Information and Communication Technology ICT: Present reality and future challenges for Algeria

Mourad ABDAT*
Maître de conferences (A)
Faculty of Economic,Commercial and Management Sciences,
University of Algiers 3(Algeria)
Mail: mourad.abdat @ gmail .com
Imane HAYOULA
Maître de conferences (A)
Faculty of Economic,Commercial and Management Sciences,
University of Medea (Algeria)
Mail: hayoula.imane @ univ-medea .dz

Date of submission:11/11/2023; **Acceptance date**: 08/12/2023; **Publication date** : 20/ 12/2023

Abstract
This study aims to determine the reality of Information and Communication Technology ICT in Algeria by studying and analyzing the leading index of this sector, which are mainly represented by the mobile phone indicator, the fixed-line phoneindicator, the Internet indicator, as well as the indicator of customers and service providers active in the field of communications. This process also takes into consideration the indicator of the development of Internet subscriptions via Satellites in the period extending from 2015 to the first trimester of 2023. A descriptive and analytical approach was used to treat and study these indicators. We concluded from the analysis that this sector was witnessing a continuous development, and all its indicators data reflect the level of efforts made to achieve progress in Information and Communication Technology and to improve the level of services provided in quantity and quality to all customers and institutions. However, despite all the work done, this sector has been unable to keep pace with applicable international standards and to reach the level of customers' aspirations, because of material, human, and technical obstacles.

Keywords*: Information and Communication Technology ICT, fixed-line phone indicator, mobile phone indicator, Internet indicator, Algeria.*
JEL Codes : *O32,O33, O38.*

Résumé
Cette étude vise à déterminer la réalité des Technologies de l'Information et de la Communication (TIC) en Algérie en étudiant et en analysant l'indice principal de ce secteur, représenté principalement par l'indicateur du téléphone mobile, l'indicateur du téléphone fixe, l'indicateur de l'Internet, ainsi que l'indicateur des clients et des fournisseurs de services actifs dans le domaine des communications. Ce processus prend également en compte l'indicateur du développement des abonnements Internet via satellites sur la période allant de 2015 au premier trimestre de 2023. Une approche descriptive et analytique a été utilisée pour traiter et étudier ces indicateurs. Nous avons conclu de l'analyse que ce secteur connaissait un développement continu, et toutes les données de ses indicateurs reflètent le niveau des efforts déployés pour progresser dans les Technologies de l'Information et de la Communication et améliorer le niveau des services fournis en quantité et en qualité à tous les clients et institutions. Cependant, malgré tout le travail accompli, ce secteur n'a pas été en mesure de suivre le rythme des normes internationales applicables et d'atteindre le niveau des aspirations des clients, en raison d'obstacles matériels, humains et techniques.

Mots-clés : *Technologies de l'Information et de la Communication (TIC), indicateur du téléphone fixe, indicateur du téléphone mobile, indicateur de l'Internet, Algérie.*
Codes JEL : *O32, O33, O38.*

*** Corresponding author.**

Introduction:

At the beginning of the third millennium, the world experienced significant and profound transformations that affected all aspects of life, especially in ICT. The production of non-material resources significantly exceeded the level of production of material resources in terms of quantity and quality, as a consequence the states adopted it as a tool to enhance their economies, increase their social and economic transactions, as well as to achieve sustainable economic development and social well-being. However, these objectives can only be achieved by establishing the legal bases and economic mechanisms that regulate and stimulate this type of activity. In this vein, Algeria sought to organize and expand activity in Information and Communication Technology by increasing the volume of transactions and services provided, as well as enhancing legal and economic protection for customers. The Algerian state intend also to provide services that are in line with the level of development taking place and to fulfill simultaneously the aspirations of citizens and institutions regarding the size and level of these services.

Through the above, the following problems can be raised:

What is the reality of Information and Communication Technology in Algeria in the light of current and future challenges?

- **The importance of the research:**

This research is crucial because it explains ICT's role as an innovative method and approach in the knowledge and digital economy, in the supply of goods and services at a level that is consistent with international standards to achieve a degree of benefit for both citizens and institutions at a stage that satisfies their aspirations in both quantity and quality. As one of the tools through which States seek to improve their economies and increase their wealth to achieve economic development and social well-being, we will analyze its main components and indicators and define the obstacles it faces in Algeria.

- **Research objectives:** In addition to answering the main problem, this research aims to:

  - Identify the scientific and knowledge concepts of Information and Communication Technology;
  - Define the role of Information and Communication Technology as a modern approach and method in enhancing the economies of States, and its importance for all State parties: institutions and individuals;
  - Learn about Algeria's efforts to promote and support Information and Communication Technology legally and economically, and to identify existing elements and challenges.

- **Research methodology:** In addressing our research, we relied on a combination of descriptive and analytical approaches. The descriptive approach was adopted to present various concepts and definitions of the subject and the analytical approach in

analyzing and evaluating Information and Communication Technology indicators in Algeria from 2015 to the end of the first trimester of 2023.

• **Research structure:** In order to crystallize this problem, this research was divided into the following elements:

1. ICT theoretical framework:

Information and Communication Technology is considered one of the modern concepts that emerged as a result of rapid development, most countries and modern business organizations sought to use it in all transactions and administrative functions.

1.1 The concept of Information and Communication Technology: As a modern concept, ICT has multiple definitions provided by researchers, the most important of which can be summarized as follows:

The words " Information and Communication Technology" mean combining the written and spoken word, static and moving images, wired and wireless communications, terrestrial or satellite, then storing data, analyzing its contents, and making them available in the desired form, at the appropriate time, and with the necessary speed (Bendiabdellah, 2004, p. 51).

Information and Communication Technology is the information revolution associated with the manufacture, expression, marketing, storage, retrieval, display, and distribution of information through modern, advanced, and fast technical means. This process goes through the collective use of computers and modern communications systems (Hadid, 2006-2007, p. 53)

Information Technology is a representation of the technological aspect of an information system (periodically used as an alternative to an information system). The task of processing, storing, updating, retrieving, and communicating data to beneficiaries relied on manual methods that had been in place for extended periods of time and that had proved to be limited and unable to accomplish the task as required, particularly after a huge increase in the volume and type of data. The recent situation has made it imperative to manage modern information technology in system applications (Abdel Karim Al-Khannaq, 2005, p. 237)

1.2 Characteristic of the Information and Communication System: After reviewing these concepts, we conclude the following (Belguidoum, 2012-2013, pp. 133-134):

- Information and Communications Technology is centrally based on the use of computer technologies and software.
- ICT applications include a number of stages, which first begin with obtaining the necessary data from its various sources, processing it, then sending results operations to the designated authorities to benefit from them.
- In order for ICT systems to achieve maximum benefit from their operations, their result must be provided to beneficiaries at the appropriate time and form;

- ICT outputs represent the emergence of many areas of development, such as sophisticated software which includes expert systems, artificial intelligence, databases, office automation, Internet, Intranet, email, and telecommunication technology.

Based on the foregoing, Information and Communications Technology is not limited to the use of modern technological machines only, but also extends to the cognitive and intellectual aspects, methods, as well as techniques necessary to transform inputs into outputs.

1.3 Benefits of Information and Communication Technology: The most important benefits of ICT application can be summarized as follows (Yakhti, 2005, p. 49):

- Developing senior management tools by regulating users' competencies;
- Improving the institution's internal recruitment;
- Improving productivity and efficiency, as well as developing services and products;
- Rapid response to the customer's necessities;
- Innovation and renewal without interruption to stay in service and maintain market share;
- Expanding the distribution network and creating offers appropriate to customer's requirements;
- The pillar of creativity, development, and the creation of modern products, new services, new markets, etc.;
- Contributing to improving the quality of services provided to customers;
- Initiating a dynamic relationship between the organization and its customers;
- The spread and expansion of electronic commerce.

1.4 ICT application: This process involves the following elements (ITU W. A., 2003, pp. 5-7):

1.4.1 Implementation and standardization of e-government applications: e-government empowers citizens through giving access to information to improve interaction with trade and industry companies. It also guarantees the implementation of government services to citizens and increases the efficiency of government administration, the efficiency of the economic system, transparency, and reducing corruption. All these actions lead eventually to increasing the capabilities of developing countries in attracting investment and foreign financial assistance.
A target date should be set for providing basic services via the Internet. Modest results have already been achieved in some countries of the region, but many services remained inaccurate due to a lack of awareness and training of the average citizens.

1.4.2 Promoting distance learning programs and projects: Member States should ensure that access to the Internet and multimedia is available in all schools, universities, and academic institutions for the purpose of education, training, skills

reshaping, and research. Attention must be paid to training teachers to adapt to the learning environments, a legal, economic, and social issues that are obstacles to the development of distance learning in the region.

1.4.3 Application of electronic health: Healthcare applications through networks can provide unique opportunities for patients and practitioners, especially in developing countries, which maintain in place the infrastructure that supports these applications. Healthcare tends to be an information-intensive field, and it requires increased encouragement for hospital management systems to use the Internet to acquire medical information.

1.4.4 E-business restructuring: It is essential, especially for small and medium enterprises, that the operations of business firms are restructured in such a way that they can adopt digital technologies. Government policies should support this process that aims to enhance the entrepreneurial spirit of the Business community.

1.4.5 Development of e-content applications and tools: Active steps should be taken to encourage the production of content in the most widely spoken languages. These steps include establishing appropriate conditions for the development of digital content and local multimedia industries, including provisions for intellectual property rights, and strengthening their management tools, as a means of promoting multilingualism and investing in projects aimed at supporting this goal.

1.4.6. Introduction of other applications: Most economic and social sectors suffer from an absence of applications that help management bodies in the decision-making process and increase the internal efficiency of companies, which could enhance their ability to produce better and more competitive products and services. Sectors like agriculture, irrigation, industry, transportation, tourism, and the environment can benefit greatly from it by applying effective tools and software such as Geographic Information Systems (GIS), to overcome these sectors' problems.

2. Information and Communication Technology indicators in Algeria: In this element, we will discuss Information Technology indicators in Algeria by overly focusing on the main ones from 2015 to the first trimester of 2023:

2.1 Mobile Network Index: This indicator is one of the key ICT indicators so we will try to include its main sub-elements as follows:

2.1.1 Development in the number of mobile phone subscribers: The telecommunications market in Algeria witnessed a remarkable development through the competition between three economic operators, namely Algeria Mobile Telecom (Mobilis), Optimum Telecom Algeria (Djezzy), and National Telecom Algeria (Ooredoo), which is determined by the following table:

Table 1. The development of the number of mobile phone subscribers according to each phone service provider.

Years	Number of subscribers (one million)			Total subscribers
	Algeria Telecom Mobile (Mobilis)	Optimum Telecom Algeria (Djezzy)	National Telecom Algeria (Ooredoo)	
2015	14087440	17005165	12298360	43390965
2016	17344746	16367886	13328689	47041321
2017	18365148	14947870	12532647	45845665
2018	19106401	15848104	12199759	47154264
2019	18633371	14707625	12084537	45425533
2020	18974678	14363102	12217893	45555673
2021	19829935	14593618	12592204	47015757
2022	21098772	15177875	12742119	49018766
first trimester of 2023	21 360 265	15 205 574	12 742 924	49 308 763

Source: Prepared by the researcher based on the annual mobile phone reports issued by the Postal and Electronic Communications Control Authority in Algeria from 2015 to 2022.

Through Table No. (01), we notice that the total number of subscribers is constantly increasing among all customers and at a varying rate. We record an increase of approximately one million subscribers to the Algerian National Telecommunications Company (Ooredoo) from 2015 until 2023, while Algeria Telecom Company (Mobilis) has the largest number of subscribers, surpassing Optimum Telecom Algeria (Djezzy) from 2016 to 2023.

2.1.2 Market Share Development in the Mobile Market: This indicator refers to the market share for each phone service provider, as the market share determines the company's performance and its position in the market as well as the size of the competition that exists between dealers in the mobile phone market in Algeria. The table No. (02) shows the market share for each phone service provider from 2015 to the first trimester of 2023:

Table 2. The evolution of the number of mobile phone subscribers by phone service provider

Years	Marketshare (%)		
	Algeria Telecom Mobile (Mobilis)	Optimum Telecom Algeria (Djezzy)	National Telecom Algeria (Ooredoo)
2015	32.46	39.20	28.34
2016	36.87	34.80	28.33
2017	40.05	32.60	27.35
2018	40.52	33.61	25.87

2019	41.02	32.38	26.60
2020	41.65	31.53	26.82
2021	42.18	31.04	26.78
2022	43.04	30.96	26.99
first trimester of 2023	43.32	30.83	25.84

Source: Prepared by the researcher on the basis of the annual mobile telephone reports issued by the Postal and Electronic Communications Control Authority of Algeria from 2015 to the first trimester of 2023

From Table No. (02), we note that Algeria Mobile Telecom Company (Mobilis) occupies first place in acquiring the largest market share from 2016 to the first trimester of 2023, at a rate of 42.32 percent, surpassing Optimum Telecom Algeria (Djezzy), which has a market share estimated at 30.83 percent. The National Telecommunications Company of Algeria (Ooredoo) comes in third place with an estimated market share of 25.84 percent.

2.1.3 Evolution of the number of subscribers according to payment method: This indicator shows the number of subscribers based on the pre-payment and post-payment methods from 2015 to the end of the first trimester of 2023 through the following table:

Table 3. The development of the number of subscribers according to payment method

Years	Prepayment	Post-payment	Total
2015	39 296 986	4 093979	43 390 965
2016	41 197 999	4 619 847	45 817 846
2017	41 943 543	3 902 122	45 845 665
2018	41 036 380	6 117 884	47 154 264
2019	40 635 183	4 790 350	45 425 533
2020	43 298 886	2 256 787	45 555 673
2021	44 403 382	2 612 375	47 015 757
2022	46 389 101	2 629 665	49 018 766
first trimester of 2023	46 717 817	2 590 946	49 308 763

Source: Annual mobile phone reports issued by the Postal and Electronic Communications Control Authority in Algeria from 2015 until the first trimester of 2023

From Table No (03), we note that prepaid subscribers constitute the most significant percentage in the mobile phone market estimated at 94.75 percent. It has recorded a slight increase of 0.70 percent, as the number of prepaid subscribers increased from 2022 to the first trimester of 2023, from 46,389,101 to 46,717,817 subscribers, meaning an increase of 328,716. The percentage of post-payment subscribers constitutes a weak percentage, estimated at 05.25 percent, it recorded a slight decline of 1.49 percent, as the number of post-payment subscribers decreased from 2013 to

2023. From 2022 to the first trimester of 2023, the number of subscribers went from 2,629,665 to 2,590,946 subscribers, indicating a decrease of 38,719.

2.1.4 Evolution of mobile subscriptions by technology: This indicator shows the level of technology provided by mobile operators from 2015 to 2022:

Table 4. The development of mobile phone subscriptions according to technology

Indicators / Years	Number of Second-Generation Subscribers GSM	Number of third-generation 3G subscribers	Number of fourth generation 4G subscribers	Total
2015	26706268	16684697	/	43390965
2016	20125227	25692619	25692619	45817846
2017	14385131	21 592 863	9 867 671	45 845 665
2018	10811663	17 422 312	18 920 289	47 154 264
2019	8514105	11 989 157	24 922 271	45 425 533
2020	7151778	9 265 682	29 506 880	45 555 673
2021	5 235 558	7 272 657	34 507 542	47 015 757
2022	4 260 261	5 961 291	38 797 214	49 018 766

Source: Algeria's Telephone and Internet Market Development Reports for the years 2020 and 2022, issued by the Ministry of Posts and Telecommunications, p. 06

From the table above, we notice that the number of subscribers is constantly increasing in both the third and fourth generations, while there is a continuous decline in the number of subscribers in the second generation from 2017 to 2022. The total number of subscribers is 49308763, including a common 4021443 in the Second-Generation GSM, representing 8.16 percent of the total subscribers, and 45,287,320 subscribers to the Third-Generation 3G and Fourth-Generation 4G, representing 91.84 percent of the total subscribers. This is an indication of the subscribers' desire to obtain the most technological Internet services.

2.1.5 Proportion of the population coverage by the mobile network: In this element, we will discuss the percentage of population coverage by the mobile phone network for the Second-Generation GSM, Third-Generation 3G, and Fourth-Generation 4G from 2015 to 2022 through the following table:

Table 5. The percentage of population coverage by the mobile phone network

Years / Network Generation	2015	2016	2017	2018	2019	2020	2021	2022
GSM	98 %	98 %	98 %	98,04 %	98,04 %	98,62 %	98,31 %	98,49 %
G3	46 %	83 %	90 %	97,45 %	97,72 %	98,97 %	98,18 %	98,07 %
G4	/	03,62 %	30,49 %	52,84 %	53,63 %	76,18 %	79,89 %	85,87 %

Source: Algerian Telephone and Internet Market Development Reports 2020 and 2022, issued by the Ministry of Postal and Telecommunications, p. 06, p. 07, respectively

From the previous table, we note that the second-generation GSM and 3G mobilenet works cover almost the entire population, while the 4G network covers more than 85% of the population in 2022. The percentage of subscribers to the Third Generation in the first trimester of 2023 reached 8.16 percent, as to the Third Generation 3G and fourth generation 4G, at a rate of 91.84 percent of the total subscribers.

2.2 Fixed-line phone Network Indicator: This element will address the overall evolution of the number of Fixed-line phone subscribers and the development of their number in Algeria according to the type of subscription between residential and professional from 2015 to the first trimester of 2023.

2.2.1 Evolution of the number of fixed-line phone subscribers: Through this element, we will attempt to address the evolution of the number of subscribers to the fixed-line phone network in Algeria from 2015 until the first trimester of 2023, through the following table:

Table 6. The development of the number of fixed-line telephone subscribers

Years	The number of fixed-line telephone subscribers
2015	3 267 592
2016	3 404 709
2017	4 100 982
2018	4 164 039
2019	4 635 217
2020	4 709 374
2021	5 097 059
2022	5 576 193
2023	5 758 353

Source: Prepared by the researcher based on the annual fixed-line phone reports issued by the Postal and Electronic Communications Regulatory Authority in Algeria from 2015 to the first trimester of 2023

Through Table No. (06), we notice that the number of subscribers to the fixed-line phone network is constantly increasing despite the competing services provided by mobile phone companies; it goes from 5,576,193 in 2022 to 5,758,353 subscribers in the third trimester of 2023. This slight increase of 182,160, is estimated at 03.16 percent.

2.2.2. The development of the number of fixed-line phone subscribers according to its type: Through this indicator, we will address the development of the number of fixed-line subscribers according to the type of subscription between residential and professional in Algeria from 2015 to the first trimester of 2023, through the following table:

Table 7. The evolution of the number of fixed-line phone subscribers by type

Years	Residential subscriptions	Professional subscriptions	Total
2015	2 832 238	435 354	3 267 592
2016	2 967 737	436 972	3 404 709
2017	3 611 735	489 247	4 100 982
2018	3 711 765	452 274	4 164 039
2019	4 190 162	445 055	4 635 217
2020	4 347 326	438 437	4 709 374
2021	4 646 659	450 400	5 097 059
2022	5 126 100	450 093	5 576 193
2023	5 302 505	455 848	5 758 353

Source: Prepared by the researcher based on the annual fixed-line reports issued by the Postal and Electronic Communications Regulatory Authority in Algeria from 2015 to the first trimester of 2023

Through Table No. (07), it is clear that the number of fixed-line phone subscribers by type is dominated by residential subscriptions, their number at the end of the first trimester of 2023 reached 5,302,505 subscribers, which represents 92.08 percent of the total fixed-line internet subscribers, while the number of subscribers for professional type for the same period was 455,848 subscribers, which constitute 07.92 percent of the total fixed-line internet subscribers.

2.3 Internet Indicator: Through this indicator, we will discuss the development of fiber-optic networks, the development of the number of fixed-line Internet subscriptions, the development of mobile Internet subscriptions, as well as the development of Internet subscriptions via satellite:

2.3.1 Development of fiber-optic networks: This indicator describes the continuous pursuit and attempts to modernize this sector and improve its services, through upgrading infrastructure and continuously extending the Fiber-optic network as shown in the following table:

Table 8. The development of Fiber-optic networks.

Years	International internet bandwidth (MB/s)
2015	485 155
2016	630 150
2017	1 015220
2018	1 136 035
2019	1 528 120
2020	2 417 500
2021	2 867 500
2022	3 757 500
First trimester of 2023	3 920 000

Source: Algerian Telephone and Internet Market Development Reports of 2020 and 2022, issued by the Ministry of Posts and Telecommunications, pp.07.08, in addition to the official website of the Postal and Electronic Communications Authority (www.arpce.dz)

Based on Through Table No. (08), we note an increase in international bandwidth, namely, the capacity of the actual international bandwidth and the operated one has raised in the first trimester of 2023 by 708 percent compared to 2015.

This is the result of efforts to improve and modernize the quality of Internet services by introducing new international cables into the service and increasing its operational capacity (ORVAL-ALVAL) (Authority, 2022, p. 7).

2.3.2. Evolution of the number of fixed-line Internet subscriptions: Through this indicator, we review the development in the number of fixed-line Internet subscriptions according to the type of technology as well as to the speed of flow:

-Evolution of the number of fixed-line Internet subscriptions according to the type of technology: In this element, we will discuss the development of the number of fixed Internet subscriptions according to the type of technology from 2015 to the first trimester of 2023 through the following table:

Table 9. The evolution of the number of fixed Internet subscriptions according to the type of technology.

Years	ADSL	Optical fiber FTTX	Fixed fourth generation 4G LTE fixe	Custom Links LS	WIMAX	Total
2015	1 838 746	/	423 280	/	233	2 262 259
2016	2 083 098	/	775 792	/	661	2 859 551
2017	2 246 918	714	920 244	34 008	621	3 202 505
2018	2 172 096	11 369	861 235	10 781	619	3 063 100
2019	2 334 005	43 115	1 191 612	11 280	444	3 580 456
2020	2 500 080	72 314	1 204 931	11 360	443	3 789 128
2021	2 656 942	165 244	1 340 957	11 786	413	4 175 342
2022	2 792 695	478 172	1 423 425	11 554	0	4 705 846
First trimester of 2023	2 783 468	6 17 324	1 493 117	1 309	0	4 895 218

Source: Algerian Telephone and Internet Market Development Reports for 2020 and 2022, issued by the Ministry of Postal and Telecommunications, pp. 07.08, in addition to the official website of the Postal and Electronic Communications Authority (www.arpce.dz)

From Table No. (09), it is clear that there is an increase in the number of fixed-line Internet subscriptions by type of technology, with 189,372 subscribers, which

represents a rate of 3.87 percent. This is an indication of the gradual increase and improvement of these services.

-The evolution of the number of fixed Internet subscriptions according to the flow speed: Through this element, we will discuss the evolution of the number of fixed-line Internet subscriptions according to the flow speed from 2017 to the first trimester of 2023 through the following table:

Table 10. The evolution of the number of fixed-line Internet subscriptions according to the flow speed.

Years	Subscriptions less than 10 MB	Subscriptions from 10 MB to less than 20 MB	Subscriptions equal to or greater than 20 MB	Total
2017	2 282 237	920 268		3 202 505
2018	2 199 194	861 301	2 605	3 063 100
2019	2 385 257	1 191 875	3 324	3 580 456
2020	2 576 105	1 205 611	7 412	3 789 128
2021	68 577	3 621 969	484 826	4 175 342
2022	10 321	4 204 916	490 609	4 705 846
First trimester of 2023	4 172 684		722 534	4 895 218

Source: Algerian Telephone and Internet Market Development Reports for 2020 and 2022, issued by the Ministry of Postal and Telecommunications, pp.08.09, in addition to the official website of the Postal and Electronic Communications Authority www.arpce.dz

According to the Table No. (10), the subscriptions of less than 20 MB per second represent about 85.24 percent, while the number of subscriptions of more than 20 MB per second constitutes about 14.76 percent of the total subscriptions, distributed as follows: 13.98 percent for subscriptions above 20 MB and less than 50 MB per second, 0.46 percent for subscriptions above 50 MB and less than 100 MB per second, and 0.22 percent for subscriptions above 100 MB per second. (Authority, 2022, p. 9) Therefore, it is proof of the rapid development of this sector in response to the aspirations of citizens and institutions to access high-flow Internet services.

2.3.3 The evolution of mobile Internet subscriptions: Through this element, you will discuss the development of mobile Internet subscriptions according to the type of technology, the density of the mobile Internet, and the development of mobile Internet subscriptions according to each customer.

- The growth of mobile Internet subscriptions by type of technology: Through this indicator, we review the evolution of mobile Internet subscriptions by type of technology from 2017 to the first trimester of 2023 in the following table:

Table 11. The evolution of mobile Internet subscriptions by type of technology.

Years	Number of mobile Internet subscriptions (3G)	Number of Mobile Internet Subscriptions (4G)	Number of mobile Internet subscriptions
2017	21 592 863	9 867 671	31 460 534
2018	17 422 312	18 920 289	36 342 601
2019	11 989 157	24 922 271	36 911 428
2020	9 265 682	29 506 880	38 772 562
2021	7 272 657	34 507 542	41 780 199
2022	5 961 291	38 797 214	44 757 505
First trimester of 2023	5 715 552	39 571 768	45 287 320

Source: Algerian Telephone and Internet Market Development Reports for 2020 and 2022, issued by the Ministry of Postal and Telecommunications, pp.08.09, in addition to the official website of the Postal and Electronic Communications Authority (www.arpce.dz)

We notice from the Table No. (11) that the number of mobile Internet subscriptions by type of technology is constantly increasing, especially the number of mobile Internet subscriptions (4G), where this indicator has witnessed an increasing transition from 3G to 4G technology in mobile Internet subscriptions.

- The evolution of mobile Internet intensity: This indicator reviews the development of mobile Internet intensity from 2015 to the first trimester of 2023 in the following table:

Table 12. The evolution of mobile Internet intensity.

Years	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**First trimester of 2023**
Mobile Internet density	46%	71,17%	75%	85%	85%	88%	93%	97,72%	98,88%

Source: Algerian Telephone and Internet Market Development Reports for 2020 and 2022, issued by the Ministry of Postal and Telecommunications, p. 09, in addition to the official website of the Postal and Electronic Communications Authority (www.arpce.dz)

From Table No. (12), we observe a slight increase in mobile Internet density from 2022 to 2023, by 01.16 percent.

- Development of mobile Internet subscriptions according to each service provider: We review, through this indicator, mobile Internet subscriptions according to each service provider from 2017 to the first trimester of 2023.

Table 13. The development of mobile Internet subscriptions according to each customer service provider

Years	Algeria Telecom Mobile (Mobilis)	Optimum Telecom Algeria (Djezzy)	National Telecom Algeria (Ooredoo)	Total
2017	13 709 805	8 922 325	8 828 404	31 460 534
2018	15 611 921	11 259 211	9 471 469	36 342 601
2019	15 741 319	11 271 088	9 899 021	36 911 428
2020	16 554 526	11 561 353	10 656 683	38 772 562
2021	17 795 290	12 708 008	11 276 901	41 780 199
2022	19 442 730	13 676 739	11 639 036	44 758 505
First trimester of 2023	19 672 443	13 838 327	11 776 550	45 287 320

Source: Algerian Telephone and Internet Market Development Reports for 2020 and 2022, issued by the Ministry of Postal and Telecommunications, pp.09.10, in addition to the official website of the Postal and Electronic Communications Authority www.arpce.dz

We notice from Table No. (13) that mobile Internet subscriptions according to each server provider are constantly increasing at varying rates; the Algeria Telecom mobile phone (Mobilis) has recorded the largest percentage of 9.29 percent at the end of 2022, followed by Optimum Telecom Algeria (Djezzy) with 7.62, and finally, National Algeria(Ooredoo) with 3.21 percent**.**

Thus, Algeria Mobile Telecom (Mobilis) acquired 43.44 percent of mobile Internet subscriptions, Optimum Telecom Algeria(Djezzy) had a share of 30.56 percent, and the Algeria Telecom customer (Ooredoo) attained 26 percent of the subscriptions. (Authority, 2022, pp. 10-11).

2.4 Indicator of the number of dealers and service providers active in telecommunications: We will attempt to address the number of dealers and service providers engaged in the telecommunications market in Algeria from 2018 to the first trimester of 2023 through the following table:

Table 14. The number of dealers and service providers engaged in the telecommunications

years	Fixed-line phone	GSM	3G	4G	VSAT	GMPCS	VOIP	FAI	Voice query	Call centers
2018	01	3	3	3	03	01	02	30	08	89
2019	01	3	3	3	02	01	01	22	08	81
2020	01	3	3	3	02	01	01	12	07	90
2021	01	3	3	3	02	01	01	05	07	70
2022	01	3	3	3	02	01	/	/	/	/
First trimester of 2023	01	3	3	3	02	01	/	/	/	/

Source: Algerian Telephone and Internet Market Development Report 2022, published by the Ministry of Postal and Telecommunications, P. 02

From Table No. (14), we conclude, according to the table, that the number of dealers and service providers engaged in Algerian telecommunications is in constant stability despite all the efforts made to expand this promising market.

2.5 Indicator of the evolution of Internet subscriptions via satellite: we will discuss the development of Internet subscriptions via satellite in Algeria from 2018 to 2022, according to the data available at the Ministry of Post and Telecommunications:

Table 15. The evolution of Internet subscriptions via satellite

years	2018	2019	2020	2021	2022
Number of Algerian Telecom satellite subscriptions ATS	901	1301	1331	1911	1383
Number of Orascom Telecom Algeria subscriptions OTA	170	74	37	23	23
Number of subscriptions via satellite VSAT	1071	1375	1368	1934	1406

Source: Algerian Telephone and Internet Market Development Report for 2022, published by the Ministry of Postal and Telecommunications, P. 11

From Table No. (15), we note that the number of subscriptions via satellites VSAT has decreased from 2021 to 2022 by 27.30 percent, despite all the efforts made, which is a consequence of the high costs of these services and their high prices internationally.

Conclusion

Based on the foregoing, it is apparent that Information and Communication Technology has become the primary driver of the global economy in today's enormous technological revolution. It accomplishes a key role in the growth of the global economy by increasing the volume, quality, speed, and accuracy of economic and commercial transactions. Therefore, its costs are reduced, and States' economies are driven to achieve more value.

In this regard, Algeria, like other countries, has endeavored to support this vital sector and to adopt it as an instrument to advance its economy. This process goes by establishing several legal, economic, and technological mechanisms according to its available capabilities and based on the level of goals to be achieved by all State's parties: institutions and individuals.

Results: From the above, we obtained the following conclusions:

- The tremendous development in Information and Communication Technology was the result of scientific, intellectual, and technical development taking place from the technological revolution that the world is witnessing today, which is, on the other hand, due to an increase in the volume of economic and commercial transactions in quantity, quality, accuracy, and speed. Therefore, it is seen as an essential economic resource in the economic process;
- Despite the efforts made to develop Information and Communication Technology in Algeria, we still confront some deficiencies in enacting laws and legislation that regulate this type of economic activity and keep pace with the level of its rapid transformations, which reflects negatively on the level of goal achievements.
- Despite all the efforts made to build and establish the infrastructure for the ICT sector, Algeria has not yet completed its development, which is reflected negatively in the level of objectives achieved at different levels of the State: individuals and institutions. It also leaves a digital and technological gap between our country and others of the developed world.
- The Internet is the main pillar of the Information and Communication System, despite its multiplicity of means. It is due to the services this network provides that reduce distances, costs, and time.
- Weak indicators of reliance on Information and Communication Technology to activate e-commerce in Algeria, it ranks 120 in the e-participation and the e-governance development indexes;
- Despite Algeria's efforts to promote electronic commerce, it remains far from the aspirations of both individuals and institutions.

Recommendations:

- **Improving infrastructure:** by providing a modern network for communications and data, as well as a modern infrastructure for wired and wireless communications capable of ensuring communication and transmission of

information between the administrative institutions themselves internally and externally, and between institutions and citizens;

- **Developing the necessary legislation and legal texts** that facilitate the work of ICT and giveit legitimacy and credibility;
- **Providing electronic security and electronic confidentiality** at a high level to protect national and personal information and to preserve, as much as possible, the electronic archive against any manipulation or falsification, because of the danger that they could bring to individuals and to the national security of the State;
- **Availability of an appropriate level of financing** which enables the government to conduct periodic maintenance and training for employees, maintain a high level of service, and be updated with any development in technology and electronic commerce worldwide;
- **Strengthening political will** by creating a specific office or committee responsible for activating ICT with all its indicators, creating the necessary and appropriate environment for work, supervising its implementation, as well as evaluating the implementation levels that it has reached;
- **Increasing the number of Internet users:** The State must charge reasonable prices in order to open the way for the most significant number of citizens and institutions to interact with Information and Communication Technology with the least effort, the shortest time, and the most modest cost.
- Establish an integrated policy for the development of this vital sector to address global and regional challenges (political, economic, technical, and security), as well as internal challenges (the challenge of development, democracy, human rights, lack of competencies, the cultural challenges, and educational challenges).

Bibliography

Abdel Karim Al-Khannaq, S. (2005). The role of Information and Communications Technology in knowledge management processes. The first international forum on the knowledge economy. Algeria: Mohamed Kheidar University of Biskra.

Authority, P. A. (2022). Development Report of Algerian Telephone and Internet Market. Algeria: Ministry of Posts and Telecommunications.

Belguidoum, S. (2012-2013). The impact of Modern Information and Communications Technology on the strategic management of economic institutions. Constantin, Faculty of Economics and Management Sciences, Algiera: University of Constantin 2.

Bendiabdellah, A. D. (2004, March). IMPACT OF NITC ON THE STRUCTURES AND BEHAVIORS OF MODERN BUSINESSES. Revue d'ECONOMIE et de MANAGEMENT , pp. 38-50.

Hadid, N. (2006-2007). Internet technology and the institution's qualification for integration into the world economy. Faculty of Economics, Commercial Sciences and Management Sciences, Algiera: University of Algiers.

Itu, W. A. (2003). - Report of the West Asia Regional Conference for the World Summit on the Information Society. Geneva: - West Asia for the World Summit on the Information Society (ITU),: Document WSIS/PC-2/DOC/8-A.

Yakhti, I. (2005). Courses in Information Technologies and Systems in small and medium enterprises. Ouargla, Faculty of Law and Economic Sciences, Algiera: University of Kasdi Merbah.