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Understanding the Adoption and Impact of Artificial Intelligence in Small Businesses: A Case Study of the Pakistani Context

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Artificial Intelligence (AI) is rapidly pacing in every sphere of life, particularly for corporations and small and medium enterprises, breeding plenty of opportunities and challenges. This research study examines the adoption and identifies the key factors influencing its integration into Pakistan's small companies. However, this research has determined that AI has the potential to enhance operational efficiency, competitiveness, improved productivity, better customer care engagement, and streamlined operations. Significant hurdles are still faced in Pakistan, such as inadequate technical expertise, limited resources, and cultural inertia related to the adaptation of this AI technology. In Pakistan, the younger employees and the Information Technology (IT) sector make it much easier to accelerate the adaptation process of AI. Addressing these challenges and unlocking the potential to drive economic growth and innovation in its small business sector is imperative. The results offer valuable insights for researchers, business leaders, and policymakers, contributing to a comprehensive understating of AI integration in emerging markets.

1. Introduction

The 21st century has witnessed an unprecedented Information Technology (IT) revolution, rapidly advancing every sphere of life. Therefore, at the forefront, Artificial Intelligence (AI) is quickly evaluating and replacing the old versions of technologies worldwide, which has become a cornerstone of modern technological innovation. While AI has been a topic of interest for decades, its practical applications have only recently begun to infuse mainstream business practices, offering significant efficiency and performance improvements across various industrial sectors. Therefore, AI technology has been influential in creating professional business applications that enhance organizational performance and production by automating operational processes and providing data-driven insights. Thus, while integrating these technologies into consumer products and services, several large corporations, such as Netflix, Google, Microsoft, and Amazon, are ahead in this AI adoption race. AI's potential to optimize customer acquisition strategies, streamline business operations, and enhance customer interactions offers a valuable opportunity for businesses aiming to maintain a competitive edge. (Skilton & Hosvepian, 2017).

Globally, the adaptation and integration of AI have been marked by significant investments and advancements. Companies are eager to utilize AI for various applications, including voice-activated smart home devices and digital advertising tools, which add a new service area to IT-based companies. Therefore, despite its transformative potential, AI is viewed mainly as a complementary tool that enhances human intelligence rather than replacing it; this partnership between humans and machines is expected to lead to better decision-making and improved large and small corporate sector outcomes (Rasheed et al., 2021). Adopting AI is not without its challenges, as it poses numerous challenges, such as ethical considerations, security concerns, and the potential displacement of jobs, which are significant issues in the IT and corporate sector that must be addressed before its complete application and utilization. Prominent figures such as Stephen Hawking and Bill Gates have highlighted the existential risks posed by AI, emphasizing the need for careful regulation and ethical considerations in its development and deployment (Cellan-Jones, 2014). For industries, the rapid integration of AI necessitates a responsive approach to human resource management and operational processes to mitigate these risks. (Tahira, 2021).

In Pakistan, small and medium-sized enterprises (SMEs) form the backbone of the economy, accounting for 90% of all businesses. These enterprises play a vital role in economic growth and development. However, adopting AI in this sector creates unique opportunities and poses challenges. For instance, limited technical expertise, resource constraints, cultural behavior, and ethical considerations are significant hurdles that need to be overcome; despite these challenges, there is a growing recognition of the importance of AI in enhancing business efficiency and competitiveness (Shahid & Li, 2019). Pakistani population belongs to a more than 60% youth bulge, as Pakistan can better equip its youth with AI benefits and skill sets. In Pakistan, the latest influx of funding for technology-based startups also highlights the promise of AI-centric solutions for various industrial sectors. The government of Pakistan is also eager to support and invest in AI development and innovative solutions to the IT sectors and provide a conducive environment for AI implementation to drive economic growth. (Nazir, 2023).

The research study aimed to examine the impact of AI and its integration into small-scale businesses in Pakistan and identify the factors influencing the adoption process. The research study is investigative and descriptive based on secondary data, which goes under in-depth review and thematic analysis. We will explore various opportunities and challenges within Pakistan's business culture and advantages for socioeconomic sectors.

Artificial Intelligence (AI) is the most evaluated part of the information technology (IT) revolution. It is a novel phenomenon in the world, particularly in developing nations like Pakistan, rapidly replacing and transforming the fabric of society. Despite the transformative nature of AI, as it can significantly change personnel capability, competitiveness, and organizational performance, plenty of challenges are posed, such as a lack of AI understanding, limited resources, and cultural barriers. Therefore, we have found a considerable research gap in this domain in Pakistan to understand the current status of AI integration in small business sectors in Pakistan. Further, the aim is to investigate the critical factors that influence the integration of AI, where it is imperative to develop a robust strategy to facilitate the effective implementation of AI technologies.

Our research study findings demonstrate the current state of AI technology adoption in small businesses in Pakistan. It provides valuable results to stakeholders and policymakers regarding the opportunities and challenges of integrating AI. In addition, it can encourage supportive policies, strategies, and development, promote AI adoption, and foster more rapid innovation in small-scale business sectors. Identifying factors influencing AI integration and utilization will improve business efficiency and increase productivity while reducing costs and meeting customers' needs better. Furthermore, AI intervention will contribute to the business sector, directly leading to economic growth and development while stimulating innovation and creating new employment opportunities. However, Pakistan's large portion of the economy is based on small-scale businesses, which can expand their market reach and contribute to the overall development of Pakistan. Thus, this research study educates and empowers owners and entrepreneurs with lucrative knowledge and resources to navigate the complexities of AI adoption as they can integrate an informed decision based on AI in their daily operations and unlock new opportunities for growth and success. Finally, the research study is filling the gap in the market and literature by providing a foundation for future studies and contributing to the academic literature. Various related challenges, opportunities, and experiences of small-scale businesses in Pakistan come in proper recorded documentation, which can be utilized to understate the dynamics of AI adoption in emerging markets and inform further scholarly inquiry in this area.

1.1 Research Objectives

- To analyze the current adaption status of AI among small businesses in Pakistan
- To identify the factors that influence the adoption of AI technologies in small businesses.
- To assess the impact of AI adoption on small business operational efficiency and performance.
- To explore the challenges and barriers faced by small industries in adopting AI technologies in Pakistan

- To provide recommendations for business owners and policymakers to facilitate the effective adoption and utilization of AI technologies.

2. Literature Review

This study literature dealt briefly with previous studies and research by various scholars on Artificial intelligence, its nature, application, and implications in various fields. Additionally, its history, description, and definitions are also mentioned to explain its impact on the business field.

2.1 A Brief Evaluation History of AI

The Artificial Intelligence (AI) evaluation period consists of four periods, such as the Germination Period between 1943 and 1995. This first phase faced many limitations regarding computers' computational capacity and processing power. Warren McCulloch and Walter Pitts introduced the Artificial Neuron as an early model known as the Linear threshold gate. Subsequently, during the foundation period between 1956 and 1980, computer usage increased in various applied fields such as Mathematics, Medicine, Information Science, and Psychology. Therefore, this phase is known for the development of Artificial Neural Networks that imitate human brain functions, nurture machine learning systems, and improve the computational capacity of computers. However, in 1956, McCarthy recommended the idea of Artificial Intelligence in a research project at Dartmouth College in Hanover, New Hampshire; this idea has attracted many researchers and scholars. Most of them had begun to study people and work on AI and received fruitful results.

Therefore, the findings of these studies reflected different aspects of life, such as chess programs, theorem-providing procedures, pattern recognition systems, the development of the "LISt Processing" (LISP) language, and so on. The application period of AI was considered between 1981 and 2000, when AI encountered many obstacles due to immature computer technology, while the range was small and slow. In addition, from 2000 onward to the present is the integration period, which can be defined as the recent paradigm shifts of AI and its application for the smooth interaction of human life and machine intelligence. Thus, computer technology experts developed various systems to fulfill users' requirements, and AI technology was promoted rapidly (Karjian, 2023).

2.2 Definition and Type of AL Technologies

Artificial intelligence comprises two words: the first is an object or thing that is not natural or actual, and the second is intelligence, which implies the ability to reason, trigger new thoughts, perceive, and learn. So, in the context of computer science, it mainly focuses on making intelligent machines that work and react like human beings. Hence, it can work in many areas, such as designing artificial computers that recognize speech, learning, planning, and solving problems (Verma, 2018). In general, Artificial Intelligence refers to the ability of machines to perform tasks that usually require human intelligence. Even though most researchers consider AI a broad field, one that covers not only the innovations of the past few years but also the achievement of the first electronic computers dating back to the 1940s. Therefore, let's consider that even old technology can still be AI. (Allen, 2020). Artificial intelligence is a technological body that feeds human knowledge through various computer and machine versions and tools. Thus, AI utilizes input data

and information, accelerating it to produce output per the command, almost the same function as human beings (Taddy, 2018).

2.2 Types of Artificial Intelligence

According to the many experts in the AI field, classify it into major even types based on usability.

1. **Analytic Artificial Intelligence**: analytic AI refers to the concept utilized for data-driven decision-making, such as advanced-level deep learning and machine learning. In addition, it collects tons of data. It puts it in the process that gives ultimate output in the form of insights that can be used for business decisions and customer analysis, as supplier risk assessment, sentiment analysis, inventory optimization, and demand forecasting are the significant functions that can be exercised in these areas.
2. **Functional AI**: this type of AI almost gives a similar function as analytical, such as collecting tons of data and process, but it does it directly for the action, as the Internet of Things (IoT) can establish a connection with Functional AI for taking adequate action once needed.
3. **Interactive AI:** Interactive AI has the potential to communicate naturally through specific systems with human beings, which predicts the needs of the users based on interaction, such as through a chatbot or intelligent personal assistant. The process of verification during conversation is also its unique feature,
4. **Text AI:** Text AI is quite a common type and is popularly used by the common public and in large organizations such as Apple, Amazon, and Google, which provide text AI services. Further, text recognition, machine translation, speech-to-text conversion, and content capabilities are examples of artificial text intelligence.
5. **Visual AI:** this type of AI refers to a process that analyzes the image, video, and direct observation, particularly in the manufacturing industry; as these kinds of features of AI, several organizations are eager to use such applications for automated inspection and face recognition solution are come in the domain of visual AI. (Hawlader, 2021)

Furthermore, various scholars have divided AI into two main categories: Solid AI and Weak AI. So, the features and attributes of this type of AI are to have consciousness and self-awareness and be able to think independently and come up with the best solutions to problems as, in a certain sense, this type of AI is a new civilization of human beings. (*Artificial Intelligence Technology - Huawei Enterprise*, n.d.) On the other hand, another Weak artificial intelligence depicts the circumstance when it cannot make machines that can truly accomplish reasoning and problem-solving. Thus, according to some scholars, we are in the weak AI era. Hence, in this era, it is undeniable that data and computing power are both crucial, as they can facilitate the commercialization of AI. (*Artificial Intelligence*, n.d.)

2.3 Previous studies on Al adoption in small Businesses Globally

Previous research studies demonstrate that large companies adopt environmentally friendly practices more quickly than small companies due to their adequate resources and vital infrastructure. In addition, small-scale enterprises tend less toward innovative approaches than large companies due to material and resource constraints. In contrast, large companies are the prey of behavioral constraints and complexities while adopting innovative techniques and strategies. (Vossen, 1998).

Another research finding demonstrates that the cost and financial resources do not impact AI adoption and integration; as a result, it shows that managers in Saudi Arabia's small businesses perceive AI to be better than existing or substitute technology. Furthermore, the relative advantages of AI increase the willingness to adopt AI as it improves their reputation and corporate image worldwide. However, due to the complex nature of AI, Saudi Arabia's small business enterprises are not ready to embrace it smoothly, which could impact them. At the same time, the level of perception regarding the compatibility of managerial staff showed a significant relationship with AI adoption. Moreover, most Saudi Arabian small and medium enterprises expressed deep concerns that AI is beneficial and suitable for their current market and business environment. Still, it is challenging to integrate quickly due to its complex nature and technicality and lack of trained personnel and experts (Badghish & Soomro, 2024).

As per other research findings and insights, although all segments of society widely recognize AI's significance and necessity, its relevance is mainly for business processes, competitiveness, productivity, and smooth operation. Still, only 28% of small businesses have implemented AI solutions in their functional and operational activities. The studies conclude that the integration of AI in the business world is still relatively early and that targeted measures are needed to promote the effective use of AI technologies. However, proportionally, small and medium enterprises utilize various AI tools such as chatbots or virtual assistants, which are most commonly used, followed by a recommendation system and machine learning. Further, the potential of AI to automate customer interactions and improve personalized offers use information for data-driven insights and decisions, as diverse benefits processes increased efficiency and productivity, improved decision-making, customized offers and services, and cost-saving were identified as crucial benefits of AI integration in the business process. (Schönberger, 2023).

Several factors were investigated in London, England. It was found that AI applications reduce the high risk to businesses, mainly for small and medium enterprises. Various corporate sections were measured through a newly developed scale, such as advertising, marketing, cyber-protection, and cash flow prediction, including human resources (HR) services operation, to observe the impact of AI integration and adaptation. Therefore, it indicated that while using AI, the business risk gets reduced and even declines to a particular level for both small and medium enterprises regardless of their gross assets, turnover, and years of operation despite innovativeness.

Another case study has quoted that, during the COVID-19 pandemic, the business sector risk was relatively high, which now has been reduced with the help of AI integration in various operations such as advertising applications, using multiple techniques for audience target through different tech-based platforms, including cash flow, forecasting, and applications for recruitment

human resource activities, which profoundly impacted the entire operations. Thus, these AI strategies were not yet developed during the COVID-19 pandemic; otherwise, they could have had a significant impact. (Drydakis, 2022). This research study on AI use among United States of America enterprises is one of low average diffusion. Yet, with higher concentration in specific sectors and extensive companies, the average company adoption in 2017 was only 5.8%, which rose to 18.2% with employment weighting till the next few years, which rapidly increasing the percentage of AI adoption and integration in all sectors of corporate (McElheran et al., 2023).

2.4 Adoption of AI in Pakistani Small Businesses:

The IT sector and its experts are relatively active and ahead in the AI adaptation and integration process in their daily operations and tasks in Pakistan while developing and working for third-party users. According to the 2025 Vision and Digital Policy of Pakistan 2018, the ICT industry size has been promised to increase its reach to $20 billion by 2025. Pakistan's IT sector exports are growing at 18% year-on-year, and their remittances are flourishing as per their export value at USS 2.1 billion of the remittance. Therefore, most experts provide low-end services instead of high-end services while using AI and Machine Learning. In 2021, the tech-based industries of Pakistan received $278 million in funding for its enhancement and development. As considerable strategies and promises have been made, newly launched companies could potentially integrate AI-centric services and solutions for clients and customers. (ARTIFICIAL INTELLIGENCE ECOSYSTEM IN PAKISTAN A REPORT BY ATOMCAMP).

According to the current research study, AI has a significant value impact in Pakistan, such as process automation, personalization, improved customer services, and reduced risk management. In this race, the younger generation is quite enthusiastic and eager to learn and adopt new technological skills than peers and old age professionals, where it is imperative to provide enough financial and moral support to the young bulge, where AI has the potential to advance the financial services of the country with secure and conducive environment (Ahmed et al., 2024)
Most small business owners know the basics of AI usage and its significance in Pakistan. At the same time, many are still ignorant while practicing their activities or making any relevant decisions while utilizing AI tools. However, the awareness and understanding of AI varies from industry to industry. In contrast, the tech-based companies' employees and employers are much better than others at understanding and using AI. Most people were unaware of AI and believed it would help improve work performance and idea generation, increase efficiency and save time, and accelerate day-to-day operations, particularly in e-commerce businesses, software sellers, and even product providers. Thus, it has been predicted, based on previous studies, that the adaptation and integration of AI would possibly be very high in the coming years in the majority of business sectors in Pakistan (*"How can Artificial Intelligence (AI) help SMEs develop in emerging economies?" A qualitative study from Pakistan* Saad Rafique, Francine Mujawinkindi *emerging economies.").*

The latest research study highlighted the complex interaction of technological and non-technological elements, emphasizing the necessity of employing a strategic approach to tackle factors affecting the integration of AI. Therefore, AI functions in a complex regulatory

environment where multiple stakeholders are interested in regulating and applying to manage various internal and external networks of stakeholders, which is essential for AI adoption to succeed. The organization and enterprise need to appoint or hire with exceptional knowledge of AI and expertise to make it more effective and sustainable. (Jan et al., 2024) On the other hand, AI significantly enables employee engagement and increases efficiency with a net output of organizational performance and productivity, which allows companies to pace in a competitive environment in Pakistan (Huang & Hayat, 2019).

3. Research Methodology

The research study is explorative and investigative, based on the secondary data source; the data has been collected from various sources such as journal articles, Magzin reports, e-books, Internet sources, government reports, conference reports, and previous literature. The research study was conducted within the context of the Pakistani business environment and the adaptation and integration of artificial intelligence. Small-scale businesses were the target, both services and manufacturing sectors, with a size range of ten-forty employees across the cities of Pakistan. Therefore, the data went through various analysis techniques such as thematic analysis depth in-review literature and investigated the factors influencing the AI adoption process while integrating into small-scale enterprises. Thus, the study comprehensively explains how AI reshapes Pakistan's small business landscape and suggests strategies for successful AI implementation.

4. Analysis

4.1 Current status of AI adoption in Pakistani Small businesses

The adoption of AI in Pakistani small companies is in its emerging stages, with awareness and implementation varying significantly across different industries. According to Ahmed et al. (2024), while the IT sector shows a promising growth trajectory, with a significant portion of IT exports linked to AI-related services, the broader adoption among small businesses remains limited. This disparity is primarily due to varying levels of awareness and technical expertise; for instance, tech-oriented companies and younger employees exhibit higher confidence and understanding of AI applications than their counterparts in more traditional industries.

4.2 Integration and Awareness

The integration of Artificial intelligence into small businesses in Pakistan is at a primary stage, constrained mainly by a lack of awareness and understanding. Despite the global surge in AI adoption across various sectors, Pakistani small business owners often exhibit limited knowledge about the technologies' potential applications and benefits. This knowledge gap is particularly pronounced in non-tech sectors, where traditional business practices dominate. The variance in awareness is influenced by industry type, with tech-oriented still dominant, with tech-oriented businesses and younger entrepreneurs showing more familiarity and readiness to embrace AI (Rafique & Mujawindkindi, 2024).

4.3 Resource Constraints

A significant barrier to AI adoption in Pakistani small businesses is resource limitations, encompassing financial and human resources. Implementing AI technologies requires substantial investment in infrastructure, software, and skilled personnel, which small businesses often cannot

afford. Lack of professionalism and technical experience lead to economic growth barriers where AI can overcome these obstacles within the local business environment (Badghish & Soomro, 2024). Consequently, small businesses struggle to integrate AI into their operations despite recognizing its potential benefits.

4.4 Impact on Operational Efficiency

The impact on operational efficiency and performance has been positive for small businesses adopting AI technologies. All corporate sectors can streamline operations by improving the decision-making process and reducing costs with the help of AI-driven automation of routine tasks, which can also enhance analysis capabilities and deeply integrate them into their marketing and advertising process in order to target potential customers and clients. For instance, in customer services, chatbots and virtual assistants can play a critical role in AI applications by providing personalized experiences and instant responses (Schonberger, 2023). Moreover, AI has a better potential to analyze and interpret big datasets while using excellent inventory management, forecasting, and market strategies that trigger company performance and productivity.

4.5 Challenges and Barriers

Artificial intelligence initially penetrates the system while facing many hurdles and challenges in its integration and adaptation process, such as cultural attitudes, technical constraints, a lack of financial resources, and, most significantly, a fear of losing and displacing employment and cyber security of the high assets and values of the corporate sector. Thus, addressing these challenges effectively through various tactics and techniques required at initial levels, such as awareness campaigns, alleviating cultural inertia, educating the masses and relevant employees, transforming mindsets, highlighting the significance of AI integration, and, most significantly, a high-security mechanism which keeps protecting the fabric of the society and business ventures is imperative. Furthermore, establishing digital infrastructure in rural areas and giving access to digital tools with reasonable packages essential for AI implementation also requires practical steps; thus, the lack of these actions and resources is a considerable barrier to AI integration for small businesses and governmental entities in Pakistan (Jan et al., 2024).

4.6 Policy and Regulatory Environment

In Pakistan, AI is still in a developing regulatory and scrutiny environment, another complexity layer for adopting and integrating AI. In addition, most enterprises have remained uncertain regarding ethical considerations and compliance-related AI technologies. Adequate, supportive, and clear policies are required to provide a conducive environment and guidelines for adopting AI tools while addressing security and privacy concerns regarding data and information (Shahid & Li, 2019). However, government recognition and ambition for AI adaptation are positive steps; however, more proactive initiatives and measures are also necessary to tackle the obstacles and provide friendly procedures to integrate AI into the small business sector.

4.7 Opportunities for Growth

AI brings significant opportunities for all sectors of society while being a great source of growth and development for the small business sector in Pakistan. Improving productivity, stimulating innovation, smoothening operations, increasing efficiency, and creating new

employment opportunities can firmly drive economic growth, which is possible through AI usage and utilization. In addition, AI can improve efficiency and help better meet customers' needs by using AI to automate routine tasks and customer care management, resolving problems and providing the best effective solutions. Moreover, expanding the business and employment market worldwide notably contributes to the country's overall economic growth and development. (Drydakis, 2022).

4.8 Strategic Recommendations

The government of Pakistan and other private sectors should adopt a holistic approach to facilitate the adoption of AI integration for small- and large-scale businesses countrywide. Such as subsidies, grants, and tax incentives, and the financial burden should be reduced for small businesses. Moreover, the government should invest in educational and training programs and attract foreign investment. AI literacy must be improved among business owners and employees at various levels, and human capital must be exerted. Through private-public partnerships, a joint venture can also facilitate the integration and adoption of AI while supporting experience based on merits and providing support to access cutting-edge technologies. Another significant component is developing a robust digital infrastructure in remote and rural areas of Pakistan, including awareness campaigns to highlight the benefits of AI and showcasing successful studies that integrate cultural attitudes (Ahmed et al., 2024).

5. Conclusion

Pakistan's economy is based on 90% of small-scale enterprises where AI adoption holds profound potential, which can improve customer engagement and operational efficiency, ultimately leading to economic growth and development. However, considerable obstacles and challenges in AI adoption and integration, such as lack of awareness, resource constraints, inadequate infrastructure, and cultural attitude, slow down the process. Investing in educational programs, developing digital infrastructure, and implementing policies can foster positive thoughts, behaviors, and attitudes toward technology in the Pakistani small-scale business sector. Furthermore, Pakistan can exemplify itself as a platoon of AI adopters and users in the corporate sector. Hence, the study provides valuable findings and feasible and viable recommendations for business owners, policymakers, and researchers, and it contributes to the broader discourse on AI adoption in the emerging AI technology market.

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