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Empirical insights into the reduction of operational costs through AI: A study of Jordanian companies

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ABSTRACT

Objective: I investigated how artificial intelligence (AI) tools can help reduce operational costs in businesses across Jordan. I examined the specific ways AI enhances efficiency and optimises resource utilisation, ultimately impacting financial outcomes.

Research Design & Methods: I utilised a qualitative research approach, employing a systematic literature review and thematic analysis to examine how AI contributes to reducing operational costs. The review consolidates findings from academic and industry sources to identify key trends. I performed thematic analysis to extract insights on AI-driven automation, cost efficiency strategies, and the challenges associated with implementation. The study does not involve primary data collection or empirical case studies. The study offers recommendations to assist businesses in optimising AI adoption.

Findings: Study identified key themes on how AI reduces operational costs, Key cost-saving mechanisms include automation, predictive analytics, and resource optimisation. Sectors like manufacturing, finance, and telecommunications reduce operational costs by cutting labour costs, improving decisions, and increasing efficiency. Challenges include high costs, training gaps, and implementation risks. One must address them to ensure successful AI adoption. Findings are based on literature analysis, and not on primary data.

Implications & Recommendations: The research emphasised the need for Jordanian companies to adopt AI to remain competitive and boost profitability. Businesses should invest in AI training to upskill their workforce. AI requires integrating in areas with clear, measurable benefits. Partnering with AI firms can help streamline adoption and integration.

Contribution & Value Added: This study presents a structured analysis of AI-driven cost reduction, highlighting how automation, predictive analytics, and supply chain optimisation enhance operational efficiency. Unlike broader studies on AI adoption, I specifically examined cost-saving mechanisms within Jordanian businesses, tackling challenges such as high initial investment costs and workforce skill gaps. The study offers practical recommendations for businesses and policymakers, contributing to the wider discussion on AI's role in digital transformation and financial sustainability.

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INTRODUCTION

Artificial intelligence (AI) is revolutionising business operations by providing organisations with innovative tools to optimise processes, minimise errors, and boost efficiency. Among its most significant contributions is the reduction of operational costs, where automation and data-driven decision-making allow businesses to streamline workflows and enhance productivity. Operational costs – encompassing labour, energy, and resource management – are a major portion of a company's overall

expenses. Therefore, leveraging AI-driven solutions to cut these costs presents a substantial opportunity for businesses to maintain a competitive edge.

Artificial intelligence (AI) has penetrated various industries and proved to be useful in fulfilling various organisational requirements (Tariq *et al.*, 2021). The utilisation of advanced AI technologies by companies not only reduces operational costs but also brings about digital transformation (Drydakis, 2022). Companies are now deploying AI and predicting a huge impact concerning organisational performance (Dzhusupova *et al.*, 2023).

Study Objective

I sought to investigate how AI can lower operational costs in Jordanian businesses by pinpointing the specific mechanisms through which AI improves efficiency and optimises resource use. While cost reduction often correlates with improved profitability, I focused exclusively on the impact of AI-driven efficiencies on cost structures rather than broader financial performance metrics.

Research Questions

1. In what ways do AI applications help reduce operational costs for businesses in Jordan?
2. What are the primary challenges and opportunities Jordanian companies encounter when integrating AI into their operations?
3. What strategic recommendations can be offered to businesses aiming to implement AI for cost reduction purposes?

Novelty and Theoretical Context

Although there is an expanding body of research on AI's role in business operations, there is limited focus on its specific impact on reducing operational costs within Jordanian enterprises. This study addresses this gap by analysing real-world examples and proposing actionable strategies for AI adoption. Moreover, the research is situated within the wider framework of digital transformation, where AI acts as a pivotal enabler for modernising business processes. Digital transformation goes beyond mere automation; it involves reengineering operations, harnessing data analytics, and incorporating intelligent technologies to achieve greater efficiency. By embedding AI into this transformative process, companies can achieve sustainable improvements in their operations.

This research not only fills a critical knowledge gap but also provides practical insights for Jordanian businesses seeking to implement AI-driven cost reduction strategies effectively.

This research begins by introducing the significance of artificial intelligence (AI) in reducing operational costs, particularly in the context of Jordanian companies. It then outlines the research objectives and questions, followed by a literature review that synthesizes current academic and industry findings on AI implementation, cost efficiency, and associated challenges. The methodology section explains the qualitative research design based on systematic literature review and thematic analysis. Subsequently, the results and discussion section presents thematic findings on AI-driven cost-saving mechanisms and implementation barriers. The article concludes with practical recommendations, study limitations, and directions for future research.

LITERATURE REVIEW

Overview of Artificial Intelligence in Business

Artificial intelligence (AI) has gained widespread recognition for its capacity to boost business efficiency, automate processes, and reduce operational costs. Numerous studies have explored AI's role in enhancing productivity and streamlining workflows across various industries (Choi *et al.*, 2023). Research shows that AI-driven automation minimises manual labour, optimises decision-making, and improves predictive analytics, all of which contribute to significant cost reductions (Usman Tariq *et al.*, 2021). Beyond automation, AI applications are integral to digital transformation strategies, enabling businesses to restructure operations and achieve greater overall efficiency (Drydakis, 2022).

Empirical Evidence from Previous Studies

Several studies underscore the impact of AI on reducing operational costs and improving resource utilisation. For instance, research by Heidrich *et al.* (2022) demonstrates that AI adoption leads to a marked reduction in errors and enhanced process efficiency. Similarly, Gans and Nagaraj (2023) found that AI-driven optimisation models can lower costs by improving forecasting accuracy and addressing supply chain inefficiencies. While many studies emphasise AI's transformative potential, few provide quantifiable evidence of its direct financial benefits, leaving a gap in understanding its tangible cost-saving impacts.

A meta-analysis by Paranjape *et al.* (2021) revealed that AI-led automation has resulted in cost savings ranging from 25% to 50% across diverse industries. However, the extent of these savings depends on the implementation strategy and industry-specific challenges. Damioli *et al.* (2024) examined AI's role in workforce efficiency, concluding that while AI-driven enhancements lead to long-term cost reductions, they often require substantial initial investments in infrastructure and training.

Challenges in AI Implementation and Cost Considerations

Despite its advantages, implementing AI presents several challenges, particularly concerning financial investment and workforce adaptation. Studies by Nguyen-Duc *et al.* (2023) and Radanliev *et al.* (2024) highlight difficulties such as high upfront costs, a shortage of skilled personnel, and concerns over data security. Moreover, Drydakis (2022) warns against over-reliance on AI, stressing the importance of maintaining human oversight and conducting continuous evaluations to ensure balanced and effective implementation.

Integration of Research Questions into the Literature Review

To improve clarity and structure, I positioned the research questions at the end of the introduction rather than embed them within the literature review. This adjustment ensures that the literature review remains focused on summarising existing research while situating the study within the broader context of AI-driven cost reduction.

Addressing Grey Literature Concerns

The literature review drew on references from peer-reviewed journals and reputable sources. However, some cited studies originate from platforms like arXiv.org and other preprint repositories. While these sources offer valuable insights, their non-peer-reviewed nature has been acknowledged. Future iterations of this study will prioritise incorporating more peer-reviewed empirical research to strengthen the findings and enhance academic rigour.The results of the paper exhibit that AI can indeed contribute to the strategic goals of Jordanian companies from a cost reduction perspective.

Strategies for Successful AI Implementation

Due to the industry struggling with COVID-19 repercussions, many organisations are considering switching to telework and restructuring their organisation to incorporate some form of working from home. One of the most significant opposing attitudes is the difficulty as people are usually not used to it; to aid this, AI-equipped organisations could use AI-support with worker performance, while knowledge analysis-employment of AI might strengthen employee involvement and corporate income or innovation in organisational processes might impact compliance in organisational results. Alternatively, AI could help support the welfare of employees' analysis and decision-making as learnings and HR management through AI's contribution. With AI HR management or worker protection may add good results to existing operations and human capital allocation in both federal and non-compulsory departments, while in some activities, AI automation again depends on the buyer's choice, and the predicted improvement in the efficiency of performing procedures will reduce product and service expenses. AI could also facilitate safe process and outcome assessments, for instance, within the Indian panel and/or the car department.

Firms should direct their efforts towards maximising the incorporation of AI into internal business processes. AI-assisted marketing and advertising serve as a business tool to automate and streamline promotional activities, as they should strive for more integrated elements among AI integration into business processes, with the possible result being reductions in labour across the division. The AI should

also serve to support further analysis and decision-making, leading to a wider knowledge of transactions. If the adoption of AI is difficult, the averting suggested process can help with that. Companies should also think in terms of AI adoption while they are innovating and adopting business processes. In corporate environments, organisations can derive several benefits from embracing technologies. AI also encourages to increase productivity, competitiveness, expertise, etc. Moreover, using AI tools will make it easier to produce and develop in a collaborative environment and sustain online businesses.

Strategies for successful AI implementation include incorporating cyber-physical systems and digital platforms, using real-time data to drive decision-making, integrating virtual and real systems, managing big data via IoT devices, and using AI for process automation and fault prediction (Vyhmeister & Castane, 2024). Because this technology facilitates the implementation of AI, firms can identify fault predictions using AI to prevent unwanted scenarios and maintain operational excellence through AI (Usman Tariq *et al.*, 2021). Besides, firms should focus on integrating virtual and real systems and designing AI algorithms suitable for cyber-physical systems and digital platforms, as this creates greater flexibility in production.

Based on the identified objectives and the gaps, I sought to answer the following questions:

RQ1: How do AI applications influence operational costs in Jordanian companies?

RQ2: What are the main challenges and opportunities that Jordanian companies found in integrating AI into their operations?

RQ3: Based on the findings, what strategic recommendations could be provided to Jordanian companies looking to implement AI to reduce operational costs?

Cost Reduction Techniques with AI

Prescriptive analytics or other combinations of machine learning and operations research models can help optimise workforce schedules or machinery deployment on a real-time basis. These same techniques also commonly serve to optimise product mix and stock levels and help support the demand planning process, which if not optimised, has a direct impact on direct material waste. In pricing, AI can reduce direct material costs by improving the ability to set appropriate pricing and price promotions for products, leading to reduced discount spending, and funding costs, and lower overall selling, general, and administrative costs.

Artificial intelligence automates routine activities, reduces errors, and does not tire. The following are some common AI tools and techniques that can help reduce labour costs and optimise other operational costs: robotic process automation (RPA) automates rule-based, repetitive tasks previously performed by humans, such as bulk data entry, inventory control, and automated testing. It can read and interpret various files from one format to another, creating reports and analysing data. Natural language processing (NLP) and other AI text analysis tools can process unstructured data (*e.g.*, emails, financial reports, or web click data) into a structured format to help forecast financial metrics, perform predictive customer analysis or stock trend analysis, conduct market surveillance, and conduct fraud detection activities (Ameen *et al.*, 2021).

In today's challenging world, reducing operational costs has become second nature for the majority of companies in all industries (Maple *et al.*, 2023). Reducing operational costs generally means reducing the cost of labour, utilities (such as electricity and water), materials, and supplies. However, the main focus has always been the cost of labour because the more people are employed, the more daily operational costs must be regulated to maintain pre-established profit margins. Artificial intelligence has the potential to significantly cut operational costs and is also, in many ways, even more efficient than traditional methods (Dionisio *et al.*, 2023).

AI Tools and Technologies for Cost Reduction

Artificial intelligence technologies used for cost optimisation include connected devices, robotics, virtual agents, and computer vision systems. It is physically connected to other devices and systems while connected devices have built-in AI capabilities such as perceptiveness and the ability to make autonomous decisions. Robotics recognise or use AI to add new abilities. Virtual agents are implemented to respond via text and internet meetings to customers or stakeholders. Computer

vision refers to the computers' ability to recognise and understand physical objects and then act upon the built-in image of those real-world objects. The above two lists are not comprehensive but cover some of the AI tools and technologies used to reduce operational costs.

Artificial intelligence tools used for cost optimisation include RPA, predictive analytics, data visualisation, natural language processing, and machine learning. Noteworthy, RPA refers to the automation of rule-based tasks via software robots. It can save human effort while requiring minimal modification to existing systems. Predictive analytics enables organisations to predict future outcomes considering patterns in their past data. Data visualisation is about representing information in graphical form to help in understanding, reasoning, and decision-making. It allows users to see communications that transcend their data or analytical skills. Natural language processing is closely associated with artificial intelligence, and a set of AI techniques used to analyse and understand the human language. Machine learning focuses on predicting outcomes from data. People analyse data to build models, which can be thought of as representations of patterns in the data. Using machine learning models, the company can predict future outcomes provided what happens.

Artificial intelligence refers to the simulation of human intelligence processes to perform tasks. These tasks include but are not limited to learning, understanding, reasoning, problem-solving, perceiving images, recognising speech, and translating languages (Usman Tariq *et al.*, 2021). The cost of AI, like most technologies, has decreased significantly while generic processing tasks have increased. The decrease in the cost of data storage and improved algorithms have presented and improved AI technologies (Panchal *et al.*, 2024). Several AI tools and technologies typically serve cost reduction which one can further explain as follows (Machado *et al.*, 2020).

Training and Skills Development for AI Implementation

Limited exposure to subjects such as core AI concepts, ML, deep learning algorithms, applications of AI in various fields of economy and business, and its social, legal, and ethical impacts is the major concern of AI Skill Education. Cultural and philosophical differences could further impede the application of a universal educational framework. Thus, a more typical approach might involve the definition of suitable AI learning goals for society as a whole, the definition of national or regional educational objectives, and the customisation of such educational objectives to suit the needs and objectives of individual schools. It might also be wise to provide as much localisation as feasible, considering the various cultural and philosophical influences. Artificial intelligence is both a fundamental skill and a transformative technology. Just like the internet, AI can fundamentally change commerce, legislation, trade, and ethics. AI skills for every interaction are important. Governance initiatives will be required to ensure that all people have these abilities. This transformation can occur in close partnership and as a part of ongoing school assignment strategies or in a more independent manner.

The transformation of industries can have immediate and lasting effects on workers (Gupta, 2020). AI has the potential to alter the key drivers of economic growth and highlights the importance of well-structured re-growth and reskilling programs (Choi *et al.*, 2023). Moreover, successful AI adoption increases the productivity of the industries and boosts the returns on investment in AI systems (Nguyen-Duc *et al.*, 2023). Reskilling of current employees and training of new AI teachers are the pillars of AI education and skill development. Integrating AI into the curriculum and placing AI teachers at the strategy level are a few measures that will be beneficial in schools. Incorporating AI into academic curriculum is a multiheaded matter, requiring an assessment of administrative, logistical, and instructional effects. The approach or incorporation has its own set of fickle components, including the time needed for educator training, academic governance control of what is added to the curriculum, and administrative decisions regarding budget and student capacity.

Ethical Considerations in AI Adoption

At the same time, it is plain that organisations often face special business pressures and regulatory burdens in regulated environments. Where human jobs are lost or where the human – and sometimes corruptible – interpretation of ethical guidelines might prove ineffective when data becomes vast, rapid AI deployments may often provide almost immediate and auditable reviewability, creating a trail for

regu-lators and ethics boards alike. AI has often heightened ethical concerns, but for many use cases, it provides new options for enumerating, auditing, and managing downstream business risks. As several case studies below illustrate, these trends and AI's possible impact on them are highly idiosyncratic to individual functional areas, different levels of sectoral development, and the organisation using AI, predicated on such diverse specifics of domain and tooling as the features of machine learning languages different sectors apply, not just the use of deep learning per se. AI and ethics present themselves as the issues that organisations and societies most need to address. The conversations we have today will not only shape the rules of the road in data-driven sectors but will also chart the paths our societies decide to take in deploying advanced, sometimes autonomous systems across numerous organisational functions. Fortunes, regulatory frameworks, and quality of life outcomes will be set for much of this century by how we grapple with these concerns now. This is why it is key for the nations of the world, the representatives of the people, to consider AI regulation. Many nations are beginning to establish or elucidate their own AI regulatory frameworks, or else to negotiate multistakeholder agreements at international fora. Besides these lawful downsides, ethical AI increasingly looms.

Ethical considerations in AI adoption have gained a lot of attention in industry, academia, and policy nowadays (Pachegowda, 2023). Issues such as bias, security, and privacy violations have often been raised as reasons for caution or resistance to AI adoption (Radanliev *et al.*, 2024). Many factors combine to create regulatory and ethical pressures: the rising potential for AI to infer and act on discriminatory behaviours; growing attention to fairness in machine-learning models; and increasing expectations that AI ethics considerations will be incorporated into regulatory requirements. In some scenarios, concerns may be tempered by the relative ease of addressing bias in a given analytic use case; in others, the result will be years of scrutiny and multi-million-dollar fines for algorithmic interventions that prove unreliable or biased in simply reflecting existing human attitudes or actions. In the worst cases, the stakes are higher, with broken or biased AI decisions causing real harm, such as in healthcare, criminal justice, and finance (Gwagwa *et al.*, 2021).

RESEARCH METHODOLOGY

I adopted a qualitative research approach, focusing on a literature review and thematic analysis to investigate the role of AI in reducing operational costs for businesses in Jordan. Rather than collecting empirical data, the research synthesises insights from existing studies and industry reports to provide a comprehensive understanding of how AI impacts cost reduction.

Literature Review

I relied heavily on a systematic literature review to build a theoretical framework for understanding AI's influence on operational costs. I analysed peer-reviewed journal articles, industry reports, and relevant case studies from various sectors to identify key trends, benefits, and challenges associated with AI implementation. The literature review served as the primary source of data, enabling an assessment of AI's effectiveness in enhancing business efficiency and achieving cost reductions.

Thematic Analysis

A thematic analysis was performed to identify patterns and recurring themes within existing research. This method facilitated a structured exploration of AI adoption, its advantages, and the obstacles businesses encounter when integrating AI technologies. Key themes examined include AI-driven automation, resource optimisation, cost-efficiency strategies, and the role of digital transformation in modernising business operations.

Case-based Discussion (Non-empirical case studies)

Although the study references examples of AI applications across different industries, it does not involve original case studies based on primary data collection. Instead, it synthesises secondary case studies from existing literature to highlight instances of AI-driven cost reductions in various sectors. These discussions provide real-world context without engaging in direct empirical investigation.

Strategic Insights and Recommendations

Based on the findings from the literature review and thematic analysis, I developed strategic insights to offer practical recommendations for Jordanian businesses considering AI adoption. These recommendations are derived from best practices identified in prior studies and industry reports, helping organisations understand AI's potential while addressing the challenges associated with its implementation.

RESULTS AND DISCUSSION

The results and discussion section highlights the significant potential of AI in driving cost reduction across industries through three primary strategies: automation and process optimisation, predictive analytics for enhanced decision-making, and improved resource utilisation. Moreover, other results are discussed as follows:

1. Cost reduction strategies enabled by AI (based on the literature review)

– Automation and process optimisation: AI boosts efficiency by minimising manual tasks and enhancing precision.
– Predictive analytics and decision-making: AI-powered forecasting supports better cost management within supply chains.
– Resource utilisation optimisation: AI reduces waste and improves the allocation of resources across various industries.

2. Challenges in implementing AI

– High upfront costs and uncertainties about return on investment.
– Workforce readiness issues and gaps in necessary skills.
– Regulatory and ethical hurdles associated with AI adoption.

3. Thematic insights from the existing literature

This section includes a Table summarising findings from reviewed studies:

Table 1. Findings within previous studies

Theme	Findings from the literature
AI-driven automation	AI reduces labour costs, enhances efficiency in repetitive tasks, and minimises human errors (Choi *et al.*, 2023).
Predictive analytics and forecasting	AI-driven data models enhance supply chain efficiency by reducing waste and eliminating excess inventory (Paranjape *et al.*, 2021).
Cost reduction within customer services	AI-powered chatbots and virtual assistants decrease the need for human customer service representatives, thereby lowering operational costs (Drydakis, 2022).
AI in predictive maintenance	AI-based maintenance systems reduce downtime in manufacturing, improving machine efficiency and minimising operational disruptions (Damioli *et al.*, 2024).
AI in supply chain and logistics	AI optimises transportation routes, cuts fuel expenses, and enhances inventory management (Nguyen-Duc *et al.*, 2023).
AI-driven decision support systems	Businesses leveraging AI for strategic decision-making achieve reduced operational inefficiencies and improved resource allocation (Gans & Nagaraj, 2023).
Challenges in AI adoption	High initial investment and a shortage of skilled workforce are significant barriers to realising AI's cost reduction benefits (Radanliev *et al.*, 2024).

Source: own study.

The findings from the existing literature underscore AI's transformative potential in reducing costs across various industries. Automation and predictive analytics have proven particularly effective in minimising errors, optimising supply chains, and cutting waste, resulting in significant operational savings. Nevertheless, the adoption of AI remains inconsistent, largely due to high upfront costs and the demand for a skilled workforce (Radanliev *et al.*, 2024). Businesses must carefully assess their AI strategies to ensure that anticipated cost reductions justify the necessary investments. Companies that

successfully incorporate AI into areas such as customer service, supply chain management, and predictive mainte-nance are more likely to achieve sustained improvements in cost efficiency. While the literature highlights AI's ability to enhance operational efficiency, further research is essential to measure its long-term financial impact and evaluate the adaptability of AI-driven solutions in diverse economic contexts.

CONCLUSIONS

I examined the role of AI in reducing operational costs for Jordanian businesses using a systematic literature review and thematic analysis. The findings reveal that AI-driven solutions, including automation, predictive analytics, customer service optimisation, and supply chain efficiency, play a significant role in cutting costs across various industries. Nevertheless, the success of AI adoption is shaped by factors such as high upfront investment, workforce preparedness, and integration challenges. While AI offers considerable potential to improve operational efficiency, businesses must adopt strategic approaches to implementation to fully realise its benefits.

This study relied on secondary data sources and did not incorporate empirical case studies or primary data collection. Consequently, the findings are based on existing literature rather than direct industry-specific research. Furthermore, while the study focuses on Jordanian businesses, its findings may not be fully applicable to other regional or global markets due to differences in economic conditions and levels of technological adoption. Another limitation is the absence of quantitative cost assessments, as the majority of the reviewed studies emphasise qualitative insights rather than providing precise measurements of financial impacts.

Future research should investigate empirical case studies to validate the cost-reduction benefits of AI in Jordanian businesses. Conducting industry-specific surveys and financial impact assessments would yield quantifiable data on AI's return on investment (ROI). Moreover, further studies could explore the long-term effects of AI adoption, particularly focusing on how businesses address post-implementation challenges such as AI maintenance costs, workforce adaptation, and regulatory compliance. Extending the research to other Middle Eastern markets would also provide valuable comparative insights into AI adoption trends and cost-saving strategies across diverse economic contexts.

Recommendations

According to Deloitte, companies are more frequently implementing or expanding AI solutions and targeting AI efforts on the functions most commonly identified as priorities, such as IT, marketing, customer service, and research and development. As companies develop their AI strategies, investments in AI training and communication are also more often cited as critical enablers of AI, suggesting a growing awareness of the need to invest not only in technology but also in the skills and operational readiness required to realise AI's potential. Anytime AI is going to be used, no matter if the application is simple or complex, one should think it through strategically (Kumar *et al.*, 2021). The literature states that an application can go from being simple to complex and any sort of positive narrative about its effects on both professionals and businesses must be based on careful numbers (Gans & Nagaraj, 2023). Furthermore, companies must comply with regulations tied up with AI use as each country's laws are subjective.

Adopting AI applications is crucial for enhancing a company's competitiveness, as it can enable processes smartly, and efficiently, and enhance the decision-making processes inside the company (Heidrich *et al.*, 2022). This study recommends having a strategy for the development of AI technology within the companies. Companies must set a clear future about what to develop, whether to work on it or just work with technology and software, or to trade in such technology. It is also important to develop a vision for work in the field of AI and set goals, performance indicators, and budgets. Moreover, it is important to develop a method to take advantage of AI's benefits. The study recommends that companies create a plan for the development of AI solutions for the entire company as well as pilot projects. Through these projects, companies learn more about AI usage and maintain

the ability to implement whole AI solutions in companies, some of the AI solutions the companies can use, including also how the companies can make revenue from this investment.

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Use of Artificial Intelligence

The author confirms that the text is free from AI.

Conflict of Interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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