Artificial Intelligence and Its Role in Enhancing the Utilization of Economic Resources

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Abstract:

This study explores the relationship between artificial intelligence (AI) and economic resources, and how AI can improve the utilization of economic resources, reduce waste, allocate resources, labor markets, and economic growth. The main objective of the study is to investigate and clarify the relationship between AI and economic resources, with the study suggesting a correlation between the variables of the mentioned relationship. The study's hypothesis is: "AI enhances the utilization of economic resources, reduces waste, allocates resources, influences labor markets, and promotes economic growth." The study concludes with some recommendations to develop policies that keep pace with the rapid advancements in AI.

Keywords: (Artificial Intelligence, AI Index, Government AI Readiness Index, Economic Resources).

1.1. Introduction:

The rapid technological advancements, with AI being a key tool in improving the management and efficient utilization of economic resources, pose a challenge for countries and institutions, especially with the increasing demand for natural, financial, and human resources. AI has become a transformative force in reshaping the global economy, serving as a strategic tool that influences how resources are managed and utilized, thereby enhancing efficiency and productivity. It has had a profound impact on economic resources across various sectors and is expected to affect around 40% of jobs worldwide, [i] replacing some jobs and necessitating readiness for this change.

The interaction between AI and economic resources opens new avenues for sustainable economic development. The relationship between economic resources and AI is crucial, influenced by enabling economic factors. Open markets and significant investments in research and development (R&D) enhance the potential for rapid AI innovation. Economic resources provide the necessary infrastructure for the utilization of big data, a cornerstone of AI. Studies indicate that small and medium-sized enterprises (SMEs) can benefit from this technology to increase their competitiveness by applying new technologies that enhance their strategic efficiency. [ii] In the context of the Fourth Industrial Revolution, technological innovations require significant contributions from knowledge resources [iii], creating synergies between these elements. This strategic relationship underscores the importance of investing in economic resources to boost AI innovation. Through this study, we will explore how AI can reshape the economic landscape and enhance resource utilization to achieve sustainable economic development goals.

1.2. Problem Statement:

Despite technological advancements, many governments and companies face challenges in efficiently managing economic resources

in the context of the Fourth Industrial Revolution. The problem lies in the suboptimal utilization of resources, leading to waste and reduced productivity, which in turn exacerbates economic issues.

The main question of the study is: How can AI contribute to improving the utilization of economic resources and reducing waste?

1.3. Importance of the Study:

The study aims to identify the dimensions of the relationship between AI and economic resources and their impact on sustainable economic development.

1.4. Objectives of the Study:

-Explore AI's role in achieving optimal utilization of economic resources.

-Identify areas where AI can be applied in economic resource management.

-Evaluate AI's effectiveness in improving resource utilization and reducing waste.

-Propose strategies to enhance the use of AI in resource management.

1.5. Hypothesis of the Study:

The hypothesis states: **"AI enhances the utilization of economic resources, reduces waste, allocates resources, influences labor markets, and promotes economic growth".**

1.6. Methodology of the Study:

To achieve the study's objectives, the descriptive-analytical method was used.

2.1. Theoretical Framework:

To date, four major industrial revolutions have occurred. These historical stages have transformed the production, economy, and society. Here are the details of the revolutions: [iv]

• First Industrial Revolution (Late 18th - Early 19th Century):

This phase began in Britain and relied on the use of steam engines to improve industrial and agricultural production. It was characterized by the development of the textile industry, the use of coal as a primary energy source, and the evolution of the railway system.

• Second Industrial Revolution (Late 19th - Early 20th Century):

This phase relied on electricity and assembly lines. It included advancements in industries such as steel, oil, and chemicals. Innovations such as the telephone, light bulb, and automobiles emerged.

• Third Industrial Revolution (Second Half of the 20th Century):

This phase relied on electronics, computers, and information technology. It was characterized by the automation of production, the use of robots, and the internet.

• Fourth Industrial Revolution (Early 21st Century):

This phase relies on smart technology, AI, and the automation of things. It is characterized by the integration of digital systems, the use of big data, and 3D printing. It focuses on integrating digital, biological, and technological advancements.

The development of AI and modern technology has had a profound impact on the global economy. This is supported by economic theories that highlight the importance of technology and AI in improving the

utilization of economic resources and productivity. In this study, we will discuss some economic theories, including:

a) New Growth Theory:

This theory emphasizes the importance of technology and innovation as the main drivers of long-term economic growth. It posits that investment in R&D and education improves the productivity of economic resources. AI enhances innovation and productivity through technologies like big data analysis and economic forecasting. Technology enhances the efficiency of resource allocation through automation and process analysis. [v]

b) Total Factor Productivity (TFP) Theory:

Robert Solow discussed the role of technology as an external factor affecting productivity. This theory measures the positive impact of technology and technological progress on productivity, regardless of the quantities of labor or capital used. The introduction of AI in economic processes reduces costs and improves quality. For example, the use of robots in manufacturing increases productivity while reducing waste. [vi]

c) Digital Economy Theory:

This theory discusses the dimensions of technology and AI in the future of the digital economy. The modern economy is shifting from reliance on traditional resources to reliance on data and AI as the foundation for innovation and production. Companies use AI to analyze big data and make better decisions. E-commerce platforms use AI algorithms to personalize products for customers. [vii]

d) Technological Change Theory:

Schumpeter focuses on innovation as a tool for reshaping economic markets. Technological progress reshapes labor markets and changes

the structure of economic production. AI replaces routine jobs with smart machines, leading the workforce towards higher-skilled jobs. This improves the efficiency of resource use, such as energy and time, through smart technologies. [viii]

e) Cost Advantage Theory:

Michael Porter discusses how technology contributes to achieving a competitive advantage. Advanced technology reduces production costs and increases competitive efficiency. AI reduces operational costs through automation and better resource management. For example, the use of AI systems to optimize supply chains reduces logistical costs. [ix]

f) Sustainability Economics Theory:

Herman emphasizes the importance of technology in achieving sustainable development and efficient resource use. Smart technology contributes to improving the efficiency of using scarce resources and achieving sustainable development. The use of AI in managing natural resources, such as applying technology to monitor emissions and reduce pollution, is an example of this. [x]

g) Disruptive Innovation Theory:

Christensen discusses the concept of disruptive innovation and its impact on markets. Disruptive innovation refers to technology that radically changes the nature of a market or industry. AI has reshaped sectors such as healthcare, manufacturing, and financial services. Companies like Tesla have used AI to revolutionize the electric car industry. [xi]

h) Human Capital Theory:

Becker explains the importance of education and training in enhancing productivity through technology. Skills and knowledge acquired (such as AI skills) improve economic productivity. Investing

in training the workforce to use modern technology increases efficiency. AI helps design educational programs that enhance the performance of the workforce. [xii]

2.2. What is the essence of Artificial Intelligence (AI)? [xiii]

❖ **Definition of AI:** AI is the ability of machines and technologies to perform tasks that typically require human intelligence. It includes a range of technologies that can be integrated to perform different types of tasks such as (language understanding, learning, and planning).

❖ **How AI Works:** AI works by mimicking human cognitive processes such as (learning, thinking, and problem-solving). Smart systems can improve their performance over time based on the information they gather.

❖ **Practical Applications:** AI applications are diverse across various fields such as (business, healthcare, transportation, and entertainment). It is used in data analysis, enhancing customer experience, and developing smart systems like self-driving cars.

❖ **Importance of AI:** The importance of AI in our daily lives is increasing, as it contributes to improving efficiency and increasing productivity in many fields. It also opens new avenues for innovation and technological development.

2.3. AI Indicators and Economic Resources Needed for AI:

❖ **Global AI Index:**

The link is below:

https://www.tortoisemedia.com/intelligence/global-ai

This is the first index to compare countries based on their level of investment, innovation, and implementation of AI. It aims to understand AI in 83 countries and record their results on AI capability based on (122) different indicators grouped into three analysis pillars: (implementation, innovation, and investment). These pillars collectively cover talent, infrastructure, operating environment, R&D, the business ecosystem, and government strategy.

The key findings of the 2024 AI Index show the top five countries as follows: [xiv]

- First Place: United States, leading the global AI Index rankings.
- Second Place: China.

(These two major powers significantly outpace all other countries in the index).

- Third Place: Singapore.
- Fourth Place: United Kingdom.
- Fifth Place: France.

This is based on the government's strategy for investing in AI, which is reflected in national public funding allocated for AI.

The Global AI Index measures countries' government AI strategies by analyzing national AI strategy documents and government spending commitments.

Saudi Arabia ranks first due to significant government spending commitments, which will be implemented over the coming years. The United States follows in second place in terms of government spending on AI. Then comes South Korea, followed by France, Germany, and Spain. Canada ranks first in terms of public investments in high-quality AI computing infrastructure.

More countries have published or are in the process of drafting a national AI strategy. Most modern AI strategies consider AI ethics. A

quarter of the countries listed in the index support the development of a basic model.

❖ **Government AI Readiness Index:**

This is an evaluation tool aimed at measuring governments' readiness to adopt and implement AI technologies in their services and institutions. This index is published annually by Oxford Insights and the Center for International Development Research. The official website is:

https://www.oxfordinsights.com/government-ai-readiness-index

➢ **Evaluation Criteria for Government Readiness:**[xv]

The index relies on several criteria, including:

a) **Digital Infrastructure:** (The extent to which a country has available and developed technical infrastructure).

b) **Human Capital:** (The level of skills and expertise in AI among the workforce).

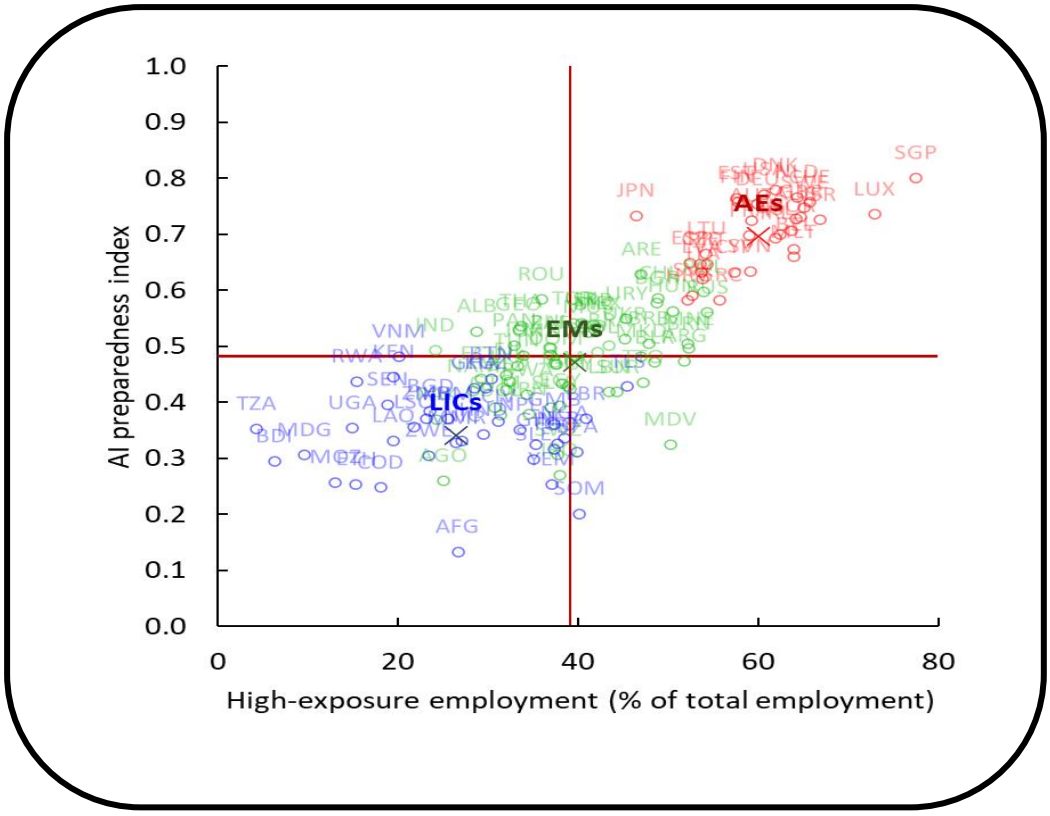
c) **Regulatory Framework:** (The presence of policies and legislation that support the development and use of AI technologies).

d) **Innovative Environment:** (The extent to which the state supports R&D and innovation in AI).

In the 2022 report, the United Arab Emirates ranked first in the Arab world and 18th globally, while Saudi Arabia ranked second in the Arab world.

Using this index, experts at the fund evaluated the readiness of 125 countries. The results showed that richer economies, including developed economies and some emerging market economies, are better equipped for AI adoption compared to low-income and developing countries. Singapore, the United States, and Denmark scored the

highest in the index based on strong results in the four criteria it tracks. This is illustrated in Figure 1.



Sources: Fraser Institute; International Labour Organization; International Telecommunication Union; United Nations; Universal Postal Union; World Bank; World Economic Forum; and IMF staff calculations.

Note: The plot comprises 125 countries: 32 AEs, 56 EMs, and 37 LICs. The red reference lines are derived from the median values of the AI Preparedness Index and high-exposure employment.

Figure 1: AI Preparedness Index and Employment Share in High-Exposure Occupations.

Source: https://www.imf.org/ar/Blogs/Articles/2024/01/14/ai-will-transform-the-global-economy-lets-make-sure-it-benefits-humanity

Based on insights from the AI readiness index, advanced economies should prioritize AI innovation and integration, while establishing robust regulatory frameworks. This will create a safe environment for AI, fostering public trust. Meanwhile, emerging market and developing economies should prioritize laying strong foundations through investments in digital infrastructure and the availability of digital skills among the workforce.

2.4 Economic Resources Required for AI Development: [xvi]

Developing and implementing AI technologies requires significant economic resources, which can be categorized into several key areas:

a) Data: AI models, especially those based on deep learning, require vast amounts of data for effective training. Model performance improves with the size of the data set, which can range from billions to trillions of tokens. Consequently, companies like Microsoft and Google have a significant advantage due to their ability to access vast, structured data from their user bases.

b) Human Capital: The high demand for skilled AI researchers and developers is evident. In 2020, approximately 70% of AI PhD graduates were employed by the industry, up from 21% in 2004. This trend has led to talent migration from academia, with expertise concentrated within the industry.

c) Computing Power: Substantial computing power is essential for training large AI models. Industry models in 2021 were, on average, 29 times larger than their academic counterparts, highlighting the resource gap between industry and academia.

d) Financial Investment: Significant financial investments are made in AI research and development. The U.S. government allocated $4.8 billion for AI research and development in 2022, with plans to increase non-defense federal spending on AI R&D to $32 billion by 2026.

e) Infrastructure and Policy Support: Developing AI technologies requires robust infrastructure and supportive policies. The National Science Foundation and other U.S. government agencies invest in AI research institutes and infrastructure to foster innovation and maintain leadership in AI.

3.1 Impact of AI on Sectors, Economic Resources, and Economic Growth:

- **Economic Sectors:** [xvii]

AI is revolutionizing various economic sectors, enhancing efficiency, innovation, and economic value. Here are some key examples:

a) Logistics: Companies like UPS are using AI to improve delivery operations and reduce package theft. UPS developed the Delivery Defense program, an AI system that assigns a "delivery confidence score" to each location based on historical data, allowing for the rerouting of at-risk packages to safer locations.

b) Healthcare: In dental care, companies like VideaHealth are using AI to improve the accuracy and efficiency of X-ray diagnoses. The AI platform can detect issues like cavities and gum disease that

might be missed by the human eye, leading to standardized diagnoses and consistent treatment outcomes.

c) Agriculture: John Deere has integrated AI into agricultural practices through precision technologies. The See & Spray technology uses computer vision and machine learning to differentiate between crops and weeds, significantly reducing herbicide usage and lowering costs for farmers.

d) Manufacturing: AI is transforming manufacturing by enhancing efficiency and reducing costs. It plays a pivotal role in process modeling, product improvement, and quality control, contributing to the Fourth Industrial Revolution.

e) Retail and E-commerce: AI is enhancing customer experiences through personalized shopping, dynamic pricing, and efficient inventory management, boosting sales and customer satisfaction.

- **Economic Resources:** [xviii]

AI is revolutionizing resource allocation and optimization in various fields:

1 .Healthcare: AI improves resource allocation by enabling more accurate diagnoses, streamlining patient care, and accelerating drug discovery.

2 .Finance: AI enhances investment decisions, fraud detection, and customer service through chatbots and virtual assistants.

3 .Manufacturing: AI optimizes resource allocation by improving operational efficiency and enabling predictive maintenance.

4 .Operations Management: AI streamlines processes and enhances decision-making by analyzing large datasets to improve business operations.

5 .Project Management: AI enhances resource optimization by providing data-driven insights for proactive resource allocation.

6. Sustainability Efforts: AI contributes to resource optimization for environmental and social goals.

3.2 Economic Growth and Future Trends of AI:

AI is expected to be a major driver of economic growth. According to IDC, AI is projected to contribute $19.9 trillion to the global economy by 2030, representing 3.5% of global GDP. Generative AI is anticipated to generate between $2.6 trillion and $4.4 trillion in value across industries. The manufacturing sector alone is expected to gain $3.8 trillion by 2035 due to AI integration.[xix]

A report by PwC titled "The Economic Impact of Artificial Intelligence on the Global Economy" [xx]

suggests that AI's impact on global GDP by 2030 could contribute up to $15.7 trillion to the global economy. This includes $6.6 trillion from productivity improvements and $9.1 trillion from consumer demand effects. The report indicates that sectors like healthcare, fintech, and manufacturing will be the biggest beneficiaries, reflecting its significant potential to boost productivity and economic growth.

Employment in advanced economies is also expected to be affected. It is estimated that around 60% of jobs may be impacted by AI technology, as it enhances the productivity of many jobs while potentially reducing demand for others.

4.1 The Iraqi Economy and AI:

For the Iraqi economy, while specific statistics are not available, the adoption of AI technologies can contribute to improved productivity efficiency across various economic sectors, fostering economic growth and creating new job opportunities.

Iraq ranked 77th globally and 9th in the Arab world in the Global AI Index 2024, indicating a growing interest in developing digital infrastructure despite economic and political challenges.

In the Government AI Readiness Index, Iraq ranked 104th out of 160 countries, with this low ranking attributed to a lack of data, the absence of a specific cybersecurity law, and unresolved conflicts between entities responsible for AI oversight. [xxi]

Iraq is witnessing an increase in technology investments, including AI, but these investments remain modest compared to other Arab countries. Sectors such as education, healthcare, and oil are expected to benefit from AI technologies, leading to improved efficiency.

The Iraqi government is working to enhance automation as part of the Digital Transformation Strategy 2030, which includes improving infrastructure and investing in AI technologies. AI is projected to contribute around $10 billion to Iraq's GDP by 2030 if investments in this area continue. The oil sector, which forms the backbone of the Iraqi economy, can significantly benefit from AI to enhance exploration and production processes and reduce operational costs.

However, Iraq's position is not yet at the desired level, requiring genuine government action in the technology sector to enable Iraq to take advantage of the rapid developments in AI.

5 .Conclusions:

a) The study's hypothesis, which states: "AI improves the utilization of economic resources, reduces waste, optimizes resource allocation, labor markets, and economic growth," has been proven.

b) The relationship between AI and economic resources is complex and multifaceted. AI requires significant economic resources for its development and implementation.

c) AI is a powerful tool for improving economic resource management and achieving sustainable development. It has the potential to significantly transform economic sectors, enhance resource allocation, and drive sustainable economic growth.

d) Achieving these benefits requires careful management of AI challenges, including job displacement, environmental impact, and ethical considerations.

e) Iraq's position is not yet at the desired level, necessitating genuine government action in the technology sector to enable Iraq to take advantage of the rapid developments in AI.

6 .Recommendations:

a) Focus on training the workforce and developing digital infrastructure to maximize the benefits of these technologies in enhancing the national economy.

b) Enhance investment in AI technologies.

c) Encourage academic institutions to collaborate with the private sector to develop innovative AI applications.

d) Governments and industry leaders should work together to ensure the desired benefits of AI are realized.

e) Develop national strategies for AI adoption and establish policies that support the use of AI in resource management.

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