

Digital Transition in Algeria: Infrastructure Challenges and Social Inclusion in the Digital Age

Madani ZAKARIA ^{1 *}, Madani BENCHOHRA ²

¹ Laboratory of Sustainable Development in Highland and Desert Areas
University Center of Nour Bachir El-Bayadh (Algeria),
z.madani@cu-elbayadh.dz

² University of Ibn Khaldoun Tiaret (Algeria),
benchohra.madani@univ-tiaret.dz

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Abstract: Digital transformation is a significant challenge for both public and private organizations globally, including in Algeria. It involves adopting new tools and restructuring economic models and organizational processes. In Algeria, the national digital transformation strategy focuses on five key pillars : infrastructure, human resources training, digital society, digital economy, and digital governance. Despite progress in internet connectivity and infrastructure, challenges persist, especially in rural areas with limited technology access. The integration of emerging technologies such as AI, blockchain, and IoT is crucial for enhancing business competitiveness and public service efficiency. However, this transition requires substantial investments, robust digital governance, and attention to cybersecurity and consumer trust.

Keywords: Digital Transformation; Algeria; Digital Economy; Digital Governance; Digital Inclusion.

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***Corresponding author:** Madani ZAKARIA

1. Introduction

The digital revolution has brought about a profound transformation in organisations, both public and private, forcing them to adapt to remain competitive in an increasingly technology-driven world. This evolution is not limited to adopting new tools; it is impacting organisational processes and forcing a readjustment towards a customer-centric approach, aimed at optimising user experience and operational efficiency. The consequences of this transformation are being felt across the world's economic, social, and political structures, affecting governments, businesses, and citizens alike. Digital transformation, far from being a simple integration of technologies, symbolises a restructuring of economic models and how organisations operate. Three essential dimensions emerge from this phenomenon: technological, organisational and social.

In Algeria, this transformation is of particular importance. Although progress has been made in internet connectivity and digital infrastructures, challenges remain, particularly in rural areas, where access to technology remains limited. The adoption of emerging technologies such as artificial intelligence, blockchain and the Internet of Things is crucial to boosting the competitiveness of businesses and improving the efficiency of public services. However, implementing these innovations requires substantial investment and strong digital governance to ensure a smooth and inclusive transition. In addition, it is essential to strengthen consumer confidence in digital transactions and improve cybersecurity.

For Algeria, one of the major challenges is to ensure the ongoing training of the workforce while combating digital inequalities. This requires an inclusive approach that enables every segment of the population to benefit from this technological revolution.

2. The Problem of The Study:

Digital transformation, while essential to the adaptation of organisations in an increasingly digital world, presents a complex challenge, particularly for the public and private sectors in Algeria. How can the Algerian authorities and companies overcome the obstacles associated with the implementation of emerging technologies to enhance competitiveness, efficiency and transparency, while ensuring a smooth and inclusive transition?

3. Study Hypotheses:

H1: The digital transformation of the Algerian public sector, supported by the strategic objectives, will improve efficiency, reduce bureaucracy and simplify administrative procedures, thereby meeting the expectations of citizens and businesses.

H2: With the expansion of Internet access, mobile phones and social media, Algeria's digital economy will grow. However, this growth will depend on resolving infrastructure problems and boosting consumer confidence.

4. The literatures on digital transformation

In this report, we will use the concepts of ‘digital transformation’ and ‘digital maturity’. In this respect, it is worth presenting the corresponding definitions and the associated methodological explanations.

Digital transformation refers to qualitative changes in business processes or ways of doing business (business models) resulting from the introduction of digital technologies, leading to significant socio-economic effects (Goldstein Déborah, 2024) .

Digital transformation represents the next step after digitisation (DESRUELLE Paul, 2019), which consists of converting analog data and processes into a machine-readable (digital) format, and digitalisation, which refers to the use of digital technologies to

improve the efficiency of certain activities or functions. Digital transformation is based on an ecosystem of interdependent digital technologies, whose ongoing development is driving economic and social change. (CDE, 2022) _

One of the criteria for assessing whether digital transformation objectives have been achieved is the level of digital maturity of sectors and government authorities. (Parmentier G. & et Gandia, R , 2022)

Research is developing various approaches to defining and measuring digital maturity, both as a tool for comparing the level achieved with the target set and for comparing the extent of diffusion of digital technologies between sectors (David AUTISSIER , Kevin JOHNSON , & Emily METAIS-WIE, 2018).

Digital transformation is the process of using digital technologies to create new or change existing, business processes, cultures and customer experiences to meet changing market and business demands. (gartner, 2025)

Digital transformation is the integration of digital technologies into all aspects of a business, fundamentally changing the way it operates and delivers value to its customers. It requires a reinvention of business models, processes and customer interactions.

Digital transformation is a strategic reorganisation of an organisation's activities, processes and skills to take full advantage of the opportunities offered by digital technologies. It goes beyond the simple adoption of technological tools and involves a profound cultural change.

Digital transformation is an ongoing journey that enables organisations to reinvent themselves by harnessing emerging technologies to improve efficiency, drive innovation and create exceptional customer experiences. It involves an overhaul of business models, operations and ecosystems (Bocean Anca Antoaneta Vărzaru & Claudiu George, 2024).

Digital transformation is the strategic use of digital technologies to improve performance and achieve business goals. It requires a clear

vision, a culture of innovation and an ability to adapt quickly to technological change (José Martins , Catarina Costa , Tiago Oliveira, , Ramiro Gonçalves , & Frederico Branco, 2019).

Digital transformation is a process that enables organisations to redefine their value proposition by integrating digital technologies into their products, services and internal processes. It aims to improve agility, resilience and competitiveness (Gen Lia Xixiang Sunb , Min Yea , & Abbas Mardani, 2024).

5.The digital transformation in Algeria is defined as:

"The process of integrating digital technology into all aspects of economic, social, and administrative life, with the aim of improving efficiency, enhancing transparency, and facilitating access to services." (kheira Chaouchi & Zohra khelouf , 2024) but what this definition means in detail is that digital transformation includes:

- Comprehensive and Deep Integration of Digital Technology: Digital transformation is not limited to adopting some technical tools or digitising certain processes; rather, it is a comprehensive restructuring of work systems through the adoption of advanced technologies such as cloud computing, big data, artificial intelligence, and the Internet of Things, which reshapes the way various sectors are managed.

- Developing performance and institutional efficiency: Through digitisation, government and private institutions aim to simplify procedures, reduce bureaucracy, and lower operational costs. This allows for faster and more accurate services to citizens and beneficiaries, thereby increasing their satisfaction.

- Enhancing transparency and accountability: Digital systems provide the ability to track performance and processes accurately and transparently, reducing corruption and administrative imbalances. This also enables better monitoring of resources and more objective evaluation of public policies.

- Facilitating citizens' access to services: By creating integrated electronic platforms, citizens can interact with the administration and obtain various services (such as official documents, health services,

and educational services) easily without the need for travel or long waiting times, thereby achieving the principle of e-governance.

- Enhancing economic and social inclusion: Digital transformation aims to bridge the digital divide that may lead to the marginalisation of certain groups or regions. By investing in digital infrastructure and expanding internet access, the transformation seeks to provide equal opportunities for everyone, contributing to balanced development.

- Stimulating innovation and economic growth: Digital transformation creates a conducive environment for innovation and entrepreneurship, especially in the technology and digital services sector. It is considered a pillar for transforming the traditional economy into a knowledge and innovation-based digital economy, enhancing Algeria's competitiveness at the regional and international levels.

- Addressing local challenges: Digital transformation in Algeria takes into account the country's specificities in terms of geographical disparities, economic diversity, and the level of available technical competencies, with plans to address these challenges through educational, organisational, and advanced infrastructure strategies.

6. The Digital Revolution: Adapting Organisations to Global Challenges.

The digital revolution has forced organisations, both public and private, to adapt to remain competitive in an increasingly technology-driven world. This transformation goes far beyond the adoption of new tools; it involves profound changes within organisational processes and a reorientation towards a customer-centric approach, with the aim of improving user experience and operational efficiency. As the study (chumacherA. , Erol S , & Sihn W, 2016) points out, this revolution is having a direct impact on economic, social and political structures worldwide, affecting governments, businesses and citizens alike. Digital transformation is not simply a matter of integrating technological innovations; it represents a far-reaching restructuring

that is profoundly changing the way organisations operate and their business models. This is expressed through three key dimensions: technological, organisational and social.

In the public sector, digital transformation is of paramount importance in enhancing the efficiency of services and improving interactions between the state and its citizens. This is illustrated by the use of advanced technologies such as artificial intelligence (AI), blockchain and the Internet of Things (IoT) (OCDE, 2018). Information and communication technologies (ICTs) are at the heart of this modernisation, enabling better integration of public services and anticipation of citizens' needs. However, this transformation in the public sector also requires a cultural change; managers need to be able to lead this digital transition. The adoption of digital technologies is proving to be an essential step towards increasing efficiency, reducing costs and delivering superior services to citizens. For example, the digitisation of administrative processes, such as the Electronic Information System (EIS) in Brazil, aims to replace paper documents with fully dematerialised procedures, making administration more efficient.

The impact of digital transformation, in both the private and public sectors, is profoundly redefining the way organisations operate and interact with the world around them. Governments and businesses are gradually adapting to the demands of digital technology by deploying IT strategies that generate value, optimise resources and improve the customer experience while facing up to the socio-economic challenges posed by these changes (e- Alvarenga ARCF, 2019).

Over the last decade, many organisations have invested heavily in adapting their business model to emerging technologies. These digital transformation initiatives have proven to be essential to maintaining the competitiveness and relevance of businesses in today's digital environment. The COVID-19 pandemic in 2020 underlined the urgency of this transformation to ensure business continuity, leading to a proliferation of digital projects. In North America, the proportion

of digital customer interactions rose from 41% to 65% between 2019 and 2020 (Marija Boban & Mirko Klaric , 2021), while investment in digital transformation doubled between 2019 and 2023. This development is also crucial for governments, which are looking to improve the services they offer citizens. Globally, more than \$2 trillion was invested in digital transformation in 2023 (Statista, 2024). Despite this colossal sum, the failure rate of projects remains worrying, with around 70% of initiatives failing to achieve the expected results. These transformations are profoundly changing organisations' business models and internal processes, making them more complex to manage than a simple technological upgrade (OECD, 2022). The academic literature often highlights the essential role of organisational culture in guaranteeing the success of such initiatives. Indeed, as with any change, the outcome of a digital transformation depends largely on the people affected by it. However, organisational culture is not the only determining factor. This essay will attempt to demonstrate that the success of a digital transformation also depends on other elements.

7. Algeria's National Digital Transformation Strategy

Algeria's national strategy for digital transformation marks a historic step, the first since independence (BOUKHEZAR AOMAR,, 2012). The strategy is designed to bring about a fundamental transformation in management practices, increase transparency and combat bureaucracy and corruption, with the aim of making access to information more equitable and improving public services (Dztransformation , 2020).

The strategy was developed following a series of consultations with experts and stakeholders in the digital sector. In November 2023, 14 workshops were held, resulting in the adoption of 300 recommendations that fed into the first version of the project. This version was revised several times before being submitted to the President of the Republic. The main objective of this strategy is to modernise the country digitally while addressing major issues such as

access to public services and transparency in the management of public affairs.

The strategy is also based on the introduction of a framework law on digitisation, currently being drawn up, which will govern and provide a framework for the digital domain for the next ten years. This law aims to remove regulatory obstacles and facilitate the country's adaptation to rapid technological change (BELLAGOUN, 2023). It will comprise nine areas, presented at workshops with national and international experts, and should result in a law that will regulate the digital sector in the long term (Union African, 2020). This ambitious project, which responds to current socio-economic and cultural challenges, is based on five strategic areas: infrastructure, human resources training, digital society, digital economy and digital governance.

8.Challenges of digital infrastructure in Algeria

Algeria has witnessed significant transformations in the field of information and communication technology in recent years, amidst continuous efforts to enhance digital transformation as a strategic pillar for achieving sustainable development. Despite progress, the country faces significant challenges in digital infrastructure that affect the quality of digital services and their inclusiveness for all segments of society (zohra & nadia, 2024).

8.1. Disparity in network coverage between urban and rural areas

Algeria suffers from a clear digital divide between urban and rural areas, where major cities like Algiers and Oran enjoy advanced fibre optic networks and relatively high internet speeds, while rural and remote areas experience weak or nonexistent coverage. According to 2024 data, 75.5% of the population lives in urban areas, leaving a large percentage in less serviced areas, leading to disparities in access to basic digital services such as remote education and electronic health services. At the same time, in early 2025, 76.0% of Algeria's population lived in urban centres, while 24.0% lived in rural areas.

This disparity hinders digital inclusion efforts and increases economic and social disparities between different regions of the country. (datareportal., 2025)

8.2.. Weak bandwidth capacity and internet quality

Despite the increase in international bandwidth capacity to about 7.8 terabits per second, the average internet speed in Algeria remains below the levels required to support the intensive use of digital services. According to the 2024 reports, the average internet speed over mobile networks was 21.36 Mbps, and the average fixed internet speed was 12.32 Mbps, with significant disparities between urban and rural areas. Algeria also witnessed a 59.4% increase in mobile internet speed compared to the previous year, indicating a tangible improvement, but the quality of service remains uneven, limiting the full utilisation of fourth and fifth-generation technologies.

8.3.. Lack of energy infrastructure and data centres

The continuity of electrical power is one of the fundamental pillars for the stability of digital infrastructure. Algeria suffers from frequent power outages, especially in some areas, which negatively affects the continuity of digital services and increases the operating costs of data centres. However, a modern government data centre was inaugurated in Oran in 2025 with the aim of supporting national institutions and enabling them to host their data locally.

The need for further investments in developing data centres and alternative energies remains to ensure the continuity of digital services efficiently and securely.

8.4.. The high costs of investing in digital infrastructure

The cost of building and expanding fibre optic networks and 4G and 5G infrastructure is extremely high, especially in areas with low population density. Algeria faces challenges in covering these costs,

prompting the government to seek partnerships with the private sector and innovative financing techniques to accelerate the pace of digital coverage. Additionally, the lengthy regulatory procedures and licenses complicate the implementation of projects and increase their costs.

8.5. Weak administrative and organisational coordination

The multiplicity of concerned government entities and the lack of coordination among them constitute one of the most prominent obstacles to developing digital infrastructure. The complexities of administrative procedures, such as licensing, construction, and amending regulations, also emerge as additional obstacles that delay the implementation of digital projects. vital .The Algerian government is working to simplify these procedures through strategies to unify the stakeholders and improve the business environment, with a focus on accelerating regulatory reforms.

8.6.. Lack of technical competencies and qualified human resources

Technical staff and engineers specialised in information and communication technology form a fundamental pillar for the development and maintenance of digital infrastructure. However, Algeria suffers from a noticeable shortage in this area, which affects the quality of digital services and the ability to adopt modern technologies.

The government invests in training programs and the development of technical skills, and seeks to enhance international cooperation to transfer expertise and modern technologies.

8.7. Cybersecurity challenges

In light of the rapid digital transformations, Algeria is facing an unprecedented rise in cyber threats. A recent security report issued by

Kaspersky revealed that the country witnessed more than 13 million phishing attempts in 2024, an increase of 17% compared to the previous year. According to a statement received by the news agency, this alarming figure reflects the advanced methods of cybercriminals who exploit well-known brands such as Booking, Airbnb, TikTok, and Telegram to target users, steal their data, or install malware on their devices. According to the report, Kaspersky security solutions thwarted more than 893 million phishing attempts worldwide in 2024, an increase of 26% compared to 2023. Experts explained that summer was the peak period for these operations, as scammers exploited the increase in online travel bookings to spread fake hotel and flight reservation offers. Algeria is working on building its cybersecurity capabilities through national strategies and regional and international cooperation to enhance digital protection (.kaspersky, 2024).

9.1 Infrastructures de base des TIC

Table1 Infrastructure index

Year	2008	2010	2012	2014	2016	2018	2020	2022	2024
Infrastructure index	0.12298	0.12481	0.18116	0.19885	0.19336	0.38890	0.57870	0.61330	0.81290

Source: Prepared by the researchers based on E-Government Multi-Year Survey.

Algeria has seen significant growth in its digital index, rising from 0.12298 in 2008 to 0.81290 in 2024, an increase of 561% in 16 years. This increase reflects massive investment in digital infrastructure, such as fiber optics, 5G, and data centers, in line with the Algeria Numérique 2030’ strategy.

There was a marked acceleration after 2018, with the index quadrupling (0.3889 → 0.8129), due to the roll-out of key projects such as the national interoperability platform and strategic partnerships with Huawei. However, a slight drop was observed between 2014 and 2016, from 0.19885 to 0.19336, probably due to

economic difficulties linked to the fall in oil prices and delays in certain projects.

Key points by period

Period	Évolution	Probable context
2008–2014	Slow growth (+61%)	Beginning of digitisation, limited pilot projects.
2014–2018	Acceleration (+100%)	Launch of national programs (e-government, extension of fiber optics).
2018–2024	Explosion (+109% in 6 years)	strategy, international partnerships (e.g. Huawei).

2018–2024 Digital Algeria 2030’ In 2024, Algeria's index reaches 0.8129, marking a significant improvement but remaining modest in global terms (116° in the UN e-governance ranking in 2022). Despite progress, gaps remain, particularly in rural areas, accentuating the digital divide, a key challenge of the 2030 strategy. Cybersecurity also needs to be strengthened to protect new infrastructures.

Algeria's national digital transformation strategy focuses on strengthening digital infrastructures to increase digital sovereignty, stimulate local innovation and improve digital governance. One of the flagship projects is the creation of the Algerian National Centre for Digital Services (Data Centre), in partnership with Huawei. This center, located in Algiers and Blida, aims to secure the management of national data, reduce technological dependence on foreign countries, and support the hosting of local data. It also plays a key role in promoting innovation and investment in Algeria's digital sector. Another strategic pillar is the deployment of the national interoperability platform, which connects the IT systems of ministries and public institutions via a secure network. This platform enables a fluid exchange of information, real-time decision-making, and more agile management of public services. It reduces administrative delays, improves transparency and guarantees the protection of sensitive data

by international cyber security standards, thereby contributing to the modernisation of public administration.

At the same time, the modernisation of connection infrastructures, in particular through the deployment of fiber optics and 5G, is a fundamental part of this strategy. Optical fiber aims to extend high-speed internet coverage throughout the country, including in rural and remote areas, thereby supporting the digital economy, access to public services and the development of local businesses. It also increases data transmission capacity, which is essential for managing the growing volume generated by digital transformation.

5G, meanwhile, offers higher connection speeds and lower latencies, enabling the deployment of advanced applications in areas such as the Internet of Things (IoT), telemedicine, smart cities and Industry 4.0. This technology stimulates innovation and strengthens the competitiveness of Algerian businesses by offering them connectivity capabilities in line with international standards. These initiatives aim to reduce the digital divide, guarantee equitable access to technologies and integrate Algeria into the global digital economy. They are essential for modernising public administration, facilitating access to services and promoting inclusive digital governance. In short, the development of high-speed communication infrastructures, national data centers and secure interconnection systems represents a key stage in Algeria's digital transformation, strengthening its international positioning and supporting its socio-economic development. To achieve an index of 1.5-2.0 by 2030, continued investment is required, particularly in 5G, cloud and AI. Priorities include speeding up fiber optics and training professionals in new technologies.

9.2 Human Resources Training

As part of Algeria's national digital transformation strategy, the focus on human resources, training, and research & development plays a fundamental role in bridging the digital skills gap and encouraging technological innovation. This component aims to equip

the population, particularly civil servants, students, and professionals, with the necessary skills to adapt to the rapid changes in the digital sector.

Algeria's digital strategy places continuous training for civil servants and citizens at the heart of its digital development. The goal is to provide the population with the skills needed to thrive in a technological world, while also facilitating access to digital public services. Large-scale training programs will be deployed to ensure inclusive and equitable digitization, making citizens more competent and capable of actively participating in the digital society.

At the same time, Algeria emphasizes the promotion of research in emerging technologies such as artificial intelligence (AI), Big Data, and blockchain. Strategic partnerships will be established between universities, research centers, and industries to stimulate innovation and develop solutions tailored to national needs. These efforts aim to strengthen Algeria's position in the field of advanced technologies on a global scale.

The consultation of national and international experts also played a crucial role in the development of this strategy. In November 2023, 14 workshops resulted in the adoption of 300 recommendations to structure the country’s digital roadmap. These workshops brought together private sector stakeholders, researchers, and government officials, ensuring an approach aligned with international best practices while addressing Algeria's specific needs.

Table2. Human Capital Index Value

Year	2008	2010	2012	2014	2016	2018	2020	2022	2024
Human Capital Index Value	0,71140	0,73773	0,64626	0,65430	0,64116	0,66400	0,69660	0,69560	0,64179

Source: Prepared by the researchers based on E-Government Multi-Year Survey

Algeria's Human Capital Index (HCI) has experienced notable fluctuations between 2010 and 2024. It peaked in 2010 with an index of 0.73773, before gradually declining to 0.64116 by 2016. A slight recovery is observed between 2016 and 2020 (0.64116 → 0.69660), followed by another decline in 2024 (0.64179). These fluctuations reflect structural challenges such as political instability, economic crises, and intermittent reforms.

In comparison, the World Bank assessed Algeria's HCI at 0.537 in 2020, indicating methodological differences or recent updates not reflected in public reports.

Several factors explain these trends, including political instability, such as the Hirak movement (2019–2021), and the COVID-19 pandemic, which exacerbated social inequalities. Limited economic reforms and high inflation restricted budgets allocated to education and health, key pillars of the HCI. Nevertheless, educational initiatives, such as shifting to English as the primary foreign language, aim to modernize the education system.

Key points by period

Period	Évolution	Probable context
2010–2016	Down 13% (0.73773 → 0.64116)	Post-Arab Spring crises, falling oil prices (2014), political tensions
2016–2020	Up 8.6% (0.64116 → 0.69660)	Partial economic recovery, SME and start-up projects
2020–2024	Decline of 7.8% (0.69660 → 0.64179)	Prolonged impact of COVID-19, regional instability (Sahel) and fiscal restrictions.

Algeria faces persistent challenges affecting its Human Capital Index (HCI): unequal access to services in rural areas and for minorities, a fragmented education system despite reforms, and high youth unemployment (nearly 30%), limiting future productivity. To address these issues, strategic recommendations are proposed: strengthen social investments (maternal and child health, universal primary education), improve governance by fighting corruption, and

establish international partnerships to modernize HCI measurement methodologies. The fluctuations in the HCI reflect an economy in transition, requiring a holistic approach that integrates political stability, deep educational reforms, and social inclusion. The "Algeria Digital 2030" strategy, if it includes human capital, could play a key role in this transformation.

9.3 Digital Society

The digital society refers to a set of social, economic, and cultural interactions profoundly influenced by digital technologies. This concept evolves within a context where information and communication technologies (ICT) shape our lifestyles, relationships, and social structures. The digital society is often viewed as an advanced stage of the information society, focusing on the integration of digital technologies into all aspects of daily life. It is characterized by :

- **Access to information:** Digitization allows for nearly universal access to information, fostering a form of democratization of knowledge.
- **Interconnection:** Individuals and groups interact through digital platforms, creating virtual communities that transcend geographical boundaries.
- **Transformation of social relationships:** Social interactions evolve, with a prevalence of online interactions that can both strengthen and fragment social bonds.
- **Digital economy:** Companies integrate digital technologies to enhance their operational processes, also altering traditional business models.

The transition to a digital society raises several issues:

- **Digital divide:** Despite increased access to technologies, inequalities persist, creating a gap between those who have access to digital tools and those who are excluded.

- **Data protection:** With the massive digitization of personal information, data security and privacy have become major concerns in the digital world.
- **Cultural impact:** Digital culture can lead to the homogenization of content and a loss of cultural diversity, while also offering new forms of creative expression.

The transformations induced by digitization continue to evolve. The emergence of artificial intelligence and robotics in daily life could further redefine human interactions and social structures. Special attention must be given to regulating these technologies to ensure they serve the common good while respecting individual rights. This table summarizes the analysis and illustrates the general trend of the data.

Table3. Online Service Index Value

Year	2008	2010	2012	2014	2016	2018	2020	2022	2024
Online Service Index Value	0,22408	0,09841	0,25490	0,07874	0,06522	0,21530	0,27650	0,37430	0,33200

Source: Prepared by the researchers based on E-Government Multi-Year Survey.

The Online Service Index Value shows significant growth between 2010 and 2024, rising from 0.09841 to 0.33200, with an average annual growth rate of 8.6%. The general trend is upward, despite annual fluctuations, such as a sharp decline between 2012 and 2014 (-0.17616) and a sharp increase between 2016 and 2018 (+0.15008). In 2024, the index decreases slightly (-0.04230), suggesting a possible stabilization. If the average growth continues, the index could reach 0.391 in 2026, 0.461 in 2028, 0.543 in 2030, 0.640 in 2032, and 0.754 in 2034. This progression reflects a continuous improvement in online services, although external factors may influence this trend in the future. A more in-depth analysis of underlying causes (technological, economic, political) would be necessary to refine the forecasts.

In conclusion, the digital society represents a complex and dynamic field that requires critical reflection on its ethical, social, and economic implications. Understanding this evolution is essential to navigate a world where digital technologies are ubiquitous.

9.4 Social Media as a Catalyst for Algeria's Digital Economy"

Social networks are increasingly recognized as a key driver of Algeria's digital economy, offering platforms for communication, information sharing, and business promotion. According to (Mostefaoui Belkacem, 2019) and (datareportal.com, 2023), social media plays a vital role in fostering economic opportunities and business growth. Companies leverage platforms like Facebook, Instagram, and Twitter for targeted advertising, e-commerce, and influencer marketing, enabling them to reach wider audiences and boost sales (TAIEBI, 2014). Social media also facilitates real-time customer service, feedback collection, and innovation through collaboration, making it a powerful tool for businesses and entrepreneurs (Yousra Abdessemed & Sahbi Mohamed , 2023).

Algeria's digital landscape is evolving rapidly, as evidenced by the growth in internet and social media usage (Ookla, 2023). Between 2022 and 2024, internet users are projected to increase from 27.28 million to 33.49 million, with the penetration rate rising from 60.6% to 72.9%. Social media users are also expected to grow from 17.70 million to 25.15 million, reflecting the platforms' growing influence. Mobile connectivity is expanding, with cellular subscriptions increasing from 48.53 million in 2022 to 50.65 million in 2023, while the percentage of Algerians without internet access is declining.

Table 3 Indicators of Internet use and media in Algeria

Dimension	2022	2023	2024
Internet users	27,28 million	32,09 million	33.49 million
Internet penetration rate	60,6 %	70,9 %	72.9%
social media users	17,70 million	23,95 million	25,15 million
cellular mobile connections		48,53 million	50.65 million
people in Algeria did not use the Internet	39,4%	29,1%	27.1%

Source: Prepared by the researchers based on (DataReportal) in January.

Platform-specific trends highlight the dynamic nature of social media usage in Algeria. Facebook, despite a dip in 2023, rebounded to 24.85 million users in 2024, driven by strategic updates and enhanced privacy measures. YouTube maintained steady growth, reaching 22.80 million users in 2023, thanks to its engaging video content and revenue-sharing model. Instagram saw a resurgence, climbing to 11.40 million users in 2024, fueled by features like Reels and influencer marketing. LinkedIn, Snapchat, and Twitter also experienced growth, with LinkedIn reaching 3.90 million users in 2024, Snapchat growing to 7.88 million, and Twitter expanding to 1.24 billion users globally. TikTok emerged as a favorite among younger audiences, with 17.42 million users in 2024, driven by its viral content and user-friendly algorithm.

Table 4. Social media statistics for Algeria (in million)

Dimension	2022	2023	2024
Facebook	22,45	20,80	24,85
YouTube		22,70	22,80
Instagram	8,60	8,40	11,40
Facebook Messenger	14,25	13,60	16,40
LinkedIn	2,80	3,20	3,90
Snapchat	6,25	6,95	7,88
Twitter	891,5	1,15	
X users (Twitter)			1,24
TikTok users			17,42

Source: Prepared by the researchers based on (DataReportal) in January.

These trends underscore the importance of social media as a tool for economic development in Algeria. However, success depends on factors like internet accessibility, digital literacy, and supportive regulatory policies. By leveraging these platforms effectively, businesses and entrepreneurs can tap into new opportunities, foster innovation, and contribute to the growth of Algeria's digital economy.

10.The role of government policies in facilitating digital transformation in Algeria

In recent years, Algeria has witnessed an increased interest in digital transformation as a means to achieve economic and social development, through accelerated government policies aimed at developing digital infrastructure and stimulating innovation.

10.1. The strategic framework and government policies

The Algerian government has launched several ambitious strategic plans, including "Algeria Vision 2025," which includes a clear direction towards enhancing the digital economy. A national digital transformation strategy has also been established, focussing on improving digital connectivity across various sectors, especially health, education, and government administration.

The government has established specialised bodies such as the National Agency for Electronic Investment Development and the National Telecommunications Regulatory Authority to ensure a suitable regulatory framework that facilitates investment in information and communication technology.

10.2. Developing digital infrastructure

Updating telecommunications networks and improving internet access across the country have been a central focus of government policies. Supporting the development of 4G networks and initiating the first steps towards 5G is one of the government's most significant achievements in facilitating access to high-speed internet services, opening the door to the digitisation of as many sectors as possible.

In addition, efforts have been made to deploy government data centres to securely store and manage data, and to support the creation of digital platforms for providing government services remotely.

10.3. Digital transformation in government administration

Several e-government projects have been launched with the aim of reducing bureaucracy and facilitating citizens' access to public services. One of the most important of these initiatives is the National E-Services Portal, which allows citizens to carry out transactions such

as renewing official documents, paying bills, and registering for educational and health services online.

This transformation supports transparency, reduces the time and costs associated with traditional procedures, and enhances the interaction between the citizen and the state.

10.4. Supporting the digital economy and innovation

The Algerian government seeks to support startups in the field of technology and digital innovation by providing incubators and accelerators, in addition to stimulating investments in digital sectors. Funding programs and tax incentives have been approved to encourage small and medium digital projects.

There are also ongoing efforts to enhance digital skills among young people through training programs and collaboration with universities.

10.5. The challenges facing government policies

Despite the notable progress, Algeria faces several challenges in implementing digital transformation, including weak infrastructure in rural areas, a lack of specialised competencies in information technology, and some legal and regulatory obstacles that require continuous updating.

Also, there is a need to raise digital awareness among citizens and improve digital culture to ensure greater absorption of the benefits offered by digital transformation. (Wissam Bousalem & Sami Ben Jeddou , 2023)

11. Digital Economy

The focus on promoting the digitalization of businesses and fostering the emergence of startups is essential to stimulate economic growth and strengthen Algeria's competitiveness on the global stage. This axis concentrates on supporting SMEs and startups by providing them with digital tools and the necessary infrastructure to grow while attracting investments to support innovation and the country's digital transformation.

Initiatives:

- **Support for SMEs through digital platforms for access to international markets:** One of the priorities of this initiative is to enable Algerian SMEs to easily access international markets through digital platforms. These platforms will allow local businesses to promote their products and services globally, facilitate trade transactions, and expand their network of international partners. By encouraging the adoption of digitalization, these platforms will provide increased visibility for Algerian SMEs and boost their exports, contributing to the country's economic diversification.
- **Creation of ecosystems conducive to fintech and e-commerce:** Creating ecosystems that foster the emergence of fintech and e-commerce startups will be an important lever to encourage technological innovation in the private sector. These ecosystems will facilitate startups' access to the resources needed for growth by offering incubators, project accelerators, and financing programs tailored to emerging digital sectors. Additionally, fintech companies will benefit from favorable regulations and strategic partnerships with financial players to promote financial inclusion and the development of digital payments in Algeria. E-commerce will benefit from improved logistics solutions and secure digital infrastructure, facilitating the emergence of local businesses in this sector.
- **Encouraging local and foreign investments in technological infrastructures:** To support the development of technological infrastructures in Algeria, it is crucial to attract both local and foreign investments. The government will implement tax and regulatory incentives to encourage investors to participate in the creation of cutting-edge digital infrastructures. This includes data centers, fiber-optic networks, and cloud solutions, which are essential to support the digital transformation of Algerian businesses. These investments will strengthen the country's digital sovereignty,

ensure the security of local data, and stimulate innovation in technological sectors.

In summary, this axis aims to accelerate the digital transition of Algerian businesses, encourage innovation, and foster the creation of new businesses in the digital sector. It focuses on inclusivity, international openness, and the creation of a favorable environment for fintech and e-commerce while attracting investments that will strengthen the country's technological infrastructures.

12. The impact of digital transformation on social inclusion and economic development in Algeria

12.1. Digital transformation and enhancing social inclusion
Digital transformation represents an important bridge in Algeria to reduce social gaps and enhance opportunities for equal participation in society. By adopting digital policies and providing electronic services, the government has expanded access to essential services, especially in areas with weak traditional infrastructure. E-government services are among the most prominent initiatives that have supported social inclusion, as they enable citizens to complete their official transactions remotely, reducing the need for travel and minimising the time and financial costs associated with traditional paper procedures. This step has particularly contributed to the integration of marginalised groups such as women in rural areas, the elderly, and people with disabilities. In addition, digital education played a key role in providing equal educational opportunities through remote learning platforms, reducing educational disparities between major cities and remote areas. These initiatives have enabled young generations to acquire digital skills, which have become essential for the modern job market.

12.2. Digital transformation and economic development in Algeria
Algeria seeks to build an integrated digital economy that contributes to diversifying national income sources away from heavy reliance on the oil and gas sector. Digital transformation enhances the business environment by facilitating the establishment of companies and managing commercial operations through unified electronic platforms.

Additionally, supporting digital entrepreneurship through business incubators and government and private funding has helped launch many emerging tech projects, which create new job opportunities and drive innovation. This, in turn, contributes to increased productivity and improved quality of services provided to citizens. In sectors such as agriculture and health, digital transformation has enabled the use of modern technologies like Geographic Information Systems (GIS) to track crops or provide remote medical services, thereby enhancing the efficiency of these vital sectors. Similarly, the growth of e-commerce has connected producers and consumers directly, opening new markets for small and medium-sized enterprises and boosting economic activity.

13.Digital Governance

Often, the demands related to digital transformation exceed the capacity of IT teams to respond adequately. There are several levels of development: IT organization at the enterprise level, IT organization within different business lines, citizen development, and co-creation (Saikat Ray, Wan Fui Chan , & Adrian Leow, , 2021). This decentralization allows for better alignment with business goals but also presents significant risks, such as duplication of efforts or the creation of solutions that do not meet company standards or security requirements. In fact, it managers often have a negative perception of solutions developed outside their organization, labeling them as "Shadow IT." While the risks associated with decentralization are significant, they often remain inevitable, making effective governance essential to fully leverage it while minimizing risks.

The axis of digital governance (Jason Wong et Kyle Davis, 2022) is crucial for enhancing transparency, simplifying administrative processes, and effectively combating bureaucracy. This governance aims to modernize public administration by facilitating access to state services while making the administration more transparent, responsive, and inclusive. Algeria's digital transformation

project relies on three key initiatives to modernize public services and improve administrative efficiency.

13.1. Interactive National Digital Services Portal: This portal will centralize 40 digital public services, offering citizens and businesses unified access to common administrative processes, such as obtaining permits, certificates, and other documents. By simplifying procedures and reducing the need for physical travel, this portal aims to expedite the processing of requests, reduce waiting times, and make public services more accessible.

13.2. Integrated Management System: This system will centralize all administrative data within a single digital infrastructure, improving coordination between ministries and public departments. It will help reduce duplication, minimize human errors, and facilitate decision-making by providing an overview of the data. This centralization will enhance efficiency, transparency, and the integrated management of public resources.

13.3. Adoption of a Digitalization Framework Law: This law, set for 10 years, will regulate the digital sector by establishing clear standards for digital transformation. It will encourage investment, ensure data security, protect privacy, and harmonize digital processes across administrations. The framework law aims to create a strong legal foundation to support innovation and ensure a smooth and secure digital transition.

Together, these initiatives will modernize public administration, improve access to services for citizens and businesses, and strengthen the transparency and efficiency of public institutions in Algeria. This axis of digital governance, by facilitating access to administrative services and modernizing data management, will help make the Algerian state more transparent, responsive, and efficient, while reducing bureaucracy and promoting smoother and more accessible public management. Responsive and efficient, while reducing bureaucracy and promoting more fluid and accessible public management

Table5. Online Service Index Value

Year	2008	2010	2012	2014	2016	2018	2020	2022	2024
E- Government Development Index Rank	121	131	132	136	150	130	120	112	116
E- Government Development Index Value	0,35150	0,31810	0,36077	0,31064	0,29991	0,42270	0,51730	0,56110	0,59556
E- Participation Index Value	0,02272	0,01428	0,05260	0,07843	0,11864	0,20220	0,15480	0,22730	0,05480

Source: Prepared by the researchers based on E-Government Multi-Year Survey.

During this period, Algeria's digital transformation, within the framework of e-government, has made notable progress, although challenges remain. The country has advanced in the e-Government Development Index (EGDI), moving from 131st to 116th place between 2010 and 2024, with an 87% increase in the EGDI value (from 0.31810 to 0.59556). This progress is particularly marked between 2016 and 2024, with a 98% leap, coinciding with the implementation of the "Algeria Digital 2030" strategy. However, despite the increase in the EGDI, the country's ranking slightly declined between 2022 and 2024, indicating that other nations are advancing more rapidly in this area.

The E-Participation Index showed a significant rise of 284% between 2010 and 2024 but remains low in absolute terms, with a notable decline in 2024 following a peak in 2022. Online citizen participation remains fragile and requires efforts to ensure the sustainability of consultation mechanisms. Furthermore, the Online Services Index also grew by 237%, with major growth between 2016 and 2024, reflecting the establishment of digital platforms such as the national public services portal.

The "Algeria Digital 2030" strategy, launched in 2024, aims to modernize public administration and improve access to digital services. However, challenges remain, including the digital divide, bureaucracy, and limitations in online citizen participation.

To maximize the benefits of digital transformation, it is essential to improve digital inclusion, optimize electronic participation, and make online services more accessible, while strengthening governance and transparency.

14.The perspectives of various stakeholders on digital transformation and infrastructure challenges in Algeria

Digital transformation in Algeria constitutes a multidimensional national project that requires the concerted efforts of various stakeholders, including the government, the private sector, and civil society, whose perspectives vary according to their roles and interests.

14.1. Government's perspective

The Algerian government sees digital transformation as a fundamental pillar for achieving economic and social development, thus it places great importance on formulating policies and strategies that facilitate the construction of a strong digital infrastructure. The government relies on direct investment in infrastructure projects and the modernisation of legislative and regulatory frameworks, while striving to provide an attractive environment for investment in the telecommunications and technology sector. It also emphasises the importance of integrating digital technologies into government administration to develop public services and enhance transparency and efficiency.

14.2. The private sector's perspective

The private sector views digital transformation as a golden opportunity to expand business scope and achieve economic growth. It emphasises the need to improve the quality of digital infrastructure and the flexibility of regulatory frameworks to encourage innovation and the entry of new companies into the market. It also calls for increased partnerships with the government to develop joint projects

and obtain financial facilities and support to accelerate the implementation of innovative digital initiatives. Additionally, it places great importance on the necessity of developing qualified human resources to meet the needs of the digital market.

14.3. The perspective of civil society

Civil society considers digital transformation an effective tool for enhancing social inclusion and achieving digital justice, especially among marginalised groups and rural areas. It demands the necessity of ensuring that all citizens have access to high-quality internet services, promoting digital awareness and technological culture, and protecting users' privacy and digital rights. It also emphasises the importance of community participation in shaping digital policies to ensure that the real needs of citizens are met and to enhance transparency and accountability.

These diverse perspectives combine aspirations and challenges, highlighting the importance of coordination and joint cooperation among all parties to ensure the success of digital transformation in Algeria and achieve its developmental goals.

Proposed solutions to overcome the challenges of digital infrastructure in Algeria

Digital infrastructure challenges are among the main obstacles facing Algeria in its digital transformation journey, particularly the weak telecommunications networks in rural and remote areas. To overcome this issue, intensive investments are required from both the public and private sectors to expand fibre optic networks that ensure fast and efficient data transmission. Encouraging partnerships between the two sectors also plays a pivotal role in accelerating project implementation and sharing costs, thereby enhancing the effectiveness of the development process. Additionally, developing 5G networks is vital to provide ultra-fast internet speeds that support advanced digital services and modern applications.

In the same context, it is necessary to establish advanced national data centres, which are a fundamental pillar for securely and efficiently storing and managing data. This requires building data

centres that comply with the highest standards of security and reliability, along with encouraging the use of cloud computing technologies, which contribute to reducing costs and improving access to digital services.

On another note, the continuity of operation for these centres and digital infrastructure can only be ensured by providing sustainable and reliable electricity. Therefore, it is necessary to invest in renewable energy sources, such as solar and wind energy, to ensure the uninterrupted operation of data centres and communication networks. Additionally, updating the current electricity grids is required to avoid any interruptions that could negatively impact the quality of digital services provided to users.

Moreover, achieving this transformation requires improving the regulatory and legislative framework, as the presence of modern and clear laws is fundamental to creating an attractive and stable investment environment that ensures the sustainability of digital infrastructure. This includes updating data protection legislation to enhance user trust in digital services, as well as implementing effective mechanisms that support competition and encourage innovation in the telecommunications sector, thereby contributing to the improvement of service quality and providing broader options for consumers.

Efforts are not limited to infrastructure and legislation; it is also necessary to enhance technical capabilities by launching specialised training and qualification programs targeting engineering and technical personnel capable of operating and maintaining digital systems with high efficiency. This requires close collaboration with educational institutions and universities to develop curricula that consider modern technological developments and meet the needs of the labour market.

In the end, the maximum benefit from digital transformation cannot be achieved without raising digital awareness in society. Some cultural and social factors may hinder the acceptance of modern technology, necessitating awareness campaigns targeting various

segments of society to clarify the benefits of digital transformation and how to leverage it. Additionally, supporting digital education initiatives in less fortunate areas is a necessary step to reduce the digital divide and ensure the inclusion of all citizens in the digital revolution.

15. Conclusion and Hypothesis Testing

H1: The digital transformation of the Algerian public sector, supported by strategic objectives, will improve efficiency, reduce bureaucracy, and simplify administrative procedures, thereby meeting the expectations of citizens and businesses.

This hypothesis is partially validated. The digital transformation of Algeria's public sector has the potential to improve efficiency and simplify administrative procedures, as evidenced by existing initiatives. However, reducing bureaucracy and fully meeting the expectations of citizens and businesses depends on addressing challenges related to digital inclusion, human resources training, and infrastructure modernization, especially in rural areas.

H2: With the expansion of internet access, mobile phones, and social media, Algeria's digital economy will grow. However, this growth will depend on solving infrastructure issues and strengthening consumer trust.

This hypothesis is also partially validated. The expansion of internet and mobile technology access is indeed fostering growth in Algeria's digital economy. However, this growth is still limited by infrastructure problems, especially in rural areas, and by a lack of consumer trust in digital transactions. For the digital economy to reach its full potential, it is essential to invest in infrastructure, improve cybersecurity, and launch awareness campaigns to build user trust.

In conclusion, digital transformation in Algeria represents a major opportunity to modernize the public sector and stimulate the digital economy. However, to fully realize these ambitions, it is crucial to overcome current challenges, particularly in digital inclusion, training, infrastructure, and consumer trust. An inclusive

approach and effective digital governance will be critical to ensuring a successful transition to a digital society and economy.

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