

Strategic Imperatives for Advancing Greece's Digital Transformation

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Abstract: *The paper "Strategic Imperatives for Advancing Greece's Digital Transformation", delves into Greece's digital landscape within the EU's digital transformation framework. It employs quantitative data analysis, trend and gap analyses, and qualitative assessments to evaluate Greece's digital infrastructure, public service digitization, digital skill acquisition, and business sector digitalization. The study identifies areas where Greece aligns or diverges from EU standards, offering strategic insights and policy recommendations to enhance Greece's digital innovation and economic resilience. Key areas include improving digital infrastructure, expanding digital public services, enhancing digital literacy, supporting business digitalization, and developing robust policy frameworks. The goal is to align Greece more closely with EU digital policies and accelerate its digital transformation.*

Keywords: European Union, European Commission, Digital Transformation, Greece, Digital Infrastructure, Policy Recommendations

1. Introduction

In an era characterized by the rapid evolution of digital technologies, the imperative for nations to adapt and capitalize on the transformative potential of digitalization has never been more pronounced. This is particularly salient for member states of the European Union (EU), where harmonizing digital advancements with regional benchmarks is crucial. This report embarks on a meticulous examination of Greece's digital landscape, situating its progress within the broader context of the EU's digital transformation agenda.

Employing a methodologically rigorous approach, the report synthesizes quantitative data analysis, trend and gap analyses, and qualitative assessments to construct a comprehensive portrait of Greece's digital milieu. This multifaceted approach facilitates a nuanced understanding of the interplay between various digital dimensions, including infrastructure, public service digitization, digital skill acquisition, and the digitalization of the business sector.

The report's analytical arc is structured to provide a granular understanding of Greece's current digital standings. This involves juxtaposing Greece's performance in key digital indicators against EU averages, thereby elucidating areas of alignment and divergence. The overarching aim is to distill strategic insights from this comparative analysis, culminating in actionable policy recommendations. These recommendations are designed to not only address identified gaps but also to propel Greece towards the forefront of digital innovation and economic resilience within the EU framework.

Through this scholarly endeavor, the report aspires to contribute to the discourse on digital transformation strategies, offering a blueprint for Greece to navigate the challenges and opportunities presented by the digital era. The ensuing analysis is predicated on the premise that a robust digital ecosystem is indispensable for sustainable economic growth and societal advancement in the 21st century.

2. Methodology

The methodology employed in the analysis of Greece's digital transformation encompasses a combination of quantitative data evaluation, trend analysis, gap analysis, qualitative assessments, and comparative benchmarking against EU averages. This multifaceted approach allows for a comprehensive understanding of Greece's current digital landscape.

- **Quantitative Data Evaluation:** This involves the collection and examination of numerical data from reliable sources concerning various digital indicators such as secure internet servers, high - capacity connectivity, digital skill levels, and digital service usage. The numbers provide a foundational understanding of the current state.
- **Trend Analysis:** By examining data over time, we assess the progression, or lack thereof, in each digital domain. This analysis helps identify patterns and directions of Greece's digital evolution relative to the EU average.
- **Gap Analysis:** We compare Greece's digital metrics to EU averages to identify discrepancies. This step highlights areas where Greece is falling short and where it excels, providing a clear picture of where efforts need to be concentrated.
- **Qualitative Assessment:** Alongside the hard numbers, we integrate qualitative data to interpret the implications of the quantitative findings. This includes evaluating the impact of digital infrastructure on economic activities, the effectiveness of digital public services, and the readiness of the workforce and businesses to adapt to digital changes.
- **Comparative Benchmarking:** Greece's digital performance is measured against EU benchmarks. This comparison offers a regional perspective on Greece's digital development, situating it within the broader context of European digital transformation efforts.
- **Strategic Insights and Policy Recommendations:** Using the data and analyses, we derive strategic insights that inform policy recommendations. These recommendations aim to guide targeted interventions and strategic investments that can catalyze digital growth and alignment with EU standards.

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3. Initial Overview and Segmentation

3.1 Digital Skills

The chart below indicates that Greece is somewhat behind the EU average in terms of the proportion of individuals with basic digital skills and significantly behind in the proportion of ICT specialists. However, Greece is almost at the EU average concerning the percentage of ICT graduates,

which could suggest a potential for growth in the ICT workforce if these graduates remain in the country and enter the relevant employment sectors. The lower percentage of ICT specialists in Greece could be a point of concern, potentially impacting the country's ability to compete in the digital sector on a European scale. This disparity may suggest the need for policy interventions aimed at enhancing ICT education and training, as well as incentives to retain specialists within the country.

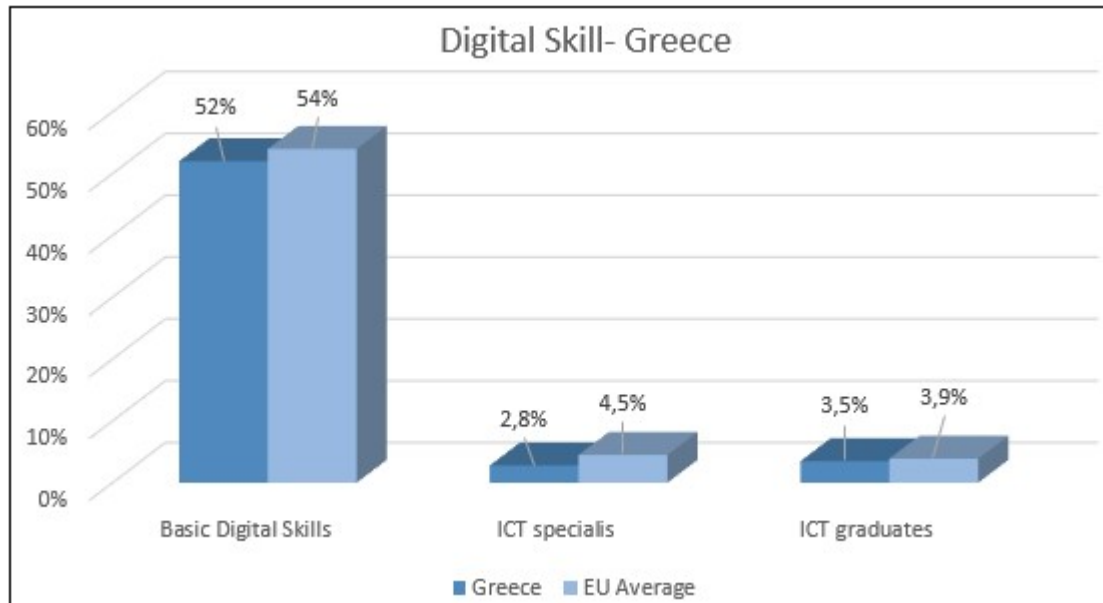


Figure 1: Digital skills - Greece

Source: European Commission¹.

The Figure 1 (Digital skills –Greece) showcases the percentage of individuals with basic digital skills, ICT specialists, and ICT graduates in Greece to the EU average.

- 1) **Basic Digital Skills:** Greece: 52%, EU Average: 54%
Greece is slightly below the EU average in terms of the percentage of the population with basic digital skills.
- 2) **ICT Specialists:** Greece: 2.8%, EU Average: 4.5%
For the category of ICT specialists, Greece has a considerably lower percentage than the EU average, indicating a smaller proportion of the workforce is specialized in ICT.
- 3) **ICT Graduates:** Greece: 3.5%, EU Average: 3.9%

When it comes to ICT graduates, the percentage in Greece is close to the EU average, suggesting that the educational output in terms of ICT graduates is nearly on par with the EU standard.

3.2 Digital Infrastructure

The follow bar chart presents an analysis of Greece's digital infrastructure as compared to the EU average. The bar chart titled "Digital Infrastructure - Greece" provides a visual representation of various indicators, including secure internet servers, very high capacity connectivity, and network coverage for both 4G and 5G.

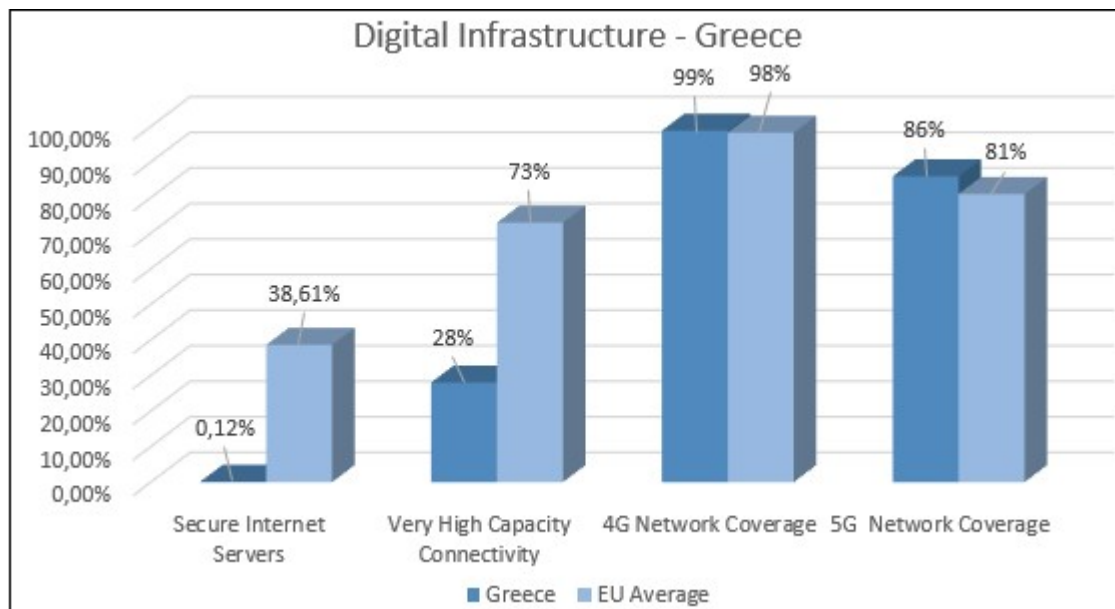


Figure 2: Digital Infrastructure in Greece

Source: European Commissionⁱⁱ.

Description:

The data is presented in percentages and covers four primary indicators:

- 1) Secure Internet Servers
- 2) Very High Capacity Connectivity
- 3) 4G Network Coverage
- 4) 5G Network Coverage

Analysis of Indicators:

- 1) **Secure Internet Servers:** Greece: 0.12%, EU Average: 38.61%.
Greece has a negligible percentage of secure internet servers compared to the EU average, which is significantly higher. This stark difference indicates a potential vulnerability in Greece's cybersecurity infrastructure.
- 2) **Very High Capacity Connectivity:** Greece: 28%, EU Average: 73%. Greece falls behind the EU average in terms of very high capacity connectivity, suggesting that the majority of the Greek network may not support ultra - fast internet speeds, which could impact digital services and economic growth.
- 3) **4G Network Coverage:** Greece: 99%, EU Average: 98%.
Greece surpasses the EU average slightly in 4G network coverage, indicating excellent penetration of current mobile network technology across the country.

- 4) **5G Network Coverage:** Greece: 81%, EU Average: 86%.

While Greece has a substantial 5G network coverage, it is slightly below the EU average. Considering the rapid global rollout of 5G, Greece is fairly competitive, but there is room for improvement to match or exceed the EU standard.

The digital infrastructure in Greece exhibits a mixed performance when compared to the EU average. While Greece demonstrates strong 4G network coverage, it significantly lags in the provision of secure internet servers and high - capacity connectivity, essential for robust digital economies. 5G network coverage is also slightly below the EU average but indicates promising growth. To strengthen its digital infrastructure, Greece will need to invest in secure internet servers and high - capacity connectivity. Enhancing these areas will provide a more secure and efficient environment for the digital economy to thrive, ensuring that Greece can meet the demands of an increasingly digital global market.

3.3 Digitalization of Businesses

The follow bar chart titled "DIGITALISATION OF BUSINESSES - Greece 2023" illustrates the percentage of businesses engaged with various digital technologies and practices.

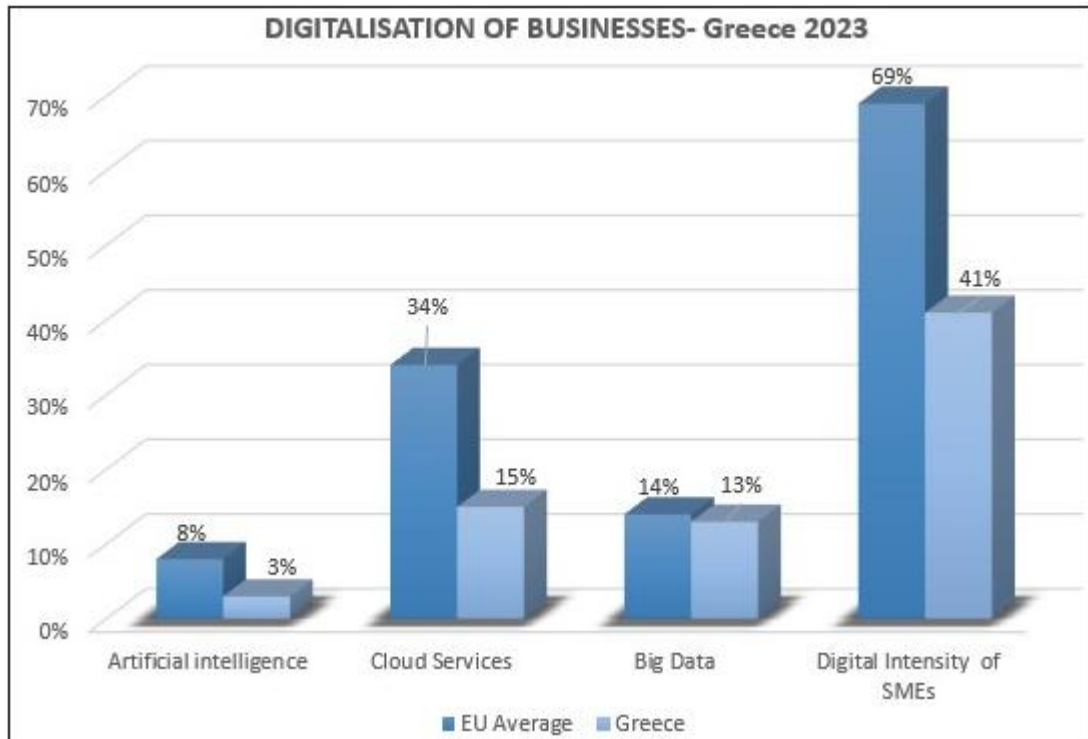


Figure 3: Digitalization of Businesses in Greece.

Source: European Commissionⁱⁱⁱ

Analysis of Indicators:

- 1) **Artificial Intelligence:** EU Average: 8%, Greece: 3%.
Greek businesses are underutilizing AI compared to the EU average, indicating a potential gap in leveraging this transformative technology.
- 2) **Cloud Services:** EU Average: 34%, Greece: 15%
Adoption of cloud services in Greece is less than half the EU average, pointing to significant room for growth in cloud computing.
- 3) **Big Data:** EU Average: 14%, Greece: 13%
Greece is nearly on par with the EU average in terms of Big Data adoption, suggesting a relatively mature state of data analytics within Greek businesses.
- 4) **Digital Intensity of SMEs:** EU Average: 69%, Greece: 41%
Greek SMEs have a lower digital intensity compared to the EU average, which may reflect on their digital operational practices and online market presence.

The digitalization of businesses in Greece in 2023 reflects a mixed landscape. While Greek businesses are broadly aligned with the EU in Big Data adoption, there is a notable lag in the integration of AI and cloud services. The digital intensity of SMEs is significantly lower than the EU average, which could impact their competitiveness and ability to innovate.

To bridge the digital gap, Greek businesses may need targeted support to adopt AI and cloud technologies, potentially through government incentives, partnerships, and educational programs to build digital skills. Improving the digital intensity of SMEs should be a strategic priority, as these businesses are crucial for economic growth and employment. Increasing digital adoption can lead to more robust business operations, greater innovation, and improved access to new markets. The close alignment in Big Data usage is a positive sign, indicating that Greek businesses have the capacity to embrace complex technologies. Overall, the focus should be on enhancing digital capabilities across all sectors to ensure sustainable business growth and alignment with European digital standards.

3.4 Digitalization of Public Services

The follow study, examines the state of digitalization among businesses in Greece as of 2023, with a comparative analysis against the EU average. The evaluation focuses on the use of Artificial Intelligence (AI), Cloud Services, Big Data, and the Digital Intensity of Small and Medium - sized Enterprises (SMEs). The follow bar chart titled "DIGITALISATION OF BUSINESSES - Greece 2023" illustrates the percentage of businesses engaged with various digital technologies and practices.

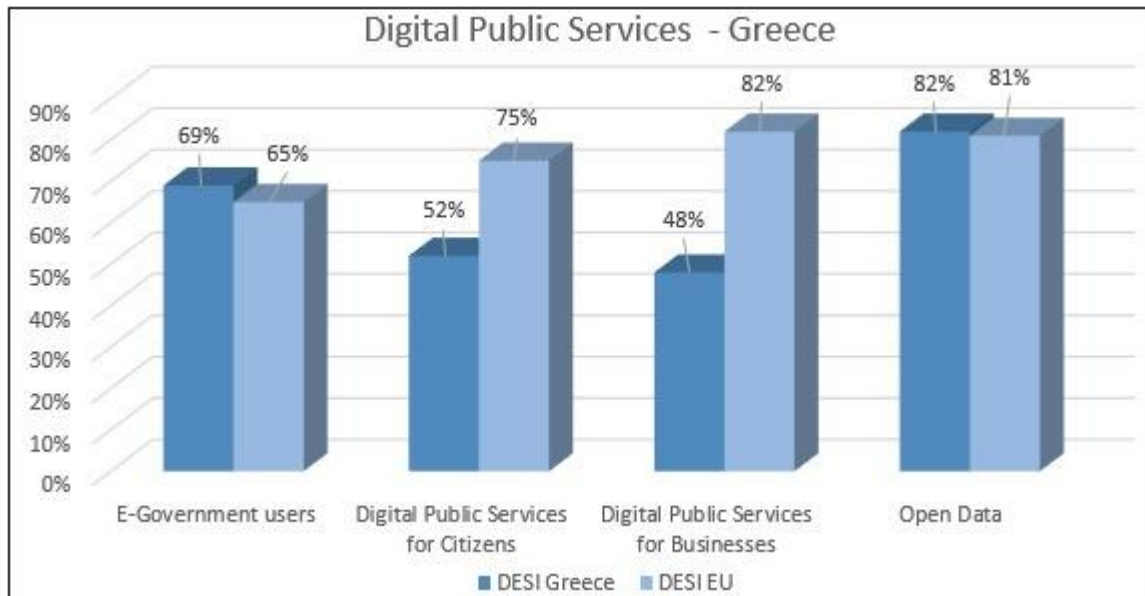


Figure 4: Digitalization of Public Services – Greece
(DESI= Digital Economy and Society Index)
Source: European Commission report 2023^{iv}.

Analysis of Indicators:

- 1) **E - Government Users:** DESI (Digital Economy and Society Index) Greece: 69%, DESI EU: 65%
Greek e - government services usage exceeds the EU average, suggesting a strong engagement with online government platforms by Greek citizens.
- 2) **Digital Public Services for Citizens:** DESI Greece: 52%, DESI EU: 75%
Greece is below the EU average in digital public services provided for citizens, indicating room for improvement in making more services available and accessible online.
- 3) **Digital Public Services for Businesses:** DESI Greece: 48%, DESI EU: 82%
The gap is more pronounced in services for businesses, where Greece significantly trails the EU average, pointing to a need for a more robust digital transformation in this sector.
- 4) **Open Data:** DESI Greece: 81%, DESI EU: 82%
In terms of Open Data, Greece is almost on par with the EU average, reflecting a good level of transparency and data sharing practices.

Greece shows a promising engagement with e - government services among its users, outpacing the EU average. However, the provision of digital public services for both citizens and businesses is substantially below the EU benchmarks. This discrepancy suggests that while the Greek population is ready and willing to engage with digital services, the government needs to expand its offerings and improve accessibility.

To enhance the digital public sector, Greece should focus on digitizing more services, improving user experience, and ensuring that businesses have the same level of digital support as individuals. Given the positive indication from the Open Data sector, Greece has a strong foundation to build upon in terms of digital transparency and information sharing. By leveraging this strength, Greece can aim to streamline services, promote innovation, and facilitate a

more inclusive and efficient public sector. The alignment with EU standards in Open Data also provides an opportunity for Greece to lead by example in this domain.

In moving forward, it will be crucial for Greece to continue investing in digital infrastructure, prioritize user - centric design in digital services, and foster a digital culture across all levels of government. This approach will help bridge the digital divide and align Greece more closely with the EU's digital transformation goals.

3.5 Trend Analysis of Greece's Digital Landscape

E - Government and Public Services:

Greece demonstrates a robust trend in the adoption of E - Government services, which suggests a successful transition of government services to digital platforms. This trend is a positive sign of the public's willingness to engage with digital government offerings. However, the trend does not extend as favorably to digital public services for citizens and businesses, where Greece shows a lag behind the EU averages. This indicates that while the government has been successful in digitizing some services, there is a disparity in the uptake or availability of comprehensive services that cater to the broader needs of citizens and businesses.

Digital Infrastructure:

The trend in digital infrastructure presents a stark contrast. While 4G and 5G network coverage in Greece is on par with EU averages, suggesting a trend toward modern and competitive telecommunications infrastructure, there is a concerning lag in secure internet servers and very high capacity connectivity. This trend points towards a potential vulnerability in network security and a lack of investment in high - speed connectivity, which are foundational for advanced digital services and the future growth of the digital economy.

Digital Skills and Business Digitalization:

The trend in digital skills is somewhat stagnant. Greece is slightly below the EU average in basic digital skills, indicating a slow growth in the overall digital literacy of the population. The low percentages in ICT specialists and graduates suggest that the trend in education and professional training may not be keeping pace with the growing demand for advanced digital skills in the workforce.

Regarding the digitalization of businesses, Greece's trend is notably behind the EU average in integrating Artificial Intelligence and Cloud Services. This slow trend indicates that Greek businesses may not be fully capitalizing on the transformative potential of these technologies, which can lead to missed opportunities for innovation and efficiency gains.

Overall Trend Perspective:

The analysis of trends across different digital domains indicates that while Greece is making progress in some areas, such as network coverage and E - Government services, it is not uniformly advancing across all aspects of the digital landscape. The trends suggest that there are critical areas requiring immediate attention and investment, such as secure internet services, high - capacity connectivity, and the digitalization of business practices. Addressing these areas is essential for Greece to secure its digital future, enhance its economic competitiveness, and align more closely with the digital advancement of the EU as a whole.

4. Gap Analysis**Secure Internet Servers:**

The data indicates a significant gap between Greece and the EU average in terms of secure internet servers. This gap is not merely a quantitative shortfall but signifies a potential qualitative deficiency in cybersecurity and trust in digital services. The reliance on secure internet servers is paramount for protecting data and ensuring secure transactions, which are the backbone of a modern digital economy. The vast difference suggests that Greece must prioritize investments in cybersecurity measures to build a more resilient digital infrastructure.

High Capacity Connectivity:

Another notable gap is observed in the area of very high capacity connectivity. High - speed and reliable internet is a cornerstone for various digital services, including cloud computing, streaming services, and a plethora of other business - critical applications. With Greece lagging significantly behind the EU average, this gap indicates a need for substantial investment in network infrastructure to support the demands of current and future digital applications.

Digital Public Services:

The gap analysis reveals that digital public services for citizens and businesses in Greece are not at par with the EU benchmarks. This gap is indicative of a slower digital transformation within the public sector, which can have far - reaching implications on efficiency, accessibility, and the overall satisfaction of the populace and business entities

with government services. Bridging this gap should be a priority to ensure inclusive access to digital services across all sectors of society.

Digital Skills:

In the realm of digital skills, Greece's lower percentages in basic digital skills and ICT specialists highlight a gap in digital literacy and specialized skills necessary for the digital age. This gap has implications for workforce readiness, innovation capability, and the attractiveness of Greece as a hub for digital businesses. There is a clear need for enhanced education and training programs to prepare the current and future workforce for the digital economy.

Business Digitalization:

The adoption of Artificial Intelligence and Cloud Services by businesses in Greece is significantly lower than the EU average. This gap suggests that Greek businesses may not be taking full advantage of the efficiencies and competitive advantages offered by these technologies. It is critical for Greek businesses to accelerate their digital transformation to remain competitive in a globalized economy.

SMEs Digital Intensity:

The digital intensity of SMEs in Greece also presents a gap compared to the EU average. As SMEs are often considered the lifeblood of the economy, their lower digital intensity suggests a missed opportunity for growth and innovation. Addressing this gap could unlock significant economic potential and contribute to the resilience of SMEs in the digital era.

Synthesis of Gaps:

The gaps identified across various components of the digital landscape in Greece point to an overarching need for a strategic and coordinated approach to digital transformation. This includes strengthening cybersecurity, enhancing network capacity, expanding digital services, improving digital literacy, and fostering digital innovation in businesses. Closing these gaps is essential not just for parity with the EU averages but for the broader goal of sustainable economic and social development powered by digital technology.

5. Qualitative Assessment**Secure Internet Servers:**

The qualitative implications of Greece's deficiency in secure internet servers extend beyond mere numbers. It suggests a systemic issue in prioritizing cybersecurity infrastructure. Secure servers are crucial for safeguarding personal, corporate, and government data. The significant gap indicates a potential risk to data integrity and a hindrance to the confidence required to expand digital services.

High Capacity Connectivity:

The low percentage of very high capacity connectivity in Greece qualitatively reflects a technological lag that may affect not only the speed but also the reliability and breadth of digital services. This limitation can stifle innovation, as high - speed internet is a prerequisite for advanced digital activities like cloud - based services, real - time data analytics, and the Internet of Things (IoT).

Digital Public Services:

The gap in digital public services for citizens and businesses suggests a qualitative lag in service modernization and digital user experience. This affects not only the efficiency and transparency of public services but also the public's engagement with the government. Digital services are not just about availability but also about ease of use, integration into daily life, and the facilitation of business operations, all of which are essential for a well - functioning digital society.

Digital Skills:

The slightly lower percentage in basic digital skills among the Greek population indicates a qualitative gap in the digital competence of the general workforce. The gap in ICT specialists and graduates is more worrisome. It suggests a qualitative shortfall in the highly skilled digital workforce needed to drive innovation and support the digital transformation of industries. This also affects Greece's ability to attract and retain businesses that are dependent on such specialized skills.

Business Digitalization:

The qualitative assessment of the low adoption rates of AI and Cloud Services by Greek businesses suggests a hesitancy or inability to engage with these cutting - edge technologies. This reluctance or incapacity can be due to several factors, including lack of awareness, limited access to skilled professionals, or financial constraints. This gap indicates a qualitative lag in competitiveness and productivity for Greek businesses, which could lead to missed opportunities in efficiency and growth.

SMEs Digital Intensity:

The gap in digital intensity of SMEs has qualitative implications for the agility and future - readiness of a significant sector of the Greek economy. High digital intensity in SMEs typically correlates with increased innovation, access to new markets, and improved customer experiences. The lower digital intensity suggests that Greek SMEs may not be leveraging digital tools to their fullest potential, affecting their overall economic impact and sustainability.

Overall Qualitative Implications:

From a qualitative perspective, Greece's digital landscape shows that while there is a willingness and capability to adopt digital practices, the infrastructure, education, and business environments need significant enhancements. The qualitative assessment indicates a need for holistic improvements in digital literacy, infrastructure modernization, public service digitalization, and business sector support. Without these improvements, Greece risks lagging behind in the rapidly advancing digital world, potentially impacting economic growth, innovation, and societal progress. Addressing these areas comprehensively can lead to a more inclusive, efficient, and competitive national digital ecosystem.

6. Synthesis of Findings

The synthesis of Greece's digital landscape reveals a multifaceted picture. On one hand, there is clear evidence of progression and alignment with EU standards in certain

areas, such as network coverage and e - Government services, suggesting that the groundwork for a digital society is in place. On the other hand, there are notable deficiencies in secure internet infrastructure, digital services for citizens and businesses, and the digital readiness of the business sector, particularly SMEs.

The synthesis points to an uneven digital evolution, with advancements in some areas being overshadowed by stagnation or decline in others. For example, the strong performance in 4G and 5G network coverage contrasts sharply with the underperformance in secure internet servers. Similarly, the readiness of the Greek population to engage with e - Government services does not seem to be matched by the availability and quality of those services, particularly for businesses.

The trends in digital skills and business digitalization suggest a qualitative gap in the workforce's preparedness for the digital economy and in the business sector's adoption of digital technologies, which may limit innovation and economic competitiveness.

7. Conclusions

From the analysis, several key conclusions emerge for reporting:

Infrastructure Investment: There is a critical need for increased investment in digital infrastructure, especially to ensure secure internet servers and high - speed connectivity. This would not only safeguard against cyber threats but also enable a broad range of digital services.

Digital Services Expansion: Digital public services for citizens and businesses need significant expansion and improvement. This would entail not just digitizing existing services but also ensuring that these services are user - friendly, accessible, and integrated across different platforms.

Skills Development: Enhancing the digital literacy of the general population and the specialization of the workforce in ICT is paramount. Targeted education and vocational training programs are needed to close the skills gap and prepare the workforce for future digital demands.

Business Transformation Support: Support mechanisms for businesses, particularly SMEs, need to be bolstered to facilitate their digital transformation. This could include financial incentives, technical assistance, and innovation hubs to foster the adoption of digital technologies like AI and cloud services.

Policy and Regulatory Frameworks: Robust policy and regulatory frameworks that promote digital innovation, protect data, and support digital entrepreneurship should be developed and implemented.

The reporting of these findings should emphasize the urgency of addressing these gaps to capitalize on existing strengths and to foster a more resilient and competitive digital economy. The focus should be on creating a cohesive

digital strategy that aligns with EU digital policies and leverages best practices to accelerate digital transformation in Greece.

Greece's digital trajectory is at a pivotal point. With solid E - Government engagement and network coverage, the foundation for a strong digital future is present. However, to sustain growth and align with the EU's digital transformation goals, Greece must address critical gaps in digital infrastructure, especially for business - related services and secure internet servers. Strategic investments, policy interventions, and public - private partnerships will be key in accelerating digital transformation efforts. By doing so, Greece can improve service efficiency, foster innovation, enhance cybersecurity, and ultimately drive economic growth in the digital domain.

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ⁱEuropean Commission

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^{iv}European Commission