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The Impact Of Applying Artificial Intelligence Techniques In Big Data Analysis On Reducing Costs. A Field Study On A Sample Of Companies In The Kurdistan Region Of Iraq

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Abstract: The purpose of this study is to check the effects of implementing Artificial Intelligence (AI) techniques in large data analysis on cost reduction within the telecom sector in the Kurdistan region of Iraq. Research focuses on four major AI techniques - machine learning, deep learning, natural language processing and expert systems - and their role in increasing operational efficiency, reducing expenses and supporting strategic financial decisions. Big data is emphasized as an analytical environment that enables effective integration of AI applications in cost management processes.

The population of the study included major telecommunications companies in the region, with a sample extracted from three major firms: Korek Telecom (Erbil, Duhok), Asia Cell (Sulaymaniyah), and Sard Fiber (Sulaymaniyah). Primary data was collected through the distribution of 130 questionnaires for finance, accounting and information management professionals. Of these, 122 reactions were received, and 117 were considered valid for analysis. The data was analyzed using statistical methods, including correlation and regression analysis, operational savings, administrative efficiency, labor productivity, future staging maintenance and risk mitigation to test the cost reduction related hypotheses.

Conclusions display a positive and statistically significant relationship between adopting AI techniques within large data environment and cost reduction in identified dimensions. Results indicate that telecom companies take advantage of AI-competent Big Data Analysis, receive more efficiency, low financial waste and customized resource allocation. The study recommends conclusions that the firms have strengthened their potential in AI-managed large data analysis to achieve permanent growth, long-term competition and better financial performance.

Keywords: Artificial intelligence, big data, reducing costs, AI techniques.

أثر تطبيق تقنيات الذكاء الاصطناعي في تحليل البيانات الضخمة على خفض التكاليف: دراسة ميدانية على عينة من الشركات في إقليم كردستان العراق

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المستخلص: تهدف هذه الدراسة إلى دراسة أثر تطبيق تقنيات الذكاء الاصطناعي في تحليل البيانات الضخمة على خفض التكاليف في قطاع الاتصالات في إقليم كردستان العراق. يركز البحث على أربع تقنيات رئيسية للذكاء الاصطناعي - التعلم الآلي، والتعلم العميق، ومعالجة اللغات الطبيعية، ونظم الخبراء - ودورها في تعزيز الكفاءة التشغيلية، وتقليل النفقات، ودعم القرارات المالية الاستراتيجية. وتُبرز البيانات الضخمة كبيئة تحليلية تُمكّن من التكامل الفعال لتطبيقات الذكاء الاصطناعي في عمليات إدارة التكاليف. تألف مجتمع الدراسة من كبرى شركات الاتصالات في المنطقة، مع عينة مأخوذة من ثلاث شركات رائدة: كورك تيليكوم (أربيل، دهوك)، وآسيا سيل (السليمانية)، وسارد فايبر (السليمانية). جُمعت البيانات الأولية من خلال توزيع ١٣٠ استبيانًا على متخصصين في المالية والمحاسبة وإدارة المعلومات. من بين هذه الاستبيانات، تم استلام ١٢٢ ردًا، واعتُبرت ١١٧ منها صالحة للتحليل. حُللت البيانات باستخدام أساليب إحصائية، بما في ذلك تحليل الارتباط والانحدار، لاختبار فرضيات تتعلق بخفض التكاليف عبر أبعاد مثل الوفورات التشغيلية، والكفاءة الإدارية، وإنتاجية العمالة، والصيانة التنبؤية، وتخفيف المخاطر. تُظهر النتائج وجود علاقة إيجابية ودالة إحصائيًا بين اعتماد تقنيات الذكاء الاصطناعي في بيئات البيانات الضخمة وخفض التكاليف عبر الأبعاد المحددة. وتشير النتائج إلى أن شركات الاتصالات التي تستفيد من تحليل البيانات الضخمة المدعوم بالذكاء الاصطناعي تحقق كفاءة أعلى، وتقلل الهدر المالي، وتُحسّن تخصيص الموارد. وتختتم الدراسة بتوصية الشركات بتعزيز قدراتها في تحليل البيانات الضخمة المدعوم بالذكاء الاصطناعي لتحقيق نمو مستدام، وتنافسية طويلة الأجل، وأداء مالي مُحسّن.

الكلمات المفتاحية: الذكاء الاصطناعي، البيانات الضخمة، خفض التكاليف، تقنيات الذكاء الاصطناعي.

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Introduction

In today's data-operated economy, organizations face increasing pressure to improve efficiency, decide and reduce costs. Global competition and economic instability have highlighted the boundaries of traditional cost management approaches, encouraging the adoption of more intelligent, technology-based systems. In this context, the integration of Artificial Intelligence (AI) techniques in Big Data Analytics has emerged as a strategic tool to improve efficiency and to achieve the cost minimalization.

AI technology is particularly capable of processing machine learning, deep learning, natural language processing, and expert systems-high-dimensional datasets, which enable real-time analysis, discrepancy detection and future modeling. When large data is applied within the environment, these tools allow firms to generate insight, reduce disruption and adapt resources with more accuracy (Zamani et al., 2023). Big data, volume, velocity, diversity, truth and value are characterized, such advanced equipment is required to convert raw information into worthy intelligence.

AI's practical applications from higher education, where the AI system streamlines system operations and strengthens the operations in budget (Martins, 2024), logistics and supply chains, where AI forecasts, inventory management and suppliers improve coordination (Shil et al., 2024; Islam et al, 2024). Despite these benefits, challenges such as data fragmentation, inter -related issues and privacy concerns are important. However, the firms are rapidly investing in A-Sanghak cost reduction strategies as the path of prolonged competition and financial stability.

Accordingly, this study examines the effects of implementing AI techniques - especially within a large data environment on machine learning, deep learning, natural language processing, and expert systems - a large data atmosphere on cost reduction in telecom companies in the Kurdistan region of Iraq. By generating empirical evidence, the study wants to provide practical guidance to further theoretical knowledge in technology-operated cost management and improve organizational efficiency.

1- Problem statement

Although Artificial Intelligence (AI) and Big Data Analytics are widely recognized for deciding, automation and future -stating analysis, limited research has examined their integrated use for cost reduction. Most existing studies emphasize general benefits or focus on productivity and service growth, while specific financial results of AI techniques - such as machine learning, deep learning, natural language processing and expert systems - Remane unwanted. As a result, organizations often invest heavy in digital technologies without obvious cost-saving objectives or average performance indicators, leaving opportunities to reduce inefficient implementation and expenditure. This difference is particularly evident in developing economies, where the absence of fragmented infrastructure and structured evaluation structure restricts the ability to measure financial returns from AI investments. Some empirical studies suggest how AI technology operates within the large data environment of the real world to support cost control, budget and resource adaptation. Accordingly, the problem addressed in this study lacks educational and practical understanding of how AI techniques can be effectively applied in large data contexts to reduce operations and financial costs. Filling this difference will provide an evidence-based structure to guide organizations in availing AI for cost efficiency and permanent performance**.**

2- Objectives of the Study

The main objective:

To examine the effects of AI techniques - within large data analysis when the matching learning, deep learning, natural language processing, and expert systems - within large data analysis on reducing operations and financial costs.

Specific objective:

A. Evaluate how AI increases big data for real-time, cost-skilled decisions.
B. Identify mechanisms connecting AI-operated analytics to cost reduction.
C. Test the relationship between AI -BIG data system and cost indicators.
D. Analyze important challenges in adopting AI for cost management.

3- Significance of the study

This study is important because it bridges the gap between emerging technologies and cost management practices by examining the role of AI techniques - learning, deep learning, natural language processing and expert systems - within large data environment. While organizations rely on a rapidly large-scale data, limited research has discovered how AI-operated analytics directly contribute to cost reduction and financial efficiency.
From an academic point of view, the study enriches existing literature by providing empirical evidence and a theoretical structure that combines A-S) data analysis with cost adaptation, leading to the understanding of mechanisms and relationships in the region.
At the practical level, findings provide insight to managers, IT professionals and policy makers who seek AI to integrate in cost management systems. By highlighting both profit and implementation challenges, study provides action to increase efficiency, reduce waste and design strategies that improve financial performance in modern organizations.

4- Hypothesis of the study:

Main hypothesis(H_1):

There is a statistically significant relationship between the application of AI techniques amidst large data analysis in organizations in the Kurdistan region of Iraq and cost reduction in organizations.

Sub-hypotheses:

H_1.1: Machine learning has a significant impact on cost reduction.
H_1.2: Deep learning has a significant impact on cost reduction.

H_1.3: Natural language processing (NLP) has a significant impact on cost reduction.
H_1.4: Expert systems have significant impact on cost reduction.

5- scope of the study

The study focuses on four AI techniques - Matchin Learning, Deep Learning, Natural Language Processing and Expert System - and their role in reducing costs when implemented within large data environment. While these methods are examined due to their documented relevance and practical application in data-intensive contexts, other technologies such as robotics and computer vision scope come out. big data dimensions are addressed through well -established "five vs.": without expanding in volume, velocity, variety, veracity, and value, governance, morality, or comprehensive issues of compliance.
The study adopts a quantitative approach, using a structured questionnaire distributed to professionals in methods management, accounting, finance and information systems. The sample is limited to selected telecommunications and data-intensive organizations in the Kurdistan region, which makes conclusions reference-specific rather than normal. By maintaining these boundaries, the research ensures the analysis and alignment centered with its primary purpose to connect AI-operated large data analytics with cost reduction.

6- Limitation of the study

This study is subject to many limitations. First of all, it depends on a quantitative, cross-sectional design using the structured questionnaire, which allows for generalization but does not capture deep organizational or cultural factors. Qualitative methods such as interviews or case studies were excluded, limiting the discovery of human and managerial effects on AI adoption.
Second, research is geographically limited to telecom organizations in the Kurdistan region, which limits the generality of conclusions for other industries or global contexts. The scope is also focused on only four AI techniques - machine learning, deep learning, natural language processing, and expert systems - while excluding others such as learning reinforcement or robotic process automation. Finally, dependence on self-reported data may introduce response bias, and cross-sectional design is not responsible for the long-term effects of AI adoption. Future research should consider to provide deep insight on mixed methods, comprehensive AI applications and longitudinal studies.

7- Model Structure

The structure model of the dissertation model component is as follows:

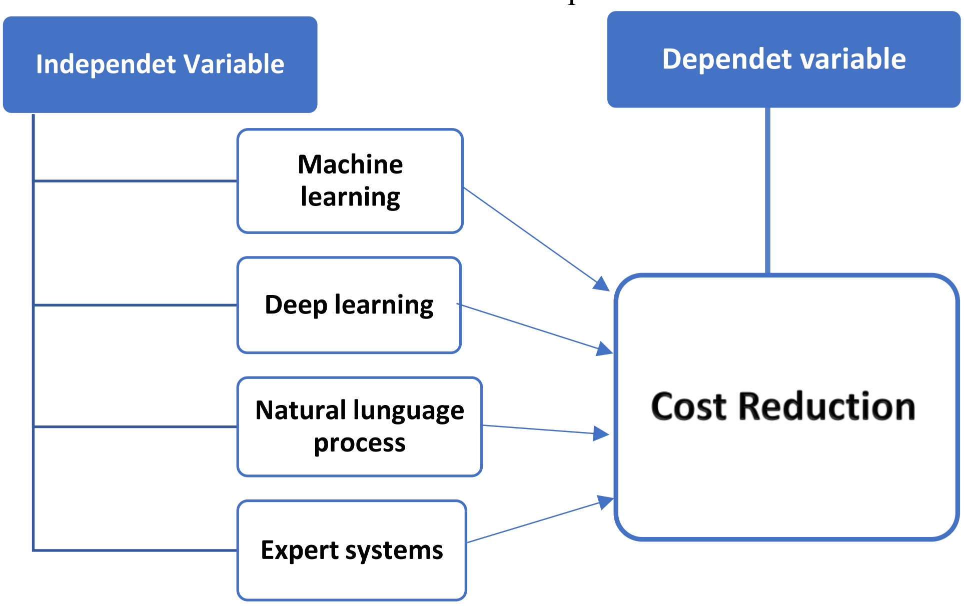

***Diagram (1)**: Model Structure*

1st: Theoretical Framework

1- Artificial Intelligence (AI) Techniques

A. Definition and Concept of AI Techniques

Artificial Intelligence (AI) techniques have been defined as computational methods designed to simulate human cognitive abilities such as learning, logic and decision making in complex data environment. Broadly, AI is a branch of computer science that develops intelligent systems capable of identifying modeling data, patterns, and automation of decision processes, especially in data-intensive areas such as finance, accounting and auditing (Barja-Martinez et al., 2021). These systems function autonomously with minimal human inputs, enable real -time analytics, discrepancy detection and operational automation that enhance efficiency and accuracy (OECD, 2021).

From a technical point of view, AI Machine, including learning, deep learning, natural language processing and expert systems, enables the analysis of large, diverse datasets simultaneously where traditional methods often fail (Omitaomu & Niu, 2021). Beyond being a technical equipment, AI is rapidly recognized as a strategic economic resource that supports cost reduction, fraud detection and financial forecast (Cao, 2021; Milana & Ashta, 2021). By improving reliability, adaptability and decision making, AI replaces accounting and financial systems, offering both immediate automation benefits and long -term competitive benefits.

B. Types of Artificial Intelligence Techniques

Machine Learning (ML): ML enables the system to detect patterns, detect predictions and improve performance without clear programming. This includes supervised, unsafe and reinforcement learning approaches (Milana & Ashta, 2021). In Big Data Analytics, ML is detected for functions such as forecast, classification, and fraud prevention, credit scoring and budget forecast. By automating decision making, ML reduces human error, strengthens financial integrity, and increases cost control (Barja-Martinez et al., 2021; Ismanov et al., 2024).

Deep Learning (DL): DL, a branch of ML, appoints the nerve network to capture complex data patterns. It is widely used in image, speech and text analysis (Zhou et al., 2021). Among large data contexts, future maintenance, discrepancy detection and time-series support using DL CNN and LSTM (Barja-Martinez et al., 2021; Omitaomu & Niu, 2021). In finance and accounting, it improves reporting, forecasting and fraud detection, thus reducing costs despite high computational demands (Cao, 2021).

Natural Language Processing (NLP): NLP allows machines to process and interpret human language using ML and DL methods. It structures unstable texts (Cao, 2021) such as reports and contracts for analysis. In large data, NLP AIDS compliance monitoring, document classification and condensation. In accounting, it automatically makes reporting, detects discrepancies, and removes ESG signals, saves time and improves accuracy (Zhou et al., 2021; Milana & Ashta, 2021).

Expert system: Expert system repeats human expertise through rules-based arguments. They increase auditing, tax planning and financial reporting by ensuring stability and transparency (Milana & Ashta, 2021; Duan, Edwards & Xu, 2021). In large data, they support compliance, preventive maintenance, and discrepancy detection, despite challenges in updating the knowledge offers reliable decision -making structures (Mostafa et al., 2022; Almanasra, 2024; Paramesha et al., 2024).

C. Big Data

(1) Concept and Definition of Big Data Analysis

(A) Big data analysis is a systematic process of gathering, managing and checking very large and complex datasets to highlight hidden patterns, correlations and insights that support decision making and improve organizational performance. As the data increases in the data scale, speed and diversity, traditional processing methods have proved inadequate, leading to advanced analytics techniques (Hashem et al., 2015). big data is usually described through "4VS" -volume, velocity, variety, and value-which exposes its magnitude, nature of real -time, diverse formats and ability to generate actionable knowledge. Subsequent studies introduced a fifth dimension, truth, data to make reliable decisions, emphasizing data reliability and quality (Wamba et al., 2017).

(B) The scholars noted that while the definitions vary depending on technical, managerial or strategic approaches, all agree that large data requires strong analytical infrastructure to generate price (Mikalef et al., 2018; Zhou et al., 2021). Its applications extend to auditing, risk assessment, performance monitoring and project management, where it complements traditional methods and enhances the quality of decisions (Yun et al., 2020; Wang & Wang, 2020). Collectively, literature underlines that Big Data is not only about the data size, but also to convert information into strategic value, forecast capacity and durable competitive advantage.

(C) Characteristics of Big Data

- The characteristics of big data are often described through multidimensional outlines that capture its complexity and strategic importance in the digital environment. One of the most quoted models identifies 4Vs: represents a huge amount of data generated from volumes, sensors, transactions and online platforms; The velocity, the speed with which the data is made and processed; Wide range of variety, structured, semi-composed and unnecessary forms; And value, ability to achieve actionable insights for better performance (Hashem et al., 2015).
- To address the issues of credibility, scholars later introduced the 5V model, which adds truth to the data accuracy and trustworthiness, it is important to make informed decisions (Wamba et al., 2017). Some studies have carried on the framework further, proposing up to seven dimensions, adding variability, which captures the dynamic and incompatible nature of data flow, and visualization, emphasizes devices that convert complex datasets into meaningful outputs for decision support (Mikalef et al., 2018). Together, these framework highlights that Big Data is not only a technical phenomenon, but also a strategic resource, which supports effectively managed efficiency, innovation and competitive advantage (Maroufkhani et al., 2020).

D. Reducing Cost

(1) Definition and Conceptual Framework of Cost Reduction through Artificial Intelligence

Through Artificial Intelligence (AI), cost reduction in cost reduction efficiency, resource usage and strategic decision making refers to the application of intelligent algorithms, future stating systems and automation tools to reduce direct and indirect expenses. AI downtime, material reduces waste and energy consumption, reducing both operating costs and capital expenditure (Elahi, 2023; Gaspar, 2018). Intel reported a reduction of 70% in overhead tests by adopting the AI-based verification systems, demonstrating its transformative effects on industrial cost structures. From a strategic financial perspective, AI enables firms to maximize maximum returns on investment allocation, workload adaptation, and discrepancy, especially in cloud and IT service environment (Infosys, 2025; Halli & Olaoye, 2025). Small and medium enterprises also benefit from scalable AI applications that reduce IT costs and adapt to resource distribution (Pasham, 2017; Murthy, 2020). In supply chains, AI increases forecasting, inventory management and logistics, transportation reduces disabilities and improves accounting accuracy (Pant et al., 2024). Applications in agriculture and energy management equally reduce waste and improve long -term stability (Ben Ayad & Hanana, 2021; Jaber, 2023).

Overall, AI-powered cost reduction is a multidimensional framework that redefines the traditional cost structures. By integrating smart technologies in accounting, finance and operation, organizations get more financial transparency, efficiency and competition.

(2) Cost Reduction and Organizational Performance

Cost reduction is important for financial stability, competition and stability. This margin, improves cash flow, and returns to investment by reducing production and administrative costs, strengthening budgetary control (Günther et al., 2017; Wang et al., 2020). Beyond financial advantage, savings aid technology adopts, supply chain efficiency, and workforce development, which enhances productivity and quality of service (Kache & Seuring, 2017; Moll & Yigitbasioglu, 2019). However, excessive cuts in areas such as R&D or talent can weaken innovation and long -term competition (Bibri, 2021). A balanced, strategic approach ensures that cost reduction is both profitability and permanent growth.

2nd: Empirical Analysis of Study Variables

The study population consists of the major telecommunications companies operating in the Kurdistan Region of Iraq. From this population, a research sample was drawn that included three leading companies: Korek Telecom (Erbil, Duhok), Asia Cell (Sulaymaniyah), and Sard Fiber (Sulaymaniyah). This sample provides an appropriate framework that reflects the reality of the study population. The process of distributing and collecting questionnaires ensured the availability of valid data for statistical analysis and for testing the proposed hypotheses.
In total, 130 questionnaires were distributed, of which 122 were returned, and after screening and validation, 117 questionnaires were deemed usable for analysis. The proportional distribution of responses was 40% from Korek Telecom, 35% from Asia Cell, and 25% from Sard Fiber, which strengthens the representativeness of the sample and provides balanced insights from professionals across different organizations and geographic locations within the region. The details are presented in Table 1.

Table (1): Distribution of Questionnaires (Distributed, Returned, and Valid for Analysis)

Company	Location(s)	Distributed	Returned	Valid for Analysis	Percentage
Korek Telecom	Erbil, Duhok	50	49	47	40%
Asia Cell	Sulaymaniyah	45	43	41	35%
Sard Fiber	Sulaymaniyah	35	30	29	25%
Total	-------	130	122	117	100%

The analyses presented within this chapter are organized to progress from initial descriptive analyses to more complex inferential analyses. As a first step, descriptive and demographic statistics are provided, offering a snapshot of the study's sample, such as the respondents' credentials, roles, and level of professional experience. This allows an understanding of the degree to which the sample is representative and allows for analyses to proceed. Second, the variables and dimensions of interest in the study are measured. Construct validity is evaluated using appropriate statistical analyses, and scale reliability is assessed by calculating Cronbach's Alpha coefficients. This ensures the reliability and validity of the adopted scales in measuring the intended constructions. Third, data distribution is assessed for normality via the Kolmogorov–Smirnov test to ascertain the validity of applying parametric statistics on the dataset. Normality is a prerequisite for accurately testing relationships among variables' hypotheses. Finally, hypothesis testing is conducted where relationships and causal effects between the independent, mediating, and dependent variables are explored. These tests enable an empirical assessment of the proposed conceptual model as well as some implications on the influence of the use of artificial intelligence methods in big data analysis on lowering costs within organizations in the Kurdistan Region of Iraq.

1- Descriptive and Demographic Statistics

This section provides descriptive, demographic sample information that is important to understand the context of study respondents and to ensure the validity of the later statistical analyses. Tables 1-3 depict the descriptive statistics of the participants' educational background, job title, and years of service. This information not only demonstrates the variation in the sample, but it also speaks to the relevance of the sample to the research aims. Through a discussion of these demographic aspects, the study lays a foundation from which the data is to be considered reliable and valid, which aids in interpreting the results later.

A. Educational Qualification

As part of the demographic analysis of the study sample, the respondents' educational qualifications were examined to provide an overview of their academic background. This information is important for understanding the level of knowledge and expertise represented in the group surveyed, as shown in Table 2.

Table (2): Distribution of Respondents by Educational Qualification

Educational Qualification	Frequency	Percent
Diploma	20	17.09%
Bachelor's Degree	81	69.23%
High Diploma	2	1.71%
Master's Degree	14	11.97%
Total	117	100%

Table 2 shows the distribution of respondents according to their educational qualifications. The findings reveal that many participants (69.23%) hold a bachelor's degree, followed by 17.09% with a diploma, 11.97% with a master's degree, and only 1.71% with a high diploma. This indicates that the sample is largely composed of academically qualified individuals, with undergraduate degrees forming the largest share.

B. Current Job Title

Respondents' current job titles were also used in a basic demographic analysis to explore which types of professionals were included in the sample collected. The distribution of positions helps us to understand what functional roles were being played by participants and how they relate to accounting and financial functions. These findings are summarized in Table 3.

Table (3): Distribution of Respondents by Current Job Title

Current Job Title	Frequency	Percent
Audit Manager	9	7.69%
Finance Manager	10	8.55%
Accountant	83	70.94%
Auditor	15	12.82%
Total	117	100%

Table 3 presents the distribution of respondents according to their current job title. The results indicate that most participants (70.94%) are Accountants, followed by 12.82% working as Auditors, 8.55% as Finance Managers, and 7.69% as Audit Managers. This shows that the sample is predominantly composed of accounting professionals who are directly engaged in financial reporting, analysis, and cost-related practices.

C. Years of Service in the Organization

To assess the professional experience of the study sample, the respondents were asked about their years of service in the organization. This variable is significant as it reflects the depth of practical knowledge and stability of the employees, which may influence their ability to evaluate the role of artificial intelligence techniques in cost reduction. Table 4 presents the distribution of responses.

Table (4): Distribution of Respondents by Years of Service in the Organization

Years of Service in the Organization	Frequency	Percent
Less than 5 years	39	33.33%
6-10 years	36	30.77%
11-15 years	20	17.09%
More than 15 years	22	18.80%
Total	117	100%

Table 4 shows that 33.33% of the respondents have served for less than 5 years, while 30.77% reported between 6–10 years of service. Additionally, 17.09% have 11–15 years of experience, and 18.80% have been in their organizations for more than 15 years. These results suggest that the sample includes both relatively new employees and highly experienced professionals, providing a balanced view across different levels of expertise.

2. Measurement of Study Variables

How exactly to measure the variables of interest for each of the empirical studies poses a more serious question of validity and credibility. In the current study, all constructions were assessed on a five-point Likert scale from strongly disagree (1) to strongly agree (5). Questionnaire items were solicited from existing literature as well as adapted and developed based on the aims of the research and organizational situation within the Kurdistan Region of Iraq.

A. Measurement of the Independent Variable

The independent variable of this study, Artificial Intelligence Techniques in Big Data Analysis, was measured through four dimensions: Machine Learning (ML), Deep Learning (DL), Natural Language Processing (NLP), and Expert Systems (ES). Each dimension consisted of four items evaluated on a five-point Likert scale.

Table (5): Measurement of the Independent Variable (Artificial Intelligence Techniques in Big Data Analysis)

No.	Item	Mean	CV	S. D.	Percent
	Dimension One: Machine Learning				
X1	Machine learning helps organizations find hidden patterns in large datasets, which can reduce unnecessary spending and improve cost management.	3.8718	22.89%	0.88608	77.44%
X2	Machine learning analyzes past data to make accurate predictions about future events, such as equipment failures or market trends, helping organizations reduce unexpected costs and plan better.	3.9487	21.25%	0.83919	78.97%
X3	Machine learning reduces manual errors by automating data analysis and decision-making, saving both time and money.	4.1538	21.35%	0.88683	83.08%
X4	Machine learning improves the way resources are used by suggesting efficient ways to reduce waste and increase productivity.	4.2222	14.62%	0.61744	84.44%
	Average of Dimension One	4.0491	19.94%	0.8074	80.98%
	Dimension Two: Deep Learning				
X5	Deep learning helps analyze large and complex data (such as images or time-series data) to identify patterns that improve decision-making and reduce costs.	4.1538	15.03%	0.62444	83.08%

X6	Deep learning can predict problems, such as equipment failures or system breakdowns, before they happen, which saves maintenance costs and time.	4.0171	21.18%	0.85079	80.34%
X7	Deep learning improves the accuracy of forecasting and planning by analyzing large amounts of historical and real-time data.	4.1197	15.67%	0.64544	82.39%
X8	Deep learning automates complex data analysis tasks, reducing the need for manual work and increasing operational efficiency.	4.1709	17.33%	0.72267	83.42%
	Average of Dimension Two	4.1154	17.27%	0.7108	82.31%
	Dimension Three: Natural Language Process				
X9	NLP helps read and understand long documents quickly, which saves time and reduces review costs.	4.0940	17.56%	0.71899	81.88%
X10	NLP finds key information (such as important terms or mistakes) in reports or contracts, making the review process easier and more accurate.	4.1026	16.13%	0.66156	82.05%
X11	NLP turns unstructured data (like emails or customer feedback) into useful insights that help in better decision-making.	4.1453	19.08%	0.79073	82.91%
X12	NLP reduces the need for manual work by automatically creating summaries, reports, or document classifications.	4.0513	20.46%	0.82886	81.03%
	Average of Dimension Three	4.0983	18.30%	0.7500	81.97%
	Dimension Four: Expert System				
X13	Expert systems provide solutions like those of a human expert, which help improve decision-making and reduce errors.	4.0256	18.58%	0.74812	80.51%
X14	Expert systems are useful for checking financial or operational processes to avoid unnecessary costs.	4.0256	22.47%	0.90460	80.51%
X15	Expert systems save time by handling tasks that would normally require experienced staff, such as audits or compliance checks.	4.2650	16.69%	0.71188	85.30%
X16	Expert systems make decisions based on clear rules, which ensure consistent and reliable results	4.1624	16.38%	0.68175	83.25%
	Average of Dimension Four	4.1197	18.49%	0.7616	82.39%
	Average of the Independent Variable	4.0956	18.50%	0.7575	81.91%

Descriptive statistics for items and dimensions, means, standard deviations (S. D.), coefficients of variation (CV), and relative percentages are summarized in Table 5. This was supported by an overall mean of 4.0956, a standard deviation of 0.7575, a coefficient of variation of 18.50%, and a relative weight of 81.91%, which indicates that, overall, the sample holds a favorable opinion on the use of AI technologies for big data analytics. The relatively low CV value reflects a good level of homogeneity in respondents' views, reinforcing the reliability of the results. This value is also higher than the neutral point of 3.0 on the Likert scale, indicating that respondents tended to agree with the positive impact that AI has on organizations' overall efficiency and cost reduction.

Machine Learning (ML): The average mean was 4.0491 with a relative weight of 80.98% and a CV of 19.94%. This reflects respondents' agreement that ML contributes to uncovering hidden patterns, improving predictions, reducing errors, and optimizing resource utilization. Although the CV is slightly higher compared to other dimensions, it still indicates an acceptable degree of consistency among participants. Deep Learning (DL): The average mean was 4.1154, the relative weight reached 82.31%, and the CV was 17.27%, indicating strong recognition of DL's role in analyzing complex data, predicting failures, and enhancing forecasting accuracy. The relatively low CV demonstrates greater agreement among respondents on the effectiveness of DL. Natural Language Processing (NLP): The mean score was 4.0983, the relative weight was 81.97%, and the CV stood at 18.30%, showing respondents' belief that NLP improves efficiency by extracting key information, processing unstructured data, and reducing manual review efforts. The moderate CV confirms a stable level of agreement with some natural variation in opinions regarding NLP's impact.

Expert Systems (ES): This dimension recorded the highest perception with an average mean of 4.1197, a relative weight of 82.39%, and a CV of 18.49%. Respondents agreed that expert systems provide reliable and consistent decision support, reduce errors, and save time by automating expert-level tasks. The C.V. value suggests a high degree of consistency in respondents' views toward this dimension.

B. Measurement of the Dependent Variable

The dependent variable of this study, Cost Reduction, was measured using sixteen items that capture multiple dimensions of operational and financial efficiency resulting from the application of artificial intelligence in big data analysis. The items addressed areas such as operational costs, labor expenses, budgeting accuracy, resource allocation, supply chain management, and long-term financial sustainability.

Table (6): Measurement of the Independent Variable (Reducing costs)

No.	Item	Mean	CV	S. D.	Percent
Y1	The use of AI techniques in big data analysis has significantly reduced operational costs by increasing efficiency and removing unnecessary processes.	3.8462	26.58%	1.02230	76.92%
Y2	AI-driven automation has lowered labor costs by replacing repetitive and time-consuming manual tasks.	3.8803	26.89%	1.04355	77.61%
Y3	AI tools have improved the accuracy of budgeting and reduced unexpected financial errors.	4.0000	23.21%	0.92848	80.00%
Y4	Big data insights generated through AI are effectively used to control and reduce costs in production or service delivery.	3.9658	23.63%	0.93709	79.32%
Y5	AI techniques, such as machine learning and expert systems, have improved the planning and allocation of financial resources.	4.1795	17.94%	0.74989	83.59%
Y6	The application of AI in administrative and reporting tasks has reduced overhead costs and manual processing efforts.	4.0940	17.85%	0.73088	81.88%
Y7	Real-time data analysis with AI helps detect and eliminate unnecessary expenses quickly across departments.	4.1795	18.22%	0.76130	83.59%
Y8	AI-powered forecasting tools prevent overspending by accurately predicting future requirements for resources and materials.	4.0940	17.27%	0.70690	81.88%
Y9	AI applications have reduced maintenance expenses by identifying equipment issues before they become costly.	4.0684	21.82%	0.88791	81.37%
Y10	AI-based systems have optimized inventory management, which has lowered storage and stock handling costs.	4.0684	21.10%	0.85829	81.37%
Y11	AI solutions have improved supply chain efficiency, reducing transportation and logistics expenses.	4.0171	25.10%	1.00844	80.34%
Y12	AI-based analysis has minimized energy consumption costs by improving operational efficiency.	4.0000	27.07%	1.08278	80.00%
Y13	AI tools help detect and prevent fraud or financial errors, reducing unnecessary financial losses.	4.1026	22.49%	0.92275	82.05%
Y14	AI and big data analysis have created sustainable cost-saving strategies that improve long-term financial performance.	4.0000	26.67%	1.06674	80.00%
Y15	AI applications have enhanced financial efficiency by improving planning and resource management.	4.0684	22.53%	0.91658	81.37%
Y16	The overall use of AI techniques in big data analysis has led to measurable reductions in total company expenses.	3.9658	25.42%	1.00800	79.32%
	Average of the Independent Variable	4.0331	22.67%	0.9145	80.66%

Table 6 summarizes the descriptive statistics for each item, including the mean, standard deviation, CV, and relative percentage. The overall results indicate a strong agreement among respondents on the positive role of AI in reducing costs, as reflected by the total mean of 4.0331, a standard deviation of 0.9145, a CV of 22.67%, and a relative weight of 80.66%. This demonstrates that the participants perceive AI applications as highly effective in improving efficiency and lowering expenses across multiple organizational areas. The relatively moderate CV suggests an acceptable level of variation in opinions, while still reflecting overall consistency and reliability in responses.

Operational and Administrative Costs: Items Y1, Y2, and Y6 recorded means between 3.84 and 4.09, with C.V. values ranging from 17.85% to 26.89%. This indicates that respondents acknowledged AI's role in reducing operational overhead, automating routine tasks, and improving administrative efficiency. The higher CV in Y1 and Y2 suggests slightly more dispersed views on cost reduction through automation, while Y6 showed greater consensus. Financial Accuracy and Planning: Items Y3, Y5, and Y8 scored relatively high (means between 4.00 and 4.18) with CV values between 17.27% and 23.21%, suggesting that AI contributes to more accurate budgeting, resource allocation, and forecasting. The relatively lower CV values here demonstrate a stronger agreement among participants on the financial accuracy benefits of AI. Maintenance, Inventory, and Supply Chain Efficiency: Items Y9–Y11 highlighted the contribution of AI to reducing maintenance costs, optimizing inventory management, and enhancing supply chain operations, with means above 4.00 and CV values between 21.10% and 25.10%. These results show that while agreement was generally strong, respondents expressed slightly more diverse views on the extent of these benefits, reflecting variability in organizational contexts.

Energy Consumption and Fraud Prevention: Items Y12 and Y13 showed means of 4.00 and 4.10 with CV values of 27.07% and 22.49%, respectively. While agreement remains positive, the higher CV for Y12 indicates that perceptions about AI's role in minimizing energy costs were more varied, likely due to differences in technological adoption across companies. Fraud prevention (Y13), however, showed more stable agreement. Sustainability and Long-term Performance: Items Y14–Y16 emphasized AI's role in promoting sustainable cost-saving strategies and reducing overall company expenses, with average responses around 4.00 and CV values between 22.53% and 26.67%. These relatively higher CV levels reflect a wider diversity of opinions regarding the long-term strategic role of AI in financial sustainability.

Overall, the descriptive analysis confirms that big AI-based data techniques are widely recognized as powerful enablers of cost reduction. The consistently high means across items, combined with CV values mostly within the acceptable range (< 30%), indicate both strong agreement and reasonable homogeneity among respondents' views. This reinforces the conclusion that AI adoption significantly reduces waste, enhances efficiency, and contributes to the long-term financial performance of organizations. The measurement of the study variables provided a comprehensive overview of the perceptions of respondents toward the application of artificial intelligence techniques in big data analysis and their impact on cost reduction. The independent variable, Artificial Intelligence Techniques in Big Data Analysis, recorded an overall mean of 4.0956 with a relative weight of 81.91% and a CV of 18.50%, reflecting a strong consensus among participants regarding the effectiveness of AI tools, particularly expert systems and deep learning, in enhancing decision-making, reducing errors, and improving operational efficiency.

Similarly, the dependent variable, Cost Reduction, achieved an overall mean of 4.0331, a relative weight of 80.66%, and a CV of 22.67%, indicating that respondents perceived AI applications as significant contributors to lowering operational, financial, and administrative expenses. The balance between means and CV values demonstrates both favorable perceptions and acceptable consistency levels across responses. The high averages across items related to budgeting accuracy, maintenance reduction, inventory optimization, and fraud prevention reinforce the view that AI adoption plays a crucial role in strengthening cost efficiency and sustainability within organizations.

3. Reliability Statistics of Study Variables

To ensure the internal consistency of the measurement instruments, Cronbach's Alpha coefficients (α) were calculated for each of the study variables. Cronbach's Alpha is widely used to assess the reliability of multi-item scales, with values above 0.70 indicating acceptable reliability, values above 0.80 reflecting good reliability, and values above 0.90 considered excellent.

Table (7): Reliability Statistics of Study Variables

Variable	Cronbach's Alpha	N of Items
Artificial Intelligence Techniques in Big Data Analysis	0.917	16
Cost Reduction	0.959	16
All Variables	0.969	32

As can be seen in Table 7, all constructions yielded very high reliability coefficients. While the overall α was 0.917, which is indicative of excellent internal consistency and reliability, the independent variable Artificial Intelligence Techniques in Big Data Analysis consists of four dimensions: Machine Learning, Deep Learning, NLP, and Expert Systems. Also, the dependent variable, Cost Reduction, exhibited a very high level of reliability with an (α) of 0.959, demonstrating that the 16 items comprising this variable all cohere in their measurement of construction. In addition, the overall Cronbach alpha for the present variables was 0.969, indicating excellent reliability of the measurement scale. This shows that the instruments that have been adopted are valid and reliable, ensuring that the following analysis of statistics and testing of hypotheses are accurate.

A. Normality Test Using Kolmogorov–Smirnov (K–S) Test

Before proceeding to hypothesis testing, it was necessary to assess whether the study variables follow a normal distribution, as this assumption underpins the use of parametric statistical techniques. The Kolmogorov–Smirnov (K–S) test was applied to the independent variable (Artificial Intelligence Techniques in Big Data Analysis), its four dimensions, and the dependent variable (Cost Reduction). The results are presented in Table 8.

Table (8): Kolmogorov–Smirnov Test Results for Normal Distribution

Variable or Dimension	Statistic	p-value	Critical Value
Artificial Intelligence Techniques in Big Data Analysis	0.177	0.001	0.126
Machine Learning	0.281	0.000	0.126
Deep Learning	0.189	0.000	0.126
Natural Language Process	0.256	0.000	0.126
Expert System	0.211	0.000	0.126
Cost Reduction	0.242	0.000	0.126

The results in Table 8 indicate that for all variables and dimensions, the K–S test was statistically significant ($p < 0.05$). This means that the null hypothesis of normality is rejected, and the distributions deviate from a perfectly normal distribution. Although the critical values are exceeded in each case, such findings are not uncommon in studies involving social sciences and Likert-scale data. Importantly, given the relatively large sample size ($n = 117$), minor deviations from normality are unlikely to severely affect the validity of parametric tests due to the robustness of these methods under the Central Limit Theorem. Therefore, despite the significant K–S results, the data were deemed appropriate for proceeding with parametric analyses such as correlation and regression.

B. Study Hypothesis Test

Following the assessment of the descriptive statistics, measurement reliability, construct validity, and normal distribution, the study proceeded to the testing of its hypotheses. The purpose of this stage is to provide empirical evidence regarding the relationships and effects between the independent variable (Artificial Intelligence Techniques in Big Data Analysis) and the dependent variable (Cost Reduction). To illustrate the hypothesized relationships, the independent variable (Artificial Intelligence Techniques in Big Data Analysis) and its four dimensions (Machine Learning, Deep Learning, Natural Language Processing, and Expert Systems) are positioned on the left side of the model, while the dependent variable (Cost Reduction) is presented on the right. The arrows indicate both the direct relationship between the independent and dependent variables, as well as the individual effects of each dimension of the independent variable on the dependent variable.

Main Hypothesis (H1): There is a statistically significant relationship and effect between Artificial Intelligence Techniques in Big Data Analysis and Cost Reduction in organizations operating in the Kurdistan Region of Iraq.

The results are presented in Table 9.

Table (9): Simple Linear Regression for the Main Hypothesis

Cost Reduction	Constant	Slope	t-value	p-value	F	p-value	R	R^2
Artificial Intelligence Techniques in Big Data Analysis	-1.217	1.282	22.354	< 0.001	499.69	< 0.001	0.902	0.813

The findings in Table 9 indicate that the regression model is highly significant, as reflected by an F-value of 499.69 with a corresponding p-value < 0.001. This confirms that the independent variable (Artificial Intelligence Techniques in Big Data Analysis) has a statistically significant impact on the dependent variable (Cost Reduction). The model's explanatory power is particularly strong, with a coefficient of determination ($R^2 = 0.813$), meaning that approximately 81.3% of the variation in cost reduction can be explained by the adoption of AI techniques. The regression coefficient (slope = 1.282) is positive and highly significant ($t = 22.354$, $p < 0.001$), suggesting that every unit increase in the application of AI techniques contributes to a substantial improvement in cost reduction outcomes. The negative constant (–1.217), while statistically less relevant, simply reflects the baseline intercept when AI adoption is absent, and does not diminish the strong positive effect of the independent variable. From an accounting perspective, these results provide compelling evidence that integrating artificial intelligence into big data analysis leads to measurable financial benefits. Organizations that actively implement AI in forecasting, resource allocation, fraud detection, and operational efficiency can achieve considerable reductions in both direct and indirect costs. This supports the argument that AI applications are not merely technological advancements, but strategic tools for enhancing financial performance and ensuring sustainable cost management in the telecommunications sector of the Kurdistan Region.

Sub-Hypotheses: H1a: There is a statistically significant relationship and effect between Machine Learning and Cost Reduction.

The first sub-hypothesis (H1a) proposed that "There is a statistically significant relationship and effect between Machine Learning and Cost Reduction." To test this relationship, a simple linear regression analysis was performed, and the results are summarized in Table 18.

Table (10): Simple Linear Regression for the Sub-Hypothesis (H1a)

Cost Reduction	Constant	Slope	t-value	p-value	F	p-value	R	R^2
Machine Learning	0.084	0.975	17.156	< 0.001	294.32	< 0.001	0.848	0.719

The regression results demonstrate that the model is statistically significant, with an F-value of 294.32 and a p-value < 0.001, indicating a strong explanatory relationship between Machine Learning and Cost Reduction. The coefficient of determination ($R^2 = 0.719$) suggests that 71.9% of the variation in cost reduction can be attributed to the application of machine learning techniques. The slope coefficient (0.975) is positive and highly significant ($t = 17.156$, $p < 0.001$), indicating that increasing reliance on machine learning leads to a notable improvement in cost reduction. The positive slope reflects machine learning's capacity to uncover hidden patterns, improve forecasting accuracy, and reduce manual errors, thereby lowering unnecessary expenses. The constant (0.084) is small and statistically less meaningful, but does not affect the validity of the main relationship.

H1b: There is a statistically significant relationship and effect between Deep Learning and Cost Reduction.

The results are presented in Table 11.

Table (11): Simple Linear Regression for the Sub-Hypothesis (H1b)

Cost Reduction	Constant	Slope	t-value	p-value	F	p-value	R	R^2
Deep Learning	-0.427	1.084	13.009	< 0.001	169.23	< 0.001	0.772	0.595

The regression model is statistically significant, as evidenced by an F-value of 169.23 and a p-value < 0.001, confirming that Deep Learning exerts a significant influence on Cost Reduction. The coefficient of determination ($R^2 = 0.595$) indicates that approximately 59.5% of the variation in cost reduction is explained by the application of deep learning techniques. The slope coefficient (1.084) is positive and highly significant ($t = 13.009$, $p < 0.001$), meaning that greater implementation of deep learning is associated with a measurable reduction in costs. This reflects the role of deep learning in processing complex and high-dimensional datasets, detecting anomalies, and predicting potential failures before they occur, thereby reducing maintenance and operational expenses. The negative constant (–0.427) has no practical impact on the interpretation of the model and is only a mathematical intercept value.

H1c: There is a statistically significant relationship and effect between Natural Language Processing (NLP) and Cost Reduction.

The results are summarized in Table 12.

Table (12): Simple Linear Regression for the Sub-Hypothesis (H1c)

Cost Reduction	Constant	Slope	t-value	p-value	F	p-value	R	R^2
Natural Language Processing	0.225	0.929	13.210	< 0.001	174.52	< 0.001	0.776	0.603

The regression model is statistically significant, as shown by an F-value of 174.52 and a p-value < 0.001, indicating that NLP has a significant positive effect on Cost Reduction. The coefficient of determination ($R^2 = 0.603$) suggests that NLP explains about 60.3% of the variation in cost reduction, which represents a substantial contribution. The slope coefficient (0.929) is positive and highly significant ($t = 13.210$, $p < 0.001$), confirming that the increased application of NLP leads to tangible improvements in cost efficiency. NLP assists organizations by automating the processing of unstructured data, extracting key insights from financial and contractual documents, and reducing the time and resources spent on manual reviews. The constant value (0.225) is statistically less meaningful and simply represents the interception of the model.

H1d: There is a statistically significant relationship and effect between Expert Systems and Cost Reduction.

The results are displayed in Table 13.

Table 13. Simple Linear Regression for the Sub-Hypothesis (H1d)

Cost Reduction	Constant	Slope	t-value	p-value	F	p-value	R	R^2
Expert Systems	-0.075	0.997	13.130	< 0.001	172.41	< 0.001	0.775	0.600

The regression model is highly significant, with an F-value of 172.41 and a p-value < 0.001, confirming that Expert Systems exert a substantial effect on Cost Reduction. The coefficient of determination ($R^2 = 0.600$) indicates that approximately 60.0% of the variation in cost reduction is explained by the adoption of expert systems. The slope coefficient (0.997) is positive and highly significant ($t = 13.130$, $p < 0.001$), indicating that a greater reliance on expert systems leads to a considerable reduction in organizational costs. This reflects the ability of expert systems to provide consistent, rule-based decision-making, automate complex tasks, and reduce dependence on human expertise in areas such as audits, compliance, and operational checks. The constant value (–0.075) is statistically less meaningful, serving only as the regression intercept.
From an accounting perspective, these results emphasize that the integration of AI tools is not merely a technological advancement but a strategic necessity for organizations aiming to achieve sustainable financial performance. By reducing operational inefficiencies, enhancing accuracy in budgeting and forecasting, and supporting reliable decision-making, AI applications provide a practical foundation for stronger cost control and long-term competitiveness. This highlights the growing role of AI as an indispensable enabler of modern accounting practices and financial sustainability in the telecommunications sector of the Kurdistan Region.
These results indicate that while all AI dimensions significantly contribute to cost reduction, Machine Learning provides the most substantial explanatory effect. From an accounting standpoint, this confirms that AI tools collectively enhance efficiency and cost control, with each dimension complementing the others in strengthening financial sustainability.
H1e: There is a statistically significant joint effect of the four dimensions of Artificial Intelligence Techniques (Machine Learning, Deep Learning, Natural Language Processing, and Expert Systems) on Cost Reduction when tested simultaneously through multiple regression analysis.

Table (14): Multiple Linear Regression for the Sub-Hypothesis (H1e)

Cost Reduction	Parameter	t-value	p-value	F	p-value	R	R^2
Constant	-1.170	-5.021	< 0.001	140.37	< 0.001	0.913	0.834
Slope-1	0.572	8.166	< 0.001				
Slope-2	0.292	3.089	0.003				
Slope-3	0.110	1.363	0.176				
Slope-4	0.299	3.603	< 0.001				

The results in Table 22 indicate that the overall regression model is highly significant ($F = 140.37$, $p < 0.001$), with a high coefficient of determination ($R^2 = 0.834$). This means that about 83.4% of the variation in Cost Reduction can be jointly explained by the four AI dimensions. Individually, Machine Learning ($\beta = 0.572$, $t = 8.166$, $p < 0.001$), Deep Learning ($\beta = 0.292$, $t = 3.089$, $p = 0.003$), and Expert Systems ($\beta = 0.299$, $t = 3.603$, $p < 0.001$) all have statistically significant positive effects on Cost Reduction. In contrast, Natural Language Processing ($\beta = 0.110$, $t = 1.363$, $p = 0.176$) does not exhibit a statistically significant effect in the presence of the other dimensions.
From an accounting and managerial perspective, these results underscore that the integration of multiple AI techniques provides a stronger explanatory power for cost reduction compared to examining each dimension individually. The findings suggest that while some dimensions (such as NLP) may have weaker standalone effects when controlled by others, the collective adoption of AI tools substantially enhances organizational efficiency and cost-saving capacity.

Conclusions and Recommendations

Conclusions

Based on the empirical findings of this research, several conclusions can be drawn:

1. The study confirmed that Artificial Intelligence techniques in big data analysis have a strong and statistically significant effect on cost reduction, explaining more than 81% of the variation in financial efficiency across the surveyed organizations.

2. Among the four AI dimensions, Machine Learning achieved the highest explanatory power (71.9%), confirming its role in enhancing prediction accuracy, detecting inefficiencies, and reducing unexpected costs.
3. Deep Learning (59.5%), NLP (60.3%), and Expert Systems (60.0%) also showed significant contributions, proving that each dimension adds unique value in supporting decision-making and reducing expenses.
4. Collectively, these dimensions provide a complementary framework for comprehensive cost reduction strategies.
5. By improving budgeting accuracy, preventing fraud, optimizing resource allocation, and reducing operational inefficiencies, AI strengthens financial sustainability and supports better governance.
6. The diversity of the sample (Korek, Asia Cell, and Sard Fiber) confirms that the benefits of AI are consistent across organizations of varying size and scope.

Recommendations

In consideration of these findings, the following recommendations are made:

1. Adoption of AI as a Strategic Priority: Telecommunications companies and other sectors in the Kurdistan Region should prioritize the integration of AI techniques in their operations, particularly in financial planning, cost management, and risk control.
2. Investment in Machine Learning: Given its high explanatory contribution, organizations should allocate resources to develop and deploy machine learning models for predictive analytics, cost forecasting, and operational efficiency improvements.
3. Enhancement of Data Infrastructure: To maximize the benefits of AI, companies must invest in reliable data collection, storage, and processing infrastructure. High-quality data is essential for achieving accurate insights and sustainable cost reductions.
4. Capacity Building and Training: Continuous training programs should be implemented for accountants, auditors, and financial managers to build competence in using AI tools. This ensures that the workforce can interpret output and integrate AI insights into financial decision-making.
5. Integration into Accounting Practices: AI applications should be systematically incorporated into accounting systems to automate routine tasks, improve reporting accuracy, and strengthen compliance with financial standards.

References

1. Almanasra, S. (2024). Applications of integrating artificial intelligence and big data: A comprehensive analysis. Journal of Intelligent Systems, 33(1), 20240237.
2. Balamurugan, M., Narayanan, K., et al. (2025). Role of artificial intelligence in smart grid–a mini review. Frontiers in Artificial Intelligence, 8, 1551661.
3. Barja-Martinez, S., Aragüés-Peñalba, M., et al. (2021). Artificial intelligence techniques for enabling Big Data services in distribution networks: A review. Renewable and Sustainable Energy Reviews, 150, 111459.
4. Ben Ayed, R., & Hanana, M. (2021). Artificial intelligence to improve the food and agriculture sector. Journal of Food Quality, 2021(1), 5584754.
5. Berisha, B., Mëziu, E., & Shabani, I. (2022). Big data analytics in Cloud computing: an overview. Journal of Cloud Computing, 11(1), 24.
6. Bibri, S. E. (2021). The potential of big data and AI for smart sustainable cities. Sustainable Cities and Society, 71, 10295.
7. Cao, L. (2022). AI in finance: challenges, techniques, and opportunities. ACM Computing Surveys, 55(3), 1-38.
8. Dlamini, Z., Francies, F. Z., Hull, R., & Marima, R. (2020). Artificial intelligence (AI) and big data in cancer and precision oncology. Computational and Structural Biotechnology Journal, 18, 2300-2311.
9. Elahi, M., Afolaranmi, S. O., et al. (2023). Applications of AI techniques through the lifecycle of industrial equipment. Discover Artificial Intelligence, 3(1), 43.
10. Eziefule, A. O., Adelakun, B. O., et al. (2022). The role of AI in automating routine accounting tasks. European Journal of Accounting, Auditing and Finance Research, 10(12), 109-134.

11. Günther, W. A., Rezazade Mehrizi, M. H., Huysman, M., & Feldberg, F. (2017). Debating big data: A literature review on realizing value from big data. The Journal of Strategic Information Systems, 26(3), 191–209.
12. Hashem, I. A. T., Yaqoob, I., et al. (2015). The rise of "big data" on cloud computing: Review and open research issues. Information Systems, 47, 98-115.
13. Ismanov, I., Qayumov, N., et al. (2024). AI and cost management: Strategies for reducing expenses and improving profit margins in business. IEEE ICKECS.
14. Jaber, S. (2023). Cost Optimization Techniques in Automation Infrastructure Leveraging AI Tools.
15. Kache, F., & Seuring, S. (2017). Challenges and opportunities of digital information at the intersection of Big Data analytics and supply chain management. International Journal of Operations & Production Management, 37(1), 10–36.
16. Kaul, D., & Khurana, R. (2022). AI-driven optimization models for e-commerce supply chain operations. International Journal of Social Analytics, 7(12), 59-77.
17. Khan, Z. F., & Alotaibi, S. R. (2020). Applications of artificial intelligence and big data analytics in m-health: A healthcare system perspective. Journal of Healthcare Engineering, 2020(1), 8894694.
18. Kushwaha, A. K., Kumar, P., & Kar, A. K. (2021). What impacts customer experience for B2B enterprises on using AI-enabled chatbots? Insights from Big data analytics. Industrial Marketing Management, 98, 207-221.
19. Maheshwari, S., Gautam, P., & Jaggi, C. K. (2021). Role of Big Data Analytics in supply chain management. International Journal of Production Research, 59(6), 1875-1900.
20. Mikalef, P., Boura, M., Lekakos, G., & Krogstie, J. (2019). Big data analytics and firm performance: Findings from a mixed-method approach. Journal of Business Research, 98, 261-276.
21. Mikalef, P., Krogstie, J., et al. (2018). Big data analytics capabilities: A systematic literature review and research agenda. Information Systems and e-Business Management, 16(3), 547–578.
22. Milana, C., & Ashta, A. (2021). Artificial intelligence techniques in finance and financial markets: a survey of the literature. Strategic Change, 30(3), 189-209.
23. Murthy, P. (2020). Optimizing cloud resource allocation using advanced AI techniques. World Journal of Advanced Research and Reviews, 2(1).
24. Olaoye, G. (2025). The Impact of AI on Cloud Cost Optimization and Resource Management. SSRN.
25. Omitaomu, O. A., & Niu, H. (2021). Artificial intelligence techniques in smart grid: A survey. Smart Cities, 4(2), 548-568.
26. Paramesha, M., Rane, N., & Rane, J. (2024). Big data analytics, artificial intelligence, machine learning, internet of things, and blockchain for enhanced business intelligence. Artificial Intelligence, Machine Learning, Internet of Things, and Blockchain for Enhanced Business Intelligence.
27. Pasham, S. D. (2017). AI-Driven Cloud Cost Optimization for SMEs. The Computertech, 1-24.
28. Picatto, H., Heiler, G., & Klimek, P. (2024). Cost-Effective Big Data Orchestration Using Dagster. arXiv preprint arXiv:2408.11635.
a. Razzak, M. I., Imran, M., & Xu, G. (2020). Big data analytics for preventive medicine. Neural Computing and Applications, 32(9), 4417-4451.
29. Samara, D., Magnisalis, I., & Peristeras, V. (2020). Artificial intelligence and big data in tourism: a systematic literature review. Journal of Hospitality and Tourism Technology, 11(2), 343-367.
30. Wamba, S. F., Gunasekaran, A., et al. (2017). Big data analytics and firm performance: Effects of dynamic capabilities. Journal of Business Research, 70, 356–365.
31. Wang, G., Gunasekaran, A., Ngai, E. W., & Papadopoulos, T. (2020). Big data analytics in logistics and supply chain management. International Journal of Production Economics, 227, 107645.
32. Zhou, L., Pan, S., Wang, J., & Vasilakos, A. V. (2017). Machine learning on big data: Opportunities and challenges. Neurocomputing, 237, 350-361.
33. Немкевич, Е. Г. (2022). Использование технологий больших данных как инструмента сокращения расходов… Экономическая наука сегодня, (16), 194-199.