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The Role of Digital Transformation in Supporting the Strategy of Institutions during the COVID-19 Crisis in Algeria

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Abstract

This study aims to discuss the current challenges facing the adoption of many digital technology solutions in government institutions in Algeria to confront the COVID-19 crisis. During the pandemic, the government placed increasing emphasis on this technology and its uses as a tool for digital transformation. It was viewed as a driver for economic diversification and became a top priority on strategic agendas. Based on a structural analysis methodology, the study's results show that despite the advancements, Algeria is still lagging behind. Therefore, government institutions must provide opportunities for digital innovation by establishing favorable regulations and protective applications to ensure security for transactions, as well as addressing gaps in the information and communication technology infrastructure to accelerate the process of benefiting from digital solutions, applications, and services.

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Keywords: Digital Transformation, Government Institutions, COVID-19 Crisis.

Introduction

The global crisis caused by the COVID-19 pandemic has threatened the global economy and various vital sectors in countries, highlighting the crucial importance of digital technology. This has propelled the world toward greater growth in the direction of digital transformation to mitigate the severity of the crisis left by the pandemic, which had a strong and long-lasting impact on various types of institutions. It created an urgent need to shift their strategies towards accelerating the development and widespread use of emerging technologies and large-scale innovations, in addition to adopting multiple technologies focused on automating knowledge. This resulted in a new computing and digitization system and the emergence of an endless number of integrative possibilities for innovations and transformative models. The COVID-19 crisis represents a great opportunity for digital transformation, as well as an opportunity for institutions to reconsider their current business models, taking this environmental change into account, especially with the increasing threat of the global pandemic. This led to the implementation of precautionary measures to maintain operations in institutions.

In light of the growing need to address the COVID-19 crisis and the technological developments it has sparked, Algerian government institutions found themselves with one option: to accelerate digital transformation. This was in response to the current situation and to overcome the challenges of the reality, which is marked by the rapid spread of various media and advanced technologies, to keep pace with the technological transformations in societies. Enhancing the role of digitalization and its widespread adoption was one of the most important approaches taken by government institutions, as it is expected to facilitate transactions, reduce the transition between government institutions, achieve administrative transparency, help eliminate administrative corruption, and save overall costs. This involves reconsidering traditional work patterns and moving towards remote work to meet current and future needs, which requires the government to transition quickly and comprehensively through comprehensive reform, restructuring the organizational hierarchy, and optimizing workflow processes. Thus, Algeria has sought to accelerate the pace of digital transformation by adopting numerous strategies and future visions to direct economic policies toward supporting and enhancing this transformation and providing the necessary basic components, with the development of digital infrastructure at the forefront.

From the above, the following problem can be raised:

What is the effectiveness of accelerating the pace of digital transformation in Algerian government institutions in mitigating the COVID-19 crisis?

I.1 - Sub-questions:

- What is digital transformation for institutions, and what are its key requirements?

- What are the manifestations of digital transformation in institutions during the COVID-19 crisis?

- What is the status of digital transformation in Algerian government institutions during the COVID-19 crisis?

I.2 - Study Hypotheses:

- Digital transformation is the process of integrating digital technology into all activities of a government institution.

- The manifestations of digital transformation are evident in the creation of e-services, the issuance of digital applications and platforms, etc.

- The adoption of digital technologies by Algerian government institutions has effectively contributed to mitigating the COVID-19 crisis.

I.3 - Importance of the Study:

The importance of this study stems from the novelty of the topic it addresses. The COVID-19 crisis is a recent topic and one that is currently highly relevant. Digital transformation is also a contemporary subject that still requires further study and theorization, especially when it comes to its partial concept, i.e., at the institutional level. This is particularly relevant in light of the challenges the COVID-19 pandemic imposed on government institutions. This approach has been clouded by ambiguity due to the lack of a suitable foundation for its implementation. Furthermore, digital transformation represents a significant challenge for many institutions that are struggling to catch up with the digital revolution and make up for what they have missed. This study also draws its importance from its uniqueness in clarifying how accelerating digital transformation helped mitigate the COVID-19 crisis, focusing on this aspect in contrast to other, albeit few, studies that have explored other ways to confront this modern global crisis.

I.4 - Objectives of the Study:

This study aims to achieve the following objectives:

- Present a theoretical framework on the concept of digital transformation and its applications in government institutions.

- Highlight the importance of digital technologies in addressing crises like the COVID-19 pandemic.

- Examine the experience of Algerian government institutions in employing digital technologies to confront the COVID-19 crisis in order to draw lessons from it.

- Draw the attention of researchers in all fields to the importance of this subject and encourage further future studies on it.

I.5 - Study Themes:

1. Literature on digital transformation in institutions.
2. Manifestations of digital transformation in government institutions during the COVID-19 crisis.
3. Evaluating the status of Algerian institutions in the field of digital transformation.

II - Literature on Digital Transformation in Institutions

II.1 - The Concept of Digital Transformation in Institutions:

In the context of the knowledge economy, digital transformation has become essential for all institutions aiming to develop and improve their services. It is a comprehensive program that targets all the activities of an institution by adopting new work models and reengineering services to focus on beneficiaries, relying on digital technology to simplify procedures and make them more user-friendly. This requires support from senior leadership. This necessity has driven many institutions to adopt digital transformation as a fundamental strategy to enhance their performance, ensuring their survival, continuity, and the growth and profitability of their services.

Digital transformation refers to the ability of institutions to adapt to and respond to rapid technological changes. It is one of the most important components and drivers of growth in institutions and government sectors, which forces them to engage in a crucial race to develop innovative solutions that ensure their continued presence in the competitive sphere. It is a significant and long-term process that begins with abandoning traditional working methods and transitioning to modern electronic approaches. This shift saves time, costs, and effort, significantly improving operational efficiency and organizing it, while also enhancing quality and simplifying the procedures to access the provided services. This is achieved by leveraging technology for organizational change through the use of digital techniques to meet objectives in a dynamic competitive environment (Al-Nadawi & Al-Zuhairi, 2020).

This view is echoed by Wade, who considered digital transformation as an organizational change through the use of digital technologies and business models to improve performance (Wade, 2015, p. 3). Similarly, Samuels sees digital transformation as a process involving the use of technologies to redesign processes and activities to make them more efficient and effective (Samuels, 2015, p. 3). This transformation occurs when institutions shift to a business model that relies on digital technologies to innovate products and services, create new revenue streams, and enhance the value of their products by building a digital strategy. This can only be achieved by measuring current digital capabilities, determining the best work structure for digital marketing activities in the institution, identifying investment plan requirements, and overcoming digital integration barriers to develop a comprehensive plan under all conditions. The digital transformation process is then driven forward with change management to achieve strategic goals (Al-Barr, 2018, p. 2).

As stated by an international consulting firm, digital transformation is a continuous process that institutions undergo to adapt to the needs of their customers and markets by deploying digital capabilities to innovate new business models, products, and services that seamlessly blend digital and manual operations, enhancing customer experiences while improving operational efficiency and organizational performance (Al-Masr & Nasr Allah, 2020, p. 5).

In general, digital transformation can be defined as the process of integrating digital technology into all areas of business, changing the way products and services are delivered. It is also a cultural shift that creates new and innovative job opportunities, requiring institutions to constantly challenge the status quo. Therefore, it demands continuous investment in developments that satisfy customers. This exposes institutions to many changes resulting from the shift to digitalization, arising from advancements in the environment, such as new Internet of Things (IoT) platforms, cloud computing, big data platforms, artificial intelligence, and others.

II.2. the Importance of Digital Transformation

Digital transformation is one of the most important factors that will determine the future of institutions in the coming period. Everyone is looking to improve efficiency, reduce spending, and quickly and flexibly implement new services, thus achieving sustainable effectiveness and competitiveness through the application of digital transformation mechanisms. This will lead to a radical change in the services provided in many fields (Al-Hajilan, 2020, p. 3). The importance of digital transformation in institutions, especially government ones, lies in achieving many positive aspects related to innovation and performance development through: (Al-Masdar & Nasr Allah, 2020, p. 7)

- **Efficiency of government transactions and services**, where government institutions use digital tools to improve their dealings with beneficiaries;
- **Improving decision-making**, where government institutions benefit from big data analytics in various fields, and can employ complex algorithms and systems for data analysis that respond to real-time changes;
- **Reducing the duration of government procedures** and creating an efficient and effective informational environment linked to the implementation of financial inclusion;
- **Facilitating data exchange**, which contributes to enhancing transparency and citizens' trust in their government institutions, with equal opportunities for citizens to access information about business and available investment opportunities;
- **Digital transformation contributes to creating opportunities for offering innovative and creative services** and helps government institutions expand and reach a broader range of clients;

- **Shifting from traditional services to digital services**, eliminating bureaucracy, reducing human errors, and separating citizens from service providers, aiming to reduce corruption and rationalize spending;
 - **Raising awareness among beneficiaries of government services regularly**, by increasing citizens' utilization of these services and expanding their coverage to a larger number of beneficiaries;
 - **Enhancing integration and connectivity between various government entities at the national level**, aiming to transition from isolated units to a comprehensive and integrated digital government approach.
- Therefore, International Data Corporation (IDC), the world's leading provider of market intelligence, advisory services, and events related to information technology, communications technology, and consumer technology markets, predicts that global spending on technologies and services enabling digital transformation will reach \$1.97 trillion in 2022, according to the semi-annual digital transformation spending guide worldwide. It expects spending to grow exponentially, achieving a compound annual growth rate of 16.7% between 2017 and 2022 (Linkit, 2019).

II.3. Requirements for Digital Transformation in Institutions

The application of digital transformation in institutions begins with technologies using a system of devices, data, storage, and software that operate within technical environments and data centers, allowing for the efficient and uninterrupted use of all assets. It is assumed that institutions will make regular and effective efforts in managing and analyzing data to provide documented high-quality data and develop tools for statistical analysis, data mining, and future forecasting. Therefore, institutions must provide qualified human resources capable of using and analyzing data to make effective decisions. It also requires planning visions and implementing them with human competencies and scientific and practical experiences, along with a belief in change and development. Furthermore, institutions must prepare an effective technical infrastructure that allows performance development both internally and externally to ensure optimal digital transformation implementation. This includes creating a technical infrastructure with policies and procedures covering all institutional activities and processes, integrated with the necessary technologies, advanced applications, and processed data (Al-Bar, 2018, p. 4). It is worth mentioning here the most prominent models applied for digital transformation in institutions: (Ahmed Amin, 2018, pp. 58-59).

- **The Behavioral Model:** This focuses on behavioral variables at the individual, group, organizational, and environmental levels.

- **The Socio-Technical Model:** Based on the degrees of technical and organizational interaction, it focuses on business strategies and the necessary software to activate computing, databases, and communications.
- **The Strategic Transformation Model:** Relies on the strategic planning of the institution and considers information and communication technology (ICT) as one of the pillars of competitive advantage.
- **The Organizational Development Model:** Focuses on the organic transformation of institutions through learning and transformative training instead of rigid solution opportunities.
- **The Ideal Model:** Based on searching for optimal solutions for ICT applications, simulating processes before actual implementation, while attempting to reduce costs, aiming for the highest results, eliminating waste, and engaging in regular replacement with continuous software development.
- **The Cost-Benefit Model:** Some institutions compare the costs of transforming into a digital institution with the expected gains from acquiring information systems.
- **The Integrated Transformation Model:** Based on the philosophy of integrated transformation for all departments and organizational levels to build a digital organization, linking changes in business systems with updates in digital management systems.
- **The Outsourced Transformation Model:** Some institutions rely on computing and software companies to manage their ICT systems.

In this context, regardless of the model adopted, Amazon Web Services (AWS), a leader in cloud computing, provides a checklist for building strategies that enable innovation freedom and developing the appropriate working methods for achieving successful digital transformation, based on: (Al-Iqtisadiyah, 2018)

- **Transforming the Vision:** Digital transformation requires a clear vision for the starting point of this transformation, which involves rethinking the approach and how new technology can help achieve it.
- **Adopting a Culture of Change:** This refers to transforming the organizational structure from a traditional hierarchical model to smaller teams empowered to make decisions. This collaborative environment between development, IT staff, and strategic units can lead to enhanced services. Thus, transforming the institution's culture and work environment in the first stage of the transformation is considered a positive step contributing to the success and implementation of digital transformation.
- **Changing the Cost Model:** Cloud services can positively impact costs by enabling the updating of infrastructure without significant capital investments. Avoiding long purchasing

processes and upfront payments allows for more projects to be implemented through instant access to computing resources anytime, anywhere, and on any device.

- **Starting Operations in the Cloud:** Some institutions prefer to transfer licenses and individual projects to the cloud, while others prefer to start operations directly in the cloud. For example, DevOps is a system that allows institutions to provide software updates and security internally and to customers. The ultimate goal is to launch products in the market, offer software updates and security faster, and make the entire process more reliable.

- **Tracking the Implementation Process:** When the full digital transformation process is meticulously executed while respecting the transformation steps, it will contribute to improving and increasing profits. Metrics are created to track and measure the progress of the process.

The digital transformation process for both private and government institutions follows general steps for digital transformation project strategies that can be relied upon and guided. However, this requires a set of essential prerequisites that must be provided by the entities assisting in the digital transformation process, including: : (Yves Prax, 2000, pp. 13-15).

- **Assisting State Institutions in the Digital Transition Process:** This is done by building and providing the necessary information and communication technology (ICT) infrastructure in various forms and orientations, to create a suitable environment for its utilization across all sectors. Additionally, efforts should be made to develop human resources by revisiting educational strategies to include updates in curricula and integrate ICT metrics at all levels. Encouraging innovation can be achieved by providing financial facilitation for research and development projects. Furthermore, it is important to update judicial and legislative systems, especially those related to intellectual property rights, internet regulations, and digital security laws to protect consumers. Economic incentives such as exemptions and tax reductions for digital projects, as well as financial subsidies in various economic sectors, should also be provided. Additionally, reducing the cost of telecommunications services and import taxes on ICT products and services is crucial.

- **Assisting Non-Governmental Organizations (NGOs) in the Digital Transition Process:** This involves leveraging ICT to advance comprehensive development goals by improving and raising awareness across different societal segments. It is essential to ensure horizontal exchange of knowledge and experiences between various institutions on one hand, and between private sector representatives and governmental bodies on the other. Efforts should be made to amplify the voices of marginalized groups to policymakers, integrating them into policies, programs, and strategies.

- **Assisting the Private Sector in the Digital Transition Process:** This involves understanding the private sector's requirements to adopt and integrate new technologies into

management, production, marketing, and other activities of various economic institutions. Experiences from institutions such as the American CHEVRON petroleum company and the Swedish SKANDIA insurance company have demonstrated their effectiveness in managing intellectual capital through digital integration.

III- Digital Transformation of Government Institutions Amidst the COVID-19 Crisis

III.1- Digital Transformation as an Option during the COVID-19 Crisis

The COVID-19 crisis played a significant role in the immediate adoption of digital transformation to ensure business continuity. Great emphasis was placed on the use of technology as it became a cornerstone during this period, significantly accelerating the digital transformation and its practical implementation. With the rapid pace of digital transformation due to the pandemic, the digital future seems to be approaching faster than ever before, possibly even faster than anticipated. As a result, many global companies such as Webex, Microsoft Teams, and Zoom began adjusting their operational policies to allow the maximum number of users to benefit from their services, contributing to the structure of remote education and work. This shift reflects the significant role that digital technologies play in helping countries face the pandemic (Qalloul & Tahla, 2020, p. 21).

Countries that had advanced in digital transformation, such as South Korea, were able to control the spread of COVID-19. They used artificial intelligence (AI), the Internet of Things (IoT), and robots to replace human teams for providing essential medical services to patients. They also relied on big data, comprehensive surveillance systems, and facial recognition technology to detect early cases of infection or those potentially at risk. Furthermore, drones and robots were used for street disinfection and in contaminated areas, while also providing guidance to pedestrians and ensuring compliance with medical instructions (Khwilad & Bouzreb, 2020, p. 43).

Countries with advanced digital infrastructure were able to offer a near-normal life for individuals, whether for work or education, but remotely, through smart government systems and video systems that allowed many people to continue their daily activities and helped students follow their lessons and lectures. Institutions quickly adapted to leverage digital technologies. For example, in China, the "Ant Group" partnered with over 100 banks to launch contactless loan initiatives to help small and medium enterprises cope with the COVID-19 crisis. In Brazil, the Central Bank launched the PIX system, a wide-reaching instant payment system. In India, the Riskcovry company introduced insurance policies against COVID-19 for companies wishing to offer health care for employees and coverage in case of wage loss (Ngorogeh & Bazarbashoglu, 2020).

Algeria, like other countries, faced a major shock due to the COVID-19 pandemic and the rapid digital changes that came with it. This situation forced everyone to employ digital technology in line with the requirements of the phase and its economic and social consequences, through the enhancement of some digital government services, which were first introduced in 2008. At that time, Algeria developed a phased strategy known as "e.Algerie2013," aimed at expanding internet

connectivity, digitizing public services, and modernizing the legal framework (Ghazal, 2014, p. 8). The digital government services launched across various sectors made many administrative and daily transactions much easier for citizens, saving time and effort. For example, the "Citizen Portal," created by the Ministry of Interior and Local Communities, allows citizens to receive information and answers to their administrative, commercial, and even investment-related inquiries. Additionally, the Ministry of Interior's portal provides information on passports, biometric national identity cards, and procedures related to them, as well as services like obtaining a criminal record and nationality documents, and paying utility bills for landlines, mobile phones, electricity, gas, water, and Algerian Airlines tickets. Algerian banks also provide electronic payment services (e-Payment), enabling users to settle bills and services through websites that accept this method.

The state also made digitalization a cornerstone of the "Algeria Vision 2035" strategy, one of the country's main development goals before the pandemic. This goal, which has become even more crucial now, aims to diversify and develop the national economy through eight key sectors: tourism, food industries, chemicals, construction materials, automotive, electronics, electricity, renewable energy, and textiles. Algeria has also launched several projects to promote digitalization, such as the "Asratak" project, the smart city project in Sidi Abdallah, e-learning initiatives, the virtual library project, and the "Orsak" program for combating natural disasters.

In response to the demands of the COVID-19 crisis and to ensure business continuity, government institutions worked to find digital solutions during the pandemic to mitigate the effects of closures and curfews. These efforts included enhancing financial technology innovations and developing digital financial services, with doubled efforts to meet customer needs effectively and efficiently and achieve digital transformation. Electronic banking services, which gained unprecedented attention since the beginning of the pandemic, became a critical element for both banks and customers. Banks began adopting digital strategies based on solid pillars that allow new business models, help institutions address critical liquidity issues, and enable them to interact with financial service providers, withdraw from existing credit lines without delay or disruption, and access alternative financing to compensate for liquidity shortages in traditional financial operations. Digital identity, which started in Algeria in 2016, allowed financial institutions to efficiently interact with clients in compliance with anti-money laundering requirements and other "Know Your Customer" standards (Delor & Boubarn, 2021). Furthermore, developments in open application programming interfaces (APIs) allowed digital financial service providers to access data from various public and private systems, increasing speed and reducing the cost of financial services without compromising security and regularity.

However, the use of digital financial services remains extremely low due to risks for both users and the financial system, such as concerns about data privacy, unequal access to technology, the digital divide, cybersecurity, operational risks, financial safety, and challenges related to

competition authorities. All of these factors require the competent authorities to exercise a high level of regulation, supervision, and oversight.

Amid the COVID-19 pandemic, e-commerce has become a secure alternative for various commercial operations and has witnessed significant growth during this crisis. For instance, the Algeria Post office provided merchants with electronic payment devices for free, prioritizing areas under lockdown (Nafea & Chabani, 2020, p. 194). E-commerce platforms gained significant importance, with the entry of Jumia into Algeria, joining local platforms such as OuedKniss, Batolis, and Ideal Forme. Telecommunication companies also benefited from digital financial services' ability to facilitate payments and provide real-time payment services for solar energy, insurance, and lending services (Delor & Boubarn, 2021). In this regard, the Ministry of Commerce launched several projects, such as an information system to monitor imported goods, while the Ministry of Finance initiated the digitization of regional treasury systems and launched an information system that allows taxpayers to fulfill their obligations remotely.

Algeria has not yet experienced telemedicine; however, the government has started to make health information available online by providing the necessary data. Additionally, medical consultations via telemedicine platforms have been launched. The country also introduced electronic pharmacy services, digital hospitals, and the digitization of contractual relations with social security bodies. Moreover, Algeria began producing a COVID-19 vaccine on September 29, 2021. As for the judicial institutions, Algeria digitized legal files, implemented electronic notifications of judicial documents, and enabled remote submission of complaints and requests (Minister of Digitalization and Statistics).

During the COVID-19 crisis, there was significant activity in the creation of digital applications and platforms aimed at improving business efficiency, reducing the risk of virus transmission, and enhancing the use of pre-existing applications created before the pandemic. Institutional meetings, including those at the highest levels, were held through various digital platforms for remote communication of news and events. Government sessions and even presidential meetings were broadcasted live, and meetings were held via Audio/VideoConference using applications like Zoom and Microsoft Teams. There is potential for further efforts to raise awareness of their benefits and encourage their growth. By expanding access to digital platforms, Algeria will enhance economic activity and simplify daily life for its citizens, allowing them to increase their assets or inject productive investments. Most importantly, this will help mitigate the shocks caused by the COVID-19 pandemic.

III.2 - Digital Transformation as an Option Post-COVID Crisis

Technology and digital solutions have proven to be essential tools during this crisis, helping governments ensure the continued provision of essential public services and address crises and emergencies by mobilizing resources to maintain digital services infrastructure and create

new, innovative digital solutions. This is evident in government initiatives to quickly launch a range of services aimed at providing vital industries and citizens with the necessary resources. Strengthening and expanding digitalization has become one of the main strategies adopted by government institutions, which have reconsidered traditional work patterns, moving toward remote work, electronic payments, and digital management, among other things.

The rapid transition to everything digital after the COVID-19 crisis has led to significant changes across all sectors and resulted in profound social transformations, altering traditional habits and responses to events and issues. Undoubtedly, the pandemic has left some positive impacts regarding the use of digital tools in daily life. Although digital technology was rarely used continuously by individuals before the crisis for various reasons, such as lack of awareness or disinterest, the pandemic forced societies to adopt these tools due to full and partial lockdowns. There is no going back now; this change is permanent and will deepen in the future. It is crucial for the state and institutions to think about how to leverage this transformation to enhance the efficiency of their operations. Institutions must develop their digital skills to adapt to this phase. Those institutions that quickly adapted to digital transformation in their work have succeeded in managing the crisis. Therefore, institutions must embrace digital work methods to survive and continue, which is inevitable, especially since remote work is one of the changes imposed by digital transformations during the pandemic, and this will continue in the future. While remote work faced many challenges, varying from one institution to another and one region to another depending on the readiness of the necessary infrastructure, such as required internet bandwidth, the applications used, and employees' ability to handle these applications, countries that made significant progress in digital transformation were the most capable in managing remote work.

Algerian government institutions were affected by the pandemic, experiencing both negative and positive consequences. As part of efforts to ensure the sustainability of operations with high efficiency across all sectors, digital mechanisms were developed to ensure the continuity of work in all circumstances and to develop new business models that employ emerging technologies while innovating new solutions. In this context, the need to accelerate the pace of digital transformation during and after the COVID-19 crisis, and to address various types of crises, became evident. This was confirmed by the former Minister of Digitalization and Statistics, Mounir Brahim, on December 28, 2020, who stated that developing a digital ecosystem that includes economic and social actors would speed up the digital transformation process. On April 1, 2021, the current Minister of Digitalization and Statistics, Hussein Sharhabil, also emphasized that his ministry was working on preparing a national digital transformation strategy, which would serve as a reference in the country's digital development efforts (Algerian News Agency, 2021).

The First President of the Supreme Court, Abdel Rashid Tabi, on Monday, June 14, 2021, highlighted Algeria's efforts in adopting electronic governance tools and accelerating their

widespread use, particularly in recent times due to the urgent necessity imposed by the COVID-19 pandemic. The pandemic underscored the need for international cooperation to ensure mutual safety. On March 23, 2021, Minister Hussein Sharhabil met with Li Jiguan, the Vice President of Huawei for North Africa, where they exchanged views regarding Algeria's digital transformation project (Algerian News Agency, 2021). Moreover, over 2,000 remote trials were conducted due to the COVID-19 crisis, which prompted Minister of Justice Belkacem Zghamti to announce the establishment of an electronic prosecution system. This system would allow citizens to file complaints and prevent any abuse, ensuring easy access to the public prosecutor and facilitating the progress of legal cases (Ghorari, 2020, p. 389).

Technology has become a driving force for radical digital transformations, contributing to creativity and innovation, and translating these efforts into applications capable of capturing commercial markets and dominating the new world. In this regard, Minister of Higher Education and Scientific Research Abdelbaki Ben Zian presented on January 18, 2021, the national strategy for research and innovation in artificial intelligence for the period 2020-2030. The strategy aims to enhance Algeria's capabilities in artificial intelligence through education, training, and research. It also seeks to support capacity building as a tool for development, enabling various economic and social sectors to overcome obstacles to the ongoing digital transformation. This will accelerate the implementation of developmental programs and projects, improve performance, create an innovative working environment, and support initiatives to increase productivity (Algerian News Agency, 2021).

I.V. Assessment of the Status of Algerian Institutions in Digital Transformation

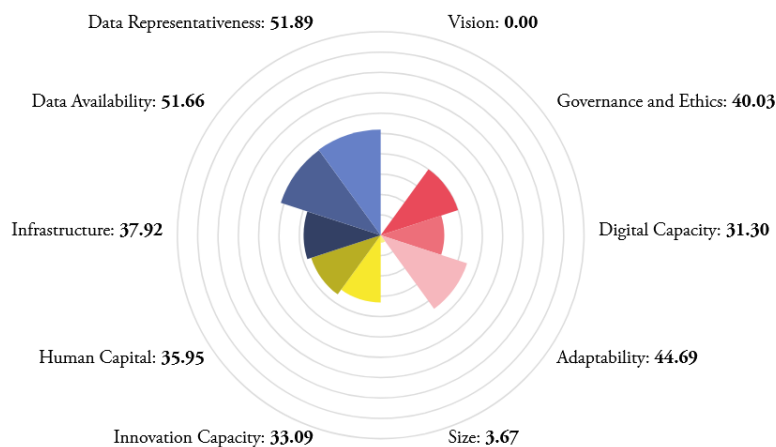
I.V.1. Government Readiness for Artificial Intelligence

Amid the COVID-19 crisis, the strategic importance of artificial intelligence (AI) for governments around the world became clearer than ever. With the onset of the pandemic, AI helped pharmaceutical companies develop new drugs and treatments. AI was also used in managing the pandemic and played a role in economic recovery by assisting in sectors ranging from healthcare to education and transportation, improving the delivery of public services.

The readiness of a government to apply and benefit from AI technologies is one of the most critical factors in promoting these technologies within institutions. According to the results of the 2020 Government AI Readiness Index, Algeria ranks 118th out of 172 countries, indicating a significant gap between Algeria and the leading countries in this index. This suggests that greater efforts are required to create a conducive environment for supporting AI technologies, particularly as Algeria adopts a digital transformation strategy. The development of a government strategy is considered one of the key global indicators that assess the progress of AI in a country. This is currently the case for Algeria, as global indicators show that despite the large number of AI research labs spread across universities in the country, Algeria still ranks low. This was confirmed

by Ahmed Kssoum, Director of the AI Research Lab at Bab Ezzouar University, who stated that there are 116 AI-related research labs in Algeria, spread across 40 universities nationwide. Despite the growing number of these labs, their output remains modest (Al-Fajr, 2021). Therefore, what the country urgently needs is a government strategy that sets national objectives, action plans, and provides funding over the coming years.

Figure 1: Government Readiness for Artificial Intelligence in Algeria



Source: Oxford Insights and International Development Center, (2020). “Government AI Readiness Index?” Available at: <https://www.oxfordinsights.com/government-ai-readiness-index-2020>.

From the figure, it is clear that Algeria faces challenges in benefiting from artificial intelligence (AI) technologies, primarily due to the country's technical infrastructure levels and human capital. One of the main obstacles is the low levels of human capital, which are crucial for making substantial progress in AI. Additionally, there are issues related to providing fast internet, simplifying the construction of data centers, and building supercomputing capacities. The country also faces challenges related to entrepreneurship, as well as regulating and controlling the activities of multinational companies like Facebook and Google in Algeria, particularly in terms of protecting information and the privacy of Algerians. A clear and strict policy regarding the localization of data centers and information, similar to those created abroad, is needed. These technologies could contribute to increasing the added value to economic sectors that support diversification, such as industries, public services, and professional services. Therefore, Algeria must intensify its efforts to make significant strides in several areas that support AI development.

I.V.2. Network Readiness Indicators

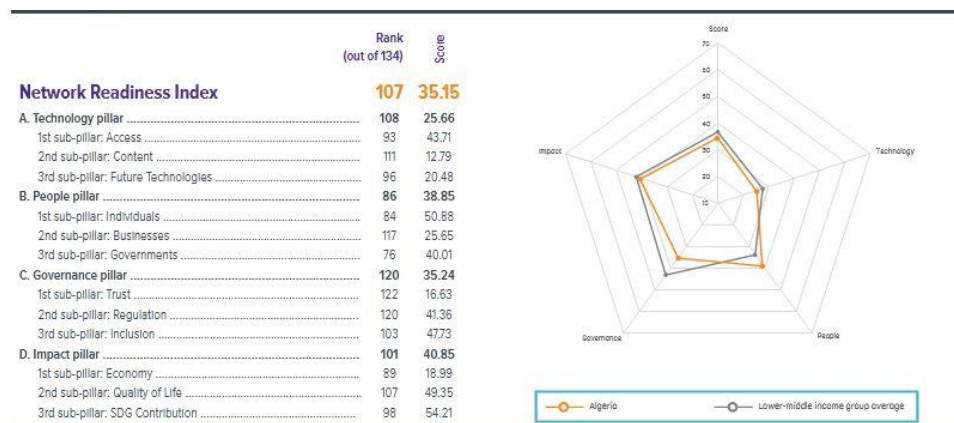
To assess the digital transformation status of any country, technical committees from the United Nations and other organizations have continuously developed shared indicators that help determine the digital gap across various sectors and guide countries in formulating appropriate strategies. One of the key indicators is the Network Readiness Index (NRI), created to assess

whether the network is ready and whether the world is prepared for a unified network. Initially developed by experts from the World Economic Forum in 2000, it was later handed over to the Portulans Institute in the United States in 2019. This index, also known as the Digital Network Readiness Index, evaluates countries' economies based on their ability to utilize Information and Communication Technologies (ICT) across four main areas, each with three sub-factors, totaling 62 indicators. These areas and sub-factors include:

1. **ICT Infrastructure:** Access, content, and future technologies.
2. **ICT Usage:** By governments, businesses, and individuals.
3. **Governance and Business Environment:** Regulatory framework, trust, and inclusiveness.
4. **Impact of ICT Use:** On economic, social, and sustainable development.

According to the 2020 annual report by the Portulans Institute, which includes 134 countries, Algeria ranks 107th with a total score of 35.15. This ranking reflects the significant digital gap faced by Algeria. The figure below shows the results specific to Algeria.

Figure 2: Network Readiness Index for Algeria, 2020



Source: The Network Readiness Index, 2020, p. 65 (PORTULANS Institute)

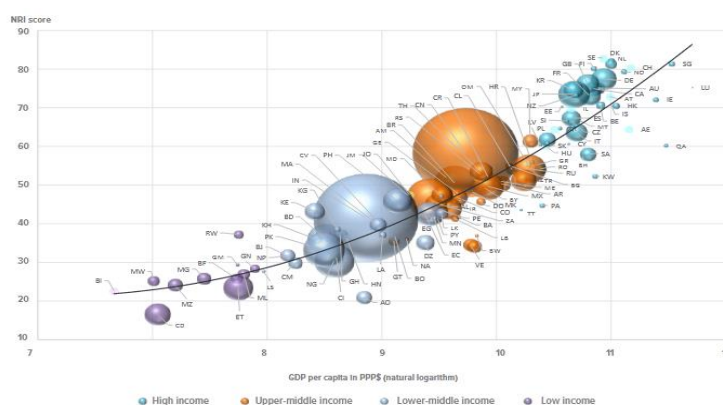
The figure demonstrates that Algeria ranks poorly across various areas and has not even reached the level of middle-income countries. Looking at the recorded numbers and scores, there is a notable lag in terms of ICT infrastructure as well as governance and the business environment. The digital gap in Algeria is particularly evident in the delay of e-government development, the weakness of e-commerce, and the lack of access to modern technologies, emerging technologies, and investment in them (such as AI, robotics, and IoT). Additionally, there is an absence of smart applications and digital platforms, coupled with weak geographic connectivity to high-speed internet, despite recent investments in infrastructure and internet services. This highlights the inadequacy of these investments in covering all regions and providing services to all Algerian institutions, regardless of their nature and legal status. There are also issues with cybersecurity,

organizational challenges, and outdated legislation. Furthermore, Algeria faces a lack of high-quality goods and services in the ICT sector, indicating the significant deterioration in the use and spread of technology. This is also reflected in the lack of trust in electronic transactions and the related administrative procedures, which reduces the willingness to adopt digital technologies and hinders the development of the economy in an environment hostile to anything intangible.

- I.V.3. Measuring Performance by Income Group and the Global Innovation Index

The adoption of multi-dimensional strategies to enhance network readiness in various countries has a significant impact on efforts to expand access to ICT, regulate it, and invest in emerging technologies. This is often closely tied to high levels of trust and security, as these countries are at the forefront of future technologies, which directly correlates with performance in the Network Readiness Index (NRI) for their economies. The income level of a country is one of the strongest indicators of performance, reflecting the extent of its digital transformation. The following figure illustrates this relationship by plotting points against GDP per capita in terms of purchasing power parity (PPP). As seen, the score increases with income level. Therefore, higher-performing countries are generally high-income economies, while lower-performing countries are predominantly low-income economies. Countries with lower-middle-income and upper-middle-income fall into the expected ranking.

Figure 3: Performance Measurement of Countries by Income Group



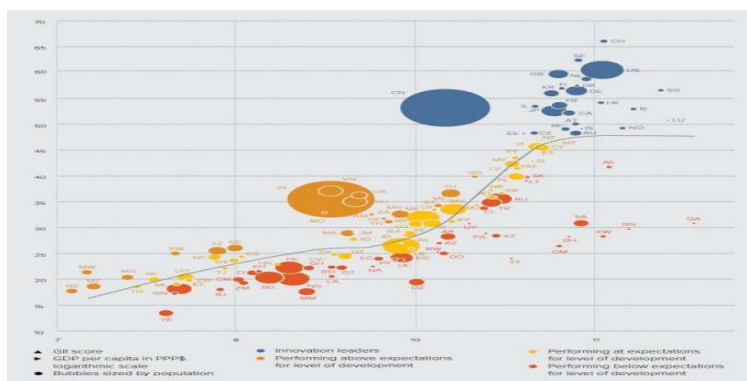
Source: The Network Readiness Index 2020, p. 39 (PORTULANS Institute)

Note: GDP per capita is calculated based on purchasing power parity (PPP) in dollars (natural logarithms). Data on GDP per capita and population (represented by bubble size) is from 2019 or the most recent available year. The data is sourced from the World Bank's World Development Indicators database. The trend line is a second-degree polynomial ($R^2 = 0.86$).

The results indicate a slow pace of digital transformation in Algeria when compared to the significant leaps made by many other countries, which could have a substantial impact on efforts toward effective digital transformation, especially during the COVID-19 crisis. It is also worth

noting that some lower-income countries, such as Vietnam, rank higher than Algeria. This suggests issues with the strategy being followed and the structure of the economy in Algeria.

Figure 4: Global Innovation Index 2020 and its Relationship with Development Performance of Each Country



Source: World Intellectual Property Organization (WIPO), 2020, p. 20

In 2020, Algeria ranked 121 out of 131 countries on the Global Innovation Index, as published by the World Intellectual Property Organization (WIPO). This low ranking is attributed to an unsupportive scientific environment for innovation in Algeria, the obstacles faced by local innovators, a lack of funding and follow-up for innovation projects, and the nature of research activities in various fields. Additionally, the absence of laws and regulations to protect innovative works has been a significant barrier. However, Algeria improved its ranking in 2021, moving up to 120 out of 132 countries, largely due to the accelerated adoption of digital solutions, applications, and services, which was driven by the COVID-19 crisis. Despite having resources and potential for higher scores in the Global Innovation Index, Algeria failed to capitalize on them due to ineffective government policies, lack of strategic direction, and insufficient national plans to develop infrastructure that would allow genuine access to the world of innovations. This situation calls for a reevaluation of national strategies to adapt to the changing national and global economic environment, especially in the field of scientific research.

V.

Conclusion:

The COVID-19 crisis has significantly compressed the timeline for digital transformation, forcing countries to quickly lay the foundations for this transition. The crisis has pushed everyone to adopt digital solutions to manage everyday tasks and operations within administrations and institutions. Many countries have sought to heavily invest in digital technologies, utilizing them not only for communication but also to ensure the continuity of vital sectors. Therefore, accelerating digital transformation has become a strategic choice that must be embraced by all nations. Algeria, too, must reconsider its approach to government digitalization, as it was an inevitable option in light of

the pandemic. The country faced various challenges, notably in government digitalization, funding, and human resources. The biggest hurdle was providing the necessary communication infrastructure, especially fast internet, which is essential for fostering innovation and technological advancement. While Algeria has made progress in adopting technology, this is just the beginning. There is still a significant gap in the necessary regulations to address this new type of transformation, as well as a lack of digital literacy among the population and a shortage of experts in smart software for dealing with the digital economy.

V.1 Key Conclusions

- Algerian government institutions were unable to manage the COVID-19 crisis effectively due to the lack of clear strategies to manage various crises successfully.
- The COVID-19 crisis was largely caused by the inability of institutions to anticipate a pandemic, which is expected to occur once every century and poses a significant threat, especially as geographic borders disappear and the world becomes a global village.
- The crisis has highlighted the critical importance of communication and information technology, which became the primary tool and foundational pillar in combating the pandemic's consequences and reshaping the rules of the game.
- Technology and smart applications have the potential to improve services and address challenges and crises effectively.
- The COVID-19 crisis demonstrated the urgent need for comprehensive digital transformation, which can only be achieved by integrating advanced technologies such as 5G and 6G. These technologies offer users full freedom to employ secure technology, with features like Network Slicing and a focus on cybersecurity. It is also essential to train personnel in network security and develop electronic protection features to accelerate the digital transformation process, strengthen national strategies for ICT development, and support smart policies to encourage investments, collaboration, and partnerships. This approach will improve operational efficiency in institutions, enhance service quality, streamline processes, and reduce costs.
- The expansion of online work due to lockdowns has accelerated the pace of digitization, as well as boosted efforts for technological innovation. However, performing all functions online is difficult, and there is a significant disparity in access to high-speed internet. This means that the Covid-19 crisis has deepened the digital divide.
- The Covid-19 crisis has highlighted the need for government institutions in Algeria to accelerate their digital transformation in delivering digital services. In particular, to stay in line with the times and its changes, and to stay ahead of potential future disruptions, they need to adjust business models for both front-end and back-end operations. Adopting the latest technologies,

including 3D printing, blockchain, the Internet of Things (IoT), digital solutions, digital currencies, artificial intelligence, and cloud computing, is the foundation of digital services.

- Although some digital services were provided by most government institutions in Algeria, they were not used in the way required by the global digital development and transformation. Therefore, it is essential to establish an efficient and effective digital administration by offering secure services with high added value, in general, to enhance modernization, transparency, and public performance, as well as to contribute to improving the business environment. This would allow for the creation of a suitable space for creativity and innovation, helping to expand and spread further, not to mention contributing to completing transactions.

- Government institutions faced major challenges regarding the increasing demand for digital services, which require a broad scope of high flexibility and immediate responses. Given the complexity of the pandemic, there are many reasons to believe that the response phase to the Covid-19 crisis will require unprecedented levels of coordination, communication, and policy changes, and this will take time.

- The crisis has demonstrated the positive potential of digital transformation, mastering new tools, and introducing new practices and business models. This calls for swift and new actions to support this transformation in Algeria, which still lacks the necessary infrastructure and equipment to deploy electronic solutions. There is a need to prioritize digitization.

V.2 - Recommendations and Study Suggestions:

- Establish the necessary infrastructure, including technology, communication networks, equipment, and devices, as well as training for all employees in government institutions;
- Allocate the budget for necessary measures for digital transformation, particularly in research, development, and digital innovation;
- Develop comprehensive awareness programs suitable for all administrative levels to reduce the resistance of some employees to digitization;
- Provide all necessary information systems and organizational preparations within the government;
- Change the business model at all levels of the institution and business structures by adopting a digital approach based on emerging technologies;
- Raise awareness among transaction users about digital dealings, the importance of accessing electronic services, and enhancing the use of digital technologies;
- Provide appropriate legislation to regulate electronic transactions;
- Learn from successful and pioneering countries in this field.

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Research Article

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