

Artificial intelligence as a catalyst for economic growth

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Received :02/01/2024

Accepted:14/02/2024

Published:01/03/2024

Abstract:

Artificial intelligence has emerged as a pioneering field with the ability to revolutionize various aspects of our lives, as it constitutes a technological breakthrough that has recently appeared widely in the world and has spread greatly thanks to its growing performance.

This study aims to explore the impact of this digital technology and its implications for the global economy in the future. Statistics and projections have shown the magnitude of the change that will form the pillars of the global economy by the year 2030, due to its enormous potential that it can provide to individuals, organizations and countries in various fields. Thus, it has become the subject of everyone's interest and the demand curve for it has begun to take an upward shape at an accelerated pace. It is also assumed that China and the United States of America will achieve the highest growth rates thanks to the use of artificial intelligence.

Keywords: Artificial intelligence, deep learning, economic growth, gross domestic product
JEL Classification: C45; O33; O4.

Introduction

Economic growth is one of the biggest challenges that preoccupy decision-makers over time, especially in light of the stakes imposed by the Fourth Industrial Revolution and the enormous technological developments sweeping the world. As a result, governments strive to keep pace with the developments of digital transformation and catch up before the gap between them widens, which prevents the achievement of steady growth.

The reasons for economic growth are many, mainly related to the diversity and quality of the government's fiscal, monetary, and other policies, but all of them have one content, which is to try to achieve growth that guarantees individuals the improvement of economic and living conditions.

Due to the technological explosion and the great openness to information that has swept the world today, and considering that those who possess information have the power, countries are accelerating among themselves to keep pace with these developments and work to attract various innovations and applications, including applications and techniques of artificial intelligence that can improve human life and improve their conditions and raise the ceiling of economic growth, in addition to the facilities and services that they provide, such as health care services, trade, education, and others in various fields, and they have hardly been without one of these technologies in their combinations, without overlooking the challenges they pose and the problems they raise.

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- **The Problem of the Research:**

In light of the above, the following problem can be raised: **Does artificial intelligence contribute to stimulating economic growth in the world?**

- **Research Hypotheses:**

To answer the problem of the study, the following hypotheses were formulated:

- Artificial intelligence contributes to improving the living conditions of individuals through the facilities it provides them.
- The broad demand for AI has a significant impact on increasing global economic growth.

- **Research aims:** The aim of this study is to:

- Introducing concepts related to artificial intelligence.
- Highlighting the most important artificial intelligence systems.
- Knowledge of economic growth, ways to achieve it, as well as its most important indicators.
- Examining the relationship between artificial intelligence and economic growth rates in the world.

- **The Importance of the Research:**

The importance of this study is based on the importance of the topic itself. Artificial intelligence has become the topic of the hour and the concern of all countries around the world. It now plays an essential role in the advancement of nations and countries. Through this research, we will try to predict the impact of artificial intelligence on the economies of countries and the extent of changes in economic growth rates in light of the use of these technologies. These changes have become a concern for decision makers and have become their main concern.

- **Research Methodology and Tools Used:**

For optimal familiarity with all aspects of this study and to answer the problem of research, We decided to adopt the descriptive and analytical approaches, because they are considered the most appropriate in such topics, as we dealt with the theoretical dimensions of the concepts of artificial intelligence and economic growth in general, as well as analyzing the effectiveness and impact of artificial intelligence on global economic growth in the future.

- **Research Structure:**

The study was divided into three main axes from which sub-headings emerge. The first axis dealt with the theoretical framework of artificial intelligence in its concept, types and branches. The second axis highlighted the cognitive approach to economic growth and the means of achieving it,

as well as the tools for measuring it. Then, in the third axis, we talked about the extent to which artificial intelligence contributes to achieving economic growth, through the readiness of countries to adopt this technology and provide appropriate infrastructure for it, as well as the extent of its impact on the global economy.

- **Previous Studies:**

- A (Shayna kabbar & Vishal Monga, 2017) study entitled A Study on Artificial Intelligence In E-Commerce, in which the two researchers reviewed the role of artificial intelligence and its applications in the development, revitalization and facilitation of various areas of e-commerce, by citing Google and Microsoft, and the extent of their success in investing these applications. This study concluded by highlighting the strong ability of artificial intelligence to obtain information and data and then analyze them and works to develop the services provided in general and e-commerce in particular.

- A study (2020، محمد) entitled Artificial Intelligence and its role in the development of economic activity in 2020, where the researcher was exposed to the relationship between the concept of artificial intelligence and economic development, as the idea of this study is that the real source of wealth now is not the money that countries possess, but has become primarily dependent on scientific knowledge and investment in the human mind, which is not only the monopoly of developed countries, but is distributed to everyone equally and has nothing to do with this investment, but is mainly related to human capital. Artificial intelligence is a branch of technology in which the human mind has been created. This study concluded that the focus on exploiting the return of the technical revolution, which is artificial intelligence applications, will have an effective impact on the prosperity of economic activities.

- A study (2022، بلعسل بنت نبي و حمروش) entitled Artificial Intelligence and its role in achieving sustainable development, in which the two researchers discussed the role of artificial intelligence in achieving the development goals in the world by 2030, including decent work and the growth of the economy as one of the goals of sustainable development, where artificial intelligence contributes to the creation of new jobs in place of traditional jobs that will be replaced by software and devices that are much more efficient than humans, which will increase productivity and economic growth, thus ensuring economic growth and increasing the size of the labor market to provide decent jobs for all.

1- Theoretical Rooting of Artificial Intelligence:

The world today lives in the midst of a reality that yesterday was close to the fabric of science fiction, so drones, self-driving cars, robots, and other modern sophisticated entities appeared. All of this is thanks to artificial intelligence, which has brought about an unprecedented technological breakthrough that has given the world a new tint that everyone must keep pace with. In this section, we will present the theoretical framework of artificial intelligence starting with definitions, types, branches, as well as uses.

1.1- The concept of artificial intelligence:

The term artificial intelligence appeared in the fifth decade of the last century, but it was not very popular at the time, contrary to what we see today from the great circulation of this term, which has met many definitions, so it defines artificial intelligence as “a system or group of computer systems capable of processing information and performing tasks that are usually performed by humans. AI can have simple forms of intelligence, such as speech recognition or analysis of visual patterns in images, and it can also be more complex, such as learning from past mistakes and problem-solving.” (Dube, 2021), also known as “the ability of computer-controlled digital devices to perform tasks commonly associated with intelligent objects. The term artificial intelligence applies to the project of developing systems that have the distinctive intellectual processes of man, such as the ability to think, discover meaning, or learn from past experiences. It has also been shown that computers can be programmed to perform very complex tasks, for example: discovering proofs for mathematical theories, playing chess with great mastery” (Copeland, 2021).

From those definitions, it can be briefly said that artificial intelligence is an attempt to simulate human intelligence, by developing systems and devices capable of performing the tasks entrusted to humans, with the ability to adapt to the various changes surrounding them without prior programming, by collecting and exploiting data.

1.2- Types of Artificial Intelligence:

Java T point (Java T point, 2022) classified the types of artificial intelligence as follows:

1.2.1- Artificial intelligence according to capabilities:

- Narrow (limited) AI:

It is the intelligence in which the final product is able to perform and accomplish only one intelligent task professionally, and it is the most types of artificial intelligence that exist today but are below the level of human intelligence, such as playing chess, self-driving cars, speech discrimination, and image discrimination.

- General AI:

It is the intelligence that exists in machines, which enables them to perform many tasks and functions like humans with a human-like efficiency like a robot, but so far there is no system that can be classified in general artificial intelligence, because this is still under research and study, and it needs algorithms and very complex neural networks.

- Super (Strong) AI:

It is the one who is smarter than humans, and can perform better tasks than humans in all fields, and requires mental characteristics such as think ability, the ability to prove, make decisions, communicate without programming, and this intelligence is still a hypothetical concept and far from reality.

1.2.2. Artificial intelligence by function:

- Reactive Machines:

This type of machine is characterized by the fact that it does not contain memory, and does not use past experiences in order to make future decisions, but depends only on the current state that it does, and it is often a model developed through machine learning and deep learning, its task is to deal with current inputs to give outputs without relying on previous cases, and it does not have the ability to improve its level, it is based on current scenarios and responds to them based on previous education such as IBM's Blue System and Google Alphago.

- Limited Memory:

They are machines that have limited memory through which they can store some information and previous experiences for a short period of time, to be used in making current and future decisions when combined with memory data, such as self-driving cars where they store previously programmed data, such as traffic lights and maps, and then use them to know the information surrounding them, such as the speed of neighboring cars and the distance between them as well as road reconnaissance.

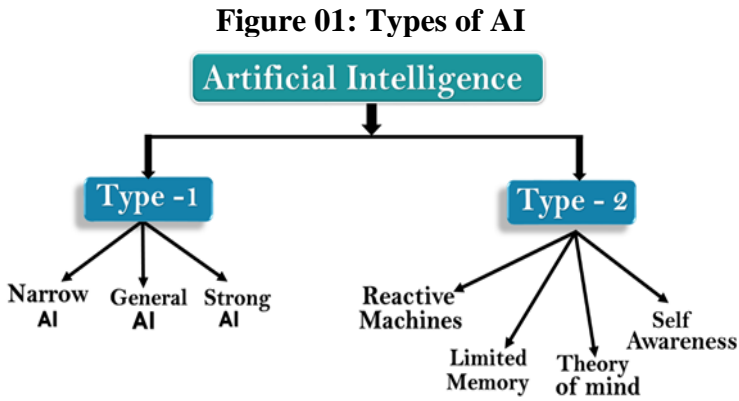
- Theory of Mind:

This type of device has not yet been developed, and it is still a research idea that many researchers and companies around the world are working on in order to reach this level. It is the ability of the machine to understand human feelings, beliefs and desires, and be able to interact socially just like humans.

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- Self-Awareness:

Self-awareness machines are the last targets and future of artificial intelligence. They are characterized by superhuman intelligence that can exceed human limits in accuracy, so that they will have their own conscience, their own feelings, and their own awareness of themselves, as they can even think real existential ideas similar to the ideas that exist in humans based on the mind, and they can also understand the feelings of those around them as humans.



Source: (Types of Artificial Intelligence, 2022)

1.3- Branches and Uses of Artificial Intelligence:

1.3.1- Branches:

She (Pedamkar, 2023) touched in an article on the 4 best techniques for artificial intelligence, represented in machine learning, natural language processing, automation and robotics, and machine vision, while some researchers (2019، بن عبد العزيز، خوالد و) believe that there are four common techniques in the use of artificial intelligence, which are expert systems, artificial neural network systems, fuzzy logic systems, and genetic algorithm systems. The following are the most commonly used ones:

- Machine Learning:

Machine learning is one of the branches of artificial intelligence, and it consists in building systems that allow the machine to learn on its own without programming, starting from its surroundings and from the data and experiments that exploit it. As for deep learning, it is one of the branches of machine learning inspired by the process of human neurons, it is based on artificial neural networks, and from the applications of machine learning in our lives today we find: self-driving cars, drones, image classification, and others.

- Expert Systems:

It is a group of machines or robots that perform the work of experts, by extracting the experiences of specialists and experts in a specific field and transferring them to the machine, so that they can be used to solve problems smartly and quickly just like a human expert, for example, travel booking applications such as Trivago and Booking.com, which enable you to book an integrated travel trip based on choosing the most appropriate place to travel, plane and hotel reservations and all procedures related to your travel.

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- Natural Language Processing:

It is a technology that enables the computer to understand and distinguish human languages, whether written or oral, and then process and use it. This technology has been used in many applications, such as Google Translate, Apple Siri, Google Assistant, and others.

- Artificial Neural Networks:

It is a data processing system that is used in the form of inputs to obtain outputs, and it is inspired by the work of the biological neural network of humans, as it was modeled on a computer to perform certain tasks.

- Automation and Robotics:

It is the programming of robots and machines to perform the monotonous tasks entrusted to man without interference from him, whether in administrative, productive, service, and other work. Automation has contributed significantly to increasing production and reducing effort and cost in the work it does, as it can work accurately, quickly, and efficiently beyond humans, as well as perform dangerous and intractable tasks. In addition, it is not affected by external, social, and physical factors, and can be applied in all fields such as transportation, manufacturing, health, security, and other uses.

1.3.2- Fields of Use:

Artificial intelligence is one of the most successful fields at the present time, as it has emerged from the research phase to commercial use, and it has proven its efficiency in many fields: medicine, industrial and commercial business organizations and others, and in its various forms: neural networks, development algorithms, smart customer systems, and expert systems, the latter of which have met with great popularity in terms of use, perhaps due to their suitability for administrative purposes, which contributed greatly to facilitating information management as an intelligent information management system (شبيخ، 2018).

2- Economic growth:

Countries have been accelerating and competing with each other for a long time to adopt the best successful economic trends in building their features and structures and improving the standard of living of their members, by adopting the best ways that allow the optimal use of their available resources in order to increase wealth and production. For this reason, theories and studies in the field of economics have evolved over the

ages, until the term economic growth emerged, which has a great impact in guiding economic policies and developing national economies.

2.1- The concept of economic growth:

The term economic growth emerged at the beginning of the nineteenth century as part of the development of economic thought and studies. It is defined as " an increase in gross domestic product or gross national income that achieves an increase in average real per capita income." (عجمية و ناصف (2006 عطية، It is also considered "the quantitative or qualitative increase of the working-age population, the tools they have to work with, and the recipes available to them to combine labor, capital, and raw materials, which would lead to an increase in economic output." (Lesson summary: Economic growth, 2023), It is also defined as "the increase in the production of economic goods and services compared from one period of time to another." Based on these definitions (CHAPPELOW, 2019), it can be said that economic growth is the quantitative increase in the production of goods and services for individuals and institutions, as well as the ability to expand investment, which inevitably leads to an increase in the country's GDP over specific periods of time.

2.2- Achieving economic growth:

He believes (تودارو، 2006) that the basic components that must be available in any society to achieve economic growth are the accumulation of capital, labor, and technological progress, while he believes (رشيد، 2013) that the phenomenon of growth is not limited in its analysis to the increase in the amount used of physical capital and labor only, but there are other subjective factors such as the importance of human capital, technological progress, experience, education, etc., and here are the most prominent factors that can be mentioned in this context:

2.2.1- Increase Physical Capital:

Adding capital to the economy increases labor productivity, using newer and better tools that enable workers to produce more output in each time period.

Individuals in the economy must engage in some form of saving and sacrifice their current consumption in order to free up the resources needed to create new capital. In addition, new capital must be of the right kind, in the right place, and at the right time so that workers can use it productively.

2.2.2- Technological Development:

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Technological progress is one of the most important sources that can currently achieve a qualitative leap in economic growth, as advanced technology allows the optimal exploitation of resources, the limitation of effort and time, and the acceleration of the pace of production with high efficiency, and the rate of technical growth depends heavily on the rate of savings and investment, as they are necessary to engage in research and development.

2.2.3- Workforce Development and Increasing Human Capital:

Increasing the labor force necessarily increases the amount of production that must be consumed in order to provide basic livelihoods for new workers, so new workers need at least to be productive enough to compensate for this and not be net consumers.

The provision of more workers also contributes to the generation of more economic goods and services, as the main factor of strong economic growth in the United States during the nineteenth century was due to the large influx of cheap and productive migrant labor. However, there are some prerequisites for this process, it is important that the right type of workers flock to the right jobs in the right places with the right types of complementary capital goods in order to realize their productive potential.

2.3- Measuring economic growth:

There are several ways to calculate economic growth, and real GDP is one of the most commonly used ways to measure economic growth. GDP can be defined as the total value of all goods and services produced within the local economy. As for real GDP, it is GDP adjusted and the effects of inflation are excluded from it. Among the most commonly used ways to measure economic growth are the following:)Bank of Canada(2010 ‘.

2.3.1- Quarterly Annual Growth Rate:

This method explains the volatility in GDP in a quarterly manner, comparing and collecting it, and then recording it at the end of the year. It is indicated that the media uses this method to show economic changes and developments, and showing changes resulting from economic factors during the quarter is one of the disadvantages of this method, as it affects the full annual rate.

2.3.2- Quarterly Growth Rate:

This method compares the level of GDP in each quarter with the results of the same quarter in the previous year, and companies use this method to know their annual profits, and reduce seasonal fluctuations.

2.3.3- Annual Average Growth Rate:

This method is less volatile than other methods. It eliminates changes resulting from factors affecting economic growth, in addition to comparing developments and changes during the previous year in full.

3- Contribution of Artificial Intelligence to Economic Growth:

Artificial intelligence has recently made rapid leaps, through which it has made new developments that can fundamentally change the lifestyle on the globe, as it has the potential to revolutionize all aspects of our daily lives, work, mobility, health, economy and others, and we will present in this aspect of the article the impact of artificial intelligence technologies and developments on the economic aspect.

3.1- The most adopted countries for artificial intelligence:

Artificial intelligence has the ability to change the way governments around the world provide public services, and this leads to significantly improving citizens' experiences with government. Governments are already applying artificial intelligence in their operations and service delivery, to improve efficiency, save time and money, and provide better quality public services, and the same proposition for wealth-producing economic institutions, as they work to introduce various applications of artificial intelligence in its various forms at various stages of the organizational process, productivity and marketing, and this works to increase productivity, reduce costs, and achieve record levels of income and growth.

The Government AI Readiness Index is a quantitative toolkit designed to provide an overview of any government's readiness to use AI. The index includes a wide range of data, from desk research on the existence of AI strategies, to statistics on AI startups, and is summarized in a single figure, facilitating global comparisons, as well as the ability to track government progress in this area over time, however, it does not reflect the full complexity of the picture on the ground. For example, Ghana's relatively low score does not recognize developments such as Google's recent choice to open its first AI research facility in Africa there, and likewise, Belarus performs poorly in the rankings, but has made strides in opening technology hubs and working with China on AI research and development.

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Table 01: Top 10 Rankings for Government AI Readiness 2023

Country	USA	Singapore	UK	Finland	Canada	France	R.Corea	Germ-any	Japan	Nether-lands
Order	1	2	3	4	5	6	7	8	9	10
Point	84.80	81.97	78.57	77.37	77.07	76.07	75.65	75.26	75.08	74.47

Source : (Hannah Miller, Richard Stirling, & Emma, Government Artificial Intelligence Readiness, 2023)

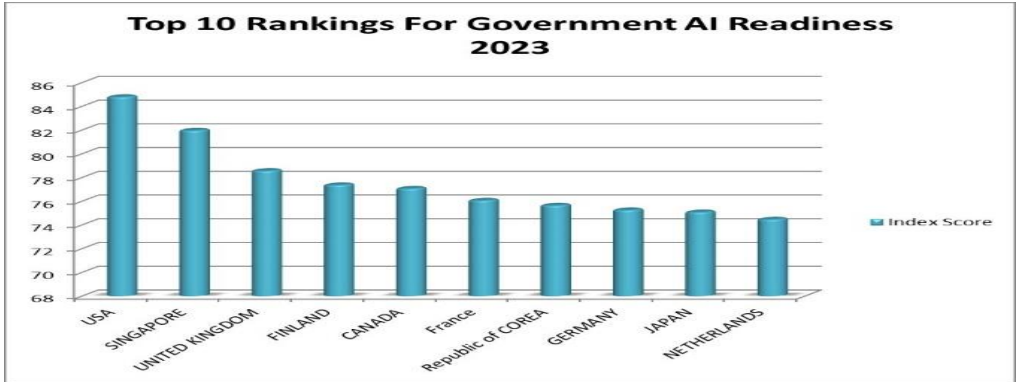
The top rankings of the 2023 Government AI Readiness Index are dominated by countries with strong economies, good governance, and innovative private sectors. USA ranks first in terms of AI readiness, followed by Singapore, the United Kingdom, and Finland, in addition to Canada, France, Republic of Korea, Germany, Japan, and the Netherlands. There are no Latin American, African, or Arab countries in the top 10.

China also comes in sixteenth place, despite what is known about it being a competing country with the United States of America in many fields, and that its central and local administrations are already implementing artificial intelligence in providing public services. The United Arab Emirates is ranked eighteenth, which has witnessed progress like some other countries, while other countries have witnessed a decline compared to previous annual reports. (Rogerson & all, 2022)

While Algeria ranked 120, far behind Tunisia (81) and Morocco (88), in addition to a decline compared to the 2022 report.

The best-performing region on average is North America, while the worst-performing regions are Africa and the Asia-Pacific region. The index highlights the current inequality in AI readiness among global governments, with high-income countries expected to perform better in the rankings than middle and low income countries. (Oxford Insights & International Development Research, 2019)

Figure 02: Top 10 Rankings for Government AI Readiness 2023

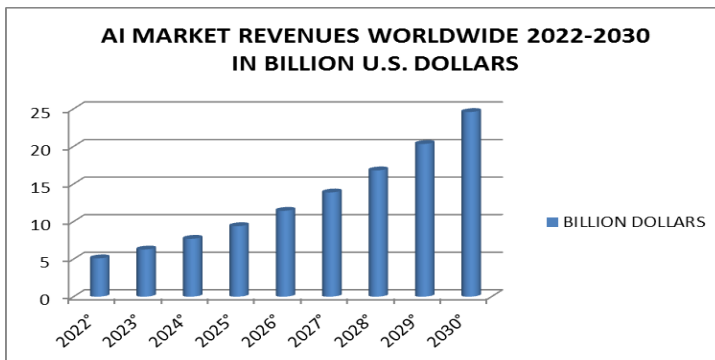


Source: Prepared by researchers based on (Hannah Miller & Richard Stirling, 2023)

3.2- Global AI Market:

Artificial intelligence has gained great popularity around the world, due to the solutions and facilities it provides to companies and organizations to improve the level of decision-making, and competition has become intense to keep pace with global growth in this field, which has brought about a global increase in the adoption of artificial intelligence technologies in various sectors and at the enterprise level, which in turn led to an increase in demand for artificial intelligence, as the value of the global artificial intelligence market reached 10.5 billion US \$ in 2022, and is expected to reach 24.58 billion US \$ by 2030, with a compound annual growth rate of 21.5 % during the expected period, 2023-2030.

Figure 03: Worldwide AI Market Revenue 2022-2030



Source: (Microsoft corporation, Intel corporation, & Alphabet Inc, 2023)

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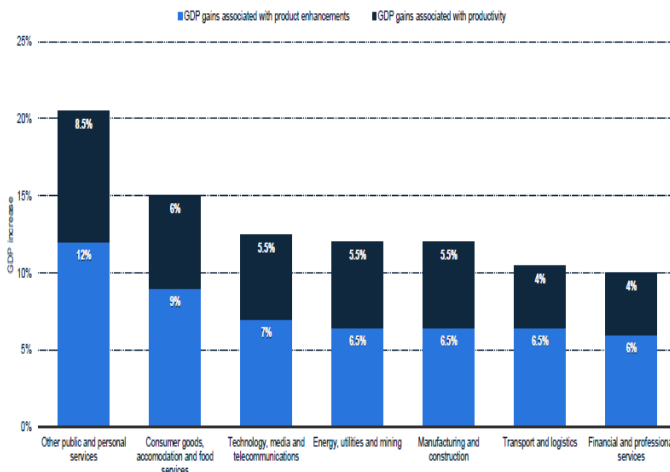
3.3- Contribution of Artificial Intelligence to Economic Growth:

They believe (حمروش و بلعسل بنت نبي، 2022) that the main incentive for artificial intelligence through which economic growth can be driven lies in "the advancement of education, health care, ending poverty and hunger, social and economic equality, smart mobility and smart cities, all of which are aspirations for a better future and to achieve future development goals.

Artificial intelligence is the new frontier for humanity, and a key pillar on which the future service sectors and infrastructure depend, as it will become an integral part of daily life in the coming years, as various sectors seek transformation with the aim of achieving sustainable development by 2030."

The environment associated with economic institutions requires the application of many artificial intelligence technologies and software, in order to confront the crises and symptoms they face, with high efficiency and effectiveness that allows them to improve the quality of their performance and production, which is inevitably due to the country's economy. The following are the expectations of the impact of artificial intelligence on economic growth by 2030, according to expert reports:

Figure 04: Projections of the increase in GDP by sectors with the contribution of artificial intelligence during 2030.



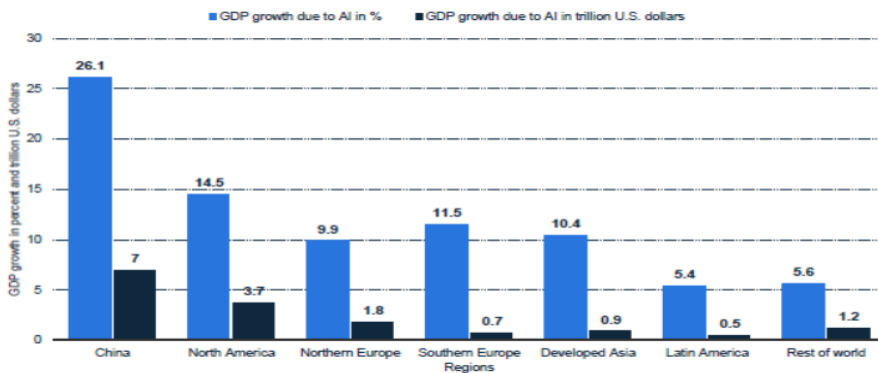
Source: (Artificial Intelligence (AI) worldwide - statistics & facts, 2023)

The chart indicates the potential economic impact of artificial intelligence on GDP by industry sectors in 2030. The public and other personal services sector comes first, with gains of 20 %, 12 % of which are

the result of product improvements, and 8.5 % are related to productivity as a result of the use of artificial intelligence, followed by the consumer goods and food services sector with an estimated 15 %, 9 % of which are related to product improvement, and 6 % are related to the use of artificial intelligence techniques to improve production. Then comes the technology, media and communications sector, then the energy and mining sector, then the manufacturing and construction sector, the transport and logistics sector, and finally the financial and professional services sector with a total increase of 10 %.

He (Thormundsson, Increase of GDPs globally due to artificial intelligence 2030, 2022) also touched on the talk of increasing global GDP due to artificial intelligence during 2030, as China is expected to be the country whose economy can benefit the most from artificial intelligence, with its GDP likely to be 26.1 % higher in 2030, equivalent to an additional seven billion US dollars, due to the impact of artificial intelligence.

Figure 05: Impact of Artificial Intelligence (GDPs) on GDP worldwide in 2030, by region



Source: (Artificial Intelligence (AI) worldwide - statistics & facts, 2023)

This statistic shows the estimated impact of AI on global gross domestic product (GDP) in 2030, by region. Where China sits on the throne of countries whose economy can benefit more than artificial intelligence, and its GDP is expected to witness an increase of up to 26.1 % due to artificial intelligence, manifested by an increase estimated at about 7 billion US dollars, followed by North America, where the rate of increase in GDP can reach 14.5 %, equivalent to pumping 3.7 billion dollars, followed by European countries and developed Asian countries with a growth rate of 9.9 % 11.5 % 10.4 %, and at the bottom of the ranking are the countries of the

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Middle East and African countries where they are considered the least affected and benefiting from artificial intelligence developments.

Conclusion:

Economic growth is affected by many factors, whether positive or negative, and to varying degrees depending on the influences and time periods that occur, and what is happening in the world today in terms of technological developments and innovations calls for economic specialists and decision makers to keep pace with these developments and anticipate the prominent and future role that artificial intelligence plays in developing and building the knowledge economy, which in turn inevitably leads to enhancing economic growth, and among those developments in computer science related to technology is a breakthrough called the quantum computer, and here two revolutions meet, the artificial intelligence revolution and the quantum computer revolution, which together form the economy of the future, and therefore this study proves the validity of what we hypothesized at the beginning, from the research, a number of results can be drawn, which we formulate as follows:

- Artificial intelligence is an innovative and very important technology in our time, as it can contribute to solving complex problems and help improve intelligent processes and decision-making.
- Technological progress is one of the most important sources that can currently make a qualitative leap in economic growth.
- The geographical spread of the artificial intelligence market has expanded due to the increasing demand for it around the world.
- There is a disparity in the adoption of artificial intelligence technologies as well as the creation of the necessary infrastructure for it between countries, which will create a gap between them in the future in the amount of benefit from them.
- China is at the forefront of global efforts in the field of research and adoption of artificial intelligence in its domestic economy, followed by the United States of America.
- China and the United States are among the countries that benefit the most from the use of artificial intelligence technologies and applications.

References

In Arabic:

- أبو بكر خوالد، و سفيان بن عبد العزيز. (2019). *تطبيقات الذكاء الاصطناعي كتوجه حديث لتعزيز تنافسية منظمات الأعمال*. الجزائر: المركز الديمقراطي العربي.
- ساطور رشيد. (12 31، 2013). دراسة نظرية حول النمو الاقتصادي والتنمية المستدامة -علاقة و روابط-. *مجلة الاقتصاد والتنمية البشرية*، 96.
- محمد أحمد محمد حسن. (07 12، 2020). *الذكاء الاصطناعي و دوره في تنمية النشاط الاقتصادي. الحكمة للدراسات التربوية و النفسية*.
- محمد عبد العزيز عجمية، و إيمان ناصف عطية. (2006). *التنمية الاقتصادية دراسات نظرية و تطبيقية*. مصر، مصر: جامعة الاسكندرية.
- ميشيل تودارو. (2006). *التنمية الاقتصادية*. (محمود حسن حسني، المترجمون)، الرياض: دار المريخ.
- هجيرة شيخ. (2018). دور الذكاء الاصطناعي في إدارة علاقة الزبون الالكتروني للقرض الشعبي الجزائري. *مجلة الأكاديمية للدراسات الاجتماعية والانسانية*، 82.
- ياسمين بلعسل بنت نبي، و الحسين حمروش. (12 06، 2022). *الذكاء الاصطناعي و دوره في تحقيق التنمية المستدامة. مجلة الدراسات القانونية والاقتصادية*، 1177-1153.
- يوسف حسين، و إسماعيل صديقي. (2021). *دراسة ميدانية لواقع إنشاء المؤسسات الناشئة في الجزائر. حوليات جامعة بشار في العلوم الاقتصادية*، الصفحات 68-89.

In Latin.

- Bank of Canada. (2010, 05 17). *Measuring Economic Growth*. Consulté le 08 31, 2023, sur bankofcanada: https://www.bankofcanada.ca/core-functions/monetary-policy/?page_moved=1#:~:text=The%20most%20common%20way%20to,remove%20the%20effects%20of%20inflation.
- CHAPPELOW, J. (2019, 04 16). *What Is Economic Growth and How Is It Measured?* Consulté le 08 30, 2023, sur investopedia: <https://www.investopedia.com/terms/e/economicgrowth.asp#citation-5>
- Copeland, B. J. (2021, 09 27). *artificial intelligence*. Consulté le 11 14, 2022, sur britannica: <https://www.britannica.com/technology/artificial-intelligence>
- Dube, R. (2021, 09). *What Is Artificial Intelligence?* Consulté le 11 14, 2022, sur lifewire: <https://www.lifewire.com/what-is-artificial-intelligence-5119206>
- Hannah Miller, & Richard Stirling. (2023). *Government Artificial Intelligence Readiness*. CANADA: Canada's International Development Research Centre.

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- Lesson summary: Economic growth.* (2023, 08 30). Récupéré sur khanacademy: <https://www.khanacademy.org/economics-finance-domain/ap-macroeconomics/ap-long-run-consequences-of-stabilization-policies/economic-growth/a/lesson-summary-economic-growth>
- Microsoft corporation, Intel corporation, & Alphabet Inc. (2023). *Explainable AI market 2023-2030*. Next Move Strategy Consulting.
- Oxford Insights , & International Development Research. (2019). *Government Artificial Intelligence Readiness*. Consulté le 09 01, 2023, sur oxfordinsights: <https://www.oxfordinsights.com/ai-readiness2019>
- Pedamkar, P. (2023, 07 06). *Artificial Intelligence Techniques*. Consulté le 08 02, 2023, sur educba: <https://www.educba.com/artificial-intelligence-techniques/>
- Rogerson, A., & all, a. (2022). *Government Artificial Intelligence Readiness index 2022*. Oxford insights. Consulté le 09 01, 2023, sur oxfordinsights: <https://www.oxfordinsights.com/ai-readiness2019>
- Shayna kabbar, & Vishal Monga. (2017). A study on Artificial Intelligence in E-Commerce. *International Journal Of Advances in Engineering and Scientific Research*, 62-68.
- Thormundsson, B. (2022, 05 17). Increase of GDPs globally due to artificial intelligence 2030.
- Thormundsson, B. (2023, 08 22). *Artificial Intelligence (AI) worldwide - statistics & facts*. Consulté le 09 07, 2023, sur statista: <https://www.statista.com/topics/3104/artificial-intelligence-ai-worldwide/#dossier-chapter1>
- Types of Artificial Intelligence.* (2022). Consulté le 07 12, 2023, sur java t point: <https://www.javatpoint.com/types-of-artificial-intelligence>