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Application of governance and orientation towards digitization of the economy in Algeria - comparative study

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Abstract:

Digital transformation in Algeria, particularly through the Fourth-Generation Universities project, aims to modernize public and university sectors. This digitalization improves the quality of education, optimizes governance, and promotes the country's socio-economic development. The government seeks to digitize its archives and use advanced technologies to enhance decision-making. However, several challenges hinder this transition, such as high infrastructure costs, the economic crisis, and the need for continuous staff training. The Fourth-Generation Universities project focuses on administrative and student services digitalization but does not fully address university governance, particularly the external financing of universities, which remains dependent on public funds. Despite these challenges, digitalization improves decision-making, policy monitoring, and can reduce public spending, thereby enhancing transparency and the efficiency of public services.

Key Words: *governance, digitization of the economy, the fourth generation of governance*

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1.Introduction

Algeria is undergoing a period of technological and informational transformation, aiming to leverage digital resources to keep pace with global development. Digitalization is seen as a means to boost economic growth, reduce bureaucracy, and improve governance. The country is actively engaging in the digitalization of its services, particularly in higher education, with the adoption of the Fourth-Generation Universities project. This project aims to modernize education and align it with the demands of the 21st century. The integration of digital technologies in higher education presents a major challenge but also an opportunity to enhance the quality of learning and create a more dynamic and interactive learning environment.

However, the transition to a digital society does not come without obstacles. Training and developing the digital skills of the population, building robust infrastructure, and establishing an appropriate legal framework are key elements for ensuring the success of digitalization in Algeria. Furthermore, it is crucial to address the ethical issues related to the use of digital technologies, particularly in the context of higher education. Protecting personal data, ensuring information security, and combating misinformation are important challenges that require careful attention.

Algeria is engaged in an ambitious digital transformation process aimed at improving the economy, governance, and education. The success of this project will depend on the country's ability to overcome challenges related to training, infrastructure, and ethics, while taking full advantage of the substantial benefits digital technologies offer.

2.Research Problem:

Digital transformation is considered a technological revolution in Algeria, especially with the transition to the Fourth-Generation Universities. This raises the following question: *"How can the digitalization of Algerian universities contribute to improving the quality of education, strengthening governance, and promoting the economic and social development of the country?"*

2.1Sub-questions:

What digital transformation does the Algerian government seek to implement across its various sectors?

What obstacles and challenges hinder the implementation of this digital transformation, and what are the chances of its success?

What does the Fourth-Generation Universities project entail, and does it foresee full or partial university governance?

3.Hypotheses: Digital transformation involves the full application of cutting-edge technologies at all levels, optimizing their use and accessibility anytime and anywhere. As for the university governance that will emerge from this transformation, it will likely focus on internal management through changes in laws and regulations, with the participation of university students in decision-making rather than focusing on financial autonomy.

3.1Sub-hypotheses:

The digital transformation the Algerian government aims to implement involves digitizing all archives and future information and using modern technology to make decisions by analyzing the digitized data.

The obstacles and challenges Algeria will face in digitalization include the high investment required in terms of hardware, especially in the context of both local and global economic crises.

Additionally, specialists will need to be involved in the implementation and periodic maintenance of this technology, and there will be challenges in including all archives in these servers.

The Fourth-Generation Universities project is about the digitalization of everything related to Algerian universities, including university administration, services, and students. However, this project may not fully embody true university governance, as the core of university governance lies in securing funding outside of the government framework, while in Algeria, university and scientific research funding remains entirely government-dependent.

4.Literature Review

The term "digitalization" has historically undergone several revolutionary stages since the early 1940s and continues to evolve. The first fully electronic digital computer, known as ENIAC, was invented in 1940. It was large, measuring about 167 meters and weighing 30 tons (Ceruzzi, 2012). Subsequently, the invention of the transistor paved the way for the miniaturization of computers (Riordan & Lillian Hoddeson, 2007), eight years after the invention of the computer. In 1965, Moore's Law was formulated, predicting that the number of transistors in integrated circuits would double every two years. In 1971, Intel's first microprocessor, the INTEL 4004, was launched, leading to the emergence of the first commercial computer. By 1975, the computer called "Altair 8800" emerged, and just six years later, in 1981 (Campbell-Kelly, William Aspray, Nathan Ensmenger, & Jeffrey R. Yost, 2018), "IBM" launched personal computers that spread widely across the world.

The greatest invention of the 20th century followed soon after: the "World Wide Web," now called the Internet, developed by scientist Tim Berners-Lee in 1989 (Berners-lee, 2000). The first website was launched to the public just two years later. In 1995, "Amazon" and "eBay" were established, with eBay launching in the same year. Six years later, the largest knowledge-sharing platform, "Wikipedia," appeared online. The widespread use of mobile phones began with the launch of the "iPhone" in 2007 (Isaacson, 2011). In 2016, the first artificial intelligence application, "AlphaGo," emerged, followed by other applications (Kelleher & Brendan Tierney, 2016). With the outbreak of the "Covid-19" pandemic, the use of AI applications such as "ChatGPT," "Claude," and "Gemini" significantly expanded

5.Conceptuel Clarifications

5.1 The definitions of digitization

It is important to clarify the concepts related to digital transformation, which refers to the integration of technologies into various fields, to avoid any confusion. Several experts and organizations have proposed definitions of digitization, which we will analyze below to better understand its implications.

- **Definition from the World Economic Forum (2016):** The WEF viewed digital transformation as a major lever for economic development but also as an area requiring concerted attention to manage its socio-economic implications . " (World Economic Forum, 2016)
- **Definition from the Digital Transformation Playbook (2016):** Digital transformation aimed to provide a practical framework for businesses seeking to adapt to a constantly evolving landscape through technology and generally refers to a guide or set of best

practices designed to help organizations navigate the challenges of digitization". (L.Rogers, 2016)

- **Definition from the MIT Sloan Management Review (2014):** "Digital transformation is a strategic journey essential for businesses looking to navigate an increasingly digital and interconnected business environment (Westerman, Didier Bonnet, & Andrew McAfee, 2014).
- **Definition from Bloomberg (2018): Digitization** is often perceived as the implementation of digital technologies by organizations to optimize their efficiency and adapt to the evolving digital world. It encompasses the integration of these technologies into administrative processes, communication management, and daily operations . (Bloomberg, 2018) .

5.2 Types of Digitization

Digitization is now a major issue for the modernization of public and administrative services. It takes various forms, affecting both the governmental sphere and the academic sector. This digital transformation aims to optimize processes, improve transparency, and enhance the efficiency of services provided to citizens.

- **-Digitization of Business Processes**: The digitization of business processes involves replacing traditional manual business processes with digital versions on computers and servers, with the goal of simplifying workflows, speeding up operations, and reducing human errors. It also facilitates decision-making by enabling the collection and analysis of data (Davenport, T. H. & Short, J. E. , 1990).
- **Digitization of Products and Services**: This refers to the transformation of physical products and services into digital products, allowing us to add digital functions to traditional products that cannot be fully digitized, such as notifications in household products. It also enables remote access to these products and automatic updates (Hui, 2014)
- **Digitization of Business Models**: It relies heavily on digital technology to rethink the business model based on value creation and delivery to customers, and to use their data to generate revenue streams. This contributes to creating flexibility in business models and the ability to scale them more easily, such as transforming delivery and taxi companies into digital applications (Weill & Woerner, S. L., 2015).
- **Digitization of the Customer Experience**: By enhancing interaction between businesses and their customers through accessible digital applications, companies can reduce personnel costs while facilitating communication with clients. Moreover, the data collected helps improve the services offered by tailoring them to customer preferences, as seen in electronic payment apps (Lemon, K. N. & Verhoef, P. C, 2016).
- **Digitization of Marketing**: The use of social media sites and search engines for marketing, leveraging collected or purchased data, enables targeted advertising campaigns. This type of marketing also offers the ability to measure and analyze the effectiveness of these campaigns in real-time, as seen in promoting a product via the Facebook platform (Kannan, P. K. & Li, H. A., 2017).

- **Digitization of Data**: This involves converting all existing data into digital format by converting documents, records, and images, creating databases that allow for analysis and conversion. It facilitates access to information and backup, such as transcription apps like CAMSCAN (Beagrie, N. & Jones, M., 2008).
- **Digitization of the Industrial Sector**: By integrating modern technologies into industries and production processes, the digitization of this sector enables the monitoring and optimization of manufacturing processes. It also offers the possibility of integrating artificial intelligence into production using robots and industry-specific guiding applications, such as the use of sensors to improve product manufacturing (Kagermann, Reiner Anderl, Jürgen Gausemeier, & Günther Schuh, 2016).
- **Digitization of Administration**: By integrating modern technologies into administrations and services, and digitizing them on online platforms, these services become more accessible. The collection of user data allows for informed decision-making in the public interest. It also improves civil transparency through these platforms, such as the Bluegrass system (United Nations, 2020).

6. Digital Transformation in Algeria: Challenges and Perspectives

Algeria has long favored traditional forms of employment and services for several decades after independence, and these practices are still present in some sectors today. However, the country has made a concrete transition towards digitization over the past two decades. This evolution was marked by the launch of the e-Algeria program in 2008, a significant first step towards digitization in Algeria. The program aimed to make the adoption of modern technologies mandatory and accelerate the use of information and communication technologies (ICT) in businesses, as well as in relations between citizens and public administrations. It consisted of 13 main pillars, including the promotion of the digital economy and the development of the necessary infrastructure to support this transformation (Algeria's Ministry of Postal and Information and Communication Technologies, 2008).

The Algerian government has taken significant steps to develop the telecommunications sector’s infrastructure, notably by expanding the fiber optic network to cover the entire national territory. The introduction of 3G services in 2013 and 4G in 2016 also contributed to this modernization, while improving internet connection speeds in cities. At the same time, efforts have been made to improve infrastructure maintenance and expand internet coverage in rural areas. On the administrative front, the government launched several online citizen portals, offering services such as social security and the ability to obtain certain documents exclusively online, such as birth certificates and passports. These services help citizens avoid visiting municipal centers. An electronic payment system has also been set up for the payment of taxes and government fees. In the financial and banking sector, banking services are now accessible via mobile phone, with only an internet connection and personal data required to carry out transactions. The development of the electronic payment system and credit cards has simplified online payments, including for utility bills like water, electricity, and gas. Moreover, the government has supported e-commerce and encouraged digital transactions by reducing the cost of associated services (Authority to control mail and electronic communications., 2016).

The Algerian government has also integrated technology into the education sector by providing computers and internet access in schools and universities. Distance learning platforms

have been created, allowing students to download and access all educational content in digital file formats. Additionally, training programs have been launched for students and teachers at all levels, especially in higher education, to familiarize them with the use of technology in learning and teaching (Bank of Algeria, 2019).

In the health sector, digitization has recently been adopted with the registration of patients in electronic medical records at certain hospitals. Telemedicine platforms have also been established, particularly in remote areas, allowing for remote consultations. The digitization of the healthcare system and health insurance facilitates the collection and management of medical information, while providing better access to updates and innovations in the medical field (Algeria's Ministry of National Education, 2018).

With this digital revolution, it is important to highlight that several challenges must be addressed to improve digitization in the future. One of the main challenges lies in improving digital infrastructure, particularly in isolated areas such as rural regions. It is also crucial to address cybersecurity to protect sensitive information and data. Moreover, awareness campaigns are needed to promote the importance of digitization and its essential role in the economy, particularly for people over 50, who may be less familiar with these technologies (Algeria's Ministry of Health, 2021).

The government must also focus on often-neglected sectors, such as tourism, by simplifying the visa process for foreigners without imposing excessive fees. Digitizing administrative documents, as well as the agricultural sector, is also essential. It is crucial to have accurate data on the individuals benefiting from government support to better target assistance and ensure that it reaches those who truly need it.

7. The Effects of Digitization on the World's Major Economic Powers

The rise of digitization has become a major goal for many countries, driven by the need for accurate data and easier access to it. While this technology can improve a country's economic situation, several nations have undertaken the digitization of their services and sectors. In this study, we have chosen one of the most economically powerful countries and compared its GDP before and after the transition to digitization, as evidenced by the following table:

Tableau 1 Indice de Compétitivité Numérique 2020 et Évolution du PIB (2000-2020)

State	GDP 2000 (billions of dollars)	GDP 2020 (billions of dollars)	Digital Competitiveness Index 2020
U.S.A	10,252	20,932	1
UNITED KI NGDPOMS	1,657	2,707	13
FRANCE	1,362	2,603	24
GERMANY	1,949	3,806	18
JAPAN	4,887	5,064	27
INDIA	468	2,622	48
ITALIE	1,145	1,886	42
CANADA	742	1,643	12
SOUTH KOREA	561	1,630	8
CHINA	1,211	14,722	16

Prepared by the researchers based on World Bank and International Institute for Management Development.

This table from the Digital Competitiveness Index 2020 reveals a profound global economic transformation, characterized by contrasting growth trajectories and a significant redistribution of economic power.

The United States remains the undisputed economic leader, with a GDP of $20.932 trillion in 2020, nearly doubling since 2000. Their technological innovation model and entrepreneurial ecosystem have maintained their global dominance.

China represents the most dramatic economic transformation. Growing from $1.211 trillion in 2000 to $14.722 trillion in 2020, it has increased its GDP twelvefold, becoming the world's second-largest economic power. This exponential growth reflects its strategy of massive industrialization, technological investments, and gradual openness

India is another remarkable case of economic development. Its GDP grew from $468 billion in 2000 to $2.622 trillion in 2020, translating to a growth of over 500%. This leap is the result of bold economic reforms, a thriving services sector, and a dynamic demographic.

South Korea and Canada, while less spectacular, have also experienced significant growth, illustrating the ability of medium-sized economies to adapt to technological changes. Germany, France, and the United Kingdom have shown more moderate but stable growth. Their GDPs have gradually increased, reflecting mature economies that prioritize quality over quantity, with sustained investments in innovation and research.

Germany, with $3.806 trillion in 2020, confirms its status as the European economic engine, based on high-quality manufacturing and a consistent technology innovation policy.

Several factors explain these growth dynamics:

The digital revolution and information technologies

Globalization of trade exchanges

The emergence of new economic models

Massive investments in research and development

Economic liberalization and open policies

The Effects of Digitization on Arab Countries

We have gathered a study on the impact of digitization on Arab countries in relation to GDP, and the result is as follows:

Table 2: Digital Competitiveness Index 2020, e-Government Development, and GDP Evolution (2000-2020) of Arab Countries

State	GDP 2000 (billions of dollars)	GDP 2020 (billions of dollars)	eGovernment Development Index 2020	Digital Competitiveness Index 2020
SAUDI ARABIC	189.5	700.1	0.7991	27
United Arab Emirates	104.3	358.9	0.8555	18
EGYPT	99.8	365.3	0.6284	58
QATAR	17.8	144.4	0.7173	24
KUWAIT	37.7	134.6	0.7913	45
ALGERIA	54.8	153.2	0.5173	79
MORROCO	38.9	119.0	0.5729	62
OMAN	19.9	73.9	0.7749	41
TUNISIA	21.5	39.2	0.6526	67
Bahrain	9.1	34.7	0.8213	35

Prepared by the researchers based on World Bank and International Institute for Management Development

Across the countries, it is clear that all the Arab countries mentioned have experienced significant GDP growth over the past 20 years, with Qatar ranking first, having increased its GDP eightfold. This performance is largely due to the importance the Qatari government has placed on technological development, technology, and communication. In contrast, Saudi Arabia and the United Arab Emirates have solidified their position as the largest Arab economies.

Regarding digital transformation, the United Arab Emirates stands out for its excellent ranking in e-government development, followed by Saudi Arabia and Bahrain. Overall, Gulf countries have made notable progress in this area, while some North African Arab countries, such as Algeria and Egypt, have relatively large economies compared to other non-Gulf Arab nations but remain behind according to the e-government development index. They need to accelerate their development in this field.

Looking at the Gulf countries, a positive correlation emerges between economic growth rates and the level of digital development. However, in other Arab countries, interest in digital development and e-governance remains relatively low compared to their domestic production outputs. Investment in this area, similar to that of Gulf countries, could further strengthen their economic power. The UAE's ranking among the Arab economic powers is bolstered by its early

investment in digital infrastructure, which has also improved its positioning in digital indicators. Finally, a significant gap is observable between the Gulf countries and other Arab nations in terms of digital infrastructure development and e-governance.

8. The Impact of Digitization on Government Spending in Arab Countries: An Analysis of Spending Trends in 2010 and 2020

In the context of growing digitization, Arab governments have made significant investments in modernizing their sectors and public services. However, this transformation could lead to a reduction in spending related to employee salaries in traditional sectors. The table below summarizes government spending in certain Arab countries for the years 2010 and 2020, illustrating the impact of digitization on public finances.

This allows for a clear presentation of the objective of your analysis.

Table 3: Evolution of Wage Expenditures (% of GDP) from 2010 to 2020 in Arab Countries

STATES	Spending on salaries (% of GDP) 2010	Spending on salaries (% of GDP) 2020	Change (percentage points)
SAUDI ARABIC	9.8%	12.0%	+2.2
United Arab Emirates	4.7%	6.2%	+1.5
EGYPT	7.1%	5.9%	-1.2
QATAR	3.8%	7.1%	+3.3
KUWIAT	11.2%	15.3%	+4.1
ALGERIA	11.1%	12.3%	+1.2
MORROCO	10.3%	11.6%	+1.3
OMAN	10.2%	14.1%	+3.9
TUNISIA	12.0%	14.8%	+2.8
BAHRAIN	6.8%	9.4%	+2.6

Prepared by researchers based on World Bank and International Institute for Management Development

The analysis of government wage expenditures, expressed as a percentage of GDP, between 2010 and 2020 in certain Arab countries highlights varied trends that reflect modernization efforts, including the digitization of public administrations, and economic reforms implemented by each country.

Overall, most Arab countries saw an increase in wage expenditures during this decade. This trend is particularly pronounced in Gulf countries such as Kuwait, Qatar, and Oman, where public spending increases are notable. For example, Kuwait recorded a 4.1-point increase, rising from 11.2% in 2010 to 15.3% in 2020. Qatar saw a similar rise of 3.3 points, while Oman recorded an increase of 3.9 points. These increases can be attributed to strategies aimed at improving public sector wages while implementing reforms to modernize public administrations, notably through the digitization of government services.

Digitization has been a key element in transforming public services in these countries, although its direct impact on wage expenditures is not immediately apparent. Digitization can

improve efficiency and resource management in the public sector, but it can also require significant investments in training and technology, which partially explains the rise in wage expenditures in some cases.

In other countries, such as Egypt, a reduction in wage expenditures was observed, with a decline of 1.2 points (from 7.1% to 5.9%). This decrease is likely related to economic reforms aimed at streamlining public spending within a context of budgetary constraints. Egypt undertook several austerity measures and public sector rationalization, while emphasizing administrative efficiency, with digitization initiatives that allowed for a reduction in the size of the public administration, while improving service delivery.

Other countries, such as the United Arab Emirates, Algeria, Morocco, Tunisia, and Bahrain, saw more moderate increases in wage expenditures, ranging from 1 to 2.8 points. This trend suggests that these countries invested in improving their public administrations and digitizing services while maintaining relatively stable wage policies. Governments sought to adjust their expenditures while enhancing the efficiency of administrative services through digital technologies.

It is important to note that these increases in wage expenditures are not solely due to digitization but also to various economic and social policies. For example, wage increases were introduced in some countries to strengthen social stability and address growing public expectations for salaries and public services.

In conclusion, while the digitization of public administrations in Arab countries has led to increased investment in the public sector, it has not always resulted in immediate reductions in wage expenditures. The impact of digitization on public finances is complex and multifaceted, influenced by economic strategies, administrative reforms, and social priorities. While these investments increase expenditure in the short term, they may lead to more efficient management and long-term savings, particularly through improved productivity and reduced administrative costs.

9. The Emergence of Governance and Digitization in the 21st Century: A Synergy to Streamline Government Decision-Making

FIRST REQUIREMENT: The emergence of governance in the 20th century:

It was viewed as an economic solution to streamline decision-making processes. However, by the early 21st century, the interest of governments in the concept of governance and its application significantly increased. This phenomenon can be attributed to the success observed in many countries that adopted this model early on to improve decision-making across various sectors. As governance is a key objective in the context of digitization, it is relevant to explore the relationship between these two concepts and how they mutually reinforce each other:

Governance is strategically integrated with digitization to achieve organizational objectives by developing digital strategies aligned with governance goals. This includes the creation of a dedicated committee for digital transformation within the board of directors, tasked with overseeing and guiding this evolution (Weill & Jeanne W. Ross, 2004).

Both concepts rely on digital technologies to enhance transparency in the decision-making process. This includes the use of blockchain to authenticate transactions and the publication of open data on digital platforms (Open Government Partnership, 2021).

Accountability, a key element of governance, can be strengthened through digitization, especially with the documentation of decisions via advanced digital work management systems (OECD, 2014).

Participation, another pillar of governance, is facilitated by digitization, enabling increased stakeholder engagement in the decision-making process. With easily accessible means, such as smartphones, it is possible to communicate with all relevant parties and create electronic platforms where citizens' opinions can be submitted and reviewed (United Nations, 2020).

In terms of digital risk management, cybersecurity risk management can be integrated into public governance by regularly conducting digital risk assessments and strengthening cybersecurity measures (NIST, 2018).

Digitization optimizes the efficiency of governance processes by using artificial intelligence (AI) to automate repetitive tasks, followed by the implementation of digital governance management systems. Additionally, the digital skills of leaders are continually evolving (Panetta, 2020).

The digital skills of leaders are continuously developed through training programs and technology workshops, benefiting both the board of directors and the leaders themselves (World Economic Forum, 2020).

Digitization and governance create ample opportunities for individuals to present their innovations and creativity in solving problems and crises. These initiatives primarily align with the ethical framework of governance and institutions, fostering digital labs that encourage creativity and development. Furthermore, it is possible to integrate the principles of digital sustainability into governance by developing specific digital sustainability performance indicators (ITU, 2020).

10. Fourth-Generation Universities in Algeria: A New Educational Model

This program focuses on the crucial role of Algerian universities in the development and revitalization of the local economy. It also aims to guide and train university students, considered an investment in human capital and scientific research. The program is evolving toward modern, updated, and more effective teaching methods, enabling students to integrate into an environment conducive to innovation, problem-solving, and creativity, with the aim of providing solutions to the challenges faced by economic institutions. We will examine this program based on available information, knowing that it was recently launched.

10.1 Key Aspects of the Fourth-Generation Universities Program

- **Emphasizing creativity**: The program seeks to give more attention to the creative aspect of all university components by offering more space for expressing innovations while creating an environment conducive to growth.
- **Transition to industrial collaboration**: There is a shift from the traditional method of funding universities and scientific research towards closer collaboration with the industrial sector, promoting partnerships. In the long term, this could allow Algerian universities to gain administrative and financial autonomy, enabling them to define their own objectives.
- **Adapting curricula to market needs**: The curriculum is being adjusted to meet the demands and requirements of the labor market, ensuring that university graduates are not faced with unemployment, which would force them to accept jobs outside their field of expertise and aspirations (Bousaidi & Boaziz, 2022).

- **Integrating applied learning and university studies**: It is essential to combine academic studies with practical application by establishing partnerships with the industrial sector. Students will have the opportunity to apply their knowledge on the ground. Additionally, students should have access to distance learning and the possibility for both students and faculty to use modern technologies for research and updating knowledge in their fields of study (Ben Zian, 2023).
- **Secondly: Challenges of the Fourth-Generation Program**
- This program is seen as a bold initiative requiring several years of experience to transition from a traditional university system to a paperless model. However, there are several obstacles to overcome (Benstaali, 2023):
- **Communication and internet infrastructure**: This remains insufficient in many regions, with areas where access to 4G or ADSL internet is non-existent. Even in urban areas, internet connections are often slow due to issues with servers or copper wiring. Improving this infrastructure requires massive investment and a skilled workforce in fiber optics, a process that could take one to two years.
- **Training qualified personnel**: After investing in modern technologies within higher education institutions, it will be essential to have qualified staff to manage this technology and to implement tailored training programs for teachers, staff, and students.
- **Awareness campaigns**: The government will need to launch large-scale awareness campaigns to inform all stakeholders in universities about the benefits and advantages of these new technologies.
- The main goal of this program is to reform the higher education sector and enhance the status of Algerian universities both regionally and internationally. The introduction of digitization in this sector offers numerous benefits for the government and society, including students, teachers, and staff. Among the benefits are continuous oversight of decisions, greater involvement of stakeholders in the decision-making process, and improved transparency in decision-making. Digitization also helps prevent administrative and financial corruption, as all decisions are digitized, traceable, and controllable at any time.
- In terms of implementation, the Algerian authorities have moved from the study phase in mid-2023 to the current period (2024) (Organisation for Economic Co-operation and Development, 2023). They have created business incubators and entrepreneurship hubs within universities, with significant investments allocated to these projects, amounting to billions. Algeria has also introduced a new system for postgraduate programs, already implemented in some universities. Furthermore, the government has initiated the first steps towards closer cooperation between the industrial sector and universities, particularly through the creation of technology transfer centers to facilitate the transfer of knowledge and technology from universities to the industrial and economic sectors (Ministère de l'Enseignement Supérieur et de la Recherche Scientifique, 2024).

11. Main Hypothesis:

11.1 The First part (digital transformation): This part is correct. The digitalization process in the Algerian government is well underway and involves the management of archives, optimization of administrative processes, and data-driven decision-making. This is reflected in initiatives such as using modern technologies for data collection and analysis, which facilitate informed decisions and better monitoring of public policies.

11.2 The Second part (university governance): This part is partially incorrect. Although university governance involves essential aspects such as transparency, accountability, and participation, the hypothesis does not consider all elements of this governance. Specifically, the aspect of external funding is more complex. While private funding is a goal, Algerian universities largely rely on public funding, limiting their financial autonomy and their ability to develop outside the government framework.

11.3Sub-Hypotheses :

- **First sub-hypothesis (government digital transformation)**: The idea that the Algerian government is implementing digitalization of archives and future information to optimize decision-making is correct. Data digitalization not only facilitates better information management but also enables a more transparent and efficient decision-making process through real-time data analysis.
- **Second sub-hypothesis (barriers to digitalization)**: This sub-hypothesis is valid. The implementation of modern technologies in Algeria faces several challenges, including the necessary investment in hardware, the current economic difficulties, and the required technical expertise. In addition to these obstacles, ongoing training of personnel is essential to ensure optimal use of technologies. The lack of infrastructure and the need for training further complicate the integration of large-scale digitalization in the country.
- **Third sub-hypothesis (fourth-generation universities project and university governance)**: The hypothesis is largely correct. While the digitalization project for Algerian universities aims to modernize administration and student services, it does not fully embody university governance in its broader sense. University governance includes not only digitalization but also financial autonomy, external funding, and the ability of institutions to manage resources independently of the government. In Algeria, funding remains largely public, which limits the impact of digitalization on truly autonomous governance of universities.

12.Conclusion

Digitalization has become a central pillar of development in many countries, especially in Western nations and certain Arab countries such as Saudi Arabia and the United Arab Emirates. It grants governments greater power in information management, control, and decision monitoring, while enabling efficient data collection regarding the needs and interests of the population. After thoroughly exploring the relationship between digitalization and governance, it becomes clear that this digital transition is essential for modernizing government structures, improving transparency, and enhancing decision-making efficiency. The benefits for citizens are also notable, as digitalization allows for a better understanding of their needs, makes public services more accessible, and ensures more responsive and results-oriented management. Thus, through the adoption of these technologies, governments can not only improve public management but also strengthen citizen participation and accelerate socio-economic development.

The analysis of the proposed hypotheses reveals several relevant elements concerning digital transformation and university governance in Algeria.

Results: Based on our analysis, we draw the following conclusions:

- **Improvement in government decision-making**: Digitalization of government sectors enables quick access to essential information, thus facilitating more informed and responsive decision-making.
- **Decision monitoring and control**: One of the major benefits of digitalization is its ability to provide constant monitoring of decisions and their impacts. This not only helps measure progress but also protects the government's interests regarding transparency and accountability.
- **Reduction in public spending**: Investment in digital infrastructure, such as the internet, can lead to significant reductions in costs related to jobs and public services. By allowing citizens to access services directly via their phones, digitalization reduces the need to maintain costly physical infrastructure.
- **Strengthening innovation and creativity**: Digitalization facilitates access to information, stimulating creativity and innovation, especially in the human capital sector. By being constantly exposed to the latest information and technologies, individuals can work in an environment conducive to innovation.
- **Complementary relationship between governance and digitalization**: Governance, an increasingly valued concept globally, becomes more effective after the digitalization of public sectors. Digitalization and governance reinforce each other, as it facilitates more transparent, accountable, and participatory management.
- **Enhanced transparency and accountability**: Thanks to digitalization, decision-making processes become more accessible and traceable. Citizens can consult and follow decisions, and this information is digitally recorded, facilitating accountability.
- **Global technological advancements**: Digitalization is progressing rapidly worldwide, with significant developments such as artificial intelligence. These technologies can replace the human element in several areas, making it imperative for the Algerian government to catch up and adopt these innovations as soon as possible.

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