

Article

The Impact of Artificial Intelligence Adoption on Management Efficiency in Small Businesses in Uzbekistan

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Abstract: This article examines the impact of artificial intelligence adoption on management efficiency in small businesses in Uzbekistan. The study aims to systematise international empirical findings, assess their transferability to the Uzbek business environment, and develop a phased model for AI adoption by small enterprises. The research employs a structured analytical literature review, comparative analysis, secondary statistical analysis, and conceptual modelling. International evidence indicates that generative AI reduced the time required to complete professional writing tasks by 40 per cent while improving output quality by 18 per cent. Another workplace study reported an average productivity increase of 15 per cent in customer-support operations. These figures, however, should not be interpreted as outcomes already achieved or automatically expected among small businesses in Uzbekistan. Their transferability depends on data quality, digital infrastructure, managerial commitment, employee competencies, and the institutional environment. The study develops a conceptual mechanism integrating the Technology Organization Environment framework, the AI capability perspective, and the automation-augmentation approach. It also proposes the AI-SAMARA model, which encompasses process auditing, infrastructure and data preparation, pilot testing, analytical evaluation, accountability and risk management, operational integration, development, and adaptive monitoring. The findings suggest that AI improves management efficiency not through the mere availability of technology, but through the purposeful transformation of business processes, organisational capabilities, and human-AI collaboration.

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Keywords: artificial intelligence, small business, management efficiency, labour productivity, AI capability, TOE framework, digital transformation, automation, AI-SAMARA model, Uzbekistan.

1. Introduction

The development of artificial intelligence technologies is significantly changing corporate management practices, work processes, and managerial decision-making mechanisms across the global economy. Whereas earlier phases of digitalisation relied mainly on information technologies to store data, automate calculations, and accelerate communication, modern AI systems can analyse data, forecast demand, generate alternative decisions, support customer relations, and coordinate operational processes. These changes are particularly important for small businesses. Their limited financial, labour, and time resources make improvements in management efficiency a crucial source of competitiveness. By automating repetitive tasks, preparing documents, processing customer enquiries, forecasting sales, managing inventories, and

personalising marketing decisions, AI tools may alleviate some of these constraints. Nevertheless, AI adoption does not automatically improve efficiency. Its economic and managerial outcomes depend on a firm's data culture, digital infrastructure, strategic leadership, employee competencies, and the external institutional environment. AI should therefore be viewed not merely as a software product, but as an organisational capability that must be aligned with corporate resources, knowledge, and management processes [1].

International studies of AI and labour productivity report positive effects alongside important limitations. In an experiment involving professional writing tasks, S.Noy and W.Zhang found that generative AI reduced average task-completion time by 40 per cent and improved output quality by 18 per cent [2]. These findings relate to a specific category of writing tasks and cannot be generalised directly to every industry or management process.

In a study of 5,172 customer-support agents, E.Brynjolfsson, D.Li and L.R.Raymond found that generative AI assistance increased the number of enquiries resolved per hour by an average of 15 per cent [3]. The effect was stronger among less experienced and less skilled employees, suggesting that AI may codify the knowledge of high-performing workers and make it accessible to novices. Because the evidence came from a single large company, however, differences in firm size, sector, and institutional conditions must be considered before applying the findings to small enterprises in Uzbekistan. AI may therefore have two-sided managerial effects. On the one hand, it automates standard operations, accelerates information processing, and augments human analytical capabilities. On the other, excessive reliance on technology may reduce the transparency of managerial decisions, constrain employee autonomy, and intensify problems concerning data security and accountability.

S.Raisch and S.Krakowski explain this tension through the automation-augmentation paradox [4]. In their view, firms should use AI in a balanced manner, not as a complete replacement for human labour, but as a technology that extends the capabilities of managers and employees.

Small business is a major contributor to economic growth, employment, and household income in Uzbekistan. According to the National Statistics Committee of the Republic of Uzbekistan, the gross value added generated by small businesses reached UZS 923,514.6 billion in 2025 and accounted for 52.2 per cent of gross domestic product [5]. Unlike large organisations, however, small enterprises do not always possess the financial resources, qualified specialists, or high-quality databases required for AI implementation. Business processes are not fully digitalised in many small firms, and data remain dispersed across different applications and documents. Consequently, the information supplied to AI systems may be incomplete, inaccurate, or mutually inconsistent.

AI development has become a priority of national policy. Presidential Resolution No. PQ-358 of 14 October 2024 approved the Strategy for the Development of Artificial Intelligence Technologies until 2030 [6]. Implementing this agenda may create new opportunities for small businesses. National strategic objectives, however, do not automatically translate into firm-level outcomes. Small enterprises require phased implementation mechanisms that reflect their circumstances and do not demand substantial initial investment.

International scholarship has examined the effects of AI on firm performance, labour productivity, organisational creativity, and decision-making. Much of this evidence, however, originates from large companies in developed economies or from narrowly defined professional tasks. It does not fully reflect the resource constraints, management practices, and institutional conditions of small businesses in Uzbekistan. Moreover, representative primary evidence capable of establishing a causal effect of AI

use on management efficiency among Uzbek small businesses remains insufficient. The present study therefore treats international quantitative findings as an evidence base and uses official secondary statistics to characterise Uzbekistan [7].

2. Materials and Methods

This study is based on a systematic analysis of existing academic and official sources rather than on a primary survey or experiment. The unit of analysis was a firm, organisation, or discrete business process in which AI technologies had been adopted. The outcome variables comprised labour productivity, operating costs, task-completion time, decision quality, service speed, error rates, and the efficiency with which employee knowledge and skills were utilised.

Management efficiency was defined as the ability to achieve specified managerial outcomes with less time and lower cost while improving the quality and speed of decisions and reducing managerial errors.

Priority was given to literature addressing AI adoption, organisational readiness, management efficiency, labour productivity, the digital transformation of small and medium-sized enterprises, and algorithmic management. The evidence base focused on studies published between 2021 and 2025. The core sources examined AI capability, the automation-augmentation paradox, the productivity effects of generative AI, organisational readiness for AI, implementation challenges in SMEs [8], and algorithmic management.

The economic role of small business in Uzbekistan was analysed using data from the National Statistics Committee, while the institutional direction of AI development was assessed on the basis of Presidential Resolution No. PQ-358. Because the selected sources differed in their content and evidential strength, they were classified as empirical, theoretical, methodological, or statistical and legal sources.

Table 1. Analytical audit of the principal sources used in the study

Source	Research design and evidence base	Main finding	Relevance to this study	Main limitation
P.Mikalef and M.Gupta	Empirical organisational study	AI capability is positively associated with organisational creativity and firm performance	Frames AI as an organisational capability rather than merely software	Findings cannot be transferred directly to every country or small firm
S.Raisch and S.Krakowski	Theoretical and conceptual study	Automation and augmentation are simultaneously competing and complementary processes	Explains the appropriate balance between AI and human labour	Provides no independent empirical estimate
S.Noy, W.Zhang	Controlled experiment involving professional writing tasks	Task time fell by 40%; quality increased by 18%	Demonstrates potential effects of generative AI on time and quality	Findings are specific to particular writing tasks

E.Brynjolfsson, D.Li and L.R.Raymond	5,172 customer– support agents; over 3 million interactions	Issues resolved per hour increased by an average of 15%	Shows productivity effects under real workplace conditions	Based on one large firm
J.Jöhnk, M.Weißert and K.Wyrtki	In–depth interviews with 25 AI experts	Technological, data, strategic, human, and organisational readiness factors were identified	Supports the construction of readiness dimensions	Contains subjective expert judgements
Sánchez Alcalde L.	Systematic review and conceptual roadmap	Ten main challenges and a six–stage adoption pathway were proposed	Supports the development of an SME implementation pathway	Not an independent– respondent– based field study
A.Milanez	Survey of more than 6,000 managers in six countries	Benefits and risks involving accountability, transparency, and worker well–being were identified	Allows managerial quality and social consequences to be assessed jointly	Uzbekistan and Central Asia were not covered
World Bank	Cross– country analytical report	AI readiness depends on connectivity, compute, context, and competency	Supports assessment of the national digital environment	Does not identify firm–level causal effects
National Statistics Committee	Official statistics for Uzbekistan	Reports economic and sectoral indicators for small business	Characterises the domestic economic context	Provides limited dedicated indicators of AI use

Some sources measure outcomes using quantitative indicators, whereas others explain the conditions and management mechanisms required for implementation. Official statistical and legal sources define Uzbekistan's economic and institutional context. Differences in samples, firm types, tasks, and performance measures make it inappropriate to pool all findings in a single statistical model. The study therefore uses a structured narrative synthesis rather than a conventional meta-analysis.

The conceptual foundation combines three related perspectives: the Technology–Organization–Environment (TOE) framework, AI capability, and the automation–augmentation approach. Under the TOE framework, technology adoption depends on technological factors, including infrastructure, internet quality, databases, software integration, and cybersecurity; organisational factors, including management support, financial resources, employee competencies, firm size, and organisational culture; and environmental factors, including regulation, public support, competitive pressure, technology–service markets, finance, and consultancy.

The TOE framework explains the decision to adopt AI but does not fully explain how adoption becomes a managerial outcome. It was therefore complemented by the AI capability perspective. Under automation, an algorithm assumes all or part of a task previously performed by a person. Under augmentation, AI processes information and generates a forecast or recommendation, while the final decision remains with a manager or specialist. Augmentation is particularly relevant to small businesses because managerial experience, personal customer relationships, and tacit knowledge play a significant role and may not be fully represented in digital data. Applying AI recommendations without human oversight may therefore generate inappropriate decisions.

In the proposed model, management efficiency is produced not by the mere presence of AI software, but through the following causal sequence: TOE factors → AI readiness → AI capability → intensity of AI use → changes in management processes → management efficiency. This relationship is moderated by the balance between automation and augmentation, data quality, managerial competence, and institutional support.

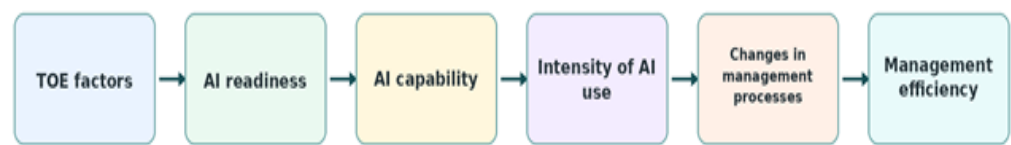


Figure 1. Theoretical model linking TOE factors to management efficiency through AI readiness, capability, and use intensity.

Indicators for assessing management efficiency. The effectiveness of AI adoption cannot be assessed solely through changes in corporate revenue or profit. These outcomes are also influenced by demand, inflation, competition, prices, seasonality, and the wider economic environment. A combination of direct and indirect indicators is therefore proposed.

Table 2. Indicators of management efficiency following AI adoption

Efficiency dimension	Indicator	Calculation or assessment method
Time efficiency	Reduction in task-completion time	$(T_0 - T_1) / T_0 \times 100\%$
Labour productivity	Output per employee or per hour	Output volume / labour input
Cost efficiency	Reduction in cost per operation	$(C_0 - C_1) / C_0 \times 100\%$
Decision speed	Time from problem identification to decision	Days, hours, or minutes
Decision quality	Forecast accuracy or share of successful decisions	Correct forecasts / total forecasts
Error rate	Share of incorrect documents, calculations, or operations	Erroneous operations / total operations
Customer service	Response and resolution time	Average response and resolution time
Sales efficiency	Conversion of enquiries into purchases	Purchases / customer enquiries
Employee development	Time for a new employee to reach expected productivity	Days or months
Financial outcome	Return on investment in the AI project	$(\text{Benefit} - \text{Cost}) / \text{Cost} \times 100\%$

It is not methodologically justified to apply quantitative findings from international studies directly to small businesses in Uzbekistan. For example, a 15 per cent productivity increase observed internationally does not imply that every Uzbek small enterprise would achieve the same result.

Table 3. Transferability of international empirical findings

International finding	Conditions under which it was obtained	Constraint on transfer to Uzbekistan	Transfer assessment
Time spent on writing tasks fell by 40% [5]	Standardised professional writing tasks and use of generative AI	Uzbek–language model quality, variation in tasks, and employee competence	Relatively high
Output quality improved by 18% [6]	Predefined output–assessment criteria	Subjectivity of quality criteria and sectoral differences	Medium
Customer–service productivity rose by 15% [6]	Large database, standardised communication, and integrated AI assistant	Small firms may have less data and weaker integration	Medium
Less experienced employees improved more rapidly [6]	Expert employee knowledge represented in the system	Firm knowledge may not be documented	Conditionally high
Algorithmic tools improved decisions and coordination [9]	Advanced digital infrastructure and management systems	Insufficient mechanisms for transparency, accountability, and employee rights	Medium

The transfer assessment indicates practical relevance for Uzbek small businesses rather than the probability of reproducing an identical effect. The precise magnitude of any impact must be established through domestic pilot projects and subsequent empirical research.

3. Results

The analysed empirical studies indicate that the most consistent effects of AI concern task–completion time and labour productivity. The magnitude of these outcomes nevertheless depends on task standardisation, employee experience, data quality, and the integration of the AI tool into the workflow.

In the experiment by S.Noy and W.Zhang participants using generative AI completed professional writing tasks in 40 per cent less time on average, and their outputs received quality scores that were 18 per cent higher [8]. These findings suggest that generative AI may, in some contexts, reduce the conventional trade–off between speed and quality. Human verification remains necessary, however, because fluent output does not guarantee factual or numerical accuracy.

E.Brynjolfsson, D.Li and L.R.Raymond provide evidence from a real work setting. A generative AI assistant increased the number of customer enquiries resolved per hour by an average of 15 per cent [9], owing to faster service and a higher likelihood of successful resolution. The effect was uneven across employees: less experienced workers benefited more, while the additional effect among highly skilled employees was smaller. AI may therefore accelerate the diffusion of expertise within an organisation and shorten the adjustment period for new employees.

This mechanism is relevant to small firms in Uzbekistan, which often lack the resources for prolonged employee training. If knowledge about products, customer–service rules, and recurring problems is digitised, an AI assistant can help a new employee retrieve relevant information and prepare an appropriate response. The firm's best practices must first be documented, however. An AI system based on unstructured or outdated information may disseminate inappropriate recommendations more rapidly. Productivity effects therefore depend not only on technology but also on the quality of knowledge management.

A second important channel concerns decision-making. Small-business decisions often rely on a manager's personal experience and limited information. AI may provide an additional analytical basis by jointly processing data on sales, costs, customers, inventories, and market signals. Decision quality depends both on forecast accuracy and on a manager's capacity to interpret the forecast. An algorithm may fail to account for exceptional circumstances, informal arrangements, or local market conditions that are absent from corporate data. AI should therefore extend the informational basis for a managerial decision rather than fully replace the manager [10].

The strongest benefits are likely to arise in repetitive, data-rich, and measurable processes. Strategic, high-risk, or legally consequential decisions should remain subject to the human-in-the-loop principle.

Operating costs are an important outcome when evaluating AI in small-business management. Cost reductions do not arise immediately after implementation. Firms initially incur expenditure on software, data preparation, employee training, system integration, and information security, short- and long-term costs must therefore be assessed jointly [11]. Treating workforce reduction as the main performance criterion would also be one-sided. Employees in small firms commonly perform multiple functions. Automating repetitive tasks may enable them to devote more time to customer relations, product development, and other higher-value activities. AI should consequently be assessed by asking how released time is redirected towards value creation, rather than simply how many jobs are removed [12].

The effect on management efficiency also depends on employee competence. Technology may partly compensate for gaps in knowledge and skills, but it cannot replace professional preparation. E.Brynjolfsson, D.Li and L.R.Raymond found that less experienced employees derived the greatest benefit from AI support [13], indicating a potential democratisation of knowledge when expert practices are represented in algorithms or knowledge bases. Unsupervised use may nevertheless weaken independent reasoning, create dependence on ready-made answers, and produce superficial professional knowledge. AI literacy, including the ability to scrutinise recommendations and understand their limitations, is therefore a prerequisite for management efficiency.

The readiness factors identified by J.Jöhnk, M.Weißert and K.Wyrtki show that outcomes primarily depend on internal organisational capabilities [14]. Even when a technological tool is available, expected benefits may not materialise if data are poor, managerial objectives are unclear, or employees are unprepared for change. Strategic readiness requires a clearly defined purpose and a measurable expected outcome. Human readiness requires management support, prior communication about effects on employee responsibilities, and employee participation in project design and testing.

The literature identifies six broad groups of barriers to AI adoption by small and medium-sized enterprises [15].

Table 4. Principal barriers and measures for mitigating them

Barrier	Manifestation	Recommended response
Financial	High initial cost	Small pilot, cloud service, and cost-benefit analysis
Technological	Lack of system integration	Use of APIs and standard formats
Data	Incomplete and fragmented data	Data audit and cleaning
Competence	Shortage of AI expertise	Short training and external expert support
Organisational	Employee resistance	Explanation and collaborative testing
Legal	Disclosure of confidential data	Usage policy, access controls, and anonymisation
Ethical	Biased or inexplicable decision	Human oversight and regular algorithmic audit

4. Discussion

The findings show that the effect of AI on management efficiency is neither linear nor automatic. Several mediating factors stand between technology availability, its actual use, and its conversion into economic value, including data quality, employee competence, management strategy, process standardisation, and the external institutional environment. This conclusion supports the AI capability concept proposed by P.Mikalef and M.Gupta. AI may fail to generate sustainable value when it remains an isolated technological resource; it becomes a strategic capability only when integrated with physical resources, human capital, organisational knowledge, and management mechanisms. It is therefore necessary to distinguish between AI use—the routine application of a programme or platform and AI capability—the integration of technology, data, competence, and management processes to achieve sustainable outcomes.

The faster and higher-quality completion of professional writing tasks reported by S.Noy and W.Zhang, and the increased productivity in customer-enquiry processing reported by E.Brynjolfsson and colleagues, are consistent with this interpretation. Human involvement remains decisive in non-standard, strategic, ethical, or legally consequential decisions. This finding supports the automation-augmentation paradox described by S.Raisch and S.Krakowski. Firms should determine which tasks are appropriate for automation and which require AI to augment human capabilities.

The mechanism identified in this study can be expressed as follows: AI tool → process change → intermediate outcome → management efficiency → economic outcome. This mechanism avoids the simplistic assumption that technology adoption itself produces efficiency. AI affects final outcomes by changing business processes; if the process remains unchanged, the use of a technological tool alone may not generate a significant economic benefit.



Figure 2. Mechanism linking AI tool adoption to economic outcomes via process change, intermediate outcomes, and management efficiency.

A phased adoption model for small businesses in Uzbekistan. The principal practical contribution of the study is the proposed seven stage AI-SAMARA model for small businesses in Uzbekistan. The framework comprises eight conceptual components organised into seven operational stages, with development and adaptive monitoring integrated into the final stage:

- A–Audit;
- I–Infrastructure and data preparation;
- S–Small-scale pilot;
- A–Analytical assessment;
- M–Management of accountability and risk;
- A–Applied integration;
- R–Reinforcement and development
- A–Adaptive monitoring.

Table 5. Stages and outcomes of the AI-SAMARA model

Stage	Principal activity	Output	Criterion for continuation
Audit	Identify the problem and process	Pilot-task specification	Problem is clear and measurable
Infrastructure	Assess data and technical capacity	Readiness assessment	Sufficient lawfully usable data are available
Pilot	Conduct a limited pilot	Initial practical outcome	Process operates consistently
Analytical assessment	Compare pre- and post-adoption results	Efficiency report	Benefits exceed costs and risks
Accountability	Define rules and human oversight	Internal AI policy	Responsibilities are clearly allocated
Integration	Connect AI to existing systems	Stable workflow	Repetitive operations are reduced
Development and monitoring	Extend scope and monitor outcomes	Updated AI capability	Outcomes remain stable and risks are controlled

The model does not require a small enterprise to make a large initial investment or develop complex AI infrastructure. At every stage, a firm can assess results and risks before deciding whether to proceed or discontinue the project.

The theoretical contribution lies in integrating the TOE framework, AI capability, and the automation-augmentation approach within a single conceptual system. This integration explains the relationship between the conditions of AI adoption, mechanisms of use, and management outcomes. Existing studies often treat AI adoption as an independent variable and firm productivity as the final outcome. This article introduces AI readiness, AI capability, intensity of use, process change, and human oversight as mediating and moderating factors. The proposed model requires subsequent empirical testing among small businesses in Uzbekistan to strengthen its scientific validity.

5. Conclusion

This study analysed the potential influence of AI technologies on management efficiency in small businesses using international empirical evidence, theoretical perspectives, and official statistics from Uzbekistan. The findings indicate that AI offers substantial opportunities, but its conversion into practical outcomes depends on technological, organisational, human, and institutional conditions.

AI can affect management efficiency primarily by reducing the time required for repetitive tasks, increasing output per employee, accelerating responses to customers, and lowering information-processing costs. International studies report a 40 per cent reduction in time spent on professional writing tasks, an 18 per cent improvement in output quality, and an average 15 per cent increase in customer-service productivity. These are international indicators of potential effects, not results achieved by small businesses in Uzbekistan. The impact of AI depends on task characteristics. Standardised, repetitive, data-based, and measurable tasks are comparatively suitable for automation, whereas strategic, non-standard, legally consequential, or ethically sensitive decisions should remain under human oversight. International empirical findings cannot be transferred directly to Uzbekistan. Firm size, sector, task type, Uzbek-language technological capacity, data quality, employee skills, and the institutional environment must all be considered. The article therefore proposes an outcome-condition-constraint principle for assessing transferability. For small businesses in Uzbekistan, phased adoption is preferable to immediate large-scale implementation. The process should begin with problem identification and data preparation, continue through a small pilot and outcome measurement, and then proceed to risk management and gradual expansion. The AI-SAMARA model was developed on this basis. Overall, AI is not an independent or automatic driver of management efficiency in Uzbekistan's small businesses. It creates sustainable economic value only when integrated with existing resources and management systems, directed towards measurable tasks, and combined with human oversight.

The following policy and practice recommendations follow from the analysis:

the national statistical system should introduce indicators for the regular assessment of ai use among small businesses;

sector-specific ai readiness criteria should be developed for trade, services, manufacturing, agriculture, and logistics;

small-business support programmes should prioritise funding for measurable pilot projects rather than merely subsidising software purchases;

AI literacy programmes for entrepreneurs should cover data security, algorithmic bias, and human oversight.

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