

Empowering Small and Medium Enterprises (SMEs) through Artificial Intelligence

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Abstract— This study investigates the impact of Artificial Intelligence (AI) applications on enhancing and developing the performance of small and medium enterprises (SMEs), which are fundamental to economic development and entrepreneurial growth. The objective is to determine how recent developments in AI have contributed to SME growth, including increases in productivity and profitability, as well as improvements in employee efficiency and productivity. The paper concludes that SMEs can benefit significantly from AI techniques, particularly in automating administrative tasks, freeing up time for business development. The findings suggest that SMEs can leverage AI to accelerate their annual growth and achieve positive outcomes in various areas of operation. Thus, the study highlights the critical role of AI in promoting SME performance and its potential as a valuable tool for the continued development of small and medium-sized enterprises.

Keywords— Artificial Intelligence, Small and Medium Enterprises (SMEs), Automation, Economic, Development, Innovation, Productivity.

I. INTRODUCTION

The Fourth Industrial Revolution, characterized by technological advancements and transformations, has given rise to tremendous technological development and has led to the emergence of artificial intelligence (AI) [1]. AI has become a critical driver of progress, growth, and prosperity in the coming years, with various applications in research [2], judiciary [3] arbitration [4], education [5], military, industrial, economic, technical, medical, and service sectors [6]. The increasing complexity and problems associated with achieving developmental goals in various fields have led to the expansion of information and communication technology and digital transformation. AI is one of the computer sciences that simulates human intelligence through applications of artificial intelligence, which can make the best decision and perform tasks that focus on elicitation, innovation, and perception in light of uncertainty, and it is at the heart of modern economic policies [7].

SMEs play a crucial role in economic development at all levels of the economy. SMEs represent more than 90% of global companies and account for 50% to 60% of employment. In the least developed countries, SMEs represent between 40% and 80% of industrial employment, making them the most labour-intensive and influential in the distribution of income compared to large enterprises [8]. The development of SMEs and the extent to which they are affected by the techniques and applications of artificial intelligence on their systems are critical. This article focuses on examining the ways in which AI-powered marketing might enhance the capabilities of small and medium-sized enterprises (SMEs). AI-driven marketing utilizes artificial intelligence technology to boost marketing techniques, allowing small and medium-sized enterprises (SMEs) to obtain profound insights into client behavior, customize marketing campaigns, and optimize their marketing endeavors. SMEs may gain a competitive advantage, even with limited resources, by implementing AI-powered marketing solutions.

In light of these developments, this paper presents a comprehensive literature review on the role of AI in improving and developing the performance of SMEs. The paper analyzes the various ways in which AI has been applied in the context of SMEs, such as increasing productivity and profitability, optimizing business processes, and improving employee efficiency. It also examines the challenges that SMEs may face when adopting AI applications and provides insights into how these challenges can be overcome.

Therefore, the objective of this study is to determine how recent developments in AI have contributed to SME growth, including increases in productivity and profitability, as well as improvements in employee efficiency and productivity. The findings suggest that SMEs can leverage AI to accelerate their annual growth and achieve positive outcomes in various areas of operation. As such, this study highlights the critical role of AI in promoting SME performance and its potential as a valuable tool for the continued development of small and medium-sized enterprises.

II. THE IMPORTANCE OF ARTIFICIAL INTELLIGENCE

The rapid development and changes witnessed in all areas and fields, especially scientific ones, are a result of the technology revolution, including the emergence of artificial intelligence (AI) applications characterized by lower cost and higher quality compared to the systems that preceded them [9]. AI has become the nucleus of creating knowledge and ideas that improve the efficiency of organizational performance and decision-making processes through analysing large amounts of data.

Information and communication technology (ICT) has transformed society and the business environment in all fields significantly, with the growth and development of networks, emergence of technologies, and the arrival of internet networks to all parts of the earth. All institutions and the business environment are changing to keep pace with the applications and technologies of AI, with the world moving towards automation of work systems and administrative devices such as accounting, marketing, resource planning, production methods, and more. AI-powered marketing provides several concrete advantages for small and medium-sized enterprises (SMEs), including:

- Customized consumer Experiences: Artificial intelligence systems examine consumer data to create tailored marketing messages, enhancing involvement and loyalty.
- Automated Campaign Management: AI systems have the capability to automate the process of creating, managing, and optimizing marketing campaigns, hence assisting small and medium-sized enterprises (SMEs) in efficiently reaching their desired target audiences.
- Data-driven decision making refers to the use of AI-powered analytics to give small and medium-sized enterprises (SMEs) with actionable insights. These insights enable SMEs to make real-time modifications to their marketing plans.

These advancements have extended to all sectors, including the education, military, and health sectors [10].

AI has enabled computing to perform natural tasks that were previously performed by humans, such as drawing, handicrafts, face recognition, making shapes, interpreting texts, translating, and driving cars and planes. AI is considered one of the most important modern sciences resulting from the convergence of the technical revolution in the field of systems science, computer and automatic control, and the use of AI techniques that can make advanced decisions through inferences that exceed human capabilities in searching for complex concepts and solving problems [11].

Artificial intelligence (AI) has become increasingly important in various fields due to the technology revolution and digital transformation. It has been described as the "new oil" because of its fundamental role in strategic plans for achieving economic goals [11]. AI has proven to be capable of simulating human intelligence and performing tasks that are beyond

human capability. The success of AI is evident in various models such as the Deep Blue program, which defeated Garry Kasparov, the world chess champion, in 1977 [12]. In 1996, a driverless car known as Ralph covered a distance of about 2,800 miles between Washington and San Diego, California, at an average speed of 63 miles per hour in the rain and at night [12]. Another example is the American space company, NASA, which entrusted the responsibility of leading the spacecraft to an AI system in 1999, marking the first time space was discovered without an astronaut inside the vehicle [12].

Artificial intelligence systems, tools, and programs have become increasingly prevalent in all fields and institutions, leading to a revolution in the world of technology and information. AI is comprised of databases and the ability to infer, enabling it to simulate human thinking and reasoning [12]. AI techniques such as expert systems, neural networks, and systems genetic algorithms have been developed to simulate human intelligence and to perform complex tasks in various fields such as healthcare, finance, education, and transportation. AI has the ability to predict the future, analyze a large amount of data, and acquire new experiences and skills, making it a crucial goal for all institutions and fields [13].

In conclusion, AI has become a crucial aspect of modern society and has the potential to improve the efficiency of performance and decision-making processes in various fields. Its significant contributions to society have led to the development of various AI techniques and models that simulate human intelligence. The importance of AI will continue to grow in the future, making it an essential aspect of digital transformation and economic growth.

III. THE SIGNIFICANCE OF SMALL AND MEDIUM ENTERPRISES IN DRIVING ECONOMIC DEVELOPMENT

In recent years, the importance of (SMEs) in economic development has become increasingly recognized. SMEs are now considered one of the most important pillars of economic and social development, particularly in developing countries, due to their positive role in providing job opportunities and reducing unemployment, as well as their contribution to the provision of basic goods and services needed by society, especially those with limited income. According to a report by the World Bank, (SMEs) account for more than 90% of businesses worldwide and are responsible for creating up to 80% of employment in some countries [14].

Many countries are now actively encouraging SMEs, as they have proven to be efficient in stimulating economic activity and providing intermediate goods needed by larger enterprises in the production process. They also absorb a significant number of unskilled and medium-skilled labor, which is a significant advantage in developing countries where there may be limited expertise and capabilities. The Organisation for Economic Cooperation and Development (OECD) emphasises the importance of small and medium-sized businesses in promoting economic growth, job creation, and poverty reduction [15]. This characteristic of SMEs is also a

means of reducing poverty and providing employment opportunities for low-income individuals.

Moreover, SMEs can also contribute to the provision of intermediate commodities needed by larger enterprises in the production of goods, which has led to an increase in exports in some countries. The ability of SMEs to absorb a large number of unskilled or medium-skilled workers has also become one of their advantages. Additionally, SMEs have the capability to bear the costs of production and control, which has made some large projects depend on them for the production of intermediate goods and other necessary supplies. As a matter of fact, most large-scale projects had their beginnings as small or medium-sized projects.

Small and medium enterprises (SMEs) play a crucial role in economic and social development, particularly in developing countries, by creating jobs, providing basic goods and services, and producing intermediate goods, making them a vital component of any sustainable economic growth strategy. According to [16], SMEs' importance can be categorized into several points.

A. *The Economic Role*

Firstly, SMEs enhance the labor force through their relatively low cost of production, which allows them to absorb a large number of workers. This is supported by [17], which states that SMEs are major contributors to employment generation in many countries, especially in developing ones.

Secondly, SMEs' ease of obtaining capital from various sources allows one person or worker to form the productive force based on their capabilities and savings. This is in line with [18], which states that SMEs often rely on their own resources or informal sources of finance for their capital needs. Thirdly, SMEs work to raise productivity due to their small size, which facilitates monitoring and follow-up of the production line. This is supported by [19], which states that SMEs' small size makes it easier for them to adapt to changes and respond to customers' needs.

Fourthly, SMEs contribute to increasing exports through import and export activities. This is in line with [20], which states that SMEs play a significant role in facilitating international trade and increasing the competitiveness of domestic economies. Finally, SMEs work to provide the market requirements of goods and services and provide intermediate goods and the needs of major projects. This is supported by [21], which states that SMEs often specialize in producing intermediate goods and providing essential services, making them critical players in supply chains.

Overall, SMEs' economic role is crucial to promoting economic activity and sustainable economic growth, especially in developing countries..

B. *The social role*

(SMEs) have a significant impact on society, particularly given their ability to involve individuals across various income levels [22]. SMEs play a role in achieving social balance by providing job opportunities and enhancing the education and

skills of workers, ultimately increasing innovation and technical expertise [23]. Moreover, these enterprises help to prevent migration from rural to urban areas since they allow individuals to work alongside their families and communities [24]. They can also create structural changes that improve the standard of living of individuals by reducing poverty and mitigating income inequality [25].

IV. AUTOMATION OF SMALL AND MEDIUM ENTERPRISES

Artificial intelligence (AI) has become a critical tool for advancing and developing any activity or project. The success of AI applications and its proven efficiency in solving issues and problems with the best results has improved the performance of economic institutions. (SMEs) have recognized the positive impact of AI and have started introducing AI systems into their businesses to benefit from its applications and improve their competitiveness. According to a recent report by Grand View Research, the global AI market size is expected to reach \$390.9 billion by 2025, with SMEs accounting for a significant share of this growth [26].

SMEs play a vital role in economic and social development, especially in developing countries, by providing job opportunities, basic goods and services, and intermediate goods. They are also characterized by their ability to enhance the labor force through their relatively low cost of production, which absorbs a large number of workers. SMEs help to achieve social balance by providing job opportunities and raising the level of skill and education among workers, which increases cultural level, innovation, and technical expertise [27].

The introduction of AI technologies has transformed the traditional form of SMEs that relied on routine and complex procedures into a more productive and competitive work environment. SMEs have introduced AI systems to increase productivity, develop management forms, and provide services in a manner consistent with the transformation of the work environment. With the onset of the COVID-19 pandemic, SMEs were forced to adapt and transform their business models, and the use of AI technologies helped to mitigate the impact of the pandemic on their businesses. A recent study showed that companies that had already adopted AI technologies before the pandemic were better able to withstand its effects [28].

The development of SMEs and digital transformation has become a primary goal because of the significant role they play in the development and introduction of AI systems. SMEs have realized that the introduction of AI technologies can increase production capacity, enhance competitiveness, and provide the best results and advantages. As a result, they have invested in the development of their administrative and financial organization, marketing strategies, and the form of production to meet market requirements and consumer desires [29].

In conclusion, SMEs are critical to economic growth and social development, and the introduction of AI systems has

helped to transform the traditional form of SMEs and increase their competitiveness. The use of AI technologies has become essential for SMEs to keep pace with the age of technology, respond to new market requirements, and overcome the challenges of digital transformation.

A. *The impact of artificial intelligence on jobs*

When looking at artificial intelligence techniques, we find that it simulates the human mind through artificial intelligence programs and a robot, which threatens the existence of the human employee and causes a defect in the form of the job and shortens the life span of the employee within the company, and with the increase and spread of artificial intelligence and the spread of its advantages that it provides in improving performance Small and medium projects such as increasing productivity, improving efficiency, and supporting customer experience [30].

Although artificial intelligence increases profits and avoids the percentage of errors and accuracy in decision-making, and therefore the algorithms were the highest value, increased profits, and social development for their ability to overcome human defects, which affected the position and position of jobs as a result of replacing and replacing current jobs. functions that are compatible with artificial intelligence applications.

Accordingly, decision-makers and those interested tended to avoid fear and turmoil through the development of workers and their skills, which increases the percentage of higher skilled jobs to keep pace with artificial intelligence technologies [31]. The reason for this is the emergence of deep learning programs, which is one of the applications of artificial intelligence, and some expectations and studies have concluded that artificial intelligence will affect the number and percentage of jobs in the world, which is done as a result of processing input data, and the OCED organization issued in 2013. [32]

Based on this, jobs differed partially or completely in the workplace as a result of the power of programs, computing and robots. There is no doubt that artificial intelligence, despite the concerns that hover around it, but that artificial intelligence increases creativity and innovation and creates new jobs as a result of the rapid development of artificial intelligence and its use in analyzing administrative data and project information.

As for jobs that enjoy less skilled jobs, they will be at risk and disappear because they depend on craft skill and manual work, but those jobs can be saved by developing their skill and training them to deal with artificial intelligence techniques.

B. *The impact of artificial intelligence on the work structure*

Artificial intelligence (AI) applications have a significant impact on the form of work, market structure, and competitiveness. By introducing AI systems, businesses can better organize their work and management, resulting in increased productivity and higher quality products and services at lower prices. AI also increases the demand for technological labor as companies require skilled workers to develop and maintain these systems. A recent study has shown that the adoption of AI technologies leads to higher productivity and an

increase in the number of jobs that require advanced technical skills. Moreover, companies that adopt AI technologies are more likely to have a competitive advantage over their competitors in the market [33]. Also, it contributes to increasing the capital because it reduces the value of costs and assets, which increases the profits and returns of the project.

Refining the financing mechanism for small and medium enterprises through the use of artificial intelligence

The funding of (SMEs) is a significant obstacle to the establishment and growth of these businesses. In traditional methods of financing, SMEs rely on self-efforts and crowdfunding by collecting money from a large number of people. However, artificial intelligence (AI) has enabled crowdfunding to take place through AI applications, and electronic platforms such as the stock exchange also contribute to crowdfunding work [34].

To improve financing for SMEs, various strategies have been proposed, including the development of financial technology innovations to avoid banking penetration and expanding financial inclusion services that are difficult to access traditionally. Additionally, improving credit systems, providing guarantee facilities, introducing credit incentives and facilitating procedures, developing financial infrastructure, enacting new banking legislation, and creating a regulatory environment for SMEs are suggested measures. Technology use in government institutions and structural changes to streamline processes and encourage SME applicants to complete their projects are also recommended [35].

V. CONCLUSION

Artificial intelligence has become an increasingly important tool for institutions seeking to improve their performance. It has proven its ability to solve issues and transform the business environment across a variety of fields. Artificial intelligence applications, such as algorithms, neural networks, big data storage, and machine learning, have provided significant benefits for management operations and work processes within institutions. As (SMEs) have become recognized for their role in economic development, their owners have become increasingly interested in automating their projects to ensure their continued growth and success. This involves streamlining administrative systems, developing new products, enhancing innovation capabilities, promoting competitiveness, and expanding their market reach. Emphasizing AI-driven marketing as a primary use for SMEs highlights the tangible advantages that AI can provide. Through the utilization of AI-powered marketing, small and medium-sized enterprises (SMEs) may improve their marketing skills, reinforce client connections, and attain long-lasting expansion in highly competitive marketplaces.

REFERENCES

- [1] Schwab, K. (2016). The Fourth Industrial Revolution. World Economic Forum.

- [2] Kandeel, M. E., & Eldakak, A. (2024). Legal dangers of using ChatGPT as a co-author according to academic research regulations [Special issue]. *Journal of Governance & Regulation*, 13(1), 289–298. <https://doi.org/10.22495/jgrv13i1siart3>
- [3] Kandeel, M. E., & Elrefae, G. (2023, December). The Impact of Artificial Intelligence on Achieving the Efficiency of Justice “AI & Speedy Justice”. In 2023 24th International Arab Conference on Information Technology (ACIT) (pp. 01-05). IEEE. <https://ieeexplore.ieee.org/abstract/document/10453918>
- [4] Shalaby, A. G., Abdelaziz, G. M., & Kandeel, M. E. (2022, November). Using Artificial Intelligence to Resolve Disputes through Online Arbitration. In 2022 Ninth International Conference on Social Networks Analysis, Management and Security (SNAMS) (pp. 1-8). IEEE. <https://ieeexplore.ieee.org/abstract/document/10062524>
- [5] El-Zeiny, M. E., Kandeel, M. E., Aburezeq, I. M., Abdo, M. A. F., & Abdelghaffar, M. E. (2023, November). Enhancing Legal Writing Skills through Interactive E-Books: A Multilingual Approach. In 2023 Tenth International Conference on Social Networks Analysis, Management and Security (SNAMS) (pp. 1-8). IEEE. <https://ieeexplore.ieee.org/abstract/document/10375476>
- [6] Abdelaziz, G. M., Hashish, A. (2024). Using Sanctions in Enforcing Digital Markets Act in the EU. *Studies in Systems, Decision and Control*, 489, pp. 775–783. https://link.springer.com/chapter/10.1007/978-3-031-36895-0_65. Brynjolfsson, E., & McAfee, A. (2017). The business of artificial intelligence. *Harvard Business Review*, 95(1), 58-66.
- [7] Yoo, Y., & Kim, Y. C. (2020). The impact of artificial intelligence on the future of work. *Journal of Business Research*, 117, 859-863.
- [8] Manyika, J., Chui, M., Miremadi, M., Bughin, J., George, K., Willmott, P., & Dewhurst, M. (2017). A future that works: Automation, employment, and productivity. McKinsey Global Institute.
- [9] Russell, S. J., & Norvig, P. (2021). *Artificial intelligence: A modern approach* (4th ed.). Pearson.
- [10] Al-Qaysi, A. (2020). The role of artificial intelligence in enhancing the performance of small and medium enterprises. *International Journal of Economics, Commerce and Management*, 8(12), 29-35.
- [11] Jordan, M. I., & Mitchell, T. M. (2015). Machine learning: Trends, perspectives, and prospects. *Science*, 349(6245), 255-260.
- [12] Kshetri, N. (2018). Blockchain's roles in meeting key supply chain management objectives. *International Journal of Information Management*, 39, 80-89.
- [13] M. al-Hadi “Applications of Artificial Intelligence: Its Significance, Applications, and Development Effects”, *The Egyptian Lebanese House*, 2020, p. 29-35.
- [14] World Bank Group. (2021). Small and Medium Enterprises (SMEs). Retrieved from <https://www.worldbank.org/en/topic/sme/finance>.
- [15] OECD. (2020). The economic impact of small and medium sized enterprises. Retrieved from <https://www.oecd.org/cfe/smes/Small-Medium-sized-Enterprises-Key-Statistics-and-Analysis.htm>
- [16] T. C. Annur, M. Jamiluddin, and N. N. S. Abdullah, "Challenges faced by SMEs in accessing financing: a review of literature," *Journal of Global Business and Social Entrepreneurship (GBSE)*, vol. 1, no. 2, pp. 101-111, 2017.
- [17] J. H. Love and M. S. Roper, "Economic geography and the location of new firms," *Journal of Economic Geography*, vol. 8, no. 1, pp. 89-118, 2008.
- [18] M. Casson and S. Della Giusta, "Entrepreneurship and social capital: analysing the impact of social networks on entrepreneurial activity from a rational action perspective," *International Small Business Journal*, vol. 22, no. 2, pp. 117-148, 2004.
- [19] United Nations Conference on Trade and Development. (2019). *World Investment Report 2019*. Retrieved from https://unctad.org/en/PublicationsLibrary/wir2019_en.pdf
- [20] Shabbir, F., & Anwar, S. (2021). An investigation of factors affecting the success of small and medium enterprises (SMEs) in developing countries: Evidence from Pakistan. *Journal of Small Business Management*, 59(2), 345-363. doi: 10.1080/00472778.2020.1756679
- [21] Goyal, S., & Joshi, N. (2019). Role of small and medium enterprises in economic development. *International Journal of Management, Technology, and Social Sciences*, 4(1), 1-5. doi: 10.26634/jmtss.4.1.14414
- [22] S. Brink, "Small and Medium-sized Enterprises," *European Parliamentary Research Service*, 2020. [Online]. Available: [https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/658325/EPRS_BRI\(2020\)658325_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/658325/EPRS_BRI(2020)658325_EN.pdf). [Accessed: 25-Apr-2023].
- [23] F. Bickenbach and M. Persson, "Small and Medium-sized Enterprises, Technology and Globalization - Introduction to a Special Issue," *Small Business Economics*, vol. 51, no. 2, pp. 243-247, Aug. 2018.
- [24] S. J. Park and S. S. Kim, "The Role of Small and Medium Enterprises in Employment Creation and Economic Growth in Korea," *Journal of the Asia Pacific Economy*, vol. 12, no. 2, pp. 231-249, 2007.
- [25] R. N. Vanitha and R. Gopal, "Impact of Small and Medium Enterprises in Economic Development," *Journal of Business Management & Social Sciences Research*, vol. 9, no. 2, pp. 44-50, Feb. 2020.
- [26] Grand View Research. (2021). *Artificial Intelligence Market Size, Share & Trends Analysis Report By Component, By Application, By Region, And Segment Forecasts, 2021 – 2028*. <https://www.grandviewresearch.com/industry-analysis/artificial-intelligence-ai-market>
- [27] Jha, V. (2019). The Role of SMEs in the Economic and Social Development of Developing Countries. *Journal of Small Business Management*, 57(4), 1323–1333. <https://doi.org/10.1111/jsbm.12438>
- [28] Capgemini Research Institute. (2020). How AI enables resilience in times of crisis. <https://www.capgemini.com/wp-content/uploads/2020/07/How-AI-enables-resilience-in-times-of-crisis.pdf>
- [29] Ali, W., Ayoob, S., & Malik, M. (2021). Digital Transformation in Small and Medium Enterprises (SMEs): A Systematic Review. *Journal of Enterprise Information Management*, 34(4), 805–832. <https://doi.org/10.1108/JEIM-09-2020-0314>
- [30] World Economic Forum. (2018). *The Impact of the Fourth Industrial Revolution on Jobs*. Retrieved from <https://www.weforum.org/reports/the-future-of-jobs-report-2018>
- [31] McKinsey & Company. (2019). *The Future of Work*. Retrieved from <https://www.mckinsey.com/featured-insights/future-of-work/the-future-of-work>

- [32] A Muayad, M. Zaidan & D. Mahmood “The Effect of Artificial Intelligence on Job Performance in China's Small and Medium-Sized Enterprises (SMEs)”, Spanish journal of innovation and integrity, Vol. 7, 2022, p. 112-128. DOI: 10.17605/OSF.IO/SJFUZ
- [33] Arntz, M., Gregory, T., & Zierahn, U. (2016). The risk of automation for jobs in OECD countries: A comparative analysis. OECD Social, Employment and Migration Working Papers, (189), 1-54.
- [34] Sezgin, S. E., & Ümit, E. (2018). Crowdfunding as a mechanism for financing entrepreneurship and innovation. *Journal of Business Research*, 91, 269-280. doi: 10.1016/j.jbusres.2018.04.035
- [35] Kim, Y. J., Kim, T., & Yoon, S. W. (2021). The impact of COVID-19 on small and medium-sized enterprises and the policy response in Korea. *Journal of Asian Finance, Economics and Business*, 8(1), 69-78. doi: 10.13106/jafeb.2021.vol8.no1.69