Accelerating Digital Transformation to Achieve Sustainable Development in Algeria

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Abstract: Since the emergence of the coronavirus pandemic, digital transformation has become a crucial tool in several aspects of life. Experts and scientists agree that digitalization is the essential key for all governments to implement sustainable development in both developed and developing countries. For example, many African countries are focusing on improving their digital systems in order to meet the 2030 Agenda for Sustainable Development. Today, this Agenda represents United Nations' 17 Sustainable Development Goals (SDGs) in order to improve the lives of billions. In the last few years, Algeria has seriously taken up the issue of digital transformation to achieve sustainable development. This research paper discusses the concept of sustainable development in Algeria and how digital transformation can contribute to reaching sustainable development. It also illustrates different aspects of sustainable development that can be impacted by the digitalization process. The paper demonstrates the efforts deployed by the Algerian government in terms of digitalization to reach sustainable development. The other objective of this study is to highlight the different challenges faced by the Algerian government during the digital revolution. To do this study, the researcher adopts a descriptive analytical method. In addition, data was gathered from various research sources (national and international literature), reports, documents, and websites in order to make a comprehensive assessment of Algeria's efforts to reach sustainable development via digitalization.

Keywords: digital transformation, ICT, Algeria, sustainable development, 17 SDCs, coronavirus

INTRODUCTION

During COVID-19, digital transformation has become a powerful tool to perform a large number of activities in various aspects of our lives. If the spread of COVID-19 has restricted people's movement, digital

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tools provide people with a variety of online activities such as telework, e-learning, telehealth, online shopping, and video calls. In fact, this crisis has shown the whole world that the digitalization process is an essential element in improving the lives of billions of people and achieving sustainable development (KPMG 2022). Digital technologies can play a vital role in achieving every single one of the 17 Sustainable Development Goals (SDGs) (ITUPP 2018). The United Nations has adopted the 2030 Agenda for Sustainable Development, which includes 17 goals to be achieved (Ono et al. 2017). In this context, all 193 U.N. member states have established mechanisms and actions to achieve the economic, social, and environmental goals of the Sustainable Development Agenda under the motto "Transforming our world" (Center for Sustainable Development 2022).

At the continental level, digital transformation is also crucial to reaching a large number of SDGs. According to Bäck (2019), digitalization is the next fundamental step and a powerful tool, especially for African countries, to accomplish all 17 of the SDGs. For this reason, the Digital Transformation Strategy (DTS) is the most important initiative launched by the African continent during the coronavirus crisis to improve the lives of the African people. The African Union adopted its own Digital Transformation Strategy (DTS) on February 9, 2020, for the period 2020–2030, to take advantage of information and communication technologies. The DTS also aims to make economic progress, create new jobs, bridge the digital divide, and eliminate poverty (Schuman Associates 2020). In addition, the DTS for Africa has been developed by the African Union in collaboration with the UN Economic Commission for Africa, Smart Africa, AUDA-NEPAD, Regional Economic Communities, African Development Bank, Africa Telecommunications Union, Africa Capacity Building Fund, International Telecommunication Union, World Bank, and other partner institutions (UNECA 2021). The DTS for Africa is expected to boost critical sectors such as e-governance, e-education, e-health, digital industry, digital trade & services, and digital agriculture (AU 2022). This strategy relies on existing initiatives, such as the Program for Infrastructure Development in Africa (PIDA), to assist in the evolution of a Digital Single Market (DSM) for the continent (Tralac 2020). SDGs could be successfully implemented if governments lead digital transformation actions and involve the essential components of society, such as principal actors

from the public sector, private sector, academia, civil society, and individuals.

Across the African continent, governments are today aware of the importance of digital technologies to grow the economy and create innovation. The Algerian government, like all other countries on the continent, has prioritized the use of digital technologies to achieve long-term development. In fact, Algeria has launched the national digital transformation strategy 2020–2030 with the purpose of ensuring sustainability in different areas. This strategy aims to improve connectivity, generalize the use of information and communication technologies (ICT), particularly in public service administrations, and improve governance in the economic sector. The elements of this strategy have been elaborated in collaboration with several public institutions and administrations, training and research establishments, experts, various economic operators and digital players, as well as start-ups, with the aim of improving public governance through digitization, facilitating public service, strengthening the economy, and promoting digital citizenship (APS 2022). The aim of this research was to demonstrate the efforts deployed by the Algerian government in terms of digitalization to achieve sustainable development goals in order to improve the lives of millions of citizens. This paper also tried to explore the impact of digital actions and programs on various sectors such as education, health, business, energy, and agriculture.

DIGITAL TRANSFORMATION & SUSTAINABLE DEVELOPMENT IN AFRICA

The Organization for Economic Cooperation and Development (OECD) describes the difference between three notions: digitization, digitalization, and digital transformation. In this regard, the OECD indicates that digitization is "the conversion of analogue data and processes into a machine-readable format." Additionally, digitalization is "the use of digital technologies and data […] that results in new or changes to existing activities," and finally, digital transformation refers to "the economic and societal effects of digitization and digitalization" (OECD 2019, 18). In other words, "digital transformation" means adopting digital technologies in companies and society. This process aims at improving the quality of connections among people, companies, and things (Urbach et al. 2021, 2). On the other hand, Tang (2021) pointed out that digital transformation encompasses new technologies such as "Social Media, Mobility, Internet of Things

(IOT), Cybersecurity, Big Data Analytics, Cloud Computing, Robotic Process Automation (RPA), Artificial Intelligence, Blockchain, and so forth."

For Wohlmuth (2019), the internet has a crucial role to play in the digital transformation process in order to achieve structural change. At the same time, the author emphasizes that three aspects are of great importance to executing such change in the digital technologies domain: "first, organizing for an 'export push' as a basis for an offensive market access approach; second, building 'industrial clusters' around major cities, capital cities, and megacities; and third, strengthening the development of 'industrial capabilities'" (Ibid., 11).

According to Adam (2019), the digital transformation process had begun in Africa by the end of the 1990s, where mobile has become the most important tool of information and communication technologies (ICT) on the continent (Korovkin 2019). In 2016, 772 million people on the continent possessed mobile-cellular telephones, and 240 million individuals had access to the network on the African continent (Srinivasan et al. 2019).

In terms of digital infrastructure, up to 30 African governments (about 55% of the continent) possess 3G networks, and about 20 countries (36% of the continent) have implanted fiber-optic and e-government platforms (Abimbola et al. 2021). Africa has made great strides in Internet access in the last decade, increasing from 2.1 percent in 2005 to 24.4 percent in 2018 (Africa Europe Alliance 2022).The company Huawei alone has constructed more than 70% of the 4G base stations in Africa, and several other Chinese companies are today involved in implanting fiber optics in many African countries (Abimbola et al. 2021). Compared to other regions of the globe, African countries have to invest more in terms of enabling their populations to access the internet. According to AUC/OECD (2022), "In 2020, intraregional Internet bandwidth as a share of total bandwidth reached 16% in Africa, compared to 20% in LAC, 56% in Asia and 75% in Europe". In the last few years, several strategies and initiatives in the digital transformation have been launched at the continental level to ameliorate the quality of life for billions of people. In this regard, Cybersecurity, DotAfrica, Policy and regulatory initiative for digital Africa (PRIDA), Digital ID Blueprint for Africa, Digital Economy for Africa Initiative (DE4A) and Digital Transformation Strategy (DTS) are the most important initiatives

launched in order to establish sustainability on the African continent (UNECA, 2021).

For example, cybersecurity (digital security) is an initiative that was launched in 2014 as a preventive measure to protect African citizens, governments, and businesses against cybercrime. But in reality, many countries in Africa have not yet developed national cybersecurity strategies, except for a few countries like Egypt, Ghana, Morocco, Nigeria, South Africa, and Senegal, which have begun early efforts to establish cybersecurity on the continent (Srinivasan et al. 2019). The Digital Economy for Africa Initiative (DE4A) is another fundamental program for the period 2020–2030. This program, which was launched by AUF in collaboration with the World Bank, aims to ensure that all the components of the continent, such as individuals, businesses, and governments, will be digitally connected by 2030. According to the Africa Europe Alliance (2022), there were 21 million online shoppers in Africa in 2017, with an annual surge of 18% since 2014.

The Digital Transformation Strategy for Africa (DTS) 2020–2030 is also a great initiative launched by the African Union in collaboration with various institutions and organizations. To offer the best services and goods, governments should rely on digital transformation in several sectors, such as education, health, business, and agriculture. Digital technologies have reshaped the relationship between individuals and public services by "enhancing transparency, accountability, responsiveness, accessibility of government services, and user experience" (Finucan et al. 2018). According to the final rankings and total scores of the Digital Transformation Index (DTI) 2022, the majority of African countries have been grouped in category C with a DTI score above 20 and category D with a score below 20. By the way, the framework of this study has been grouped into five grades: S (above 80), A (above 60), B (above 40), C (above 20), and D (below 20), based on their DTI scores (Park et al. 2022).

According to the United Nations Conference on Trade and Development (UNCTAD)'s E-commerce Readiness Index, some African countries are active in e-commerce, such as Mauritius (scoring at 68.4 out of 100), Tunisia (58.1), South Africa (54.4), and Nigeria (53.2) (Abimbola et al. 2021). In Mauritius, for instance, the ICT sector is considered the third pillar of its economy, contributing 5.6% of its GDP and having a growth rate of 4.4%. This sector alone employs over 23,000 citizens in more than 750 businesses. On the other hand, Egypt is the only country in Africa to have established a

national strategy for artificial intelligence (AI) to reach national sustainable development goals (Ibid.).

DIGITAL TRANSFORMATION & SUSTAINABLE DEVELOPMENT IN ALGERIA

The internet is necessary for every country to reach digital transformation. In Algeria, the Internet came for the first time in 1994, thanks to CERIST (Le Centre de recherche sur l'information scientifique et technique). In 1998, this new technology was slowly opened to certain providers. Only 2.6% of the population had internet access in 2006 (Djoudi 2009). According to the latest report of the Regulatory Authority of Post and Telecommunication, the number of subscribers to fixed and mobile Internet in Algeria exceeded 43.92 million in the 2nd quarter of 2021 (APRCE 2021). Also, the statistics indicate that there are no Internet subscribers in the lower categories of 1 MB per second, due to the sector policy of providing a high rate to meet the aspirations of the Algerian citizen. In Algeria, the 3G mobile phone service was launched in December 2013. According to the APRCE's report (2021), the number of subscribers to mobile networks has reached more than 47 million (equivalent to 90.22%), and the number of subscribers to fixed internet has reached 5.1 million (equivalent to 9.78%).

In this regard, the Algerian government has consolidated the infrastructure to permit a large public to access the internet. Furthermore, the length of the optical fiber is 81872 km, and 1541 municipalities are now connected to fiber optics. The Algerian government, like all African governments, has given importance to the issue of digitalization to achieve sustainable development. In 2022, Algeria held the African Digital Summit at the International Conference Center (CIC) in Algiers, with the participation of more than 1,200 decision-makers and 100 exhibiting companies and startups from twenty countries in Africa and around the world (Aps 2022a).

In Algeria's context, an enormous amount of money has been spent to establish programs and initiatives in digital transformation to reach sustainable development goals. In the last few years, Algeria has set up a special account no. 302-128 entitled "Fund for the Appropriation of Uses and Development of Technology," commonly known as FAUDTIC, which has been renamed since the finance law for the year 2018 "Fund for the Appropriation of Uses and Development of

Information and Communication Technologies and the Reorganization of the Radio Frequency Spectrum" (Khider 2021).

The other objective of ALCOMSAT-1 is to meet the telecommunications needs of other sectors, in particular by providing various services such as high-speed Internet, distance learning, telemedicine, and videoconferencing (El Watan 2019). One year later, public television and radio channels, as well as the Agence Algérie Presse Services (APS), have been broadcast for the first time by the Algerian telecommunications satellite ALCOMSAT-1 (APS 2017). According to the Ministry of Post and Telecommunications (2022), the first applications of this new technology have been launched through e-education and e-health pilot projects with a view to connecting 27,000 schools and 3,700 hospitals with the aim of providing education and care at a lower cost. Eventually, this technology will make it possible to benefit from other Internet services.

THE DEGREE OF CONTRIBUTION OF DIGITAL TRANSFORMATION ON KEY SECTORS IN ALGERIA

The main aim of this research paper is to give an understanding of the contribution of digital transformations to sustainable development in Algeria. For the purposes of this work, the author has focused on a set of essential sectors to evaluate the contribution of digitalization to reaching sustainability in each of those areas. In this regard, agriculture, education, health, governance, energy, and business are some of the 17 goals established in the 2030 agenda.

For this study, the six strategic pillars identified in the digital transformation were used as key areas in assessing the efforts deployed by the Algerian government to make progress in economic growth and innovation. All these sectors have been selected because they are of great importance in our lives, and these sectors have been tremendously impacted during the coronavirus pandemic. In this regard, this study has concentrated on the government's efforts to improve these goods and services. Through all these pillars, we can understand the contribution of digital technologies to every single pillar, and we will find out the roles of various actors in different sectors of the economy.

Digital Transformation in the Energy Sector

In 2018, the CEO of the strategic company Sonatrach indicated at the international energy conference in the western city of Oran

(Algeria), that the company has to use digital technologies in order "to reduce costs and optimize its output" (Chikhi 2018).

In December 2017, the Algerian Electricity Production Company (SPE), a subsidiary of Sonelgaz, in partnership with General Electric Power, set up a digital monitoring center. In fact, this center uses new digital technologies for monitoring, optimizing performance, and making predictive diagnoses of structures. According to the CEO of Sonelgaz, the digitalization of power plants would allow problems to be identified before they arise and give us the possibility of making the necessary corrections to the electrical system, the purpose of which is to reduce downtime and unscheduled outages and improve the reliability not only of assets but of our power plants as a whole. With the support of General Electric, the company will train 250 engineers and operators in APM solutions, which will be assigned to future power plants. (Reporters 2017)

In addition, Algeria has an enormous future in renewable energy due to the potential it has. According to Harrouz et al. (2017), Algeria has to replace its traditional electricity grids with a smart grid using emerging technologies. The intelligent grid allows two-way communication and facilitates the transmission lines between the source and the distribution substations for the network (Ibid.). In fact, Algeria has an ambitious project on RE for the period 2020–2030. According to Bouznit et al. (2020), by 2030, it is expected to produce 22,000 MW, representing 27% of total electricity generation in the country. Algeria has the potential to achieve 100% energy sustainability by 2030 because it can use 130,000 km2 of the Saharan desert to install photovoltaic panels to generate clean energy for all of Europe and northern Africa (Hadji 2016, 30).

Digital Transformation in the Services Sector

In this sector, several public administrations have recently developed 454 online public services. On the other hand, 178 public services are currently in the process of digitalization (APS 2022b).The Minister of Digitization and Statistics said that the bill on digitization was "in progress" and aimed at the facilitation and streamlining of administrative procedures for the acceleration and expansion of the process of digitalization, in addition to the development of the digital economy and e-commerce.

In this regard, the Ministry of Post and Telecommunications reported that 10 million "Eddahabia" electronic payment cards had been issued by Algérie Poste, stressing that this figure "will make it

possible to further promote e-services." On the other hand, more than 340,000 students from the 58 wilayas have registered at the university online in the 2021–2022 academic year, in addition to more than 100,000 other students who have paid the registration fees via the internet by electronic card. (APS 2022b)

Digital Transformation in the Health Sector

Due to the vastness of the Algerian territory, telemedicine is becoming a solution and a necessity to provide quality care, even in landlocked areas. In 2015, the Algerian telemedicine and e-health company, SATeS (the Algerian telemedicine and e-health company), was established for this purpose. The SATeS now supports many health projects in rural areas, including pediatric, domestic, and traumatic accident management, tele-monitoring of chronic diseases, tele-dermatology, and participation in the national cancer plan.

Concerning health infrastructure in Algeria, the public sector contains 60,000 beds, 13 university hospitals, 31 specialized structures, and 185 regional centers. This sector enrolls 56,210 doctors (generalists and specialists) and 80,000 nurses. Ratios for the public sector are as follows: There are 1.1 doctors for every 640 people and 2.1 hospitals for every 1000 people. In the public sector, care is provided at no cost. The private sector represents 6% of the capacity of the public sector. It has 3,400 beds, 225 private clinics, 480 specialists, 200 generalists, and 1200 nurses (Lahchem & Kaci 2020). Regarding access to connection in health structures, the system interconnects 5 university hospital centers (CHU), 12 public hospital establishments (EPH), and a central site equipped with a management platform. This new achievement for the health sector was set up as part of the Appropriation Fund for the Use and Development of Information and Communication Technologies (FAUDTIC). It is worth noticing that the Bab El-Oued University Hospital was the first establishment to have opted for telemedicine, applying this concept to hospitals in the south of the country as well as to European hospitals in the early 2000s. (P3A 2016)

Regarding the SIHATIC project, Mr. Abdelkader Hadj Miloud, Director of IT Systems at the Ministry of Population Health and Hospital Reform, said that "SIHATIC is a project whose main objective is to provide the structures in charge of health with an automated, integrated, and global information and communication system to create, update, share, and exploit health system information." SIHATIC is based on three essential actors, namely the patient, the

practitioner, and the decision-maker, and aims to improve patient care, especially through the use of telemedicine solutions. (Brahami 2022) In the health care sector, for instance, the National Fund of Social Insurance for the Employed has developed a digital platform aimed at ameliorating and modernizing public service for the benefit of social security beneficiaries (Maghreb Healthcare 2022).

Digital Transformation in the Education Sector

In the higher education sector, Algerian universities have adopted for the academic year 2020-2021 a digital education system using the Moodle platform, which is an acronym for Modular Oriented Object-Dynamic Learning Environment. Lecturers could prepare their lessons and upload them to the MOODLE platform in the form of a Word document, a PowerPoint presentation, a PDF file, or video clips. This electronic platform allows students (both bachelor's and master's) to peruse courses online too (Mohamed Yassd 2022). Lecturers at universities use other informal platforms such as Zoom, Google Meet, Jitsi apps, etc.

In this context, Huawei Algeria Company has signed, in October 2018, a cooperation agreement with the Algerian Ministry of Higher Education and Scientific Research to implement an academy of excellence in two public universities. In addition, Huawei Algeria Company attempts to establish 30 academies of excellence later. The main objective of this cooperation is to use Industry 4.0 technologies and their applications to fight the COVID-19 pandemic (Zermane & Aitouche 2020).

Algeria has successfully launched the e-education project via the Alcomsat-1 satellite. In this context, a demonstration interconnecting via Alcomsat-1 schools with each other, as well as hospitals, was carried out on November 15, 2018 from the city of Adrar (1430 km south-west of Algiers) (El Watan 2019). For Djamila Khiar, who has been president of the "Fédération nationale des associations de parents d'élèves," digital learning in Algerian schools didn't exist before the emergence of coronavirus. Following the outbreak, e-learning courses were quickly established to ensure the country's education (ETF 2020).

Digital Transformation in the Agriculture Sector

In their research, Laoubi and Yamao (2012) insist that enhancing and developing an information system in agriculture is one of the challenges faced by the Algerian government. Agriculture must embrace a digital transformation enabled by connectivity. Some solutions already exist to help farmers use resources more efficiently

and sustainably. These new technologies can improve decision-making by enabling better management of risk and variability to optimize returns and improve economics (Aib 2022).The electronic portal of the CNA was launched at the beginning of February 2021 under the brand "Ghorfati" (room); its objective, among other things, is to put an end to heavy bureaucracy and make way for a mapping of national agricultural production.

This electronic portal is intended for any professional farmer registered in the Agricultural Register who can subsequently transmit and relay useful information to be recorded on the platform (Bureau Business France d'Alger 2021). On November 13, 2022, the livestock census operation, using electronic chips, was launched in order to create a digital database on this animal wealth and to determine the true number of breeders in Algeria. (Algeria invest 2022)

DISCUSSION

This research paper tends to demonstrate the colossal effort made by the Algerian government to take advantage of new technologies in order to gain sustainable development. It is worthy of notice that Algeria has a population of 44.2 million inhabitants. The majority of the population in Algeria is young and tech-savvy, with the readiness to be adapted to education in digital technologies. There are 43.92 million people connected to the network, and 25 million are present on social media platforms. The cell phone is the main device used by young people to connect. The digital divide may be one of the challenges that residents of Algeria's southern cities face (Loucif 2022). In this regard, the geographical challenge can negatively impact the government's efforts to reduce this digital gap.

In the energetic sector, Algeria has seriously taken multiple measures, such as the digitalization of stations. Clean energy is one of today's challenges, particularly in Algeria, which has enormous potential. Even though Algeria has taken some initiatives in terms of e-services, this sector still needs more effort. Algerians, on the other hand, are unfamiliar with online shopping. For example, only 4.6% of that makes online purchases or bill payments. (Dehimat & Baroudi 2022) Concerning the e-Algeria 2013 project, completion is currently estimated to be 28%. According to the UN E-Government Survey 2020, Algeria ranked 120th in the e-government development index measuring online service, telecommunications infrastructure, and human capital for the 193 UN member states (UN 2020, 44).

In the higher education sector, the lack of interaction between lecturers and students at universities is a critical obstacle for online learning. On the other hand, teachers and students are not familiar with learning through electronic platforms (Ghounane 2022). In the educational sector, the cost of the internet today represents one of the barriers to e-education. For example, the cost of an internet connection is fifteen euros per month for one gigabit, and the purchase of a router is fifty euros. Compared to purchasing power (a mean salary of 200 euros), the costs of an internet connection are significant barriers to the widespread adoption of eLearning. According to Kecheur (2017), 60% of secondary schools did not possess a laboratory of computer science in 2011.

The World Health Organization (WHO) indicates that increasing the access of patients and their relatives to health information via digital technologies might reach a sustainable health system and improve the quality of individual care (M. Musso et al. 2020, 104). In this regard, the Algerian government has created the SIHATIK platform to facilitate two-way communications between practitioners and patients.

CONCLUSION

According to the UN's 2030 agenda, digital transformation is an important key for Algeria to achieve sustainable development. Currently, the digital transformation is a critical force for change that will reformulate entire segments of society, including the business sector, government, and civil society, and make millions of people's lives easier (UNDP2022).Digital technology is a fundamental tool for countries to respond to different crises and reach sustainable development goals (Ibid.).This research paper tried to illustrate the effort conducted by the Algerian government in order to implement sustainable projects and facilitate the lives of millions. In this context, Algeria should adapt its national policy to fit with the 2030 agenda to face the challenges of the future. The first challenge facing the Algerian government is a geographical one. It is worthwhile to significantly strengthen the structure.

Digital technologies are today regarded as new tools to cope with outbreaks of coronavirus. These tools represent now new alternative to face the current challenges. Using digital means enables people to access the best goods and services in many sectors such as healthcare, education, and governance (OECD et al. 2020). Since 2021, Algeria has had its own school of artificial intelligence. The main objective of

the National Higher School of Artificial Intelligence is to form engineers specializing in the theory of artificial intelligence and data sciences. These engineers have to develop practical and innovative solutions to the problems of the various socio-economic sectors such as health, energy, agriculture, transport, etc. (ENSIA 2022)

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