Cyprus Review* 37-66.

[38] Dolgikh, et al, (no 11)

[39] Andriy Stavytskyy, Ganna Kharlamova, Eduard Alexandru Stoica, 'The Analysis of the Digital Economy and Society Index in the EU' (2019) 9(3) *TalTech Journal of European Studies* 245-261.

an EU- and national-level roadmap, creating a strong shared governance framework to monitor progress and address gaps, and promoting multi-national projects combining investment from the EU, Member States, and the private sector. The policies identified in the compass refer to innovative technologies, the regulatory and regulatory framework and the democratic principles governing the rule of law. To monitor the progress towards achieving the goals, the EU uses instruments such as National Strategies, Multi-State Projects, Committees, dialogue, and cooperation process, etc.

The DESI index was established by the European Commission as a tool for recording the digital performance of countries, recommending a set of qualitative and quantitative dimensions that reflect the digital evolution of the Member States of the European Union. It should be noted that the DESI index is a ranking index, and it does not reflect a country's performance in absolute terms but its performance in comparison to the rest. Therefore, a low ranking does not necessarily mean that the country has not made progress, but that other countries have probably progressed faster. The official definition contained in Article 3 of the Decision of the European Parliament and of the Council is:

> Digital economy and society indicator (DESI): annual set of analysis and measurement indicators on the basis of which the Commission monitors the overall digital performance of the Union and the States members across policy dimensions, including their progress towards digital goals.

The index in its current form is structured in four dimensions:

1. Human capital, which measures the skills and familiarity of a country's citizens with the digital world.
2. Connectivity, which includes fixed and mobile broadband networks, as well as connection prices.
3. The integration of digital technology, which reflects the degree of digitisation of businesses and e-commerce.
4. Digital public services, which measures the degree of digitisation of public services giving a greater basis to the degree of e-governance and e-health services.

The analysis of the index can lead to the assessment of countries in relation to their performance both overall and in individual dimensions as well to check their progress over time and compare their performance both with digital integration leaders and their competing countries. Under these circumstances, the index is developing into a very useful tool for grading the digital level of European countries, providing the possibility for each country to identify deficiencies and shortcomings and

allowing the EU to approach the goal of a further administrative convergence of the Member States. The focus on the control of the digitisation of a country's economy and society provides the basis for the instrumentalisation of the index in the effort to develop public administration and especially Electronic Governance. Although only one of the four parameters refers specifically to public administration (digital public services) it is important to examine the remaining three parameters that make up the index (human capital, connectivity, integration of digital technology) as they contribute decisively to the shaping of the framework under which Electronic Public Administration is developed. Therefore, their consideration is of particular importance for the holistic evaluation of the level of Electronic Governance.

The index acts as a kind of cumulative overview of the results of a country's digital development by identifying the environment in which e-governance is developing. By identifying and examining areas of digital priority, it essentially contributes to the adoption of accurate political and administrative decisions, which will lead to the general improvement of the public sector and the economic and social development of the States. Ultimately, by highlighting the lags/problems, it contributes to laying the foundations for new e-governance priorities.

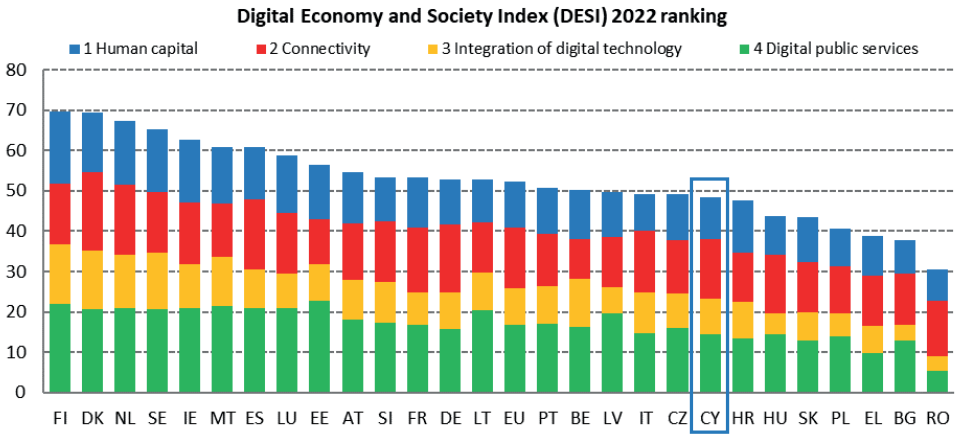
The Course of Digital Transformation in Cyprus and Greece According to the DESI Index

In recent years, Cyprus has marked an upward trend in relation to the digitization of the economy and society, carrying out important reforms in this direction. Accordingly, the field of Electronic Governance in Cyprus is developing rapidly, actively contributing to the overall upgrade of the Cypriot public administration. Nevertheless, compared to the course of most EU Member States (as reflected in the DESI index), it appears to fall short of the European average, noting deficiencies and problems in need of improvement. Currently, in the DESI 2022 index, Cyprus ranks 20th among the 27 EU Member States, rendering evident the need for individual improvements and corrective actions.

Despite ranking low among other European countries, when compared to the 2021 ranking chart, progress seems to have been achieved by showing improvements in almost all dimensions of the index, with the biggest improvements observed in connectivity, integration of digital skills, and digital public services. However, it should be noted that the index is comparative. Hence, any progress noted was not significant when compared to the rest of the European countries which showed an even greater progress.

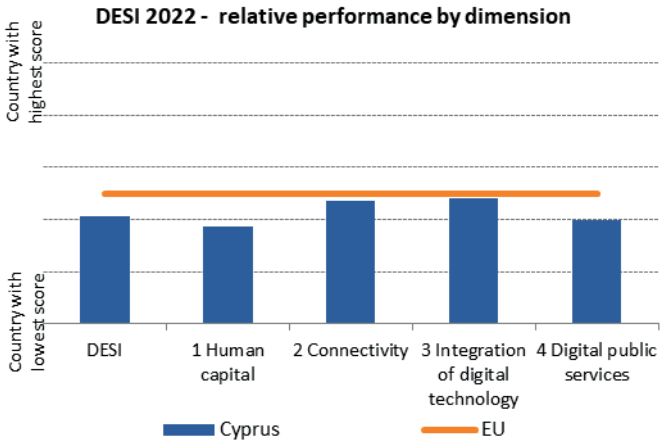
Figure: 2

	Cyprus		EU
	rank	score	score
DESI 2022	20	48.4	52.3



Πηγή: European Commission, 2022

Figure: 3

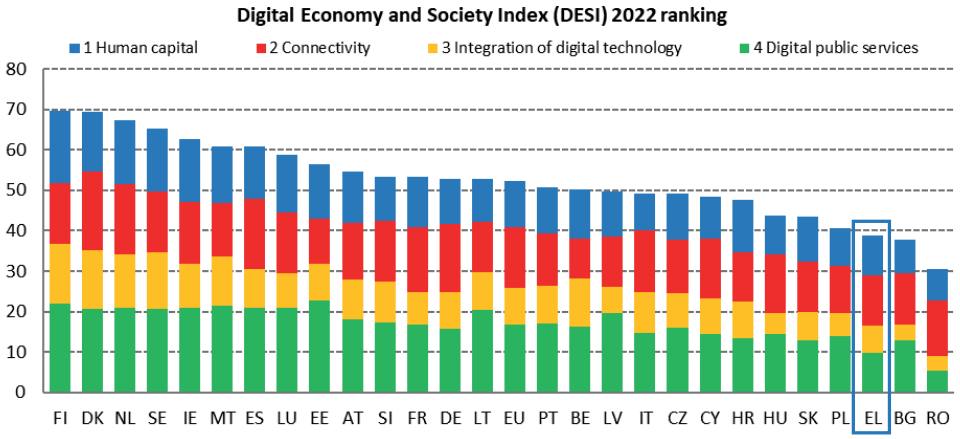


Πηγή: European Commission, 2022

In recent years, Greece, like Cyprus, has presented important reforms in the direction of the digitisation of society and economy by integrating IT and communication technologies and by drastically strengthening the electronic services of the public administration. Currently, Greece ranks 25th according to the the DESI index.

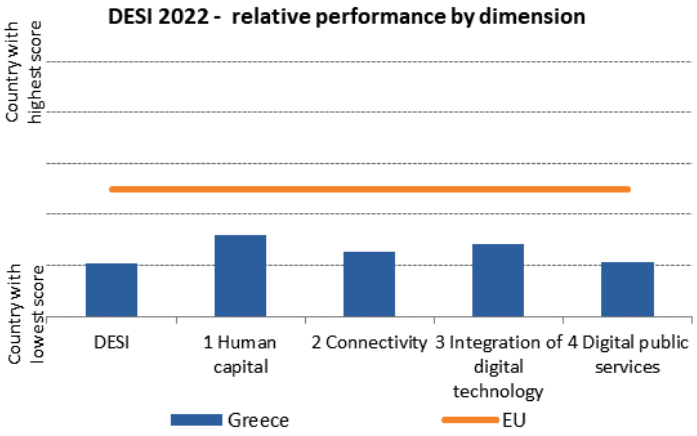
Figure: 4

	Greece		EU
	rank	score	score
DESI 2022	25	38.9	52.3



Source: European Commission, 2022

Figure: 5



Source: European Commission, 2022

Despite maintaining a particularly low ranking, Greece demonstrates significant progress, having improved in almost all dimensions of the index. It should be noted that in the years 2020 and 2019 Greece ranked 27th, and in 2018 it came 28th. Despite the visible progress, the comparative dimension of the index points out short-

comings that need to be improved to achieve administrative convergence with the EU. It is a fact that although Greece has increased its score to 38.9 points, the EU average has also increased to 52. 3 points.

The distance from the European average is largely due to the speed of integration of digital changes by most European countries in relation to Greece, which highlights the structural problems of the country. In the next chapter, each dimension of the DESI for Cyprus and Greece is presented and analysed on the relevant European Commission's reports.

Human Capital

Cyprus ranks 21st in the Human Capital dimension and is placed below the European average in all indicators (with the exception of the indicator regarding the percentage of women experts in ICT, in which it is equal to the average at 19% and the indicator regarding the percentage of companies providing ICT training, in which it exceeds the average - 25% against 20% of the average). At this point, it should be mentioned that despite the fact that Cyprus falls short of the European average, it is upgraded from the 23rd place in 2021 to the 21st in 2022. The low performance of Cyprus can be explained by the reduced number of workers with expertise in ICT, the population's lack of basic digital skills (50% of the population has basic digital skills and 21% has advanced skills), the low percentage of specialists in ICT in relation to the total workforce, (the percentage in question amounts to 3.9% compared to 4.5% of the average of the European Union and 8% of pioneer Sweden). Cyprus performs clearly better in internet use, as 97% of households in small towns and suburbs, 93% in cities and 91% in rural areas have access to the internet. A point of concern is the fact that 6% of citizens have skills exclusively in 'information and communication'. This dimension presents the lowest score of all the other dimensions and falls well short of the EU average.[40]

The Commission's annual report mentions the actions promoted by Cyprus to accelerate its digital upgrade, which focus on education (through the creation of a new teacher and school evaluation system, including teacher training in digital skills), digital transformation of school units with the aim of strengthening digital skills and skills related to education in the fields of science, technology, engineering and mathematics (STEM), and digital skills in general, with a special mention of the program 'Digital Skills: Action Plan 2021 – 2025', which focuses on accelerating the digital transition through the creation of an open, digital society.

[40] European Commission, 'Digital Economy and Society Index (DESI) 2022 Cyprus' (2022).

Table: 1

1 Human capital	Cyprus		EU
	rank	score	score
DESI 2022	21	41.8	45.7

	Cyprus			EU
	DESI 2020	DESI 2021	DESI 2022	DESI 2022
1a1 At least basic digital skills % individuals	NA	NA	50% 2021	54% 2021
1a2 Above basic digital skills % individuals	NA	NA	21% 2021	26% 2021
1a3 At least basic digital content creation skills[3] % individuals	NA	NA	60% 2021	66% 2021
1b1 ICT specialists % individuals in employment aged 15-74	2.7% 2019	3.1% 2020	3.9% 2021	4.5% 2021
1b2 Female ICT specialists % ICT specialists	19% 2019	18% 2020	19% 2021	19% 2021
1b3 Enterprises providing ICT training % enterprises	31% 2019	25% 2020	25% 2020	20% 2020
1b4 ICT graduates % graduates	2.6% 2018	2.9% 2019	2.7% 2020	3.9% 2020

Source: Digital Economy and Society Index 2022 Cyprus

Greece, on the other hand, ranks one place behind Cyprus in 22nd place with a score of 40.1 against the EU average of 45.7. Despite the undeniable progress it has shown compared to previous years, it still falls short of the European average in all subcategories of the Human Capital dimension. The low performance of Greece is derived from the reduced number of employees with advanced skills in information technologies (22% compared to 26.5% of average of the EU), and the particularly low percentage of ICT specialists in relation to the entire workforce, (2.8% compared to 4.5% of the EU). Greece's performance is very good in certain indicators such as women with expertise in ICT (where it exceeds the European average with a percentage of 21% compared to 19% for the EU) and the existence of basic digital skills of the population (with a percentage of 52% approaching the European average, which amounts to 54%).[41]

Through the Ministry of Digital Governance (in collaboration with many other agencies), Greece has developed a strategy for the promotion of digital skills. The National Academy of Digital Skills, launched in 2021, aims to become the key development agency for digital education, for public and private sector workers. Particular

[41] European Commission 'Digital Economy and Society Index (DESI) 2022 Greece'. (2022).

emphasis is placed on the development of civil servants' digital skills by the Ministry of the Interior and the National Center for Public Administration and Self-Government by organising specialized training programs[42]. Moreover, the Ministry of Education designs upgraded study programs in areas of Computer Science and Communication, aiming to contribute to the overall development of citizens' digital skills.

Table: 2

1 Human capital	Greece		EU
	rank	score	score
DESI 2022	22	40.1	45.7

	Greece			EU
	DESI 2020	DESI 2021	DESI 2022	DESI 2022
1a1 At least basic digital skills	NA	NA	52%	54%
% individuals			2021	2021
1a2 Above basic digital skills	NA	NA	22%	26%
% individuals			2021	2021
1a3 At least basic digital content creation skills[3]	NA	NA	62%	66%
% individuals			2021	2021
1b1 ICT specialists	2.0%	2.1%	2.8%	4.5%
% individuals in employment aged 15-74	2019	2020	2021	2021
1b2 Female ICT specialists	22%	29%	21%	19%
% ICT specialists	2019	2020	2021	2021
1b3 Enterprises providing ICT training	15%	12%	12%	20%
% enterprises	2019	2020	2020	2020
1b4 ICT graduates	3.1%	3.4%	3.5%	3.9%
% graduates	2018	2019	2020	2020

Source: Digital Economy and Society Index 2022 Greece

Connectivity

Cyprus is ranked 12th in connectivity this year, showing a remarkable rise in its ranking (note that in the year 2021 it was ranked 24th). Despite this, there is still a marginal deviation from the European average. This deviation is derived mainly from the low performance in several indicators, such as the fixed broadband penetration of at least 100Mbps, the penetration of at least 1 Gbps, the coverage of fixed very high-capacity networks (VHCN) and the coverage of optical fibers (FTTP).

The progress shown by Cyprus in this dimension originates from the development of next-generation access networks (NGA), where the 5G readiness indicator

[42] Ioannis Papapolychroniadis, Ioannis Rossidis, Georgios Aspridis, 'Comparative Analysis of Recruitment Systems in the Public Sector in Greece and Europe. Trends and Outlook for Staff Selection Systems in the Greek Public Sector' (2017) 6(1) Academic Journal of Interdisciplinary Studies.

exceeded the EU average of 67% with a coverage reaching 75%. According to the Commission's annual report, in order to achieve further improvement of Cyprus' performance in the connectivity dimension, actions should be taken to strengthen the cabling of buildings to prepare them for Gigabit capacity (Gigabit-ready), to promote the adoption of very high-capacity connectivity and to strengthen the corresponding networks in underserved areas. A special mention is made in the 'Broadband Plan of Cyprus 2021-2025'.

Table: 3

2 Connectivity	Cyprus		EU
	rank	score	score
DESI 2022	12	58.8	59.9

	Cyprus			EU
	DESI 2020	DESI 2021	DESI 2022	DESI 2022
2a1 Overall fixed broadband take-up % households	87% 2019	92% 2020	92% 2021	78% 2021
2a2 At least 100 Mbps fixed broadband take-up % households	2% 2019	3% 2020	26% 2021	41% 2021
2a3 At least 1 Gbps take-up % households	<0.01% 2019	<0.01% 2020	0.17% 2021	7.58% 2021
2b1 Fast broadband (NGA) coverage % households	100% 2019	100% 2020	100% 2021	90% 2021
2b2 Fixed Very High Capacity Network (VHCN) coverage % households	10% 2019	26% 2020	41% 2021	70% 2021
2b3 Fibre to the Premises (FTTP) coverage % households	10% 2019	26% 2020	41% 2021	50% 2021
2c1 5G spectrum Assigned spectrum as a % of total harmonised 5G spectrum	0% 04/2020	67% 09/2021	67% 04/2022	56% 04/2022
2c2 5G coverage[5] % populated areas	NA	0% 2020	75% 2021	66% 2021
2c3 Mobile broadband take-up % individuals	84% 2018	84% 2018	91% 2021	87% 2021
2d1 Broadband price index Score (0-100)	37 2019	42 2020	64 2021	73 2021

Source: Digital Economy and Society Index 2022 Cyprus

In the same dimension, Greece occupies the 22nd position for the year 2022 with a score of 49.6% against 59.9% for the EU. Despite its low position in this category, Greece has also shown significant progress in all indicators of this dimension. Particular areas of concern are: the coverage of very high capacity networks (VHCN) in which Greece receives a percentage of 20% compared to 70% of the EU, and the penetration of fixed speed broadband communications, where Greece has a percent-

age of 9% compared to 41% of the EU.[43] Despite this, the country's progress in all the individual sectors of this dimension indicate an upward course, creating positive estimates for the future. = The new National Broadband Plan initiated in 2021 is being prepared, and it aims to achieve the Gigabit targets for 2025 and the Digital Decade targets for 2030 by planning to create an investment-friendly environment.

Table: 4

2 Connectivity	Greece		EU
	rank	score	score
DESI 2022	22	49.6	59.9

	Greece			EU
	DESI 2020	DESI 2021	DESI 2022	DESI 2022
2a1 Overall fixed broadband take-up	76%	77%	82%	78%
% households	2019	2020	2021	2021
2a2 At least 100 Mbps fixed broadband take-up	1%	3%	9%	41%
% households	2019	2020	2021	2021
2a3 At least 1 Gbps take-up	<0.01%	<0.01%	<0.01%	7.58%
% households	2019	2020	2021	2021
2b1 Fast broadband (NGA) coverage	81%	87%	92%	90%
% households	2019	2020	2021	2021
2b2 Fixed Very High Capacity Network (VHCN) coverage	7%	10%	20%	70%
% households	2019	2020	2021	2021
2b3 Fibre to the Premises (FTTP) coverage	7%	10%	20%	50%
% households	2019	2020	2021	2021
2c1 5G spectrum	0%	99%	99%	56%
Assigned spectrum as a % of total harmonised 5G spectrum	04/2020	09/2021	04/2022	04/2022
2c2 5G coverage[4]	NA	0%	66%	66%
% populated areas		2020	2021	2021
2c3 Mobile broadband take-up	67%	67%	76%	87%
% individuals	2018	2018	2021	2021
2d1 Broadband price index	49	53	58	73
Score (0-100)	2019	2020	2021	2021

Source: Digital Economy and Society Index 2022 Greece

Integration of Digital Technology

In the digital technology integration dimension, Cyprus is ranked 17th, rising three places, compared to 2021. Thanks to the achieved progress, Cyprus can significantly approach the European average (35.6 points compared to 36.1 for the EU). The improvement in its ranking is mainly due to the increase in the percentage of SMEs (Small and Medium-sized Enterprises) with at least a basic level of digital intensity and the increase in companies using mass networking and cloud computing (el-

[43] European Commission (no 41).

ements which far exceed the corresponding European averages scores). However, Cyprus performs poorly in terms of big data, and the percentage of businesses using artificial intelligence (AI) applications, issuing e-invoicing, and selling online.[44]

In order to strengthen digital technology, the 'Industrial Policy of Cyprus' established in May 2019 aimed at creating a technologically developed industry, contributing significantly to the development and competitiveness of the Cypriot economy. In January 2020, the national AI strategy was adopted and includes actions for the development and exploitation of AI in Cyprus. Meanwhile, since 2021, a new cyber security strategy has been implemented with the aim of consolidating a secure electronic environment in Cyprus, with special provisions and actions for the protection of critical information infrastructures, contributing to the formation of a solid economic development environment.

Table: 5

3 Integration of digital technology	Cyprus		EU
	rank	score	score
DESI 2022	17	35.3	36.1

	Cyprus			EU
	DESI 2020	DESI 2021	DESI 2022	DESI 2022
3a1 SMEs with at least a basic level of digital intensity % SMEs	NA	NA	66% 2021	55% 2021
3b1 Electronic information sharing % enterprises	33% 2019	33% 2019	34% 2021	38% 2021
3b2 Social media % enterprises	38% 2019	38% 2019	42% 2021	29% 2021
3b3 Big data % enterprises	5% 2018	6% 2020	6% 2020	14% 2020
3b4 Cloud % enterprises	NA	NA	42% 2021	34% 2021
3b5 AI % enterprises	NA	NA	3% 2021	8% 2021
3b6 ICT for environmental sustainability % enterprises having medium/high intensity of green action through ICT	NA	NA 2021	NA 2021	66% 2021
3b7 e-Invoices % enterprises	11% 2018	13% 2020	13% 2020	32% 2020
3c1 SMEs selling online % SMEs	12% 2019	15% 2020	17% 2021	18% 2021
3c2 e-Commerce turnover % SME turnover	8% 2019	5% 2020	5% 2021	12% 2021
3c3 Selling online cross-border % SMEs	9% 2019	9% 2019	8% 2021	9% 2021

Source: Digital Economy and Society Index 2022 Cyprus

[44] European Commission (no 40).

Greece ranks 22nd in the digital technology integration dimension, far behind the European average (Greece's score is 26.6 compared to the EU's 36.1). In contrast to Cyprus, Greece presents a very low percentage of SMEs with at least a basic level of digital intensity and businesses that use cloud computing. The areas where Greece approaches the European average are: social media, big data and e-commerce turnover, while in the area of SMEs selling online it exceeds the average performance of European countries. Sectors with relatively low performance remain: AI, electronic information sharing, and selling online cross-border.

Table: 6

3 Integration of digital technology	Greece		EU
	rank	score	score
DESI 2022	22	26.6	36.1

	Greece			EU
	DESI 2020	DESI 2021	DESI 2022	DESI 2022
3a1 SMEs with at least a basic level of digital intensity % SMEs	NA	NA	39% 2021	55% 2021
3b1 Electronic information sharing % enterprises	38% 2019	38% 2019	35% 2021	38% 2021
3b2 Social media % enterprises	19% 2019	19% 2019	29% 2021	29% 2021
3b3 Big data % enterprises	13% 2018	13% 2020	13% 2020	14% 2020
3b4 Cloud % enterprises	NA	NA	17% 2021	34% 2021
3b5 AI % enterprises	NA	NA	4% 2021	8% 2021
3b6 ICT for environmental sustainability % enterprises having medium/high intensity of green action through ICT	NA	65% 2021	65% 2021	66% 2021
3b7 e-Invoices % enterprises	9% 2018	NA 2020	NA 2020	32% 2020
3c1 SMEs selling online % SMEs	9% 2019	NA 2020	20% 2021	18% 2021
3c2 e-Commerce turnover % SME turnover	4% 2019	NA 2020	11% 2021	12% 2021
3c3 Selling online cross-border % SMEs	4% 2019	4% 2019	7% 2021	9% 2021

Source: Digital Economy and Society Index 2022 Greece

Although Greece has not formulated a clear national strategy for the digital transformation of its industry, several improvement efforts have been attempted in recent years. In particular, efforts are being made to simplify the licensing process for industrial enterprises, numerous projects are being planned for the digitization of industries, such as comprehensive support for the digital transformation of SMEs in

e-commerce applications, telecommuting systems, digital upgrading, AI tools, cyber security systems, and cloud infrastructure (capital of the order of 375 million euros is foreseen).[45] A National Cyber Security Operations Center will be created to support security in critical infrastructures, implement individual proposals of the Hellenic European Center for Digital Innovation, and establish an independent research unit for artificial intelligence and data science, among others.

Digital Public Services

Cyprus is ranked 20th in the digital public services dimension, moving up one position compared to 2021. Despite the progress made, it is about 10 points behind the European average, highlighting not only the shortcomings but also the significant room for improvement. Cyprus approaches the EU average when it comes to e-governance users and exceeds it in open data and digital public services for businesses. However, it falls significantly short in the area of pre-filled forms (31% compared to 64% for the EU) and Digital public services for citizens (56% compared to 75% for the EU), which is a cause of serious concern. The adoption of the eIDAS Regulation (Electronic Identification, Authentication, and Trust Services) led to the introduction of a national electronic identification (eID) scheme which comprises several legislative acts adopted in April 2021. The creation of a national scheme on eID and the possibility for an e-signature will enable the public interaction digitally with the government through the Government Gateway web platform. More precisely, the adopted 'Trust Service Provider (TSP)' will provide eID to all citizens above 18 years of age. .

Furthermore, the Cypriot government aims to create a digital environment which will host governmental systems and services. This initiative foresees addressing the problem of scattered IT governmental systems and limited cyber security.

The project is in its initial stage, while its procurement phase is under preparation. However, the aim is to gradually expand it to cover all governmental departments.[46]

Greece got 39.4 points, thus staying far behind the European average (67.3 points). It ranks 26th, being the worst performer among the four key dimensions of the index. Greece manages to score higher than the EU average only in e-governance users and open data, but it falls significantly short in all other categories. Although Greece's performance is particularly low in several categories, the progress being made is particularly significant (not yet reflected in the index data), leading to a gradual narrowing of the gap (36 versus 63 in DESI 2021). Even though access to services

[45] European Commission (no 41).
[46] European Commission (no 40).

Table: 7

4 Digital public services[6]	Cyprus		EU
	rank	score	score
DESI 2022	20	57.5	67.3

	Cyprus			EU
	DESI 2020	DESI 2021	DESI 2022	DESI 2022
4a1 e-Government users % internet users	58% 2019	59% 2020	63% 2021	65% 2021
4a2 Pre-filled forms Score (0 to 100)	NA	NA	31 2021	64 2021
4a3 Digital public services for citizens Score (0 to 100)	NA	NA	56 2021	75 2021
4a4 Digital public services for businesses Score (0 to 100)	NA	NA	86 2021	82 2021
4a5 Open data % maximum score	NA	NA	91% 2021	81% 2021

Source: Digital Economy and Society Index 2022 Cyprus

Table: 8

4 Digital public services[9]	Greece		EU
	rank	score	score
DESI 2022	26	39.4	67.3

	Greece			EU
	DESI 2020	DESI 2021	DESI 2022	DESI 2022
4a1 e-Government users % internet users	68% 2019	67% 2020	69% 2021	65% 2021
4a2 Pre-filled forms Score (0 to 100)	NA	NA	45 2021	64 2021
4a3 Digital public services for citizens Score (0 to 100)	NA	NA	52 2021	75 2021
4a4 Digital public services for businesses Score (0 to 100)	NA	NA	48 2021	82 2021
4a5 Open data % maximum score	NA	NA	82% 2021	81% 2021

Source: Digital Economy and Society Index 2022 Greece

for citizens and businesses have improved in 2021, Greece still scores well below the EU average on both indicators for digital public services for citizens and for digital public services for businesses with a score of 52 for citizens (EU average: 75) and 48 for businesses (EU average: 82).

From a thorough examination of the wider operation of Greece's e-governance systems, the main areas of concerns are: lack of long-term vision, gap between digital strategy, action plan and implementation, absence of a realistic implementation strategy plan, lack of continuity in Public Administration, absence of citizen-centric approach, inefficient process planning, problematic institutional and legal framework, ambiguity in the involvement and participation of competent bodies, problems in human resource management, lack of staff training, absence of high level software design, absence or non-application of common design principles, ambitious development of information systems that cannot be maintained, etc.[47]

Greece has launched a comprehensive digitisation plan for its public services, based on the Digital Transformation Bible, implementing around 450 IT projects. A key digital reform is the implementation of the single portal ('Gov.gr') which hosts over 1,370 digital public services achieving for 2021 more than 566 million transactions (six times the 2020 level of 94 million). At the same time, multiple efforts are being made to improve the level of interoperability and the effective implementation of the 'once only' principle, permitting to foresee a significant increase in this indicator in the following year.

Discussion

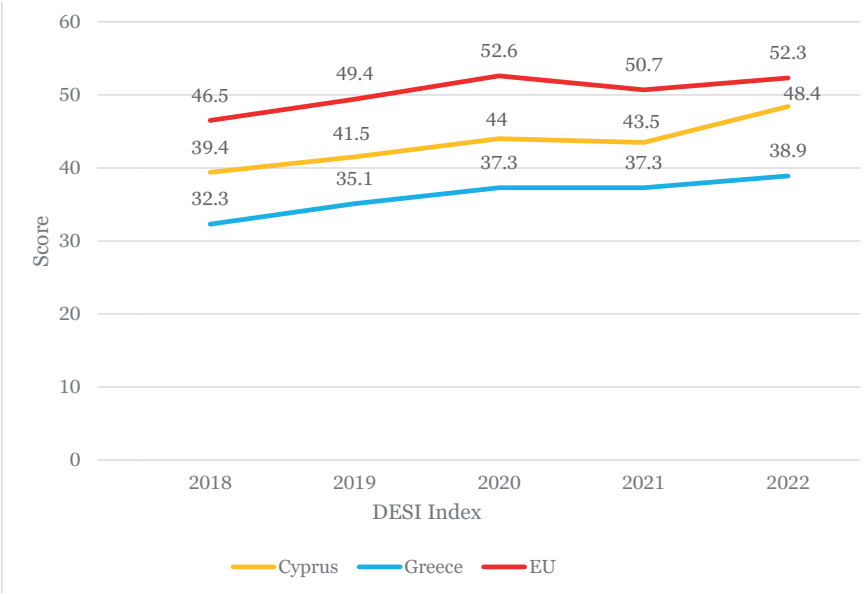
From the preceding analysis, it is clear that both Cyprus and Greece have shown progress in the field of digital transformation, as they have managed to reach the EU average. However, since the index is comparative, Cyprus' and Greece's ranking does not change significantly, despite the indisputable progress (increase in their score over time).

Table: 9

DESI Index	Cyprus		Greece		EU
	Rank	Score	Rank	Score	Score
DESI Index 2022	20	48,4	25	38,9	52,3
DESI Index 2021	21	43,5	25	37,3	50,7
DESI Index 2020	24	44	27	37,3	52,6
DESI Index 2019	24	41,5	27	35,1	49,4
DESI Index 2018	23	39,4	28	32,3	46,5

[47] Dimoidis Spinellis D., 'Electronic Governance in Greece' (Ηλεκτρονική Διακυβέρνηση στην Ελλάδα) (Athens: Dianeosis, 2018). available at https://www.dianeosis.org/wp-content/uploads/2018/03/EGov_Upd_090318.pdf (last accessed 07/03/2023).

Figure: 6



Source: Digital Economy and Society Index 2018-2022 Cyprus/Greece

In Cyprus, although several digital reforms have been carried out, the bodies of the Cypriot public administration show great heterogeneity in relation to the inter-functional maturity and electronic transformation of internal processes.[48] The progress made in all areas sends encouraging signals for the course of digital transformation and electronic public administration. However, additional actions are needed for convergence with the EU and the general development of digital services. According to the analysis carried out regarding the dimensions of the DESI index, special emphasis must be placed on human resources and digital public services sectors where Cyprus presents the greatest deviation compared to the European average.

The analysis of the index elements identifies critical actions to improve e-public administration, since digital public services are obviously an integral part of the e-governance system.[49] Cyprus' low performance in digital public services highlights

[48] Deputy Ministry of Research, Innovation and Digital Policy, 'Digital Cyprus 2025', available ath-ttps://www.dmrid.gov.cy/dmrid/research.nsf/all/927EA351714F99EDC22587CE0028C090/$file/Digital%20Strategy%202020-2025.pdf?openelement (last accessed 7 March 2023).

[49] Asgarkhani Mehdi, 'Digital Government and its Effectiveness in Public Management Reform' (2005) 7(3) *Public Management Review* 465-487.

the need to implement additional administrative reforms to strengthen the E-governance system itself. Accordingly, the analysis and consideration of the remaining three dimensions of the index can significantly contribute to the formation of the appropriate administrative and technological environment for the promotion of Electronic Governance. Connectivity is a basic condition for the utilisation of digital services.[50] The rapid development of Cyprus in this field created the foundations for the consolidation of Electronic Governance. The dimension Integration of digital technology is also at a fairly good level, marking a significant increase compared to 2021. An area of concern is the dimension of human capital in which Cyprus falls significantly short of the European average. The evaluative analysis of the European Commission's findings can highlight the areas in which emphasis should be placed for keeping pace with advanced Europe, such as: the development of basic and advanced digital skills, the provision of incentives to attract ICT specialists, etc.

Greece is also in a similar (albeit slightly more unfavourable) position (its ranking and overall score is at a lower level than Cyprus). Despite the efforts, Greece still lags significantly behind the European average in all parameters of the index.[51] The Greek outdated infrastructure and the lack of an effective strategic plan of the previous years, combined with the pathogenic public administration[52] and the multifaceted difficulties of integrating digital technologies, have led the country to a difficult position regarding the level of digital transformation, that of being at the tail end of the EU.[53] The need for additional digital reforms is imperative, while the requirement for implementation expertise is evident.[54]

The reference to the DESI highlighted problems and shortcomings during the process of digital transformation of the country, which greatly affects the effort to

[50] Harekrishna Misra, Umanag Das, 'Role of Connectivity in Citizen Centered E-Governance in Myanmar: Learning from Indian Experience' (2014) EGOSE, Proceedings of the 2014 Conference on Electronic Governance and Open Society: Challenges in Eurasia.

[51] Sokratis Katsikas, Stefanos Gritzalis, 'Digitalization in Greece: State of Play, Barriers, Challenges, Solutions. In Beyond Bureaucracy' (Springer Cham, 2017) 355-375.

[52] Petros Katsimardos, Konstantinos Bouas, Ioannis Rossidis, Labros Babalioutas, 'Greek Crisis: It's Not About Growth. It's About Governance' (2017) 9(3) *International Journal of Current Research*.

[53] Spinellis (no 47).

[54] Haralampos Anthopoulos,. 'Freedom of Information in the Age of Digital Platforms' (Η Ελευθερία της Πληροφόρησης στην Εποχή των Ψηφιακών Πλατφορμών) (2021) 1(1) *Public Administration Review* (in Greek);

Lucas Introna, Niall Hayes, Dimitra Petrakaki 'The Working out of Modernization in the Public Sector: The Case of an E-Governance Initiative in Greece' (2009) 33(1) *International Journal of Public Administration* 11-25.

transition to a purely electronic public administration. The DESI's dimension mostly connected to Electronic Governance, that of digital public services, is underdeveloped in Greece. The country is second to last in the European ranking, showing lags in many areas. Particular emphasis should be placed on the development of digital public services for citizens and for businesses by reforming the extroverted dimension of electronic public administration though a focus on the digital service of citizens and businesses. However, the analysis of the index showed that the other dimensions which constitute the digital environment in which the Greek public administration operates show serious deficiencies. The connectivity and integration of digital technology is insufficient and, as a result, the required technological conditions are not met to form the essential environment under which e-governance systems will operate effectively and efficiently. The formation of the required technological infrastructure is a decisive challenge for Greece in order to enable a leap in the development of electronic public administration. The human capital dimension is of similar importance. Citizens must be equipped with digital skills to be able to take advantage of the configured e-governance systems. It is a fact that Greece lags behind in all sub-parameters of human capital, making it clear that targeted public policies must be adopted in this direction.

The performance of Cyprus and Greece in relation to the Digital Economy and Society Index has prompted the Governments of recent years to take significant measures to modernise and develop strategic plans. The requirement to keep pace with advanced Europe in the context of an imperative need for administrative convergence, create an important means of pressure for multifaceted organisational and socio-political changes.[55] These evolving digital conditions should methodically lead to the formation of the appropriate technological and administrative environment that will support the development of Electronic Governance.[56] The DESI can develop into a particularly useful policy tool which highlights the problems and outlines the required actions to achieve the goal of developing an advanced digital society and economy for Cyprus and Greece.[57]

[55] Christine Leitner, 'E-Governance in Europe: The State of Affairs' (2003) European Institute of Public Administration, Maastricht., EPIAScope, 37-39.

[56] Ramon Gil-Garcia, Sharon S Dawes, Theresa Pardo, 'Digital Government and Public Management Research: Finding the Crossroads' (2018) 20(5) *Public Management Review* 633-646.

[57] Rossidis, I., Belias, D. 'Combining Strategic Management with Knowledge Management. Trends and International perspectives' (2020a) 10(3) *International Review of Management and Marketing* 39-45.

Conclusions

From the preceding analysis, it becomes evident that a significant effort has been made to accelerate the digital transformation of Cyprus and Greece, creating the foundations for the corresponding upgrade of the Electronic Governance systems.[58] Nevertheless, the significant shortcomings in relation to the European average make it clear that actions should be taken to further digitise society and the economy, focusing on redefining their strategic orientation.[59] The State's assistance through targeted public policies is a necessary condition towards digital transformation.[60] The development of a strategically targeted digital culture with the parallel cultivation of digital skills, also combined with the strengthening of digital public services[61] will create the foundations for the two countries' convergence with the EU. According to Spinelis[62] 'a key problem during the digital evolution project is found in the lack of a timeless vision for Electronic Governance despite the formulation and implementation of piecemeal goals from time to time'. A strategic vision and mobilisation of the entire society with activation and cooperation of all technological and administrative means is therefore required for the development of Electronic Governance.[63] In this context and in conjunction with the previous analysis, the following proposals are identified for the gradual improvement of digital perspectives.[64]

- Adherence to a single strategic plan under which the digital transformation will be developed, with particular emphasis on human capital.
- Development of communication channels so that citizens are informed about the existence and usefulness of digital services in order to increase the level of trust.

[58] Giannis Kalogirou, Panagiotis Panagiotopoulos, 'E-Government' (Ηλεκτρονική Διακυβέρνηση) in Kalogirou, G. et al. (eds), *Information Society and Knowledge Economy* (Athens: Greek Academic Electronic Textbooks and Aids. Kallipos Repository, 2016) (in Greek).

[59] Ioannis Rossidis, Dimitrios Belias, Stefanos Papailias, 'Strategic Management and Performance in the International Environment' (2020b) Book of Proceedings, International Conference on Contemporary Marketing Issues.

[60] Veiko Lember, Taco Brandsen, Piret Tõnurist, 'The Potential Impacts of Digital Technologies on Co-Production and Co-Creation' (2019) 21(11) *Public Management Review* 1665–1686.

[61] Joydeep Guha, Bhaskar Chakrabarti, 'Making E-Governance Work: Adopting the Network Approach' (2014) 31 (2) *Government Information Quarterly* 327–336.

[62] Spinellis (no 47).

[63] Rossidis et al., (no 59)

[64] Hu Qian, 'Preparing Public Managers for the Digital Era: Incorporating Information Management, Use, and Technology into Public Affairs Graduate Curricula' (2018) 20(5) *Public Management Review* 766-787.

- Utilisation of human resource expertise combined with citizen participation in shaping digital political services.
- Development of citizens' digital skills through specialised training programs with special emphasis on civil servants.
- Incentivise the development/attraction of skilled IT professionals.
- Provide opportunities for all citizens to use IT and communications media by creating uniformed service conditions.
- Focus on shaping citizen-centric design of digital services.
- Further utilisation of digital technologies with the aim of improving the quality, efficiency and effectiveness of Public Administration.
- Development of modern electronic infrastructures in all public organisations to fully achieve the transition to digital services.
- Development of very high capacity fixed networks (VHCN) and fiber optic coverage (FTTP).
- Leveraging the European Connectivity Toolkit to reduce costs, increase the speed of VHCN deployment and ensure timely and investment-friendly access to the 5G spectrum.
- Alignment with European policies to facilitate the development of advanced network infrastructures (e.g. European Gigabit Society and Digital Compass 2030).
- Funding from European financial mechanisms to cover investments in connectivity and integration of digital technology.
- Establishment of security policies and implementation of a national strategy for security in digital infrastructures and the internet.
- Continuous monitoring, control and feedback of e-governance systems.

The goal of developing Electronic Governance through the establishment of digital transformation is a particularly laborious and difficult one, but at the same time it is also a necessary process for the development of public administration and society/economy as a whole. Greece and Cyprus have made significant progress, but they still have a long way to go to create the appropriate digital ecosystem that will allow them to develop a modern and efficient electronic public administration.

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