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The Contribution of Digital Transformation to Supporting Economic Growth in Algeria

Abstract

Digital transformation is a cornerstone of modern economic development, significantly contributing to enhancing efficiency, productivity, and competitiveness at the national level. This research aims to explore the relationship between digital transformation and economic growth in Algeria using a descriptive-analytical approach. The descriptive method provides a comprehensive overview of Algeria's digitalization status, while the analytical method examines the relationship between digital transformation and various economic factors. A conceptual framework is developed, incorporating various indicators to assess digital transformation and economic growth. The study's findings indicate that Algeria's heavy reliance on the oil sector poses a challenge to achieving sustainable economic growth, as fluctuations in oil prices impact GDP per capita, highlighting weak economic diversification. Additionally, Algeria's economy suffers from low digital readiness due to insufficient investment in information and communication technology (ICT) infrastructure, limiting the benefits of digital transformation and affecting competitiveness. Furthermore, digital transformation faces challenges related to the lack of effective implementation strategies and institutional incentives, which slow down its impact. The research presents several key recommendations, including diversifying national income sources beyond oil, increasing investments in digital infrastructure, and supporting startups and technological initiatives. It also emphasizes the importance of improving policies related to digital transformation and investing in workforce training on digital skills. Finally, the study calls for future research to provide quantitative evidence of the relationship between digital transformation and economic development in Algeria.

Keywords: *Digital transformation, Economic growth, Digital infrastructure, Algeria*

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Rəqəmsal transformasiyanın Əlcəzairdə iqtisadi artımın dəstəklənməsinə töhfəsi

Xülasə

Rəqəmsal transformasiya müasir iqtisadi inkişafın əsas dayaqlarından biridir və milli səviyyədə səmərəliliyin, məhsuldarlığın və rəqabət qabiliyyətinin artırılmasına əhəmiyyətli töhfə verir. Bu tədqiqat Əlcəzairdə rəqəmsal transformasiya ilə iqtisadi artım arasındakı əlaqəni təsviri-analitik yanaşma ilə araşdırmağı hədəfləyir. Təsviri metod Əlcəzairin rəqəmsallaşma vəziyyətini geniş şəkildə təqdim edir, analitik metod isə rəqəmsal transformasiya ilə müxtəlif iqtisadi amillər arasındakı əlaqəni təhlil edir. Tədqiqat çərçivəsində rəqəmsal transformasiya və iqtisadi artımı qiymətləndirmək üçün müxtəlif göstəriciləri əhatə edən konseptual çərçivə hazırlanmışdır.

Tədqiqatın nəticələri göstərir ki, Əlcəzairin neft sektorundan yüksək asılılığı dayanıqlı iqtisadi artımın əldə olunmasında ciddi maneədir, çünki neftin qiymətlərindəki dəyişkənlik adambaşına düşən ÜDM-ə təsir göstərir və iqtisadiyyatın zəif diversifikasiyasını ortaya qoyur. Bundan əlavə, informasiya və kommunikasiya texnologiyaları (İKT) infrastrukturuna yetərli investisiyaların qoyulmaması ölkənin rəqəmsal hazırlıq səviyyəsinin aşağı olmasına səbəb olur, bu da rəqəmsal transformasiyanın potensial faydalarının məhdudlaşmasına və rəqabət qabiliyyətinə mənfi təsir göstərir. Rəqəmsal transformasiya həmçinin effektiv həyata keçirmə strategiyalarının və institusional təşviqlərin çatışmazlığı səbəbilə problemlərlə üzləşir ki, bu da onun təsirini zəiflədir.

Araşdırmada neftdən kənar milli gəlir mənbələrinin şaxələndirilməsi, rəqəmsal infrastrukturun inkişafına investisiyaların artırılması, startapların və texnoloji təşəbbüslərin dəstəklənməsi kimi bir sıra əsas tövsiyələr irəli sürülür. Eyni zamanda, rəqəmsal transformasiya ilə bağlı siyasətlərin təkmilləşdirilməsinin və rəqəmsal bacarıqlara sahib kadrların hazırlanmasına sərmayə qoyulmasının vacibliyi vurğulanır. Nəhayət, tədqiqat rəqəmsal transformasiya ilə iqtisadi inkişaf arasındakı əlaqənin kəmiyyətcə sübut edilməsi üçün gələcək tədqiqatlara ehtiyac olduğunu qeyd edir.

Açar sözlər: Rəqəmsal transformasiya, İqtisadi artım, Rəqəmsal infrastruktur, Əlcəzair

Introduction

Digital transformation has become the cornerstone of modern economic development, playing a crucial role in enhancing the efficiency, productivity, and competitiveness of national economies. By integrating digital technologies across various sectors, countries can streamline processes, reduce costs, and unlock new opportunities for innovation and growth (Bukht & Heeks, 2017, p. 3).

The positive effects of digital transformation on economic growth are manifold. It can enhance productivity through process automation, expand access to global markets via e-commerce, and drive innovation by enabling the development of new products and services. Furthermore, digital transformation can improve public services, making them more accessible and efficient, thereby enhancing overall quality of life.

Research

However, the shift toward digital transformation is not without challenges. Rapid adoption of digital technologies can lead to negative consequences if not managed carefully. These include the potential for increased inequality, as those without access to digital tools may be left behind, and the risk of job displacement due to automation. Additionally, transitioning to a digital economy requires

substantial investment in infrastructure, education, and cybersecurity, posing significant challenges for countries like Algeria, where these areas may still be underdeveloped.

1.1 Research Problem

In light of the above, the main research question can be formulated as follows:

Has digital transformation contributed to enhancing economic growth in Algeria?

To answer this central question, the following sub-questions are proposed:

- What is the relationship between digital transformation and economic growth?
- How does digital transformation impact the Algerian economy, both positively and negatively?
- What strategies or recommendations can enhance digital transformation in Algeria?

2.1 Research Hypotheses

Based on the proposed questions, the study puts forward the following hypotheses:

- There is a positive relationship between digital transformation and economic growth.
- Digital transformation contributes to strengthening certain aspects of the Algerian economy but may also face challenges that negatively affect other areas.
- Enhancing digital transformation in Algeria can be achieved through the implementation of specific recommendations based on a comprehensive analysis of the current situation.

3.1 Research Objectives

This study aims to achieve the following:

- Analyze the relationship between digital transformation and economic growth.
- Assess the positive and negative impacts of digital transformation on the Algerian economy.
- Provide recommendations to enhance digital transformation in Algeria.

4.1 Study Structure

The study is divided into five sections. The first section includes the introduction. The second section presents the theoretical framework of the study. The third section outlines the research methodology and data. The fourth section is dedicated to presenting and discussing the results. Finally, the study concludes with key findings and recommendations.

2. Theoretical Framework of the Study

- ### 2.1 Concept of Digital Transformation

Digital transformation refers to the comprehensive integration of digital technology into all aspects of an organization's operations, fundamentally altering how businesses function and deliver value to customers. It is not merely about adopting new technologies but represents a cultural shift that requires organizations to continuously challenge the status quo, experiment, and embrace failure as part of the learning process

This concept emerged in the late 20th century as a result of rapid technological advancements and the widespread adoption of the internet, reflecting fundamental changes in the business environment. Researchers have defined digital transformation in various ways, but it generally involves leveraging technology to reshape business processes and enhance performance (Khousa & Krayri, 2023, p. 55).

In today's world, digital transformation has become a key trend across industries and service sectors. It is considered a comprehensive initiative that influences an organization's structure and operations. It is also defined as the use of technology to drive fundamental changes in an organization's processes. Therefore, digital transformation is not just about technological tools but also about rethinking management processes, workforce skills, and their application (Wahba & Kara, 2022, p. 12).

Digital transformation is a holistic process that integrates digital technology into all aspects of an organization, leading to fundamental changes in its management and value delivery to customers. This transformation goes beyond adopting new tools and technologies; it requires a cultural and organizational shift that involves redesigning processes and administrative structures to keep pace with technological advancements. It includes adopting data-driven strategies, improving performance through modern technologies, and enhancing individual and group skills to adapt to these changes. In other words, digital transformation is an ongoing commitment to rethinking

business operations, emphasizing innovation, experimentation, and fostering a culture of continuous improvement.

- **2.2 Steps for Successful Digital Transformation**

The key steps for a successful digital transformation include:

- **Developing a clear strategy:** Define the goals and objectives of digital transformation in alignment with the overall business strategy.
- **Engaging leadership:** Ensure commitment and support from top management to drive the transformation process.
- **Empowering employees:** Provide training and resources to help employees adapt to new technologies and processes.
- **Investing in the right technologies:** Choose technologies that align with organizational goals and can be scaled as needed.
- **Focusing on data:** Utilize data analytics to gain insights and make informed decisions.
- **Monitoring and adapting:** Continuously track progress, gather feedback, and be ready to adjust strategies as needed (Slaimi & Bouchi, 2019, p. 950).

- **2.3 Challenges of Digital Transformation**
- **Cultural resistance:** Employees and management may resist changes due to fear of the unknown or discomfort with new technologies. Overcoming this requires strong leadership and a clear vision.
- **Skill gaps:** There is often a mismatch between employees' existing skills and the skills required for digital tools and processes. Continuous training and development are essential.
- **Cybersecurity risks:** Increased reliance on digital systems exposes organizations to cybersecurity threats. Implementing strong security measures is crucial.
- **Integration issues:** Integrating new digital systems with existing legacy systems can be complex and challenging. Proper planning and execution are necessary to ensure smooth integration.
- **Cost:** Digital transformation requires significant investment in technology, training, and change management. Organizations need to carefully manage and justify these investments (Bellaaj, 2024, p. 275).

- **2.4 Impact of Digitalization on Economic Growth**

Digitalization influences economic growth in several key ways:

- **Increased productivity:** Digital technologies enable automation, improve communication, and provide advanced data analytics. These improvements lead to more efficient operations, cost reduction, and increased output.
- **Job creation:** While automation may replace some jobs, digitalization also creates new employment opportunities in areas such as IT, data analytics, cybersecurity, and digital marketing. It can also lead to the emergence of entirely new industries.
- **Innovation and entrepreneurship:** Digital technologies lower barriers for new businesses and foster innovation. Startups can leverage digital tools to develop new products and services quickly and cost-effectively.
- **Market expansion:** Digital platforms and e-commerce allow businesses to access global markets more easily. Small and medium-sized enterprises (SMEs) can reach customers worldwide, increasing their growth potential.
- **Enhanced services:** Digitalization improves service delivery across various sectors, including healthcare, education, and finance. For example, telemedicine and online education expand access to remote areas, improving service availability and quality.
- **Financial inclusion:** Digital financial services, including mobile banking and fintech solutions, provide access to financial resources for unbanked or underbanked populations, stimulating economic activity and growth in underserved regions.
- **Improved infrastructure:** Investment in digital infrastructure, such as high-speed internet and data centers, is essential to support digitalization. These investments stimulate economic activity and provide a foundation for future growth.

- **Efficient supply chains:** Digital technologies enhance supply chain management through better tracking, inventory management, and logistics coordination, leading to cost savings and reduced delays.
- **Data-driven decision-making:** Businesses and governments can use big data analytics to make informed decisions, optimize operations, and identify new growth opportunities.
- **Resilience and adaptability:** Digitalization increases the flexibility of economies by enabling remote work, virtual collaboration, and online service delivery. This adaptability is crucial during disruptions such as pandemics or natural disasters (Khan, Khan, & Aftab, 2015, pp. 141–143).

2.5 Literature Review on Digitalization and Economic Growth

- **Study by Beier et al. (2017):** This study examined the expected changes brought by digitalization in the industrial sector by comparing highly industrialized economies (Germany) with major emerging industrial economies (China). The researchers conducted experimental surveys questioning manufacturing companies in Germany and China from various sectors regarding the potential impact of digital manufacturing on these companies. Their results indicated that digital transformation may affect not only the environmental aspect (resource efficiency, renewable energy sources) but also social transitions and economic growth (Beier, Niehoff, Ziems, & Xue, 2017, pp. 227-237).
- **Study by Parviainen et al. (2017):** According to this study, digitalization contributes to gradual economic growth. Countries at a more advanced stage of digitalization reap 20% more economic benefits compared to those in the initial stage. The researchers found that digitalization effectively reduces unemployment, improves quality of life, and enhances citizens' access to public services. They also stated that it enables governments to operate more transparently and efficiently, which positively influences national economic growth (Parviainen, Tihinen, Kääriäinen, & Teppola, 2017, pp. 63-77).
- **Study by Toader et al. (2018):** This study emphasized that ICT infrastructure has a beneficial and strong impact on economic growth. It found that a 1% increase in ICT infrastructure usage contributes to per capita GDP growth ranging between 0.0767% (fixed broadband subscriptions) and 0.396% (mobile phone subscriptions) (Toader, Firtescu, Roman, & Anton, 2018, p. 3755).

- **Study by Raeskyesa and Lukas (2019):** This analytical and descriptive study analyzed eight middle-income ASEAN countries (1999-2014) using regression analysis. The study found that ICT indicators significantly boost economic growth, physical capital, and human capital. Additionally, ICT usage and intensity had a stronger impact on growth than just access to ICT. (Raeskyesa & Lukas, 2019, pp. 267-278)
- **Study by Rath and Hermawan (2019):** Using annual data from Indonesia from 1980 to 2014 and employing the autoregressive distributed lag (ARDL) approach on the augmented neoclassical growth model, this study revealed a positive impact of ICT advancements on economic growth in both the short and long term. Other factors, such as total factor productivity, human capital, and capital per worker, were also found to be beneficial for economic growth (Rath & Hermawan, 2019, pp. 103-123).
- **Study by Bongomin et al. (2019):** This study investigated aspects of financial digital innovation, such as mobile money services, and their impact on economic progress. A survey of 379 micro, small, and medium enterprises (MSMEs) in Uganda revealed that adopting and utilizing mobile money services can increase access to financial markets, subsequently enhancing financial service usage and reducing risks to achieve stable and inclusive growth in developing countries (Bongomin, Yourougou, & Munene, 2019, pp. 185-203).

Despite the growing pace of digital transformation across all economic sectors, some authors remain skeptical about the achieved results, believing that digital transformation processes are still in their early stages.

- **Study by Van Ark (2016):** Van Ark proposed that the new digital economy (mobile technologies, the Internet, and cloud services) has not yet generated any clear improvements in

productivity growth. Analyzing data from the U.S., U.K., and Germany, the study recorded a rapid decline in ICT prices, a shift from ICT investment to ICT services, and a steady increase in knowledge-based assets supporting ICT. Nevertheless, Van Ark concluded that the new digital economy is still in its installation phase, and productivity effects may only emerge once the technology reaches a widespread deployment phase (Van Ark, 2016, pp. 3-18).

• **Study by Maurseth (2020):** This study Found that ICT's impact on productivity and economic growth is moderate and varies by region. While ICT initially boosted optimism in the 1990s, its benefits were more pronounced in the U.S. than in Europe or Japan. Macroeconomic data indicated that Internet usage positively impacted economic growth before 2000, but its effect turned negative for wealthy countries after 2000. (Maurseth, 2020, pp. 31-86).

Although there are numerous studies describing the relationship between digital transformation and economic growth, further investigation is needed to assess the impact of digitalization within individual countries. So far, there is no unified approach for selecting methods and indicators that enable a comprehensive evaluation of such effects.

3. Research Methodology

In this study, a descriptive-analytical approach was adopted to examine the impact of digital transformation on economic growth in Algeria. The descriptive method was used to provide a clear picture of the state of digitalization in Algeria, while the analytical method was employed to uncover the relationship between different variables.

To achieve the study's objectives, a conceptual framework was developed based on a comprehensive set of indicators covering various aspects of digital transformation and economic growth. These indicators were selected based on their theoretical and practical significance, measurability, and data availability.

3.1 Economic Growth Indicators

These indicators aim to measure the overall macroeconomic condition of the country and include:

• GDP per capita;

• Global Competitiveness Index 4.0: This index tracks the performance of approximately 140 countries based on 12 pillars of competitiveness. It evaluates the factors and institutions identified by empirical and theoretical research as key determinants of productivity improvements, which in turn serve as the main drivers of long-term growth, economic development, and prosperity.

3.2 Digital Transformation Indicators

These indicators aim to assess Algeria's progress in digital transformation and include:

Network Readiness Index (NRI): Evaluates 134 economies based on technology, people, governance, and impact to assess their digital readiness.

Resilience Indicators (Risk Assessment): Measures a country's ability to withstand external shocks using the Global Resilience Index, which evaluates six physical and twelve macroeconomic factors on a scale from 0 (lowest resilience) to 100 (highest resilience).

The study relied on primary data collected from multiple sources, most notably:

• The World Bank, which provided data on GDP and GDP per capita;

• The Global Resilience Index issued by FM Global to assess the economy's resilience;

• The Global Competitiveness Index issued by the World Economic Forum to measure Algeria's economic competitiveness;

• The Network Readiness Index issued by the Portulans Institute to evaluate digital infrastructure readiness.

To facilitate understanding and interpretation of the results, data was systematically processed, organized into tables and clear graphical representations, allowing readers to easily visualize trends and changes. Additionally, detailed comparisons were conducted between Algeria's performance and that of other countries with similar economic levels, such as Arab nations and lower-middle-income countries. This approach helped identify strengths and weaknesses with greater precision.

4. Study Results and Discussion

- *4.1 Study Results*

The first phase of the research involves examining **Algeria's GDP per capita**. The significance of this measure lies in its ability to assess **economic growth** by identifying changes in **production volumes** or **real income levels** of residents.

Furthermore, data derived from **official reports of the World Bank** indicate that in **2019, global economic growth weakened significantly**. In addition to the **general slowdown in external demand**, Algeria's **export performance deteriorated** due to the **OPEC agreement**, which led to a **decline in crude oil prices.**

Figure 1: GDP Per Capita Growth Rate in Algeria for the Period 2000-2023
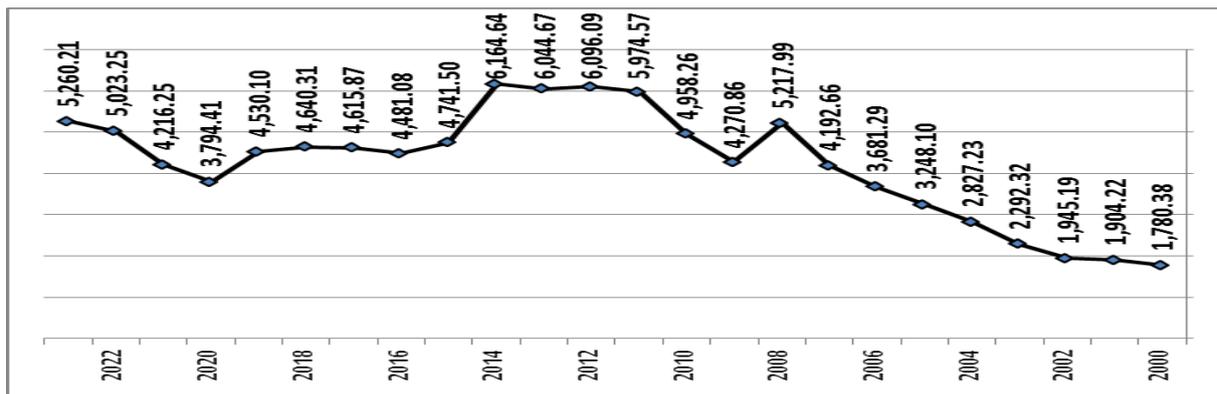
Source: Prepared by the researchers based on World Bank data.

-   World Bank Group. (2024). World Bank National Data: GDP per capita (current US$) - Algeria. Retrieved from https://2u.pw/NeqErCrs

Figure 1: Growth Rate of GDP per Capita in Algeria (2000-2023)

Figure 1 illustrates the evolution of the growth rate of GDP per capita in Algeria at current prices in USD over the period from 2000 to 2023. The curve shows noticeable fluctuations in the growth rate over these years, reflecting the impact of various economic factors that Algeria experienced during this period. The key observations include:

Period of 2000-2006: GDP per capita grew steadily from $1,780.38 to $3,681.29, reflecting continuous economic improvement driven by stable oil prices and increased production.

Period of 2007-2012: The strongest growth period, with GDP per capita rising from $4,192.66 to $6,096.09, fueled by high oil prices, increased government revenues, and higher public spending.

Period of 2013-2019: GDP per capita declined after peaking in 2012, dropping to $4,741.50 in 2015 before stabilizing at $4,530.10 in 2019, mainly due to falling oil prices affecting the economy.

Period of 2020-2023: The COVID-19 pandemic caused a sharp drop to $3,794.41, but gradual recovery began in 2021, with GDP per capita reaching $5,260.21 in 2023, showing resilience despite slow recovery.

Analyzing the curve highlights that Algeria's economy has gone through periods of growth and recession, reflecting fluctuations in oil prices and global economic conditions. Despite some periods of improvement, the economy remains vulnerable to external factors such as oil prices and global economic crises. These fluctuations underscore the need for economic diversification and reducing excessive dependence on the oil sector to achieve sustainable growth.

In light of this, it can be assumed that Algeria generally exhibits **positive GDP growth dynamics**, allowing the situation on this indicator to be considered satisfactory.

The second research step involved analyzing data related to the **Global Competitiveness Index (GCI)**, with Figure 2 presenting a diagram of Algeria's value across the **12 competitiveness pillars.**

Figure 2: Global Competitiveness Index 4.0 for Algeria
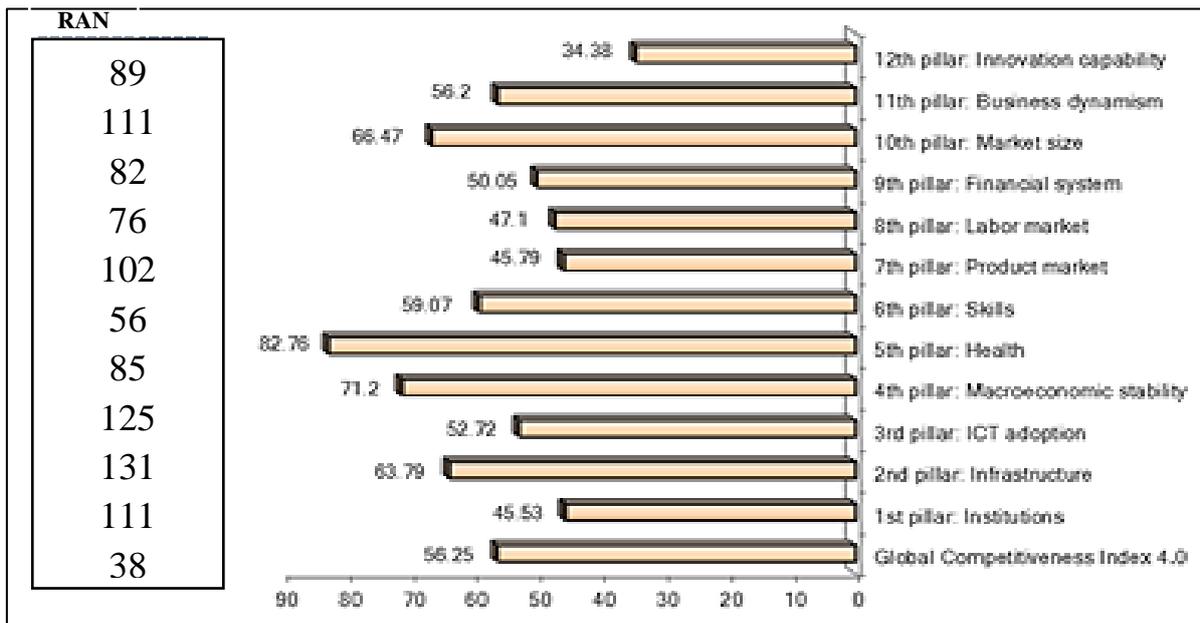
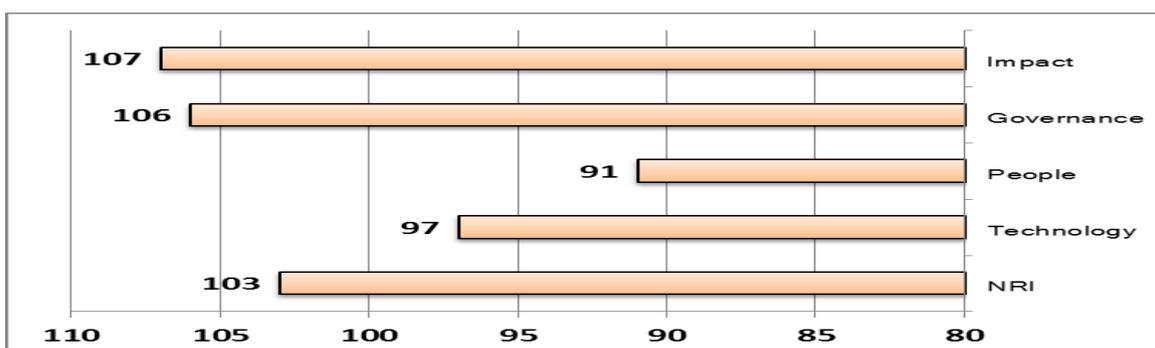**Source:** Prepared by the researchers based on World Bank data.

- World Bank Group. (2024). WEF Global Competitiveness Index 4.0 Coverage: 2017-2019. Retrieved from: https://prosperitydata360.worldbank.org/en/dataset/WEF+GCI

Algeria ranks 89th in the Global Competitiveness Index 4.0, indicating moderate global performance and the need for strategic improvements. In the Institutions pillar, it ranks 85th (56.25), reflecting governance challenges. Infrastructure ranks 93rd (63.79), highlighting developmental needs. ICT Adoption is weak at 111th (52.72), emphasizing the need for digital investments. Macroeconomic Stability is poor at 131st (71.2), showing financial instability.

Health ranks 125th (82.76), indicating adequate services but coverage issues. Skills rank 85th (59.07), requiring workforce development. The Labor Market ranks 55th (45.79), showing some flexibility, while the Financial System struggles at 102nd (47.1), needing reforms. Market Size is moderate at 76th (50.05), while Business Dynamism (111th, 56.2) and Innovation Capacity (89th, 34.38) remain weak.

Algeria must focus on infrastructure, innovation, and economic stability. Despite challenges, GDP growth and ICT adoption trends indicate potential economic recovery, necessitating further analysis of digital transformation and macroeconomic stability. According to the 2023 Portulans Institute Report, which assesses countries' digital readiness, Algeria ranks 103rd out of 134 countries, with a total score of 37.52 (FM Global, 2024). The following figure presents Algeria's digital readiness data.

Figure 3: Algeria's Global Ranking and Pillars of the Network Readiness Index (NRI)

Source: Prepared by researchers based on data from

- Portulans Institute. (2024). The Network Readiness Index Algeria 2023. Retrieved from: https://networkreadinessindex.org/country/algeria/

Figure 3 presents Algeria's global ranking based on the pillars of the Network Readiness Index (NRI). The analysis reveals that Algeria ranks relatively low in most pillars, indicating significant challenges in the field of digital readiness.

- **Impact:** Algeria ranks 107th globally in terms of impact, reflecting a weak ability to achieve tangible results from the use of digital technology. This suggests that digital technologies have not significantly contributed to positive societal and economic changes.
- **Governance:** Algeria holds the 106th position in digital governance, highlighting challenges in regulating and implementing policies and procedures that promote the use of digital technology. This may be due to a lack of an adequate regulatory framework or weak enforcement.
- **People:** Algeria performs relatively better in this pillar, ranking 91st. This indicates that there is a moderate level of readiness among the population to use technology, but it remains insufficient to achieve substantial progress.
- **Technology:** Algeria ranks 97th in this pillar, reflecting a limited capacity to adopt and develop modern technology. This indicates a gap in technological infrastructure and in the adoption of digital innovations.
- **Network Readiness Index:** Overall, Algeria ranks 103rd in the NRI. This low ranking reflects the broad challenges facing Algeria in terms of digital readiness, ranging from infrastructure to governance and impact.

Based on this analysis, it can be concluded that Algeria faces significant difficulties in improving its position on the global digital readiness map. Despite some progress in population readiness, other aspects such as governance and impact require substantial improvements to achieve meaningful advancement.

Table 1: Algeria's Ranking by Sub-Pillars of the Network Readiness Index.

Sub-Pillar	Rank	Sub-Pillar	Rank
Inclusion	98	**Individuals**	62
Access	101	**Economy**	90
Quality of Life	102	**Future Technologies**	91
SDG Contribution	106	**Content**	92
Businesses	111	**Governments**	92
Trust	117	**Regulation**	96

Source: Prepared by the researchers based on data.

- Portulans Institute, The Network Readiness Index Algeria, 2023. Retrieved from:https://download.networkreadinessindex.org/reports/countries/2023/algeria.pdf

Algeria's performance in the Network Readiness Index reveals significant disparities across different sub-pillars. In the "Inclusion" pillar, Algeria ranks 98th globally, highlighting a large portion of the population that remains disconnected from digital technology. This aligns with its weak ranking of 101st in the "Access" pillar, reflecting deficiencies in digital infrastructure and internet availability. Additionally, Algeria ranks 102nd in "Quality of Life," indicating that digital transformation has yet to bring tangible improvements to citizens' daily lives.

Businesses also struggle with digital adoption, as shown by Algeria's 111th ranking in the "Businesses" pillar, which affects competitiveness and innovation. The "Trust" pillar ranks even lower at 117th, pointing to a lack of confidence in digital infrastructure and security. However, there are signs of improvement in "Future Technologies" (91st), suggesting some level of readiness for modern innovations. The country performs notably better in the "Individuals" pillar, ranking 62nd, reflecting progress in personal technology use.

Despite these rankings, Algeria shows some strengths within its income group and region. Among lower-middle-income countries, it ranks 23rd overall and leads in the "Individuals" pillar. At the sub-pillar level, Algeria outperforms similar economies in five areas: content, individuals, governments, regulation, and inclusion. However, within the Arab region, Algeria ranks 12th and lags behind in all four main pillars, remaining below the regional average across all sub-pillars. To improve its digital readiness and competitiveness, Algeria needs comprehensive strategies to enhance infrastructure, business adoption, and public trust in digital technologies.

Table 2: Algeria's Results Compared to the Averages of Its Income Group and Region, Overall and by Pillar.

Dimension	Algeria	Low-Middle Income Countries	Arab Countries
Network Readiness Index	37.52	38.41	46.59
Technology	31.45	32.12	41.17
Individuals	35.63	43.38	42.66
Government	41.18	43.27	53.45
Impact	41.82	43.89	49.08

Source: Compiled by researchers based on data.

- Portulans Institute, The Network Readiness Index Algeria, 2023:
https://networkreadinessindex.org/country/algeria /

By comparing Algeria's results with the averages of low-income countries and Arab countries, as shown in Table 2, several key observations can be made:

• Network Readiness Index: Algeria scored 37.52, which is lower than the average for low-income countries (38.41) and significantly below the Arab countries' average (46.59). This indicates a need for stronger efforts to improve digital readiness and competitiveness.

• Technology Pillar: With a score of 31.45, Algeria falls below the low-income countries' average (32.12) and significantly behind Arab countries (41.17), reflecting challenges in adopting and developing technology.

• Individuals Pillar: Algeria scored 35.63, trailing both low-income countries (43.38) and Arab countries (42.66). This highlights a digital divide, with many citizens unable to fully benefit from digital opportunities.

• Government Pillar: Algeria's score of 41.18 is below the averages for low-income countries (43.27) and Arab countries (53.45), suggesting obstacles in digital transformation and e-governance implementation.

• Impact Pillar: Scoring 41.82, Algeria lags behind the averages of low-income countries (43.89) and Arab countries (49.08), indicating a limited impact of digital technology on society and the economy.

Overall, Algeria performs below average in all dimensions compared to low-income countries and Arab nations. This underscores the urgent need to enhance investments and policies that support digital transformation and improve digital readiness indicators.

Algeria's **Resilience Index score** stands at **43.1**, placing it at **rank 94** globally. It is essential to consider that the **Global Resilience Index** is a comprehensive metric that determines a country's position in the rankings and calculates the average impact of resilience-related factors. This index integrates **12 key resilience drivers**, classified as related to **physical factors**, where a country's score represents its overall resilience status.

Figure 4 below illustrates how the estimates vary based on the considered factors.

Figure 4: Algeria's Position in the Global Resilience Index 2024.
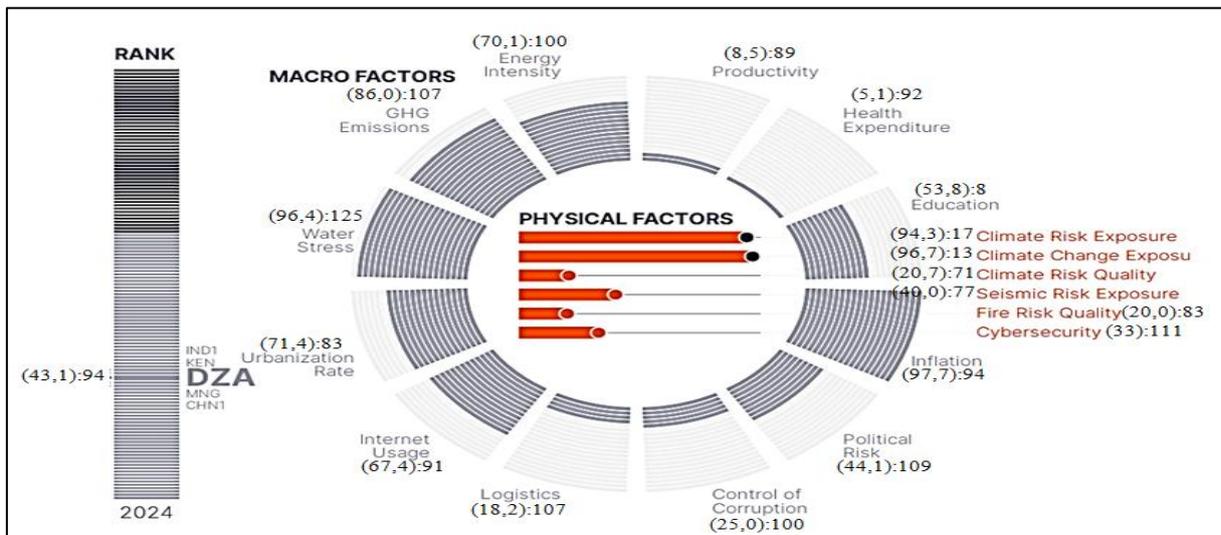
Source: Prepared by researchers based on data from FM Global, 2024

Retrieved from: https://www.fm.com/resources/resilience-index/explore-the-data/?&cr=DZA&sn=ex&cd=DZA

Algeria's 2024 Global Resilience Index ranking highlights major challenges in responding to risks, particularly in climate and technological resilience. The country ranks low in climate risk exposure (13) and climate change exposure (17), showing high vulnerability to climate disasters. Its climate risk quality ranking of 71 reflects gaps in preparedness, raising concerns about long-term environmental sustainability.

Infrastructure and security risks are also significant, with weak rankings in earthquake preparedness (77), fire risk quality (83), and cybersecurity (111). Environmental and technological issues persist, as seen in Algeria's high greenhouse gas emissions (107) and energy inefficiency (100). Additionally, its internet usage ranking (91) suggests a need for stronger digital infrastructure.

With an overall resilience ranking of 94, Algeria faces urgent challenges, including water stress (83) and rapid urbanization (125). To improve, the country must prioritize climate risk management, infrastructure development, and cybersecurity. Comprehensive strategies in these areas are essential for enhancing resilience and future adaptability.

4.2 Discussion of Results

• Dependence on the Oil Sector: Algeria's economy is highly reliant on oil, making it vulnerable to global price fluctuations. Periods of rising oil prices, such as 2007–2012, coincided with GDP growth, reinforcing this dependence. However, weak economic diversification threatens long-term sustainability during external shocks.

- Competitiveness and Digital Readiness: Algeria struggles with low rankings in global competitiveness and digital readiness, reflecting inadequate digital infrastructure and slow technology adoption, which hinder economic growth.
- Comparison with Previous Studies: Beier et al. (2017) highlighted digitalization's role in boosting economic growth. The study supports this, suggesting that improving Algeria's digital readiness could help, though the country lags behind advanced economies like Germany and China.

Similar to Parviainen et al. (2017) noted that digitalization enhances economic growth, but Algeria struggles to fully benefit due to weak digital infrastructure. While the study suggests a positive link between digitalization and economic growth, Algeria must invest more in technology. Mićić Ljubiša (2017) and Toader et al. (2018) emphasized ICT investments as key to boosting productivity, aligning with findings that improved digital readiness could benefit Algeria's economy.

Unexpected mixed effects of digitalization may be due to policy delays or weak institutional support. Van Ark (2016) and Maurseth (2020) suggest digitalization takes time to impact growth, and Algeria may still be in an early stage. If the benefits seem limited, ineffective implementation or inadequate policies could be factors. Strengthening digital strategies and infrastructure is essential for Algeria to realize the full economic potential of digitalization.

Conclusion

The use of information and communication technology (ICT) has driven economic growth, improved service quality, and created new opportunities globally, but maximizing its benefits requires strong regulations and a skilled workforce. In Algeria, heavy reliance on the oil sector limits sustainable growth, as fluctuating oil prices directly impact GDP per capita, exposing weak economic diversification. Additionally, low digital readiness due to insufficient ICT investment hinders Algeria's competitiveness, while weak implementation strategies slow digital transformation. To address these challenges, Algeria must diversify its economy, invest in digital infrastructure, support startups, and establish clear transformation strategies with measurable objectives. Workforce training in digital skills is crucial for enhancing productivity, and stronger government policies are needed to support innovation, transparency, and efficient public services. For an effective digital strategy, Algeria's leadership must consider economic growth, digital life, and environmental resilience. Future research should conduct a quantitative analysis to better understand the impact of digital transformation on economic development.

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