

The Role of Artificial Intelligence in Empowering Startups

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Abstract:

This study aims to highlight the role played by artificial intelligence in enabling startups to achieve success, whether in growth and stability, innovation and competition, or even in transforming from a startup into a large corporation. The study concludes that various institutions are increasingly adopting artificial intelligence technologies as a strategic necessity to achieve their diverse objectives.

Key words: Artificial Intelligence, AI Technologies, Startups, Achieving Success.

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1. INTRODUCTION

The field of technology, computing, and software has witnessed significant development, leading to the emergence of many modern technologies that receive widespread attention. Artificial intelligence is one of the most prominent among these technologies, considered the fruit of accumulated human knowledge and experience. These accumulations have transitioned from theoretical research to practical application, proving their efficiency across diverse fields. Due to the importance of artificial intelligence in achieving institutional goals with high efficiency, researchers' interest in it has increased, and it is expected to open unlimited horizons for innovation.

This technology also contributes to enhancing institutional efficiency and support, achieving multiple advantages that help ensure their continuity and promote growth.

Problem Statement

Based on the above discussion, the research problem is formulated as follows:

How does artificial intelligence contribute to enabling startups to achieve success?

Sub-questions

To answer the above problem, the following sub-questions are posed:

- What is meant by artificial intelligence?
- What is the importance of startups?
- What are the characteristics of startups?
- What are the gains of startups from using artificial intelligence technologies?

Hypotheses

- The use of artificial intelligence is limited to startups with a technological nature.
- The use of artificial intelligence supports innovation and competitive ability.

Research Structure

To address the research problem, this study is divided into three main parts:

- ❖ Fundamentals of Artificial Intelligence
- ❖ Startups
- ❖ The Contribution of Artificial Intelligence in Empowering Startups

2. Fundamentals of Artificial Intelligence

2.1 Concept of Artificial Intelligence

Definitions of artificial intelligence have varied and differed due to the relative ambiguity surrounding the concept to this day. This variation stems from the multiplicity of AI fields, the diversity of its applications, and differing interpretations by researchers, prompting many specialists to approach the concept from various angles, offering definitions that reflect their specializations and cognitive frameworks. Among these definitions are:

Artificial intelligence is defined as: "a science and technology concerned with studying the development of computer functions in parallel with human intelligence, so that the computer becomes capable of perception, learning, problem-solving, and decision-making in a logical manner and in the same way as the human mind thinks" (Abd-Essadiq, 2023, p. 133).

It is also defined as: "a branch of computer science concerned with designing intelligent computer systems that simulate the characteristics of intelligence in human behavior; it is the intelligence created by humans in machines or computers, or the scientific and technical current that includes methods, theories, and techniques aimed at creating machines capable of simulating human intelligence" (Muhammad Ibrahim, 2022, p. 1032).

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It can also be defined as: "the ability of a machine to perform cognitive functions associated with human minds, such as perception, reasoning, learning, interaction with the environment, problem-solving, and even creativity" (kimash, 2023, p. 356).

It is also defined as: "a comprehensive term for applications that perform complex tasks previously requiring complex human interventions, such as communicating with customer's online and conducting business analysis without the need for experts" (Kifaya and Al-Fawair, 2025, p. 178).

From the above definitions, it can be concluded that artificial intelligence refers to the field concerned with designing intelligent systems capable of simulating human thought and efficiently handling tasks that require human cognitive abilities. This is achieved by providing these systems with vast amounts of data and information, or through self-learning mechanisms, allowing them to continuously develop and improve their performance over time.

2.2 Historical Development of Artificial Intelligence

Artificial intelligence has witnessed significant development over the past decades, progressing through multiple stages from initial concepts to the complex applications we see today. The following table reviews the historical development of AI over time:

Table (01): Historical Development of Artificial Intelligence

Year	Milestone or Innovation
1923	First use of the word "Robot" in English
1943	Foundation of neural network science
1945	Isaac Asimov coined the term "Robotics"
1950	Alan Turing presented the Turing Test to evaluate intelligence; Claude Shannon published a detailed analysis of chess as research
1956	John McCarthy coined the term "artificial intelligence"; introduction of the first AI program at Carnegie Mellon

	University
1958	John McCarthy invented the LISP programming language for AI
1964	Danny Bobrow's thesis demonstrated that computers can understand natural language well enough to correctly solve algebraic word problems
1965	Joseph developed a computer program for natural language processing (ELIZA), demonstrating the possibility of human-machine communication using English dialogue
1969	Scientists at Stanford Research Institute developed the robot (Shakey), capable of movement, perception, and problem-solving
1973	The Robotics Association team at Edinburgh University built a robot (Freddy) capable of using vision to identify and assemble models
1979	Stanford introduced the Stanford Cart, the first computer-controlled autonomous vehicle
1985	Artist Harold Cohen introduced a computer program that creates original artistic images
1990	Major progress in all AI areas: machine learning, case-based reasoning, multi-agent planning, scheduling, data mining, web crawling, natural language understanding and translation, virtual reality, games
1997	The Deep Blue Chess program defeats world chess champion Garry Kasparov
2000	Interactive robots become commercially available; MIT displays the Kismet robot with an expressive face
2004	DARPA presents a major challenge requiring competitors to produce autonomous driverless cars

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2005	ASIMO robot, an intelligent humanoid capable of walking at human speed to serve customers in restaurants; Blue Brain initiative in Switzerland aims to simulate the human brain in molecular detail
2009	Google builds a self-driving car without a human driver (autonomous driving)
2011	Launch of SIRI by Apple and Google Now by Google—smartphone applications using natural language to answer questions, provide recommendations, and perform actions
2013	Release of NEIL from Carnegie Mellon University to extract visual knowledge from web data
2017	The "Future of Life" Institute in California organized the Asilomar Conference on Beneficial AI to discuss AI ethics. The conference resulted in formulating guiding principles for beneficial AI research
2018	Alibaba's language processing model surpasses leading humans in reading comprehension and understanding tests at Stanford University; announcement of Google Duplex service, allowing AI agents to conduct natural conversations by simulating human voice and booking appointments over the phone

Source: (Boubeha, 2022, p. 92)

2.3 Characteristics of Artificial Intelligence

Artificial intelligence is characterized by a set of distinctive features that have made it the focus of widespread attention from researchers and have contributed to expanding its applications across multiple fields. The most prominent characteristics include (Al-Mansour, 2024, pp. 37–39):

- **Knowledge Representation Capability:** Unlike statistical programs, AI programs include a method for representing information using a special structure to describe knowledge, including facts,

relationships between facts, and rules connecting these relationships. This set of structures forms a knowledge base that provides maximum information about the problem to be solved.

- **Use of the Optimistic Experimental Approach:** One of the key characteristics of AI is that its programs tackle problems for which no general solution method is known. These programs choose a seemingly effective solution method while retaining the possibility of changing it if the initial choice proves inefficient. This focuses on adequate rather than optimal solutions, unlike traditional programs. For example, solving quadratic equations is not considered part of AI because the method is already known.

- **Ability to Handle Incomplete Information:** AI applications can find solutions even when complete information is unavailable. While incomplete data may lead to less realistic conclusions, these conclusions may still be correct.

- **Learning Ability :** A key trait of intelligent behavior is the ability to learn from previous experiences and improve performance by considering past errors. This ability is linked to generalization, deduction of similar experiences, and selectivity in ignoring excess information. For example, intelligent teaching applications can adapt their teaching strategies based on student behavior, prioritizing methods that prove more effective for individual learners.

- **Reasoning Ability:** The ability to derive possible solutions to a specific problem based on known data and prior experiences, especially for problems where traditional methods are inapplicable. This is achieved computationally by storing possible solutions and applying reasoning strategies and logical rules.

- **Natural Language Processing:** A distinctive feature of intelligent programs is interaction through the user's natural language. The quality of communication improves significantly if the program can understand written or spoken input, enabling effective dialogue, error diagnosis, and enhanced language understanding and production.

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AI encompasses computer program characteristics that simulate human mental abilities and work patterns, including reasoning, experimental research, knowledge representation, handling conflicting or incomplete data, learning from experience, and perception of the most complex forms of natural intelligence that AI scientists aim to achieve.

3. Startups

Startups are among the most important mechanisms and tools relied upon to achieve strategic economic goals and national economic growth, thanks to their flexibility and innovative, profitable projects.

3.1 Concept of a Startup

The first appearance of startups was in the United States immediately after World War II, with the emergence of venture capital firms primarily focused on the technology sector, especially information and communication technology. Startups are defined as:

"Any company aiming to develop technology, a product, or an economic model often innovatively to achieve rapid growth in the short or medium term" (Hamroush, 2022, p. 138).

Terminologically, according to the English dictionary, a startup is a small project that has just begun. The word "startup" consists of two parts: "start," referring to launching, and "up," referring to strong growth. The French dictionary "La Rousse" defines it as "young, innovative institutions in the field of modern technologies" (Bouruissa, 2022, p. 80).

A startup is also defined as an institution designed to search for a repeatable and scalable business model. The term "scalable" indicates that the goal of every startup is growth, eventually transitioning from a startup to a fully operating institution, typically a small or medium-sized enterprise (SME). Although SMEs represent the next stage, there are differences between them. Startups are also defined as young, innovative, and growth-oriented businesses (employees, revenue, customers), seeking a sustainable and scalable business model, often built on great ideas and growing to achieve success

(Tilili, 2022, p. 7).

Based on these definitions, startups can be defined as newly established institutions built on an innovative idea developed by an entrepreneur with distinctive entrepreneurial qualities, aiming for accelerated growth by offering new products or services capable of penetrating unsaturated markets or creating entirely new markets. These institutions operate in environments characterized by high levels of risk and uncertainty, requiring founders to adopt a flexible and scalable business model to ensure continuity and expansion.

3.2 Characteristics of Startups

Startups are distinguished from other institutions by the following characteristics (Shitun, 2024, p. 137):

- **Newly Established Institution:** It operates in an experimental (initial) market phase, starting from the entrepreneur's idea before legal registration. It remains young for a certain period before either scaling up into a large institution or failing.
- **Creativity and Innovation:** These institutions are characterized by continuous creativity, innovation, and development, potentially leading to new products, services, or updated methods.
- **Ability to Grow and Develop:** The most important shared feature is the ability to grow, penetrate markets, and generate high, rapid revenues relative to setup and operating costs encouraging investor funding due to rapid development.
- **Conditions of Uncertainty:** Due to market innovation gaps and lack of encouraging data, market research is difficult, placing startups in an environment of uncertainty.
- **Search for an Innovative Business Model:** To enter the market, startups must innovate a new idea or create a new market providing previously unmet needs. Their business model is unprecedented, repeatable, and scalable, ensuring continuous profit flows and expansion.
- **Freedom of Choice:** Complete freedom to choose between growth

and maturity or failure and bankruptcy.

3.3 Importance of Startups

The importance of startups can be summarized as follows (Youssef and Sadiqi, 2021, pp. 71–73):

- **Providing Productive Job Opportunities and Combating Unemployment:** They have a high capacity to create jobs, absorb inexperienced workers, graduates, and idea holders, directly addressing unemployment.
- **Innovation in Research and Development, Especially in Technology:** A vital tool for national development, enabling product innovation at a cost 24 times lower than large corporations.
- **Increasing Productivity and Maintaining Competitiveness:** Through modern tools and techniques, startups reduce costs and improve product quality, gaining competitive advantage.
- **Spreading Positive Values in Society:** Addressing economic, social, and cultural issues through research, introducing new values, developing consumer culture, and encouraging acceptance of change.
- **Contributing to Relative Economic Development:** Promoting values like initiative, creativity, time management, efficiency, and effectiveness; producing innovative goods and services; diversifying products; and supporting traditional sectors like agriculture.
- **Investing Savings and Attracting Investors:** Employing owners' savings instead of hoarding them, enabling capital accumulation, income redistribution, and attracting local and foreign investors.
- **Contributing to Economic Growth:** Creating long-term jobs, increasing annual income, contributing to GDP, and penetrating global markets to bring in foreign currency.
- **Flexibility and Rapid Adaptability:** Offering smooth, flexible solutions to production cost problems for large companies and heavy societal challenges.

3.4 Success Factors for Startups

These include factors related to entrepreneurs and company management (Zatar, 2023, p. 1128):

- **Existence of a Creative Idea:** The correct starting point. Creativity and innovation are essential for continuity, growth, market expansion, and competitiveness.
- **Entrepreneur and Personal Traits:** The entrepreneur is the key actor, possessing traits like risk-taking, initiative, and innovation, supported by administrative, social, and personal skills, often developed through training.
- **Entrepreneur's Environment and Business Environment:** Includes forming a unified, prepared team where each member contributes a key project area.
- **Diverse Funding Sources:** If financial resources are insufficient, collective funding sources (e.g., angel investors, crowdfunding) should be sought to support the initiative.

4. The Contribution of Artificial Intelligence in Empowering Startups

Artificial intelligence serves as a key enabling factor that drives startups toward success and innovation. AI can empower startups in several ways:

- **Enhancing Innovation and Competitive Ability:** AI plays a crucial role in driving digital transformation for startups by opening new commercial opportunities. It enables companies to discover innovative business models and support entrepreneurial activities. For example, AI can analyze consumer opinions and posts across e-commerce platforms and social networks to extract behavioral patterns, allowing startups to predict customer needs and innovate new products and services. Additionally, AI provides a competitive edge by integrating customer preference analysis with industry standards, supporting data-driven decisions and improving business strategies (Dahm and Ben Djerrad, 2025, pp. 57–58).
- **Process Automation :** AI automates routine and repetitive tasks such as customer service, inventory management, and digital marketing. This allows startups to save time and resources, focusing

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on core creative activities (El-Boraq, 2025).

- **Predicting Future Trends:** Thanks to AI's ability to analyze historical data and identify various patterns, it can easily help startups anticipate and read future market trends, enabling them to prepare for challenges and seize opportunities (Joseph Studios, 2025).

Despite the advantages AI offers startups specifically and institutions generally, there are challenges, including a shortage of specialized expertise in developing AI applications and the high cost of developing such systems.

Nevertheless, the numerous opportunities and benefits AI provides such as gaining competitive advantages, innovating new products, entering new markets, and finding practical, rapid solutions cannot be denied.

5. Conclusion

The trend toward adopting artificial intelligence technologies has opened new horizons for various institutions, especially startups, enabling them to enhance their capabilities and achieve success according to their set goals.

This study concludes with the following results and recommendations:

Results:

- Institutions, regardless of size or type, are increasingly adopting AI technologies to facilitate operations and keep pace with global developments.
- Artificial intelligence can be considered a strategic necessity for any institution seeking excellence, especially startups, which rely on technology and thus align with the digital age.
- AI is a strategic pillar for startups to achieve success.
- The future of institutions will be linked to developing AI applications rather than creating them from scratch.
- Startups play a vital role in the economic field, technology transfer, and innovation.

Recommendations:

- Enhance awareness of the importance of AI in various institutions and educational establishments.
- Increase focus on AI and technology by establishing specialized educational institutions.
- Establish agreements between economic institutions and leading technology and AI organizations.

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