



Information and Communication Technology as an Approach to Strengthening the Digital Economy During Crises: The COVID-19 Crisis as a Model

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Abstract

Many countries' economies are witnessing rapid developments, as they are undergoing a transformation from an economy based on production to an economy based on information and knowledge, where the information and communication technology sector has experienced rapid growth over the past few years, electronic services have flourished and the use of this technology has increased significantly in the economic and social sectors, and the notable prosperity in the sector has been accompanied by the growth of the countries' macroeconomies at a better pace than before, due to their reliance on information technology. The importance of the latter is perhaps demonstrated by its ability to help countries deal with the COVID-19 crisis, as the latter posed a threat to the global economy, which managed to withstand it by relying on several means, most notably information technology.

Article info

Received

07/05/2026

Accepted

28/09/2026

Keyword:

- ✓ Information and communication technology,
- ✓ digital economy
- ✓ COVID-19
- ✓ economic growth

1. Introduction

Information and communication technology plays an important role in promoting economic development, given its distinctive characteristics. Widespread information and communication technology transcends the geographical and political borders of countries, making the world a small village. It is also characterized by the abundance and diversity of information and programs, making it an important source of information available anywhere and at any time, and at a low cost, whether for individuals, economic institutions of various types, or governments. It also plays a major role in developing human resources through the programs it adopts, such as training programs and educational programs. It is necessary to pay attention to this technology and develop its uses effectively, while training and educating individuals on how to use it, and raising their awareness of its importance in economic development and progress, in addition to the social and cultural aspects of society. It also works to develop and protect the global economy during crises, and perhaps the most important crisis we can address is the COVID-19 crisis, where information technology played an important role in dealing with it by maintaining the resilience of the global economy. From this standpoint, the problem we can raise here revolves around: To what extent did information technology succeed in influencing the global economy during the COVID-19 crisis?

To answer this problem, the following elements must be addressed:

First axis: The conceptual framework of the study

Second axis: The role of information and communication technology in achieving the economic dimension

Third axis: The role of information technology in addressing the coronavirus crisis

Chapter One: The Conceptual Framework of the Study

Before addressing the topic, it is first necessary to clarify a number of basic concepts relevant to the study, through the following sections.

First: The Concept of the Digital Economy and Economic Growth

The digital economy is the post-industrial economy, an economy that relies on information technology as its most important factor of production. The period of its emergence remains unclear and ambiguous, and it is therefore impossible to determine a specific date separating the two periods. However, the mid-1970s is generally considered the point at which the digital economy began to emerge and appear on the international scene. Its most important features are reflected in the following:

The dominance of international organizations over the global economy:

The International Monetary Fund.

The World Bank and the World Trade Organization.

The need for a new international system to govern the current system of international economic relations.

The development of a new energy base represented by alternative energy sources.

Rapid technological progress in all scientific fields, both old and new.

Remarkable developments in the media and communication sector, which have become more influential **(Hiyam Khazal Nashour, 2020, p. 12)**.

The influence and dominance of the services and information sector over the other sectors.

Economic growth has today become one of the most important terms addressed by economic and political researchers in various societies, as it has become the principal factor officially relied upon to measure the advancement and progress of nations. The more developed their economic strength and activities are, and the more stimulating and transparent the conditions under which they operate, the greater their chances of attaining higher positions in the global ranking. On the basis of the positive or negative changes recorded, a country advances or falls in the ranking.

Economic growth means expanding an economy's capacity to produce over a given period. An expansion in potential production occurs when there is an increase in natural resources, human resources, capital, and technological progress **(Zakaria Oudhina, 2014, p. 10)**.

The digital economy is considered the latest stage in the historical development of the global economy, which evolved from the primitive, agriculture-based economy to the Industrial Revolution, eventually reaching a stage dominated by information and communication technologies. This is due to the structural changes that have affected the foundations of economic thought throughout the development of the global economy **(Hiyam Khazal Nashour, p. 12)**.

Economic growth is also defined as an increase in gross domestic product or gross national income that results in an increase in the average individual's share of real income, provided that:

There is an increase in the average individual's share of income.

The increase is real rather than monetary.

The increase occurs over the long term (Zakaria Oudhina, p. 11).

Elements of Economic Growth

The sources of economic growth are numerous and diverse, and it is difficult to study and analyze all of them. Nevertheless, it is generally agreed that the sources of economic growth can be classified as follows:

Capital Accumulation: This involves allocating a portion of current income as savings to be invested in order to increase future income and output, with the aim of increasing production. Capital accumulation may also result from domestic or external borrowing and foreign aid.

Labor: Labor is considered one of the important elements in increasing production and, consequently, in increasing national output growth rates. Population growth constitutes the basis for increasing the labor element and the labor force in general. An increase in the total population means an increase in the overall size of the domestic market and, consequently, an increase in the size of the labor force.

Technological Progress: Numerous studies have indicated that most of the increase in real per capita income in industrialized countries is attributable to technological progress, while only a small portion is attributable to capital accumulation (**Zakaria Oudhina, p. 11**).

Second: The Concept of Information Technology:

Information technology has become part of the everyday lives of individuals and business organizations. It also contributes to building industrial interconnections that are less visible and more complex, but more efficient and, in most cases, less costly.

Information and communication technologies, with their advanced tools, are of great importance. Since the Industrial Revolution, nothing has affected human life as profoundly as information technology, which has become indispensable to peoples, institutions, and states. The world is witnessing rapid technological transformation and successive developments in computers, software, communication devices, and their means, as well as an enormous volume of information that grows and is transmitted easily and rapidly between countries around the world. This has made information technology an important tool in modern business organizations and has required organizations of different types and sizes to keep pace with this tremendous technological progress if they are to survive in a competitive environment. The world has entered an advanced era without boundaries, in which information and communication technologies play the role of the supporting pillars of this progress, which has become a distinctive feature of the age (**Hiyam Khazal Nashour, p. 165**).

Definition of Information and Its Uses : The origin of the word “information” is traced to the Latin word *informatio*, which means explaining or clarifying something. The term is used to refer to communication processes aimed at conveying a signal or message—that is, information—and making it known. Information is “data that have been prepared in a form that is more useful to the individual, either because they have perceived value in current or expected use, or because they are useful in the decisions being made” (**Zakaria Oudhina, p. 34**).

Information is also defined as data that have been processed in a way that gives them meaning for their recipients or users and adds real or perceived value to current or future decision-making processes (Mohamed Lamine Belhouchat, 2019, p. 04).

In terms of use, information is viewed as having three main uses: Information as a process, that is, the act of informing.

Information as knowledge, referring to what has been understood through information as a process.

Information as an intangible object. Consequently, when it is communicated, it must be expressed, described, or represented in a material form, such as signals or texts. Any type of expression or representation constitutes information as an object (Zakaria Oudhina, p. 35).

The Economic Importance of Information:

The economic importance of information is evident in the following ways: It helps rationalize the state's expenditure on research and development in light of the information available.

It provides alternatives and methods for solving technical and technological problems, as well as tests that help limit future problems.

It ensures a broad knowledge base for solving problems.

It raises the level of effectiveness and efficiency of technical activities in the production and services sectors.

It helps ensure sound decisions in all sectors and at different levels of responsibility.

It facilitates research and education, as information is the fundamental foundation of both processes.

It supports democratic and social development, enabling individuals who possess information to make decisions that shape their way of life and participate in the development of their societies.

It contributes to economic development, as the economy of any state cannot advance without relying on information and its technologies.

It contributes to developing the state's capacity to benefit from the expertise acquired in other countries (Zakaria Oudhina, p. 36).

Information Transmission Technology

Information transmission technology is defined as all technologies used to process, transmit, and store information in electronic form. It also refers to a three-way integration between microelectronics, computers, and modern communication media, including all devices, systems,

and software related to the circulation of information. The computer is the best example of information technology (**Kholoud Asim, 2013, p. 233**).

Networks are defined as a group of computers organized and connected through communication lines, enabling their users to share available resources and transmit and exchange information among themselves. Information travels through computer networks via communication media or channels, and network communication media are classified into wired and wireless means (**Zakaria Oudhina, pp. 37–38**).

There are numerous definitions of information and communication technology:

Hillegel defines information and communication technology as “systems characterized by their responsiveness, designed on computers to help organizations and their human resources collect, store, retrieve, process, and transmit data” (**Hiyam Khazal Ashour, p. 165**).

All types of technology used to process, transmit, and store information in electronic form, including computer technology, communication media, interconnection networks, fax machines, and other equipment widely used in communications.

UNESCO’s definition: The application of electronic technology, including computers, satellites, and other advanced technologies, to produce analog and digital information, store, retrieve, distribute, and transmit it from one place to another.

Information technology consists of computer hardware and ready-made software, in addition to communication networks and other devices required to process, store, organize, display, send, and retrieve information with the required efficiency, speed, and accuracy (**Zakaria Oudhina, p. 54**).

Effects of Using Information and Communication Technology

Information and communication technology has numerous direct and indirect effects, the most important of which can be addressed as follows:

Applications of information and communication technology have brought about tremendous developments at the institutional level. These applications have also penetrated all public and private institutions of various types, and it is difficult to find any institution that is entirely free of such applications in one form or another.

The production of goods and services that directly contribute to the total value added generated in the domestic economy.

Increased productivity in the information technology sector, contributing to the overall productivity of the factors of production in the domestic economy.

Contribution to gross domestic product and the creation of employment opportunities.

Increased government revenues.

Changes in the balance of payments (**Zakaria Oudhina, p. 39**).

The use of information technology also leads to an increase in the volume of new knowledge. For example, the use of the Internet plays a major role in disseminating knowledge within the domestic economy. The resulting increase in new knowledge improves the quality of products and leads to the production of new products, which ultimately contributes to achieving higher rates of economic growth.

Section Two: The Role of Information and Communication Technologies in Achieving the Economic Dimension

Information and communication technologies have a significant impact on the economic sphere. In previous years, economic activities relied on traditional tools and methods. Over time, however, the methods and tools adopted by economic institutions evolved. Technological substitution in the context of the new economy takes place through the expansion of economic activities based on technological developments in the fields of information and communication, which provide substantial competitive advantages across economic processes.

First: The Role of Information and Communication Technologies in Achieving Economic Growth

The future of the economy in general depends on the outputs of the education system and society's ability to transfer these outputs to the market, which constitutes the arena of competition. Economic literature indicates that countries possessing skilled human capital achieve high and sustainable growth rates, given that industrial technology drives growth and requires an abundance of human and physical capital. Economists also agree that technological and industrial progress is the principal source of economic advancement. Modern industrial technologies have changed the ways of life, work, and production, enabling industrial and financial institutions and companies to produce more, or maintain the same level of output at a lower cost. Machines powered by energy have replaced human effort, while contributing to the development of energy sources and alternatives, as well as progress in transportation, communications, and other fields (**Saad Khalil Mahmoud Al-Kawaz, 2018, p. 280**).

Numerous studies have demonstrated that both the production and use of information and communication technologies contribute to economic growth. These important studies have provided indicators confirming that actual productivity is achieved through experience in using information and communication technologies. Today, these technologies have therefore become closely associated with economic development. The transition to a knowledge-based digital economy, driven by new goods and services, is a factor in growth, competitiveness, and job creation. This is consistent with the Organisation for Economic Co-operation and Development's indication of the potential positive impact of information and communication technologies.

The use of information and communication technologies also contributes to increasing the volume of new knowledge. The use of the Internet, for example, plays a major role in disseminating knowledge and expanding the local economy. This results, on the one hand, in improving the quality of existing products and producing new ones, and, on the other hand, in increasing the overall productivity of the factors of production in the local economy. Ultimately, this leads to higher rates of economic growth (Ghol, Nadia, 2019, p. 2018).

Second: The Implications of Information Quality for Investment Decisions and Economic Development

The information and communication technology revolution has contributed to growing interest in information, improving its quality, and delivering it as quickly as possible to decision-makers in order to enable sound investment decisions. Such decisions depend fundamentally on high-quality information to rationalize decision-making and, consequently, help raise economic development rates.

The information and communication technology industry has also become an important economic resource for many countries, and its significant role in strengthening national economies cannot be ignored. This industry contributes to economic development and promotes the development process by providing employment opportunities.

Information has been transformed into economic products, similar to goods offered in the market and subject to the law of supply and demand. Technological transformations have contributed substantially to changing individuals' attitudes toward the use of information and its functions, giving material form to its value. This has reached the point where human society has become based on the principle of computer-mediated communication, reflecting humanity's technological advancement in the processing and distribution of intellectual, knowledge-based, and informational content through computers. If we examine the actual foundations underlying the progress of industrialized countries, we find that the most important foundation is management and organization, which in turn rest on a number of supporting foundations and principles (Kholoud Asim, p. 244).

The report entitled "Employment 2001," issued by the International Labour Office, indicates that despite the communications revolution currently taking place in the world, increasing numbers of workers remain unable to find employment or access emerging technological resources necessary to secure productivity in an increasingly digitally dependent global economy (**The Role of Information Technology in Influencing the Global Economy**, <https://alsaifco.net/ar/news/de>).

The report also points to the widening digital divide between rich and poor countries due to differences in the speed of information and communication technology diffusion. Therefore, developing countries' policies should focus on access to technology and ensuring that workers receive the education and skills necessary to use and benefit from it. This would encourage development and job growth. Accordingly, a coherent national strategy for information and communication technologies, an adequate telecommunications infrastructure, and an educated

workforce are essential. The role of information technology lies in developing local skills in the production and use of software.

The report indicates that information and communication technologies can help bridge the gender gap in employment and improve women's living conditions. Women generally work in fields requiring fewer skills and receive lower wages, and women constitute a minority of users in both developed and developing countries. For example, in Internet use, most users worldwide are men, except where Internet access is highly developed, as in the Scandinavian countries and the United States **(The Role of Information Technology in Influencing the Global Economy, <https://alsaifco.net/ar/news/de>).**

Information and communication technology is among the most important fields to have received considerable attention in recent years, as a result of prevailing economic conditions and the intense competition characterizing the global economy. It has become closely linked to the development of contemporary societies, contributing directly to the construction of a new society based on electronic information services associated with communication, production, and education services.

From this perspective, countries are making considerable efforts to integrate information and communication technologies into various sectors, particularly the economic sector, in an attempt to keep pace with the information revolution, bridge the digital divide between themselves and developed countries, make the best possible use of these technologies, and gain control over them **(Mohamed Lamine Belhouchat, previous reference, p. 13).**

Section Three: The Role of Information Technology in Addressing the COVID-19 Crisis

The information and communication technology ecosystem constitutes a cornerstone in addressing challenges. Each economic sector faces its own challenges, which require tailored solutions. No country or company can create such solutions by working alone; rather, this requires an open, participatory, and cooperative approach in which every actor contributes to the recovery process and to navigating the post-virus period, which specialists and leaders agree will not resemble the pre-virus period. Addressing crises requires better sharing of knowledge and expertise, particularly in the technological field. Local talents and competencies also play an important role in efforts to restore normal conditions.

First: The Importance of Information and Communication Technologies During the COVID-19 Crisis

No one can deny the importance of developing the ecosystem. By relying on skilled human technical resources and enhancing their strengths and expertise, these resources can certainly provide substantial support in achieving the objectives of ambitious national plans and strategies aimed at further social and economic development. The important role of the information and communication technology sector in designing the systems needed by societies and businesses to

overcome this crisis more effectively should never be underestimated, nor should its role in developing frameworks for building a sustainable, knowledge-based digital economy (**Zang L. and Yang, Harnessing Technology to Address the COVID-19 Crisis and Advance Development, Al-Ghad newspaper**).

The COVID-19 crisis revealed the fundamental importance of information and communication technologies, highlighted their positive aspects, and reinforced their strategic significance. They became a key indicator in classifying countries and assessing their strength, as well as their capacity to confront major national crises. They emerged as the first line of defense for human beings and redefined the boundaries of the relationship with technology. The crisis also facilitated the establishment of a kind of technological social contract, based on the voluntary surrender of part of one's freedom and privacy in exchange for health protection, echoing Jean-Jacques Rousseau's social contract in defining the relationship between authority and citizens in order to guarantee rights and freedoms.

The imposition of quarantine measures and the requirement to avoid direct contact between people, together with the negative effects on meetings, relationships, and activities, led to the increased use of digital technologies to preserve these activities. The need for remote work, education, meetings, business transactions, trade, entertainment, sports, and other activities increased. This strengthened the role of the virtual world in human life and marked a transition from dependence to security through digital technologies. Individuals, parties, organizations, institutions, and states that fail to recognize the importance of these technologies will be left behind by time, and they will have no place in the post-COVID-19 period without them. Digital technology is not merely a decision, but rather a long-term strategic process that must be given the highest priority (**Nasser Hamadouche, Digital Technology in Confronting the COVID-19 Crisis, Al-Shorouk newspaper**).

Second: The Role of Information and Communication Technologies During the COVID-19 Crisis

The COVID-19 pandemic was the first pandemic in history in which technology and social media were used on such a wide scale to inform people, protect their safety and productivity, and maintain communication among them. At the same time, the technologies relied upon for communication and access to information created an amplified infodemic that continued to undermine global response efforts and threaten measures taken to combat the pandemic (**World Health Organization report, Managing the Infodemic During the COVID-19 Pandemic: Promoting Healthy Behaviors and Mitigating the Harmful Effects of Misinformation and Disinformation, 23 September 2020**).

In this context, the United Nations Secretary-General launched a United Nations communications response initiative in April 2020 to combat the spread of misinformation. The United Nations also issued guidance on addressing and countering hate speech in the context of COVID-19. The United Nations and civil society organizations have been working to harness their collective expertise and knowledge to address these information epidemics. As the pandemic continues to generate anxiety

and uncertainty, there is an urgent need for stronger measures to address the infodemic and adopt a coordinated approach involving states, multilateral organizations, civil society, and all other actors with a clear role and established responsibility in combating misinformation and disinformation (**World Health Organization report, Managing the Infodemic During the COVID-19 Pandemic: Promoting Healthy Behaviors and Mitigating the Harmful Effects of Misinformation and Disinformation**).

Digital technologies have demonstrated their ability to change the rules of the game during crises and support health responses, such as telemedicine; enable businesses to adapt to restrictions on movement, such as working from home and mobile payments; help small and medium-sized enterprises survive during periods of economic contraction, such as through financial technology; deliver agricultural inputs, such as electronic vouchers; enable social safety-net programs to operate more effectively, through mobile payments; and support the continuation of educational efforts, such as education applications and virtual classrooms. Increased digital transformation will not only better prepare economies to face future shocks, but can also support greater effectiveness and efficiency at the economic and governmental levels. For example, governments can provide faster and more transparent services through e-government platforms, thereby improving efficiency and reducing opportunities for corruption (**World Bank Group report, Protecting People and Economies: Integrated Policy Responses to Combat the Novel Coronavirus (COVID-19)**, pp. 46–47).

Countries should also seek to restore their long-term programs, such as the Sustainable Development Goals, and renew attention to employment opportunities and economic transformation. Multiplying investment in resilient infrastructure and building human capital should be among the core elements of this vision. Prioritizing gender and climate—both of which have not yet realized their full economic potential—would create significant opportunities for achieving inclusive and sustainable economic growth. This second phase should build on the immediate policy response, which is ideally expected to lay the policy and institutional foundations for recovery (**World Health Organization report, Managing the Infodemic During the COVID-19 Pandemic: Promoting Healthy Behaviors and Mitigating the Harmful Effects of Misinformation and Disinformation**).

A report issued by the international consulting firm McKinsey stated that advanced modern technologies helped Asian countries respond rapidly to the spread of the coronavirus and, consequently, manage the crisis more effectively than others.

Technology greatly helped improve the level of healthcare provided to COVID-19 patients and conduct examinations through high-speed Internet. The report highlighted China's experience in using remote diagnostic centers to monitor cases in Wuhan, the epicenter of the virus, and in enabling medical teams from across the country to follow patients' conditions online. For example, one area in which technology helped improve the performance of Asian governments in managing the crisis was the more transparent and accurate exchange and sharing of data related to the virus.

In South Korea, approximately 22,000 pharmacies made data available that enabled the government to inform citizens about the number of face masks available at each pharmacy, thereby avoiding crowds. Countries such as Australia and Singapore also provided citizens with the latest developments concerning the virus through WhatsApp channels (**McKinsey & Company report, Technology Helped Asia Manage the Crisis More Effectively, Al-Arab International newspaper, Asharq Al-Awsat, Economics section, p. 15148, 19 May 2020**).

It should be noted that countries adopted different strategies to mitigate the severity of the pandemic. While some countries adopted containment strategies to limit the number of new infections, particularly in East Asia, notably Japan, South Korea, and Singapore, others used their strong healthcare systems to help people recover more quickly, with Germany being the clearest example. Other countries focused all their efforts on discovering a vaccine or treatment for the virus, as was recently announced in the United States. The following are three examples illustrating how technology was directed toward combating the pandemic:

New Uses of Mobile Devices

Many countries rely on smartphone applications, such as WhatsApp, to track how close users are to other people. If a person is diagnosed with the virus, the government sends notifications to all users who have been in close proximity to that infected person during the previous 14 days, whether at the office, in the market, at family gatherings, or elsewhere. This helps people who may have been exposed to the virus (**Ahmed Rushdi, 7 September 2020, pp. 3–4**).

Big Data Monitoring Some countries install surveillance cameras at the front doors of individuals suspected of infection who are under quarantine. These cameras are connected to artificial intelligence (AI) systems that alert officials whenever any of these individuals attempts to leave the doorstep.

Social Media For example, Facebook shares users' location information with officials to help researchers assess the likelihood of an outbreak in specific areas, as well as the effectiveness of social-distancing measures. This also includes information concerning proximity to infected areas or individuals (**Ahmed Rushdi, pp. 3–5**).

Conclusion

The emergence of the information society in the modern era has played a major role in developing human cognitive capacities, contributing to the removal of geographical and political barriers, and ushering humanity into an age characterized by precision in work and speed of execution. It has also created a society moving toward the digital economy, while introducing new concepts such as e-government and e-learning.

In today's knowledge economy, knowledge and information constitute the foundation of economic growth and development. The determinants of institutional and economic success have become increasingly dependent on the use of knowledge. The emergence of the concepts of the electronic

economy and electronic commerce, whose volume has grown considerably, has played a major role in the growth of economies at the global level. Electronic marketing has likewise contributed to this development, differing from conventional marketing in terms of its form and methods.

References

_Zakaria Oudhina. Economic Growth in the Context of Information Technology: An Econometric Study of Algeria, 1999–2005. Master's thesis submitted in partial fulfillment of the requirements for a Master's degree in Economic, Commercial and Management Sciences, Faculty of Economic, Commercial and Management Sciences, Department of Economic Sciences, Mohamed Boudiaf University, M'Sila, Algeria, academic year 2014–2015.

_Ahmed Rushdi. "The Impact of the Coronavirus Pandemic on the Technology Sector." Political Analyses, Egyptian Institute for Studies, 7 September 2020.

_Kholoud Asim. "The Role of Information and Communication Technologies in Improving Information Quality and Its Implications for Economic Development." Journal of the College of Baghdad University for Economic Sciences, Special Issue of the College Conference, Baghdad, Iraq, 2013.

_Mohamed Lamine Belhouchat. "The Impact of Information and Communication Technologies on Economic Growth: An Econometric Study of North African Countries During the Period 2000–2017." Seventh International Conference on Technology Transfer at the International Level, 26–27 June 2019, Faculty of Economic, Commercial and Management Sciences, Djilali Bounaama University, Khemis Miliana, Algeria.

_Saad Khalil Mahmoud Al-Kawaz and Jassim Mohamed Ali Al-Tahan. "Information and Communication Technologies as a Tool for Economic Growth." Cihan University-Erbil Scientific Journal of Administrative and Financial Sciences, Special Issue, No. 2, Part S, September 2018.

_Nadia Ghol and Adjala Al-Ajjal. "The Role of Information and Communication Technologies in Achieving the Dimensions of Sustainable Development in Algeria." Journal of Strategy and Development, Vol. 9, No. 16 (Special Issue), January 2019, Abdelhamid Ibn Badis University, Mostaganem, Algeria.

_Hiyam Khazal Nashour and Iqbal Jassim Jaafar. "The Contribution of the Information and Communication Technology Sector to Economic Development in the United Arab Emirates." North African Economics Journal, Hassiba Ben Bouali University, Chlef, Algeria, Vol. 16, No. 24, 2020.

_World Health Organization. Managing the Infodemic During the COVID-19 Pandemic: Promoting Healthy Behaviors and Mitigating the Harmful Effects of Misinformation and Disinformation. 23 September 2020.

_World Bank Group. Protecting People and Economies: Integrated Policy Responses to Combat the Novel Coronavirus (COVID-19).

_McKinsey & Company. “Technology Helped Asia Manage the Crisis More Effectively.” Asharq Al-Awsat, Economics section, No. 15148, 19 May 2020.

_Nasser Hamadouche. “Digital Technology in Confronting the COVID-19 Crisis.” Al-Shorouk newspaper.

_Zhang Liang. “Harnessing Technology to Address the COVID-19 Crisis and Advance Development.” Al-Ghad newspaper.

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