



The Role of Artificial Intelligence in Enhancing Innovation in Entrepreneurship

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Abstract ;	Article info
<i>This study seeks to highlight the role of artificial intelligence (AI) in promoting innovation within the field of entrepreneurship. As one of the most disruptive technologies of the contemporary era, AI, when strategically implemented, substantially augments the breadth and effectiveness of business operations. The results reveal that AI acts as a fundamental driver of innovation in entrepreneurial initiatives, enabling organizations to adapt more readily to fluctuating market conditions and preserve their competitive advantage. Engaging with institutions that specialize in AI allows startups to benefit from both technical expertise and state-of-the-art technologies, thus enhancing the innovative quality of their products and services.</i>	Received May 20;2025 Accepted June 27;2025
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1. Introduction:

In recent years, artificial intelligence has experienced remarkable advancements, becoming a foundational element across diverse sectors such as healthcare, education, manufacturing, and marketing. This rapid technological evolution has spurred a global increase in interest toward entrepreneurship, now broadly acknowledged as a vital engine for economic growth and societal advancement.

This intensifying focus on entrepreneurship stems from its capacity to expand business capabilities and unlock access to previously unreachable markets, facilitated through intelligent data processing and the adoption of novel technological frameworks. In response, many governments have implemented targeted strategies to stimulate entrepreneurial ventures, offering financial incentives and infrastructural support designed to cultivate innovation.

Within this entrepreneurial landscape, artificial intelligence has evolved from a complementary resource to a core instrument that empowers startups and innovators to transform abstract concepts into practical, market-oriented solutions. It provides entrepreneurs with sophisticated tools that not only improve operational efficiency but also accelerate strategic decision-making and generate insights that extend beyond the scope of traditional human analysis. At the same time, its growing influence introduces pressing concerns regarding its impact on conventional employment structures and the imperative for enterprises to adapt to swift and continuous technological change.

1. Problem Statement:

In light of these trends, the primary research question examined in this study is: **How can artificial intelligence enhance innovation in entrepreneurship without diminishing the creative contribution of the human element?**

2. Sub-Questions:

To support the investigation of the main research question, the following sub-questions are proposed:

- Does the integration of artificial intelligence reduce the significance of the human element in the innovation process?
- Does the implementation of artificial intelligence generate new avenues for innovation within entrepreneurial ventures?
- In what ways can artificial intelligence contribute to maintaining sustainable, long-term innovation in entrepreneurial activities?

3. Research Hypotheses:

To methodically address the central research problem and the accompanying sub-questions, the following hypotheses have been established:

- **First Hypothesis:** Although artificial intelligence supports data analysis and the ideation process, it cannot replace human creativity in generating entirely original and contextually nuanced solutions.
- **Second Hypothesis:** Artificial intelligence enhances analytical capabilities and introduces new possibilities in product and service development, thereby enabling the emergence of novel opportunities for innovation.
- **Third Hypothesis:** By employing predictive analytics to anticipate future challenges, artificial intelligence contributes to the design of innovative and sustainable solutions, particularly in response to persistent environmental and economic issues.

4. Study Objectives:

This study aims to achieve the following objectives:

- Provide a conceptual framework that defines artificial intelligence and entrepreneurship;

- Identify the principal domains of artificial intelligence and the leading companies pioneering its development;
- Highlight the significance of integrating artificial intelligence into entrepreneurial initiatives;
- Examine the role of artificial intelligence in fostering innovation within the entrepreneurial sector;
- Draw conclusions and propose practical recommendations that can support and advance entrepreneurship through the strategic adoption of artificial intelligence.

5. Methodology Used:

This research adopts a descriptive-analytical methodology, which facilitates a thorough exploration of the topic by combining theoretical perspectives with empirical observations. This approach enables a balanced understanding of both the conceptual and practical dimensions of artificial intelligence in entrepreneurship.

6. Study Structure:

To comprehensively investigate the multifaceted aspects of the topic, the study is organized into the following thematic axes:

- **First Axis:** The theoretical foundations of artificial intelligence and entrepreneurship;
- **Second Axis:** An evaluation of the impact of artificial intelligence technologies on the global economy;
- **Third Axis:** The role of artificial intelligence in promoting innovation within entrepreneurial activities.

First Axis: The Theoretical Foundation of Artificial Intelligence and Entrepreneurship

Artificial intelligence encompasses a collection of technologies designed to develop systems and software capable of emulating human cognitive functions, including learning, reasoning, and decision-making. In recent years, AI has established itself as a critical element in a wide range of industries, including entrepreneurship, by offering significant opportunities for

enhancing performance and stimulating innovation. This section addresses key conceptual aspects related to both artificial intelligence and entrepreneurship.

First: Terminological Approach to Artificial Intelligence

1. The Concept of Artificial Intelligence:

Various definitions and interpretations of artificial intelligence have been advanced, with no single consensus among economic theorists. One perspective views artificial intelligence as “the ability of a system to correctly interpret external data, learn from such data, and utilize that knowledge to achieve specific objectives and tasks through flexible adaptation” (Souidan, 2023, p. 380).

Another interpretation defines AI as “a branch of computer science that enables the creation and design of computer programs capable of simulating human intelligence, allowing machines to perform tasks such as thinking, understanding, listening, speaking, and movement in place of human beings” (Rwabah, 2018, p. 93).

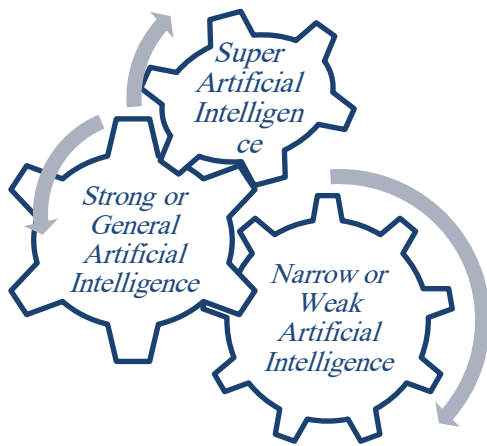
A further definition posits that artificial intelligence is “the ability of machines and digital computers to execute specific functions that mimic human cognitive processes, including thinking and learning from past experiences, among other mentally-driven operations” (Khafoush, 2024, p. 63).

Synthesizing these perspectives, artificial intelligence can be understood as a specialized field within computer science aimed at developing systems and algorithms that perform tasks requiring human-like intelligence. These tasks include learning, logical reasoning, problem-solving, environmental interaction, and autonomous decision-making. Thus, AI endeavors to replicate the cognitive functions of the human mind through computational systems.

2.Types of Artificial Intelligence:

Artificial intelligence can be classified into three main types, ranging from simple reactive functions to perception and self-interaction. The following diagram illustrates the types of artificial intelligence:

Figure No. (01): Types of Artificial Intelligence



Source: Prepared by the researcher

From the diagram, the following can be inferred:

- **Narrow or Weak AI:** This is the simplest form of artificial intelligence and refers to programming AI to perform specific functions within a defined environment. An example is the "Deep Blue" robot developed by IBM, which defeated world chess champion Gary Kasparov.
- **Strong or General AI:** This type is characterized by the ability to collect and analyze information, leading to the accumulation of experience from situations encountered, enabling the system to make autonomous and independent decisions. Examples include self-driving cars, chatbots, and personal self-assistance programs.
- **Super Artificial Intelligence:** These are models still under experimentation and aim to simulate humans. Two main types can be distinguished here: the first seeks to understand human thoughts and emotions that influence behavior and possesses limited capacity for social interaction. The second represents a theory-of-mind model wherein such systems can express internal states, predict others' feelings and attitudes, and respond accordingly, representing the next generation of ultra-intelligent machines (Khalifa, 2017, pp. 62–63).

3. Fields of Application for Artificial Intelligence Technologies:

Artificial intelligence encompasses numerous domains; however, they can be summarized in the following table:

Table No. (01): Fields of Application for Artificial Intelligence Technologies

Field	Content
Natural Language	In this field, computational linguistics, physiology, speech recognition, speech synthesis, machine translation, and philosophy have all flourished.
Computer Vision	This domain has contributed to the development of fingerprint recognition technologies and electronic tools that mimic the human visual system, playing a significant role in the advancement of both civilian and military industries, as well as the field of physiology.
Robotics	This area has propelled disciplines such as mechanical engineering, industrial robotics, control systems, electronics, and cybernetics into far-reaching economic and scientific applications.
Game Playing	Games have contributed to the advancement of artificial intelligence by integrating user intelligence into programs. They have also supported the evolution of computer science and managerial competitions.
Theorem Proving	This domain has fostered developments in mathematics, logic, and some aspects of philosophy.
Theory of Computation and Automatic Programming	This field has influenced the evolution of mathematics and computer science.
Heuristic Search	It encompasses the mechanisms of search and its various types, as well as the development of expert systems.
Computer Hardware	This field has contributed to the progress of electronic hardware components and the general development of computer sciences.
Programming Languages and Systems	It has enriched computer science through languages and environments that facilitate the creation of new systems.
Knowledge Engineering (Expert Systems)	This domain has impacted many fields such as chemistry, medicine, management sciences, operations research, civil engineering, and the oil industry through information systems, leading to significant economic savings.

Problem Solving	This area has advanced the fields of psychology, logic, and mathematics.
Knowledge Representation	It has supported the development of philosophy, computer science, and systems theory.
Cognitive Modeling	This field has influenced a wide range of disciplines, including philosophy, psychology, human skills, neuroscience, physiology, and music.

Source: (Aïfa, 2025, pp. 6–7)

Second: The Conceptual

Framework of Entrepreneurship:

The subject of entrepreneurship has garnered considerable attention from states, as it has come to represent one of the fundamental pillars for the development and growth of various economies. This is due to its potential for expanding business operations and increasing the ability to access new markets through intelligent market analysis tools and various emerging technologies it employs. Consequently, many countries have sought to support and encourage it by providing diverse forms of aid and facilities to investors and entrepreneurs.

1. Definition of Entrepreneurship:

Given the widespread use of the term “entrepreneurship” across various domains and by researchers from different fields, no single definition encompasses its full scope. There are multiple perspectives and approaches to defining it, the most prominent of which include the following:

Robert Hisrich stated that entrepreneurship represents “the process of creating something of value by devoting the necessary time and effort, assuming the accompanying financial, psychological, and social risks, and receiving the resulting rewards of monetary gains and personal satisfaction.”

In other words, it is the process of value creation through opportunity exploitation using unique resources (Roshdi, 2013, p. 19).

Some economists define the term entrepreneurship as: “the dynamic of creating and exploiting business opportunities by an individual or a group of individuals through the establishment of new organizations for the purpose of creating value” (Salami, 2012, p. 2).

It has also been described as “the process of generating money, gaining profits, and increasing wealth by embracing the following characteristics: risk-taking, management, leadership, innovation, and initiative. It is also considered the primary source of entrepreneurial spirit, embodying the realization and implementation of opportunities available in the work environment” (Hadidan, 2017, p. 26).

Meanwhile, some economic theorists view “entrepreneurship” as referring to “the social actions and processes undertaken by the entrepreneur to establish a new enterprise or develop an existing one within the prevailing legal framework, in order to create wealth, by taking initiative, identifying business opportunities, and pursuing and materializing them in real-world settings” (Touaiti, 2015, p. 13).

Accordingly, and based on the previous definitions, the term “entrepreneurship” refers to the set of activities that enable an individual to establish a new enterprise with positive impacts on various aspects of economic and social life.

2. Importance of Entrepreneurship:

In light of both local and global changes, there has emerged a need for a new concept that empowers business organizations in general, and individuals in particular, to achieve leadership in their current and future endeavors, especially given the increasing need to create new jobs. The concept of entrepreneurship has contributed to enhancing economic growth, developing human capacities, and generating returns from social and community benefits due to its linkage with sustainable development. This has created a pressing need to improve the behaviors, practices, and activities that embody the concept of entrepreneurship, contributing to the dissemination of entrepreneurial spirit across various specializations and fields. This trend has led to the incorporation of the word “entrepreneurship” into many traditional concepts to express the pursuit of these behaviors. Currently, it is widely believed that individuals possessing certain skills and capabilities can achieve distinct advantages

that enable them to expand their business ventures.

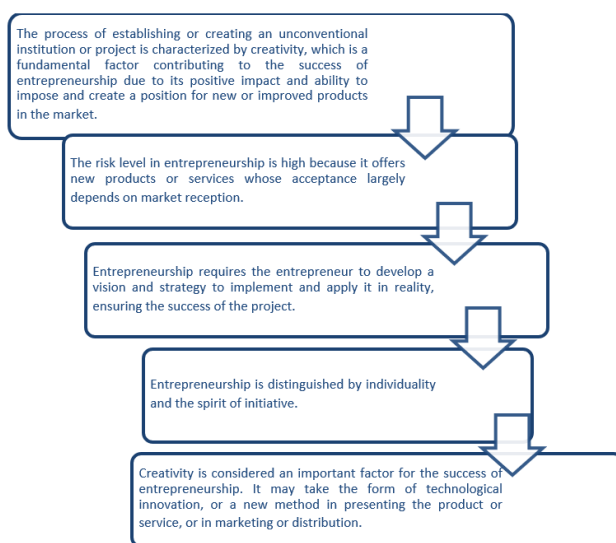
Accordingly, entrepreneurship offers numerous benefits, which may be summarized as follows:

- Generating wealth by offering distinguished products that meet advanced customer needs;
- Enabling business organizations to grow and expand in the regions where they operate;
- Achieving balanced development across all parts of the country, thus contributing to resolving the issue of regional disparities within a single state;
- Creating new economic activities and jobs to reduce unemployment and open up new markets;
- Enhancing national income and export volume through increased economic growth and the effective use of capital factors (land – capital – machinery) by leveraging the entrepreneurial potential present in society. (Anbar, 2017, pp. 8–9)

3. Characteristics of Entrepreneurship:

Entrepreneurship is characterized by a number of attributes, which include the following points:

Figure No. (02): Characteristics of Entrepreneurship



Source: (Shakroun, 2015, p. 6; Khalifa, 2017, pp. 62–63)

Second Axis: Analyzing the Impact of Artificial Intelligence Technologies on the Global Economy

Artificial intelligence (AI) technologies have undergone a significant surge, profoundly transforming a wide spectrum of industries, from healthcare and finance to education and agriculture. These technologies have become integral to daily operations, owing to advancements in computational power, the exponential growth in accessible data, and breakthroughs in machine learning algorithms.

Against this backdrop, a substantial body of research has examined the anticipated economic impacts and broader implications of deploying artificial intelligence across diverse global economic sectors. These effects may be outlined as follows:

2-1. Market Size and Global Investment Levels in Artificial Intelligence:

The global AI market is projected to experience rapid expansion, with industry revenues estimated to reach approximately \$60 billion by the end of 2025. According to certain forecasts, this market is expected to register a compound annual growth rate (CAGR) of roughly 52% through 2025, driven by the increasing demand for AI applications in areas such as the Internet of Things (IoT), healthcare, and industrial automation (PwC, 2017, p. 04).

At the sectoral level, the integration of AI technologies into the development of nine essential functions across nineteen industries is estimated to boost output by between \$3.5 trillion and \$5.8 trillion. This growth accounts for nearly 40% of the total projected annual economic benefits derived from technological advancements in these sectors, which are anticipated to range from \$9.5 trillion to \$15.4 trillion on a global scale (McKinsey, 2018, p. 17).

Furthermore, the adoption of AI is expected to drive up investment expenditures and intensify competitive dynamics, underscoring the necessity for new management and

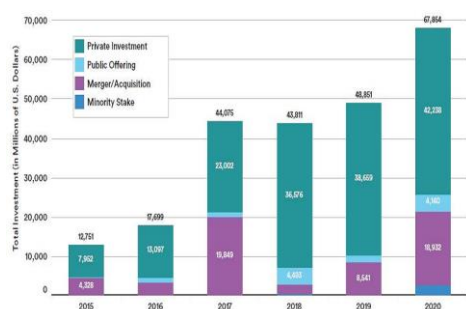
investment frameworks that support the diffusion and adaptation of these technologies. Over time, these dynamics are projected to yield considerable economic advantages, particularly for early adopters who are poised to benefit more significantly compared to lagging counterparts (Hiba & Mohamed, 2021, p. 17).

From a geographical and national standpoint, China is forecasted to realize the most substantial economic gains from the deployment of AI technologies, with expected benefits nearing \$7 trillion and a projected growth rate of 26.1% by 2030. North America follows with anticipated gains of around \$3.7 trillion, corresponding to a 14.5% increase in GDP. Combined, China and North America are expected to contribute approximately \$10.7 trillion in global AI-related economic gains.

In addition, Europe and emerging Asian economies are projected to yield approximately \$3.4 trillion in benefits. Conversely, other regions, particularly developing countries and emerging markets, are likely to experience more modest gains, largely due to lower adoption rates of AI technologies compared to more advanced economies (PwC, 2017, p. 07).

Accordingly, there has been a consistent upward trend in global AI investment volumes, as illustrated in the following figure:

Figure No. 03: Global Corporate Investments in Artificial Intelligence by Investment Activity (2015–2020)



Source: CapIQ, Crunchbase, and Netbase Quid, 2020

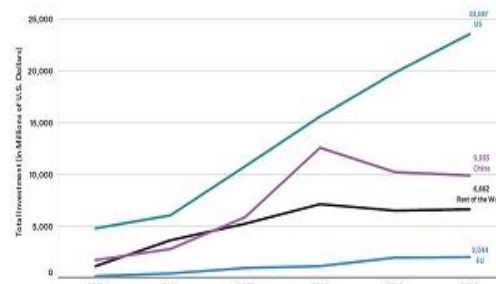
From the figure above, we observe that global investment in AI rose from \$12.7 million in 2015 to \$44 million in 2017. It then witnessed

a slight decline in 2018, reaching \$43.8 million, before increasing again to peak at \$67 million in 2020.

With regard to the impact of AI technologies on the development of private investment by geographic region, the United States holds a leading position in AI investment, with its funding exceeding \$23.6 billion in 2020. China follows with \$9.9 billion. However, it is important to note that China has pioneering public investments in AI, as both central and local governments heavily invest in research and development within the AI domain.

This is illustrated in Figure No. 04.

Figure No. 04: Private Investment in Artificial Intelligence by Geographic Region (2015–2020)



Source: CapIQ, Crunchbase, and Netbase Quid, 2020

2. Leading Companies in Artificial Intelligence Technologies:

Many global economic experts agree that the world's leading companies investing in modern artificial intelligence technologies include Amazon, Baidu, Nvidia, Tesla Motors, Microsoft, IBM, Google, and Facebook. All of these are American companies, except Baidu, which is the only Asian company from China in this domain. Baidu has invested approximately \$3 billion in research and development related to AI technologies.

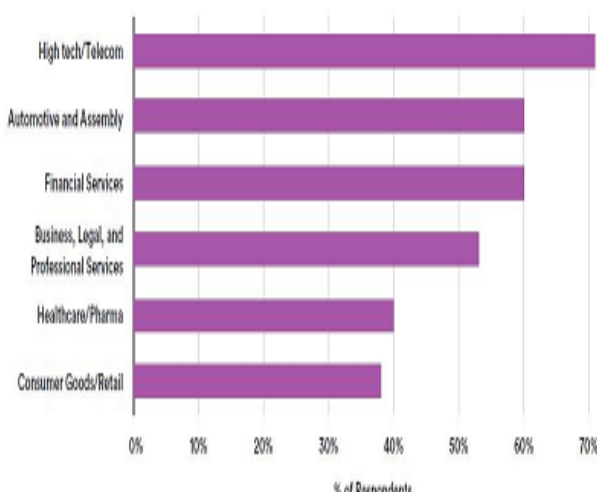
Modern artificial intelligence technologies have witnessed rapid development in the Asia-Pacific region, particularly in China. Companies such as Baidu, Tencent Holdings, and Alibaba have made substantial investments in this field. For example, Alibaba invested around \$15 billion in research and development, employing around

100 scientists across the United States and China over a span of three years.

Statistical data indicate that modern AI applications have significantly expanded in the Asia-Pacific region, where there are approximately 24 companies in China, 25 in India, 26 in Japan, and 27 in South Korea.

This widespread presence confirms that artificial intelligence has been mainly applied in sectors such as trade, technology, telecommunications, automotive, entertainment, financial services, manufacturing, law, professional services, healthcare, pharmaceuticals, consumer goods, and retail. This is illustrated in the following figure:

Figure No. 05: Adoption of Artificial Intelligence in Companies by Sector, 2020



Source: McKinsey and Company, 2020 / Chart: 2021 AI Index Report

3. Income Distribution Inequality:

Artificial intelligence is expected to exacerbate the digital divide and income inequality between developed and developing countries for several reasons, the most important of which include: (Hiba & Mohamed, 2021, p. 23)

- The high level of investment required to develop and adopt these technologies;
- The limited motivation in developing countries, which suffer from high unemployment and low labor wages, to adopt

AI technologies that would result in increased automation in order to preserve social stability;

- The low value of human capital required to lead qualitative advancements in these systems.

However, this does not mean that developing countries are incapable of achieving technological progress in the field of artificial intelligence. Rather, this depends on the future choices pursued by each of these countries and their efforts to pave the way toward preparing a supportive technological environment.

Accordingly, the dominance of developed countries in the development of AI systems will allow major tech companies to control massive data repositories, giving them the ability to attract top talent and benefit from productivity and income gains. This will lead to a decline in labor's share of income generation, in favor of increasing capital's share beyond simulation models, and consequently, a reduction in demand for labor and skill levels. (Hiba & Mohamed, 2021, p. 23; Khalifa, 2017, pp. 62–63)

Third Axis: The Role of Artificial Intelligence in Supporting Innovation in Entrepreneurship

Artificial intelligence (AI) is currently one of the most influential technologies shaping the future of business, particularly in the field of entrepreneurship. From startups to large corporations, all are adopting AI to redefine work methodologies, achieve greater efficiency, and deliver innovative products. AI plays a fundamental role in propelling entrepreneurship to new levels of success.

1. The Role of Artificial Intelligence in Entrepreneurship:

As technology continues to evolve, it becomes essential to adapt and leverage AI to enhance decision-making, productivity, and overall organizational success. AI contributes to simulating human intelligence processes through machines, especially computer

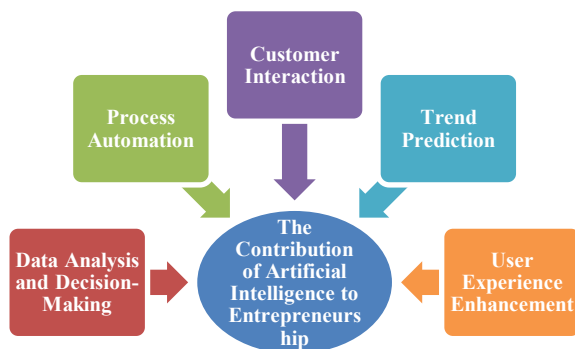
systems. Accordingly, AI can support data analysis, predictive modeling, and the automation of routine tasks. By integrating AI into managerial practices, organizations can gain a competitive edge and stimulate innovation. Among the numerous benefits of integrating AI into entrepreneurship are the following: (Hashima & Al-Azab, 2024, p. 3)

- **Enhanced Decision-Making:** AI algorithms can rapidly analyze vast amounts of data to provide valuable insights for better decision-making.
- **Increased Efficiency:** Automating repetitive tasks saves time, allowing leaders to focus on strategic initiatives.
- **Predictive Analytics:** AI can forecast trends and outcomes, enabling proactive planning and risk mitigation.
- **Personalized Leadership:** AI tools can provide tailored training and development plans for individual team members.

2. The Contribution of Artificial Intelligence to Enhancing Entrepreneurship:

To illustrate the extent of AI's contribution to entrepreneurship, reference is made to the following figure:

Figure No. (04): The Contribution of Artificial Intelligence to Entrepreneurship



Source: Prepared by the researcher

Based on the above figure, AI contributes to enhancing entrepreneurship, as evidenced by the following:

- **Data Analysis and Decision-Making:** Entrepreneurs use AI to rapidly and accurately

analyze massive datasets, which helps them make data-driven decisions and improve business strategies.

- **Process Automation:** AI facilitates the automation of routine tasks such as customer service, inventory management, and digital marketing. This enables startups to save time and effort, allowing them to concentrate on innovation and business development.
- **Customer Interaction:** AI-powered chatbots are a prominent example of how customer experience can be enhanced. By responding to inquiries and providing instant support, companies can improve customer satisfaction and increase engagement.
- **Trend Forecasting:** Startups can use AI to anticipate market trends and customer needs. By analyzing user behavior and data, they can offer personalized products or services tailored to specific demands.
- **Improving User Experience:** Thanks to AI, companies can customize the experience for each user based on their behavior and preferences. For instance, e-commerce platforms use AI technologies to provide personalized product recommendations for each customer.

3. The Relationship Between Artificial Intelligence in Design and Creativity and Innovation:

The integration between creativity and innovation on one side and artificial intelligence in industrial design on the other can be clarified through the following points: (Hadhli & Sheikh, 2022, pp. 855–856)

- **Human creativity and innovation are inputs to artificial intelligence:** It is important to recognize that developed countries are undergoing a historical turning point, transitioning toward knowledge-based economies, largely thanks to innovations and inventions in artificial domains. The relationship between the concepts of "creativity and innovation" and "artificial intelligence" can be explained by the fact that creativity and innovation serve as inputs to

AI, since AI mimics something innovative and programmed by the creator or innovator.

- **Human creativity is the organization's greatest asset and competitive advantage:**

AI has positioned human creativity as the most valuable asset and source of competitive differentiation for enterprises.

- **Integration of creativity and innovation with artificial intelligence:** The application of AI in manufacturing requires interconnected networks capable of extracting data from production lines, design and engineering teams, and quality control departments, forming a fully integrated intelligent process. For this to succeed, the correct smart devices must be placed at the appropriate data collection points.

- **Innovation in AI contributes to reducing costs and increasing sales:** For instance, AI enables sensors to detect defects on production lines, with this data sent to a cloud containing product specifications to validate the issue, followed by an immediate decision to remove the defective unit from the line. This process can save manufacturers millions, not only during production but also by minimizing costly product recalls. While implementing such technologies remains expensive in some markets compared to low labor costs (e.g., in China and India), the continued advancement of AI will likely lower costs. With future developments, AI will become essential for evaluating opportunities and forecasting demand, thus reducing operational costs. Additionally, manufacturers can boost sales by using AI to design and produce innovative, customized products tailored to individual customer needs.

Conclusion:

Artificial intelligence stands as one of the principal drivers substantially contributing to the advancement of innovation within the entrepreneurial domain. By integrating AI technologies into their operations, entrepreneurs and innovators are empowered to enhance operational efficiency, deliver

innovative solutions, and identify untapped market opportunities.

Moreover, AI facilitates faster and more accurate data analysis, reinforcing strategic decision-making processes that are crucial to the success of entrepreneurial ventures. With AI embedded in startup ecosystems, conventional obstacles, such as cost minimization, customer experience enhancement, and the development of tailored products and services in response to dynamic market trends, can be effectively addressed. The expanding role of technological integration in business operations boosts organizational competitiveness and growth potential, positioning artificial intelligence as an indispensable instrument for strategic foresight and long-term sustainability in entrepreneurship.

Based on the study, the following conclusions have been drawn:

- While artificial intelligence contributes to the ideation and design of innovative products and services, leading to improvements in product quality and customer satisfaction, it remains incapable of fully replicating human creativity in generating entirely original and context-specific solutions.
- AI is among the foundational technologies adopted by modern institutions, supporting the automation of routine operational tasks and the reduction of operating expenses. This enables organizations to reallocate resources toward innovation and the development of high-value products and services.
- Through predictive analytics, AI assists in formulating forward-looking and sustainable innovations by anticipating future problems. This capacity is particularly valuable in responding to persistent environmental and economic challenges.
- AI possesses advanced capabilities in processing and analyzing large-scale datasets, transforming them into actionable insights. These insights equip entrepreneurs with the strategic intelligence required to make sound, evidence-based decisions.

_ AI supports business scalability and enhances access to new and emerging markets by leveraging intelligent tools for market analysis and forecasting of global trends.

_ By means of automation and precision analytics, AI drives innovation and strengthens the sustainability of entrepreneurial ventures, whether through increased resource efficiency or reduced environmental impact. This contributes to innovation in emerging areas such as the circular economy and renewable energy technologies.

_ AI amplifies the capacity of entrepreneurs to work synergistically with technological tools, expediting the innovation process and enabling higher-impact outcomes within shorter timeframes.

_ Overall, AI functions as a transformative force in reinforcing innovation within entrepreneurship, enabling organizations to swiftly adapt to rapidly evolving markets and maintain a competitive advantage over rivals.

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