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The impact of digital transformation on e-commerce in Algeria: in the light of some ICT indicators

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Abstract---This research aims to study the impact of digital transformation in the development of e-commerce, in the light of some ICT indicators in Algeria, such as the use of smartphones and the availability of the internet. In addition to innovation and intellectual property indicators. The study found that the digital transformation in Algeria is growing at a good pace, through supporting investments in digital infrastructure, which reflected a good improvement in the efficiency of e-commerce operations, the development of the use of the internet and smartphones increased the orientation of consumers towards online demand, increased sales of companies and opportunities in marketing their products and services, the development of electronic shopping platforms, and expanding access to new markets. However, the e-commerce sector in Algeria is still far from global levels, due to the obstacles it faces such as the lack of high-speed internet availability, electronic payment solutions, cyber security issues, and the lack of technical skills that need to be addressed to ensure sustainable growth in this area.

Keywords---Digital transformation, Electronic commerce, Information and Communication Technology.

1. Introduction

The digital revolution has changed the rules of the game in the world of Commerce, as e-commerce has become a major engine of global economic growth. Digital transformation has reshaped traditional business models, allowing companies to reach a wider customer base and offer customized products and services. It also improved the efficiency of logistics operations, which contributed to speeding up the delivery of orders and reducing costs.

Digital transformation is one of the most significant trends affecting society and companies, as technological progress and the widespread use of the internet and smartphones have radically reshaped business models and corporate operations. Many companies have adopted digital transformation strategies to improve value creation. (Tabim, V. M, 2024), and the digital transformation and innovation in the resulting business models have also radically changed the expectations and behaviors of consumers, as they have access to dozens of media channels, actively and effortlessly communicate with other companies and consumers.(Verhoef, P.C et al, 2021).

Digital transformation can be defined as a process aimed at improving an entity by making significant changes in its characteristics through combinations of Information Technology, Computing and communications. (Mikalef, P & Parmiggiani, E., 2022). This definition considers digital transformation as a process that includes significant changes through the introduction of information and communication technologies, which enables customers to search more efficiently using digital devices, providing convenience, efficiency and diverse options.

The covid-19 pandemic has accelerated the pace of digital transformation in the service sector in an unprecedented way. It has pushed companies to adopt new technologies and innovations to meet the changing needs of customers, and deal with the challenges imposed by the pandemic. This change was the transformation of qualitative data into quantifiable quantitative data, which allowed companies to more accurately analyze customer behavior and improve their experience. As a result, digital transformation has become a crucial element in corporate strategies to enhance flexibility and efficiency, adapting to the constant changes in the market (Chin, H et al, 2023).

In this context, in parallel with the increase in technological innovations and digital progress, e-commerce has become a Business Standard that opens up great prospects for the digital economy of the world. this means that the future growth in information and communication technologies (ICT) and the development of the world of computers leads to an increase in the growth rates of online business transactions and helps in building e-commerce, which in turn leads to the construction of a stronger and faster-growing digital economy compared to other branches of the economy (Gazieva, L. R et al, 2020).

At the local level, Algeria has witnessed radical transformations in the field of information and communication technologies in recent years. Although Algeria is

striving to diversify its economy through digital transformation, its e-commerce sector is still in its early stages. There are challenges related to a modest technological infrastructure and a lack of awareness of the importance of e-commerce. However, promising signs of the growth of this sector are emerging, as the interest of companies and consumers in switching to e-commerce is increasing, which opens up promising prospects for the development of the national economy. The problem of this research formulated through the following main question: **What is the impact of digital transformation on e-commerce in Algeria?**

2. The reality of digital transformation in Algeria

2.1. Indicators of ICT development in Algeria

The level of ICT development in countries can be found through the ITU ICT Development Index (IDI), which measures and compares the progress of countries in this area and highlights the technical gaps between them. The scores of this indicator range from zero to 100.

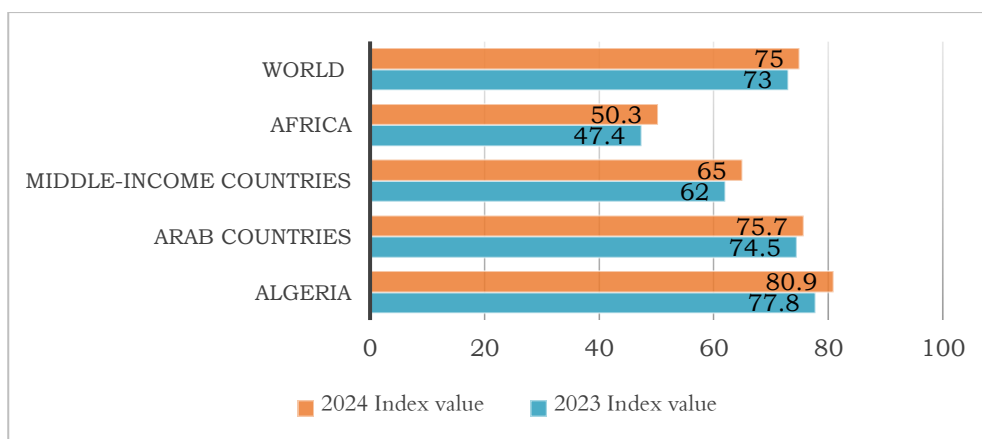


Figure1: Evolution of the ICT Development Index for Algeria (2023-2024)
Source: International Telecommunication Union, The ICT Development Index (2023), (2024), Measuring digital development.

The graph shows that the value of Algeria's ICT Development Index for the year 2024 has reached 80.9, ranking 82 out of 170 countries included in the ranking, which is 6 places ahead compared to the year 2023, whose index was 77.8 in 2023. Thus, it is considered to exceed the African average for the year 2024 estimated at 50.3, and the average of the Arab countries that scored an average score (75.7). However, this result hides serious disparities, as the group of Arab countries includes countries with the highest score in the Digital Development Index (IDI) (100.0), namely Kuwait, and the third lowest score (28.7) among the 170 economies in the total IDI 2024, as well as the average of middle-income countries 65 points.

2.2. Algeria's innovation ranking

There are several indicators used in the evaluation of research, development and innovation in various countries of the world, the most important of which is the Global Innovation Index, a report published annually since 2007 by the World Intellectual Property Organization WIPO, INSEAD International Business School and Cornell University, in order to give a picture of the multidimensional aspects of innovation that would contribute to the design of appropriate economic policies to promote long-term growth, as it provides a database for a large group of countries, and the following table shows Algeria's ranking in the Global Innovation Index.

Table1: Algeria's Ranking in the Global Innovation Index (2020-2023)

Index value/100	2020		2021		2022		2023	
	V	R	V	R	V	R	V	R
Global Innovation Index	19.48	121	19.9	120	16.7	115	16.1	119

Source: WIPO, (2023), Global Innovation Index 2023 Innovation in the face of uncertainty, 16th Edition, WIPO Publication No. 2000EN/23. available on <https://www.wipo.int>, accessed on: 02/09/2024.

According to the table, it is noted that Algeria is lagging behind in the ranking of the Global Innovation Index for the year 2023, where it ranked 119 out of 132 countries included in the rating with a value of 16.1/100, with a low index value compared to 2020, in which it ranked 121 globally with a value of 19.48, and its performance remains late compared to the first year in which the Global Innovation Index was released in 2007, in which it ranked 83 globally, which weak results do not reflect the great potential that Algeria enjoys financially and humanly to advance the field of research and development and innovation compared to neighboring countries was ranked better in 2023, similar to Tunisia, which ranked 79th globally with an innovation index value of 26.9, Morocco ranked 70th with a value of 28.4, Egypt ranked 86th with a value of 24.2, while the highest value was collected by Switzerland with a value of 67.6, which is the first globally in the field of innovation in 2023.

2.3. Scientific publications and patents

Patents are an important measure to measure the level of innovation, research and development in countries, as they represent an indicator of technological activities and research projects in academic and industrial institutions. At the same time, they reflect the inputs and outputs of technological innovation, as the number of patents filed annually reflects the volume of investments in research and development.

According to the global intellectual property index report issued by the World Intellectual Property Organization for the year 2022, Algeria ranked 64th globally with 5,250 exploited patents, and ranked 81st globally with 1,118 patent applications. By comparison, China is in the lead globally with a huge number of patent applications, reaching 1,619,268, while Saudi Arabia came in 28th place

globally and first in the Arab world with 5,831 patent applications. These figures reflect the large gap in the level of innovation between countries and highlight the need to strengthen research and development efforts in Algeria (WIPO, 2023).

According to the 2023 annual report of the Scimago Journal Rank index (SJR), which is based on the SCOPUS database and is considered a measure of the impact of peer-reviewed scientific journals, Algeria ranked 56th in the world for the number of scientific publications, which amounted to 10,996 publications. This figure is insignificant compared to the number of scientific publications in the world's leading countries, such as China, which took the first place with 1,028,625 publications, and the United States of America, which came in second place with 724,534 publications. The comparison also shows that Saudi Arabia, which ranked 20th globally and first in the Arab world, has registered 58,005 scientific publications (SIR, 2024).

2.4. Information and communication technology infrastructure in Algeria

Since 2000, developments in the telecommunications and digital technology sector have become a priority for Algeria. After the implementation of Public Law No. 03-2000 in August 2000, which laid the general foundations of post and telecommunications, the country has undergone radical changes in telecommunications policy, resulting in noticeable progress, especially in the field of mobile technology, where the second generation (2G) was introduced in 2001, the third generation (3G) in December 2013, and the fourth generation (4G) in September 2016. To promote this development, law 18-04 was passed on May 10, 2018, aimed at improving the business environment, facilitating access to the electronic communications market, and increasing the quality of services for all citizens (MPT, 2020).

Information and Communication Technology in any country is often measured according to a set of indicators, represented by landline, mobile phone and the internet, so in light of this, we will try in this part to clarify these indicators in Algeria.

2.4.1. Mobile phone subscriptions

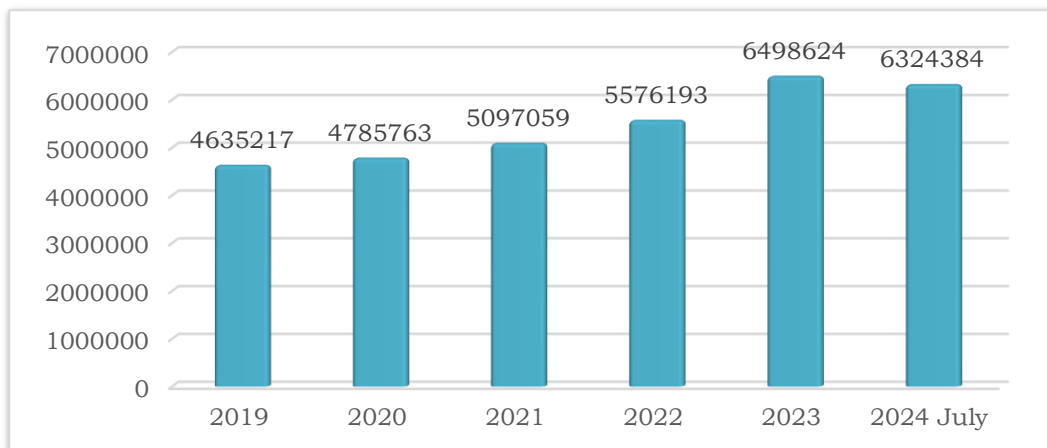


Figure 2: Evolution of Fixed-Line Subscribers (2019-2024)

Source: Ministry of Postal and Telecommunications, 2024, Regulatory Authority for Postal and Electronic Communications, available on <https://www.arpce.dz/ar/indic/mobile>, accessed on: 10/08/2024.

Based on the data presented in the table, it shows that the fixed and mobile phone market in Algeria has witnessed a remarkable development in recent years. The number of fixed-line subscriptions has recorded continuous growth, increasing from about 4.6 million subscribers in 2019 to more than 6.3 million subscribers in July 2024. This increase reflects an estimated growth rate of 36.44% over six years. This expansion reflects the strengthening of the telecommunications infrastructure and meeting the growing demand for fixed-line services. It also reflects the success of policies and initiatives aimed at improving and expanding communication services, which may contribute to improving the quality of communication and providing better services.

2.4.2. Mobile phone subscriptions

By this indicator it is possible to find out the percentage of individuals who own a mobile phone. According to the information and Communication Technology Development Index (IDI), the percentage of individuals owning a mobile phone in Algeria has moved from 83.3% in 2023 to 85.9% in 2024, an estimated growth rate of 2.6% (ITU, 2024). For further clarification, the development of mobile phone subscriptions in Algeria during the period (2019-2024) can be reviewed through the following figure.

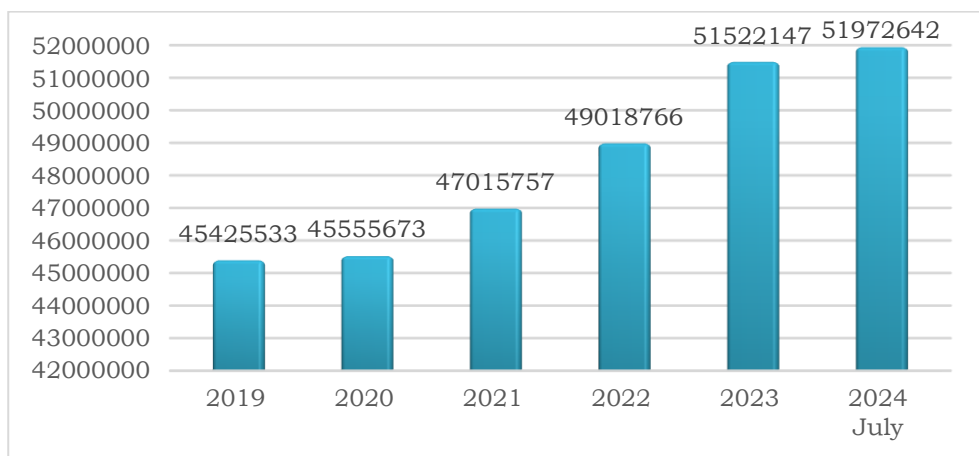


Figure 3: The evolution of Mobile Subscriptions (2019-2024)

Source: Ministry of Postal Services and Telecommunications, 2024, Regulatory Authority for Postal and Electronic Communications, available on <https://www.arpce.dz/ar/indic/mobile>, accessed on: 09/09/2024.

Over the past six consecutive years, the number of mobile subscriptions has witnessed a remarkable growth of 6.5 million, surging from over 45 million in 2019 to approximately 60 million by June 2024, reflecting a 14.41% growth rate. Notably, the majority of these subscriptions are of the fourth-generation (4G) type. Concurrently, third- and second-generation subscriptions have exhibited a consistent decline since the advent of 4G technology in late 2016. This trend can be attributed to the migration of Algerian subscribers towards broadband internet services, driven by the latter's superior streaming speeds and significantly higher data rates compared to previous generation.

2.4.3. The development of internet usage in Algeria

Based on the Information and Communication Technology Development Index (IDI), Algeria has experienced a notable expansion in internet usage. The proportion of the population utilizing the internet rose from 69.7% in 2023 to 75% in 2024, signifying a growth rate of 5.3%. These findings indicate a positive trajectory in Algeria's digital development (ITU, 2024). For further clarification, the development of fixed and mobile internet subscriptions in Algeria during the period (2019-2024) can be reviewed in the following table:

Table 2: The evolution of fixed and Mobile Internet Subscriptions in Algeria (2019-2024)

Index	2020	2021	2022	2023	July 2024
Fixed Internet Subscriptions	3.789.128	4.175.372	4.705.846	5.541.377	5.773.790
Mobile Internet Subscriptions	38.772.562	41.780.199	44.757.505	48.090.232	48.854.358

Source: Ministry of Postal Services and Telecommunications, 2024, Authority of Regulatory for Postal and Communications Electronic, available on <https://www.arpce.dz/ar/indic/mobile>, accessed on: 09/09/2024.

The data of the table show positive trends in the use of the internet, as the number of fixed-line internet subscriptions is constantly growing. In 2020, the number of subscriptions reached more than 3.7 million, and this number continued to increase in the following years to reach more than 5.7 million subscriptions in the first half of 2024, recording an increase of 52.37% since 2020.

The number of mobile internet subscriptions has also seen a noticeable increase. The number of subscribers increased by more than 10 million subscribers over a five-year period, with a growth rate of 26%. While the number of subscribers in 2020 more than 38 million, then this figure increased to more than 44 million in 2022, reaching more than 48 million in the first half of 2024, an increase reflecting the preference for using mobile phones as the main means of accessing the internet.

2.4.5. Fiber optic network subscriptions

Fiber optics is rapidly becoming the preferred means of data transmission in modern communications, and is necessary to support the growing use of the internet (Rezgui, H., 2021). Fiber optics to the home (FTTH) is a technology that allows access to the internet with very high streaming, where the fiber optics are connected to the home end. Fiber-optic networks allow to provide a connection with very high quality and flow speed, in addition to providing optimal response, which reduces the occurrence of interruptions and excludes the occurrence of electromagnetic disturbances.

Table 3: The Evolution of The Number of Households Connected to The Fiber Optic Network to The end of The House (2019-2024)

Index	2019	2020	2021	2022	2023	June 2024
(FTTH)	43.115	72.314	165.244	478.172	1.080.948	1.315.267

Source: Ministry of Postal and Telecommunications, 2024, Regulatory Authority for Postal and Electronic Communications, available on <https://www.arpce.dz/ar/indic/mobile>, accessed on: 09/09/2024.

According to the table, it is noted that there is a positive development in connecting households to the fiber optic network, although it is somewhat slow, but it continues to grow, as the number of households connected to the fiber optic network to the home FTTH increased from 72,314 households in 2020 to 478,172 households at the end of 2022, reaching 1.31 million households in the first six months of 2024, thus Algeria is considered at the continental level the second African country after South Africa, reaching the threshold of one million subscribers fiber optics to the very home.

2.4.6. Internet prices and streaming speed

According to a study by Statista on mobile internet prices globally, the average cost of consuming one GB of internet in Algeria was 0.73 USD in 2022. Thus, Algeria ranked 75th globally out of the 233 countries and territories surveyed, and sixth in the Arab world after Somalia, Sudan, Kuwait, Egypt and Syria (Statista, 2023).

Regarding the fixed internet basket price in Algeria, the latest ITU report for 2024 indicated that this percentage is 3.9% of the National per capita income. This percentage is considered acceptable when compared to middle-income countries, such as Tunisia, where the percentage is 2.6%, Nigeria, where the percentage is 19.7%, and Morocco, where the percentage is 3.8% (ITU, 2024).

It can be said that the data shows that Algeria is making progress in achieving relatively affordable internet costs, both in mobile and fixed internet. However, the great disparity between countries highlights the importance of pursuing domestic policies and investments in infrastructure to improve internet access and mitigate costs.

With regard to the speed of internet flow, the data of the Global "Speed Test" index specialized in analyzing and testing internet speeds indicate that Algeria occupies relatively late positions at the global level. According to the 2024 rating, Algeria ranked 93rd out of 111 countries in mobile internet streaming speed, recording an index value of 24.69 and a streaming speed of 11.71 MB. Compared to the year 2023, in which an index value of 22.24 and a streaming speed of 11.62 MB were recorded (Speedtest Global Index, 2024).

As for the fixed internet streaming speed, Algeria ranked 147th out of 162 countries in the 2024 ranking, with an index of 14.42 and a streaming speed of 2.44 MB. This represents a decrease of one place compared to the year 2023, when Algeria was in 146th place with an indicator of 12.08 and a streaming speed not exceeding 0.94 Mbps. Despite the slow progress, Algeria's performance in the field of mobile internet is still below the world average, which indicates the need for further investment and development in this sector (Speedtest Global Index, 2024).

Table 4: Mobile and fixed-line internet streaming speed in Algeria (2024)

Index	2024	
Mobile internet streaming	V	24.69
	R	93
Streaming fixed-line internet	V	14.42
	R	147

Source: (Speed test Global Index, 2024)

3. E-commerce in Algeria

In this section, we review the development of e-commerce indicators in Algeria.

3.1. The evolution of the number of electronic payments

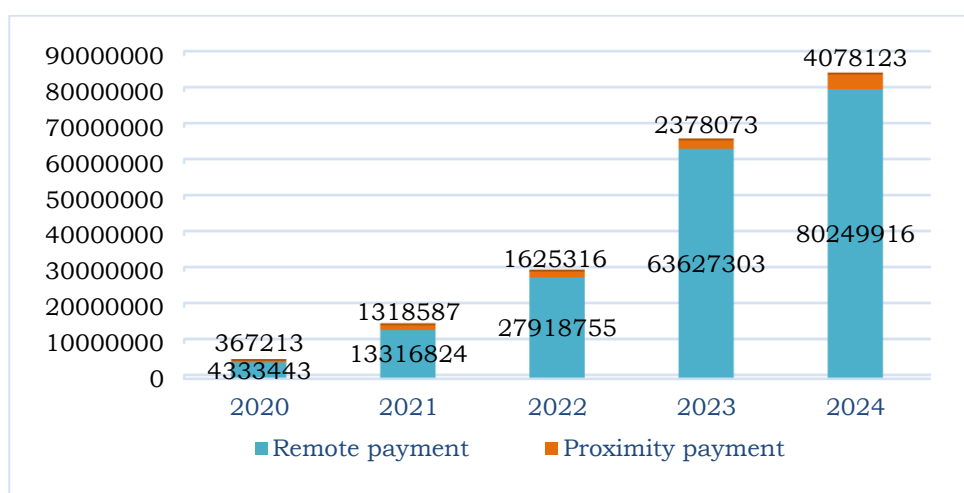


Figure 4: The evolution of the number of electronic payment transactions in Algeria (2020-2024)

Source: Ministry of Postal and Telecommunications, 2024, Regulatory Authority for Postal and Electronic Communications, available on https://www.arpcce.dz/ar/indic/mobile_ accessed on: 09/09/2024.

During the last five years, there has been a significant increase in the number of electronic payment transactions in Algeria from 4.7 million in 2020 to 84.3 million in June 2024. This is a very significant development in the number and amounts of online payments, as the number of payments increased by more than 98% between 2020 and 2022, while the amount of transactions increased by about 240% during the same period. The total number of remote and mobile payments increased between 2022 and 2024 by 185%, this development reflects a significant change in consumer behavior and an increasing interest in digital transactions, thanks to the increase in the number of holders of electronic payment cards, as well as the expansion of the range of services available on the commercial platforms of Algeria post.

3.2. The volume of online sales in Algeria

In 2023, global e-commerce retail sales reached an estimated USD 5.8 trillion (Statista, 2024). In the USA, for example, total e-commerce sales reached 282.3 billion dollars in the first quarter of 2024, an increase of 5.3% over the first quarter of 2023, and accounted for 15.2% of total sales (the Department of Commerce American, 2024).

The exponential growth of this sector globally. It reflects the growing dependence on online shopping and its significant impact on the global economy. E-commerce sales in Algeria can be presented in the following table:

Table 5: The Evolution of online sales volume in Algeria (2017-2024)
Unit: USD

Index	2017	2018	2019	2020	2021	2022	2023	2024 June
Amount of online sales in Algeria	542	602	712	875	1,003	1,115	1,025	1,202

Source: Statista, Montant des ventes en ligne en Algérie entre 2017 et 2024, (2024), <https://fr.statista.com>, accessed on: 17/09/2024.

The figure demonstrates a consistent upward trend in e-commerce sales in Algeria, surging from 542 million Dollar in 2017 to over 1 billion Dollar in 2024. This significant increase indicates market expansion and a growing inclination towards online shopping, reflecting a notable evolution in the e-commerce sector. However, despite domestic progress, Algeria's e-commerce market remains relatively less developed compared to global markets that generate trillions of dollars in sales.

3.3. The development of e-commerce in Algeria

The global economy is moving towards increasing the activation of e-commerce in the sectors of knowledge, communications, the digital revolution and information technology, because it has become a vital requirement in business strategies in light of the gradual transformation of economic systems from the traditional system to the knowledge-based system.

As for the development of global e-commerce, statistics indicate that the number of shoppers via the Global Information Network reached 1.5 billion people in 2020, compared to about 1.4 billion people in 2019, an increase of 7%, and the value of e-commerce sales increased by about 8% to reach about 26.7 trillion US dollars in 2020, equivalent to 30% of the global gross product, compared to about 25.6 trillion US dollars in 2019 (ITU, 2024). The e-commerce market in the Arab countries grew by about 46.6% in 2020 compared to 2019, reaching the value of e-commerce activities to about 22 billion US dollars at the end of 2020 (A Essalam, M & Hasen. D.K, 2021).

As for Algeria, in light of the accelerated developments in e-commerce activities following the covid-19 pandemic, which began since 2020, reports indicate that the volume of electronic activities has developed significantly, especially that during that period institutions worked to launch new services in light of the development of the use of information and communication technology and the desire to move towards the digital economy and the expansion of e-commerce across the world. According to the (GIE Monétique) report, the number of e-commerce sites in Algeria has increased from 48 sites in 2020 to 510 sites in 2024, an increase of 962.5% (GIE Monétique, 2024).

These and other reasons have made Algeria work to improve and prepare the infrastructure in the field of Informatics and internet networks for the development of electronic commerce, and it has also worked to enact a set of laws to regulate electronic transactions, including Law No. 18-05 dated May 10, 2018, which defines the general rules for electronic commerce of goods and services that define a series of provisions that define the rights and obligations of electronic suppliers and electronic consumers. In addition to the Cybercrime Law, automated accounting and electronic signature and certification (Official Gazette, 2018).

Algeria has also adopted a stimulating trend with regard to taxes on electronic commerce, such as Article 41 of the finance law 2020, which stipulated that the reduced rate of Value-Added Tax be set at 9% on sales completed electronically, and Article 42 of the same law, which provided for the establishment of a value-added fee of 0% to be applied to purchases of materials, goods and services benefiting from the purchase by exemption or exemption from the fee on the value-added realized by companies affiliated to the Directorate of major institutions (Iariouwi, A. R & Kassem, K., 2021).

In order to understand the reality of e-commerce in Algeria, we will rely on the report of the United Nations trade and development organization on the world e-commerce index, which measures the economic readiness of countries to benefit from the online market. The following figure shows the development of the e-commerce index for Algeria according to the report of the World Bank during the period (2016-2020).

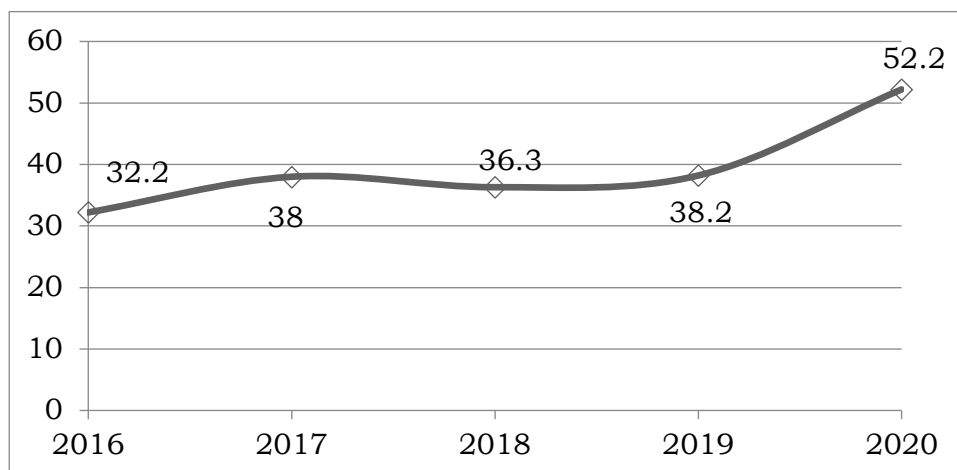


Figure 5: Algeria E-commerce Growth Index (2016-2020)

Source: World Bank Group, UNCTAD B2C E-COMMERCE INDEX 2016, 2017, 2018, 2019, 2020.

It is clear from the above figure, according to the report issued by the World Bank, that in 2020 Algeria made a big leap globally in the field of electronic commerce, advancing by 27 ranks in one year, which indicates a significant improvement in the business environment and digital trade. The report pointed out that Algeria is among the four countries that have achieved the greatest progress at the global level, namely Brazil, Ghana and Laos, moving from the 107th place in 2019 to the 80th place globally in 2020, this indicates that Algeria has begun to realize the important role played by e-commerce in increasing economic growth and opening doors for individuals to integrate into the new economy and the need to use information and communication technology for commercial purposes, and this significant progress in the ranking reflects the success of policies and initiatives aimed at promoting e-commerce in the country.

As for the Arab world, Algeria ranked tenth, close to Tunisia, which ranked 77th globally in 2020, and ahead of Morocco, which ranked 95th globally, while Algeria is still lagging behind compared to other Arab countries such as the UAE and Qatar, which shows the need for more efforts to progress in the global rankings.

4. The most important challenges and obstacles of e-commerce in Algeria in light of digital transformation

The development of e-commerce in Algeria faces several obstacles and challenges, despite the trend towards digital transformation. Among these challenges are:

- **Digital infrastructure:** weak networks and communications in some regions, which affects the speed and quality of Service.
- **Legal and regulatory issues:** the lack of a clear legal framework regulating e-commerce, which creates ambiguity and limits trust between consumers and sellers.

- **Awareness and education:** lack of awareness and knowledge about e-commerce among some groups, which hinders the effective use of technology.
- **Security and privacy:** fears of data breach and electronic fraud affect consumers' confidence in online purchases.
- **Electronic payment:** the lack of electronic payment options and the presence of challenges in the payment system, such as the lack of widespread adoption of digital payment systems.
- **Competition:** compete with traditional commerce, which continues to dominate the market, making the transition to e-commerce even more challenging.
- **Cultural transformation:** resistance to change from some individuals and companies that prefer traditional methods.
- **Skills availability:** lack of technical skills among individuals and companies in the field of e-commerce and digital marketing.

5. Conclusion

After studying the ICT indicators in Algeria, it is clear that the digital transformation has made a noticeable impact on e-commerce in the country. Advances in ICT have enhanced the market's ability to adopt innovative digital business models, improving operational efficiency and expanding access to new markets.

Investing in digital infrastructure and expanding the range of internet services has facilitated the implementation of e-commerce strategies, increased competitiveness and contributed to the creation of a more dynamic business environment. However, significant challenges remain, including a lack of trust in electronic transactions, cyber security and a lack of technical skills to meet the needs of the growing market.

In the light of the studied indicators, the success of digital transformation in promoting e-commerce in Algeria requires integration between government initiatives and the private sector. Efforts should continue to improve the digital infrastructure, provide a stimulating legislative environment, promote digital culture among consumers, as well as expand the scope of education, training and innovation in the field of technology. In this way, Algeria can strengthen its competitiveness in global markets and achieve sustainable economic growth.

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