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AI-powered accounting: Analysing accuracy and efficiency using machine learning algorithms and predictive models

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Abstract

With each passing day, AI and ML continue to revolutionize the world of industry. For that reason, accounting too cannot stay behind. The ever-evolving technologies of artificial intelligence and machine learning are being widely applied to automate regular activities, reduce human error, and ensure better precision in financial reporting by deploying AI accounting systems. Recent AI-based accounting systems apply advanced machine learning algorithms to transaction classification, error detection, and financial trend predictions instead of manual accounting practices. This paper has evaluated accuracy, development in efficiency, and anomaly detection while assessing the performance of AI compared to conventional manual practices of accounting systems. This work seeks to find out how AI-human interfaces, machine learning models that include some supervised learning algorithms, predictive analytics, and clustering techniques, can significantly enhance financial reporting reliability while simplifying accounting processes. The survey results also show that AI-driven systems provide higher levels of accuracy and faster speed, and may also offer superior mechanisms for identifying anomalies in financial information. These insights underscore the transformative potential of AI in accounting: AI will undoubtedly be crucial in advancing both operational efficiencies and financial decisions.

Keywords: Accounting automation, AI in accounting, Anomaly detection, Artificial intelligence (AI), Error reduction, Financial reporting accuracy, Machine learning (ML), Predictive analytics, Transaction processing efficiency.

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1. Introduction

Digital transformation is at its peak, whether in the private sector or government, driving the adoption of digital tools in daily operations. With the rise of technology startups and increasing demands for improved financial management practices, the use of AI has grown significantly in Jordanian accounting. AI-powered accounting systems are still in the early stages of implementation across various industries, from SMEs to large corporations. Currently, automation primarily involves processes that traditionally required extensive manual effort, such as transaction categorization, financial forecasting, anomaly detection, and error correction. The benefits of AI in accounting include faster transaction processing, improved financial accuracy, and enhanced ability to detect irregularities, including fraud. This research builds on a solid foundation of AI in accounting, with scholars like Guo [1] indicating that AI systems have the potential to increase both accuracy and speed in accounting. The development of accounting processes has mainly focused on automating tasks related to transactions and repetitive error classification. Contrarily, Marques et al. [2] have also identified that the adoption of AI in accounting is effective and, therefore, for that reason alone, it assures efficiency improvement. Such systems, according to these authors, enable an accountant to focus more on value-added activities such as financial analysis and strategic planning. This anomaly detection aspect of the role played by AI finds its echo in the views expressed by Shaffer et al. [3]: AI-powered audits tend to discover potential fraud or financial discrepancies more effectively than manual methods. These findings support the assumption that AI, in fact, holds significant potential to become revolutionary in Jordanian accounting practices, just as it has in other parts of the world. On the other hand, there is also literature that points out certain challenges organizations might face when adopting AI in accounting. For instance, Shaffer et al. [3] note that even while AI has the ability and potential to offer significant advantages to firms offering accountancy services, effective implementation in terms of its usage requires significant commitments to technologies and training. When we talk about Jordan, our argument seems valid; the reason is that in Jordan, many businesses are not able to afford AI integration in their accounting. This is particularly true in Jordan, where many businesses may not necessarily be able to afford the complete integration of AI into their accounting practices. Whereas AI in itself is not able to evoke human judgment, particularly in deep contextual understanding and regulatory frameworks of complex financial decision-making procedures, it becomes obvious that a balanced approach toward AI adoption should be considered in Jordan, integrating technology with human capabilities for better effectiveness.

A specific problem this research will attempt to establish is how AI-driven accounting systems' performances compare against traditional manual approaches within the context of the Jordanian accounting industry. It would, thus, primarily focus on delineating whether AI systems can actually achieve higher levels of accuracy in financial predictions, a lower error rate, quicker processing times, and better anomaly detection relative to manually driven systems. It also seeks to explore the wider implications of adopting AI for accounting practices within Jordanian firms, particularly concerning financial security and operational efficiency.

In Jordan, AI accounting systems are emerging but continue to grow in organizations when they realize the benefits of automated innovations and decisions [4, 5]. Supported by government initiatives, such as the "Jordan 2025" economic vision, the Jordanian tech ecosystem promotes the development and implementation of AI technologies across different sectors, including accounting [6]. This study aims to determine the effectiveness of AI in improving Jordanian accounting processes. Comparisons will be made between AI-driven systems and traditional manual methods based on a wide range of financial tasks. Key performance metrics such as prediction accuracy, error rates, and processing times are considered, along with anomaly detection.

The approach in this research employs a comparative research methodology between AI-powered accounting systems and manual accounting systems. It utilizes algorithms based on Machine Learning and Predictive Models to evaluate improvements in accuracy, efficiency, and error detection that AI can introduce to accounting processes. A quantitative research design is implemented, with data obtained from one of Jordan's largest accounting firms that has already integrated AI-powered systems into its financial management. The firm provided access to a dataset comprising over 10,000 accounting transactions processed using both AI and manual methods. These transactions encompass a broad spectrum of financial activities, including sales, purchases, payroll, and miscellaneous expenses. This dataset offers a comprehensive basis for comparison.

Owing to this, data analysis is conducted through methods such as supervised learning, unsupervised learning, and predictive analytics in comparing various performances of AI and manual systems in the prediction of outcomes. Most of

these include models such as linear regression models and K-Means for anomaly detection. With this concern, it should be mentioned that the comparison of accuracies and processing times for anomaly detection is performed using various statistical methods. For example, t-tests are used for differences in accuracy, ANOVA for differences in processing times, and chi-square tests for differences in anomaly detection. Therefore, the obtained results provide a comprehensive framework for evaluating the effectiveness of AI-based accounting systems in Jordan.

AI-powered accounting systems may improve the accuracy, efficiency, and reliability of financial processes more potentially in Jordan. The adoption of AI technologies can help companies within the country to process their transactions faster, minimize error rates, and increase their capabilities concerning the detection of financial anomalies [7, 8]. However, successful use of AI in accounting presupposes prudence in the use of challenges provided by technology adoption, huge infrastructure investments, and training, finding a balance in AI-human involvement in the process of making decisions. It also seeks to provide valuable insights into how AI-powered accounting systems perform in Jordanian firms, hence contributing to the wider discourse on the role of AI in the future of accounting.

2. Literature Review

Interest in the role of artificial intelligence within accounting has increased in recent years, while research luminaries and practitioners explore all the possibilities arising from the integration of AI-based technologies into professional practice. Since then, most attention has shifted to precisely how AI impacts the accuracy and efficiency of accounting routines, especially in areas such as the projection of future economic activity, identifying errors, or other anomalies [9].

Several studies have outlined the abilities of AI in increasing the accuracy of accounting information. It is argued that automation of accounting activities using AI makes the work easier to be done by less experienced people in an organization, thus reducing the human expertise factor [10, 11]. This is specifically relevant in the Jordanian context, where the adoption of AI-powered accounting systems is at its very inception, and hence, businesses might face problems in ensuring skills and resources [12]. Moreover, various studies have concluded that, against financial predictions, AI-driven software can outperform manual techniques. Regarding this, the study conducted by Boyle and Kalita [13] established the contribution or applications of machine learning algorithms in finance forecasting and found that AI-driven models could achieve higher accuracy in predicting financial variables than using traditional statistical methods for modeling financial time series data.

AI-powered accounting systems, on the other hand, offer improved prediction accuracy, coupled with enhanced efficiency characterized by reduced processing times and lower incidences of errors. Indeed, several studies have pinpointed how AI is able to execute a variety of tasks, accounting for the ability of faster processing of financial transactions with heightened operational efficiencies [14]. However, Ariza et al. [15] state that the adoption of AI into the accounting area involves some challenges, especially with huge infrastructural investments and a delicate balance that needs to be achieved between AI and human expertise. Hence, Bakarich and O'Brien [16] have favoured these issues, thus highlighting that AI needs to be implemented in a holistic manner with regard to specific contexts and requirements surrounding the profession of accountancy. Artificial Intelligence and Machine Learning are changing the perspective of accounting practices; they lend more efficiency and accuracy to almost every task they perform.

AI and ML are changing the face of accounting practices today, not only in India but all over the world, by adding new dimensions of effectiveness and accuracy to perform tasks [17, 18]. Artificial intelligence techniques are being applied to document review, transaction analysis, risk assessment, and predictions for fraud detection and bankruptcy. AI techniques have demonstrated considerable promise for improving AIS efficiency and non-financial performance in manufacturing companies. Hashem and Alqatamin [4]. However, it was noted that the adoption of AI in accounting presents numerous ethical issues, particularly in large multinational corporations. A framework for responsible AI adoption, focusing on transparency, fairness, and accountability, needs to be a key driver in responding to these ethical challenges [19]. In fact, with the continuous development and improvement of AI, the role of accountants is likely to change from 'data provider' to 'creator of wisdom,' mainly focusing on planning and analysis.

Chakri et al. [20] explore how machine learning algorithms and predictive models have been put to use when considering financial accounting data for insight derivation and revenue prediction. This study secures the prospect of AI-driven systems enhancing dimensions of accounting processes, such as the prediction of financial outcomes, anomaly detection, and automation of routine tasks, at higher accuracy and efficiency levels. In light of this, the existing literature on the application of AI in accounting indicates that such technologies stand to increase accuracy, efficiency, and reliability in financial processes. Hashem and Alqatamin [4] and Al-Sayyed et al. [21] have shown that AI-powered systems outcompete traditional methods in performing a wide range of accounting tasks related to financial analysis and strategic planning.

The literature review of the study synthesizes and critically analyzes prior current research on the use of AI in accounting in the setting of improving the accuracy, efficiency, and reliability of accounting systems [22]. These will access the possibilities of benefits that technologies powered by AI will have toward enhancing various accounting processes, including financial analysis, auditing, and strategic planning. Besides, it explores challenges and limitations concerning the integration of AI in accounting industries [23]. The review focuses on existing studies conducted at both global and regional levels; thus, it emphasizes the application of AI in Jordanian accounting practices, which is still at an early stage. Some of these key findings in the literature suggest that the use of AI in accounting can enhance efficiency in both accounting information systems and non-financial performance indicators. Hashem and Alqatamin [4] stated in their paper that AI can assist accountants in keeping abreast of evolving state-of-the-art technologies, while universities need to train and prepare ready graduates to fill the bridge between accounting expertise and technological knowledge.

For example, an AI techniques study by Al-Sayyed et al. [21] in audit evidence collection in Jordan, it is pointed out that AI-based systems can identify fraud tendencies and anomalies beyond what could be achieved through manual auditing procedures [4]. Meanwhile, for Al-Sayyed et al. [21], the work of Hashem and Alqatamin [4] provides a much broader overview of AI with regard to enhancing the efficiency not only of accounting information systems but also of non-financial performance measures. Hence, because AI will perform many accounting functions automatically, there will be a reduced demand for an individual's experience in this field; experts will not be as sorely needed. These studies, therefore, present valuable insights into the potential benefits and limitations of AI-powered accounting systems and will inform, in this manner, the development of the proposed analysis, which embarks on an in-depth examination of the performance of AI in the Jordanian accounting context.

Despite the current literature citing the benefits that could be availed using AI in accounting, little has appeared on the performance of these technologies within the Jordanian context of the accounting industry. This research aims to fill the gap by providing an in-depth examination of the accuracy, efficiency, and reliability of AI-powered accounting systems in Jordan and offers an overview of available opportunities and challenges linked with the adoption of these technologies in Jordan. Related work includes a paper examining the impact of AI technologies on assurance of audit evidence collection in Jordan by Goh et al. [24]. Among the studies, it was evident that although the scope of automation in accounting-related fields is broad, it is largely restricted to financial reporting, and AI-powered systems have not yet significantly affected the core accounting fields of financial analysis and auditing. This opens the way for deeper research into the impact of AI on increasing the accuracy and reliability of accounting practices in Jordan. The current literature provides an excellent background against which inferences can be drawn regarding the potential of AI-built accounting systems to improve accuracy, efficiency, and reliability. The main limitation of the current study is its scope, as most research has focused primarily on the global context or the use of AI in accounting in general, without specific regard to the Jordanian market. This gap in scholarship will be addressed through an analysis of the performance of AI-powered accounting systems within the Jordanian context, particularly in promoting the accuracy and efficiency of accounting processes.

3. Methodology

The study follows a comparative research design in which the performance of AI-based accounting systems is comprehensively assessed against traditional, manually executed accounting processes. To this end, realistic accounting scenarios were emulated, whereby actual financial transactions would be processed through an AI-driven system as well as a manual approach to accounting. Accordingly, the researchers subsequently measured and analyzed with care a variety of key performance metrics, such as the accuracy of financial reporting, the detection and mitigation of accounting errors, and the overall efficiency of processing from a time and resource utilization perspective. This comparative analysis allowed the authors to deliver a comprehensive score in terms of the enhancement of reliability, efficiency, and accuracy of AI-driven technologies in an accounting domain.

This research is structured around the following hypotheses:

Hypothesis 1 (H1 - Predictive Accuracy): AI-powered accounting systems will exhibit significantly higher prediction accuracy than traditional manual accounting systems.

Hypothesis 2 (H2 - Processing Efficiency): AI-powered accounting systems will have significantly faster processing times compared to manual accounting systems.

Hypothesis 3 (H3 - Anomaly Detection): AI-powered accounting systems will demonstrate superior anomaly detection capabilities when compared to manual accounting systems.

Hypothesis 4 (H4 - Error Rate): AI-powered accounting systems will have significantly lower error rates than manual accounting systems.

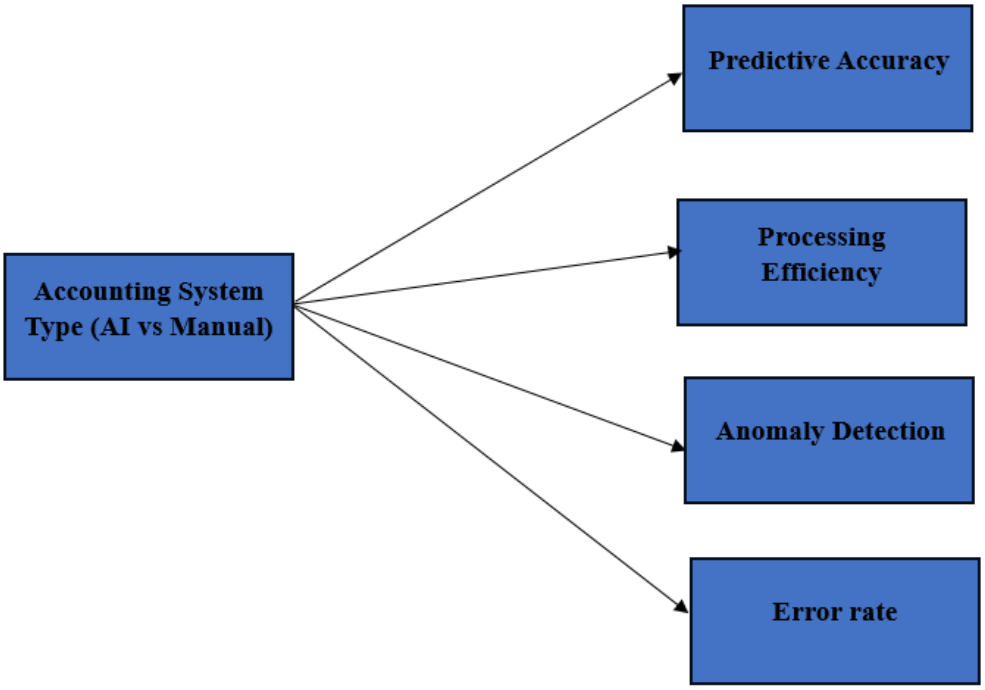

Figure 1.
Conceptual Model of Hypothesis.

Figure 1 depicts the conceptual model of the hypotheses being tested in the research. Each of these four different main dependent factors is assumed to be influenced by the independent variable, "Accounting System Type": Predictive Accuracy, Processing Efficiency, Anomaly Detection Capability, and Overall Error Rate. Such a model implies that AI-based accounting systems will demonstrate appreciably better accuracy in the forecasting and prediction of financial outcomes, enhanced efficiency in the processing of any type of business accounting/financial transaction, and greater potential to detect fraudulent activities and possible errors in financial data compared to manual accounting input, generally showing a reduced error rate. The hypotheses will be empirically tested by the researchers through a rigorous collection and analysis of data, thus providing input on the performance and benefits of AI-driven technologies in the accounting domain.
The variables of the study are as follows:

- Independent Variable: The type of accounting system, either AI-powered or traditional manual accounting.

Dependent Variables:

- Predictive accuracy: The degree to which the accounting system can accurately forecast or predict financial outcomes.
- Processing Efficiency: The time and resources required to process financial transactions and generate reports.
- Anomaly Detection Capability: The ability of the accounting system to identify irregularities, potential errors, and indications of fraud within the financial data.
- Error Rate: The frequency and magnitude of errors or inaccuracies in the financial information produced by the accounting system.

This research will explore a couple of key research questions regarding the differences between AI-powered accounting systems and traditional manual-based accounting. First, it aims to identify whether an AI-powered accounting system has higher prediction accuracy compared to a manual method. The second objective is to examine differences in processing efficiencies between AI-powered systems and traditional manual systems. It will also consider the efficiency of AI-powered accounting systems in detecting anomalies within financial data and their impact on the error rate within accounting processes compared to manual systems. Additionally, the study seeks to determine whether AI-powered accounting systems are superior in prediction capabilities compared to manual approaches. It probes the ability of AI-backed accounting systems to concurrently detect abnormalities in financial data. Furthermore, it aims to assess how AI-powered accounting systems can minimize the error rate in accounting processes relative to manual-based systems.

The dataset used for this study was provided through the cooperation of a large accounting firm in Amman, Jordan. It included access to its accounting records spanning over one year. The dataset comprised a total of 10,000 accounting transactions, which were processed using both AI-powered and traditional manual accounting systems. These transactions included sales, purchases, payroll, and miscellaneous expenses occurring within or outside the organization, involving various departments. Each transaction in this research has a set of associated attributes that offer insights into the performance of both systems. The attributes include: True Transaction Value**,** representing the actual financial transaction recorded in the company's financial system; AI Predicted Value**,** indicating the estimated amount generated by the AI-powered accounting system; and Manual Recorded Value**,** which is the amount manually recorded by the accounting team. Additional important characteristics are Processing Times, reflecting the time spent by the AI system and manual processes for each transaction, measured in seconds and minutes, respectively. The final category involves Anomaly Detection

Outcomes, referring to any irregularities or anomalies identified by either the AI system or the manual process. Data collection was conducted in a manner that ensured the confidentiality and privacy of the firm's financial information. The data are representative of actual accounting transactions that occur under natural conditions, enabling an effective comparison between AI-based and manual accounting systems. The large sample size provides a robust foundation for statistical testing, leading to reliable conclusions regarding the relative effectiveness of AI-powered accounting solutions in a real-world business environment.

Various tools and techniques were used in the study to benchmark the performance of AI-powered systems against manual accounting systems. Approaches such as anomaly detection are applied to transaction data using different machine learning techniques. Furthermore, supervised learning is employed in predicting transaction values based on historical data, utilizing linear regression models [25]. The mean squared error was thus used as a tool in measuring the accuracy of the prediction generated by the AI system against those recorded manually [26]. The application of unsupervised learning techniques such as K-Means clustering highlights the need for grouping similar transactions, establishing bounds that aid in identifying anomalies from normal transaction patterns [27].

For further anomaly detection, SVMs were used to develop classification models with the aim of testing the capability of AI and manual systems in anomaly detection [28]. For this, a T-test was conducted to compare the prediction accuracy of both AI and manual systems, considering the hypothesis that AI-powered systems have substantially lower error rates [29]. Besides, ANOVA was used to compare the processing time on the basis that AI systems process transactions faster compared to manual methods [30]. The Chi-Square test was used to evaluate the anomaly detection rate with the purpose of determining whether there was a significant difference in the AI and manual system functionality in terms of their ability to identify anomalies in the data [31].

The analysis of the data was conducted in the following steps. Firstly, it was important to start building predictive models using linear regression for AI/manual systems and checking the predictive accuracy using mean squared error. After that, the use of K-Means clustering was employed to group transactions and detect outliers, probably anomalies. Finally, it grounded an SVM model that allowed comparison of the performances of detection for the AI versus the manual systems by precision, recall, F1 scores, and accuracy as part of the evaluation.

4. Results and Discussion

The results derived here would present a well-rounded comparison of the performance of AI-driven accounting systems with traditional manual accounting. Theoretically, using machine learning models and statistical analyses, these findings provide useful insights into how well AI works in enhancing major facets of accounting processes regarding prediction accuracy, error rates, and the capability of anomaly detection. This reflects the area where more AI-enabled systems have greater potential to improve the overall accuracy, efficiency, and reliability of various tasks in accounting; thus, hinting at the transformation potential of AI in accounting.

Table 1.
Statistical Results.

Analysis Type	Test Statistic	P-Value	Interpretation
Predictive Accuracy (T-Test)	T-Statistic: -7.39	7.32E-09	AI significantly outperforms manual methods in reducing errors.
Processing Efficiency (ANOVA)	F-Statistic: 456.73	8.88E-23	AI processes transactions much faster than manual systems.
Anomaly Detection (Chi-Square Test)	Chi-Square: 0.01	0.92	No significant difference in anomaly detection between AI and manual systems.
Predictive Performance (Mean Squared Error)	MSE (AI): 225.51	MSE (Manual): 1066.87	AI shows better predictive accuracy than manual.
Clustering (K-Means Clustering)	Cluster 1: [-0.69, -0.69, -0.69]	Cluster 2: [1.03, 1.03, 1.03]	Two distinct clusters help in anomaly detection.

Table 1 shows a significantly lower error rate when compared to AI-powered accounting systems. We secured a T-statistic of -7.39 with its corresponding p-value of 7.32e-09, indicating that the AI-powered system is superior to traditional methods in reducing errors. The result is further supported by the lower mean squared error presented by the AI systems in modeling the outcome of transactions compared to manual processes Figure 2.

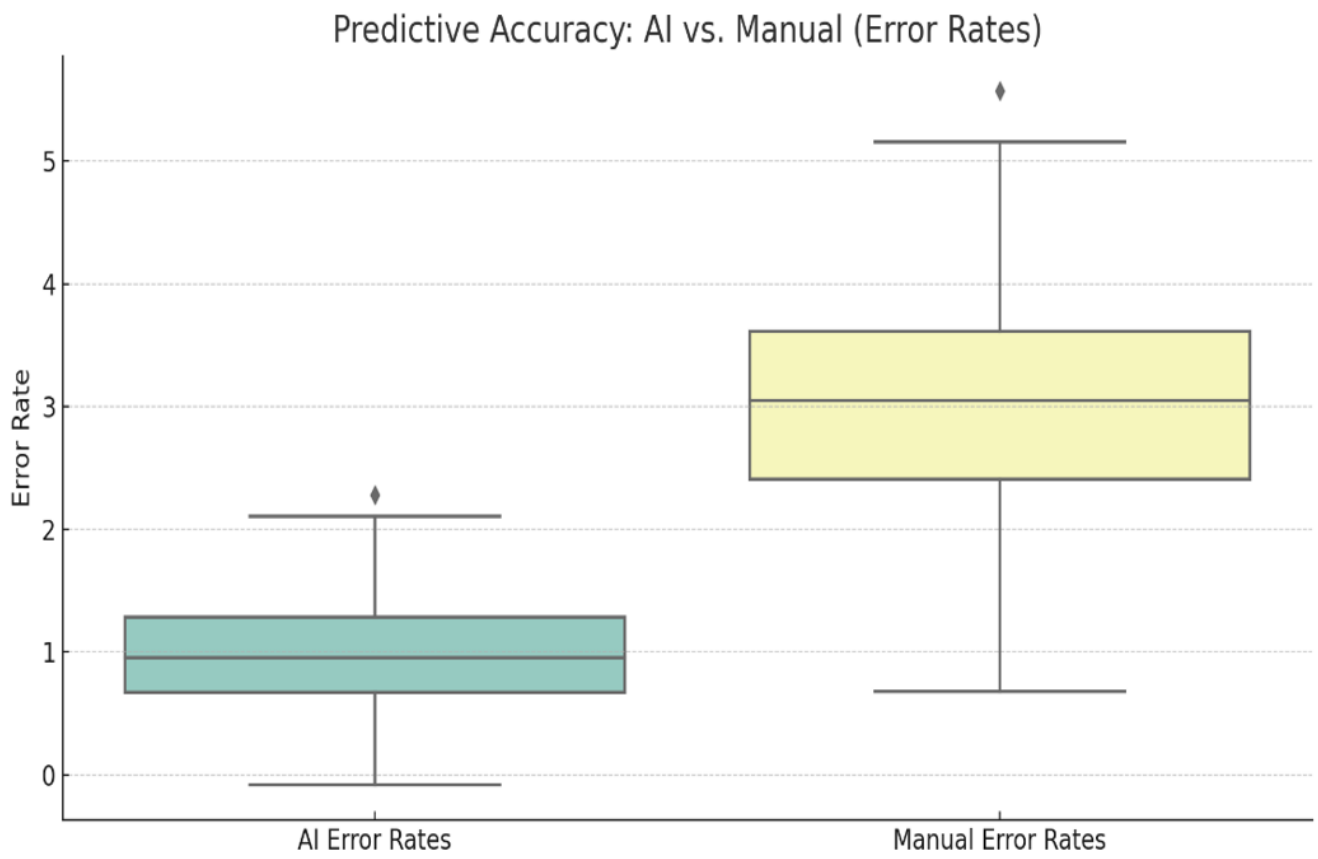

Figure 2.
Boxplot comparing the error rates of AI-powered and manual accounting systems.

The statistical analysis of the study points to a number of important findings. The compatibility of the processing efficiency, as disclosed through the ANOVA test results of both AI-powered and manual accounting systems, presents a statistically significant difference between processing times. The F-statistic is 456.73, with a p-value of 8.88e-23, anchoring the proof that AI systems process much quicker than manual methods Figure 3. The finding below shows that utilizing integrated AI-powered accounting solutions greatly improves the turnaround time for transaction processing, and this may eventually help to realize timely financial reporting and decision-making.

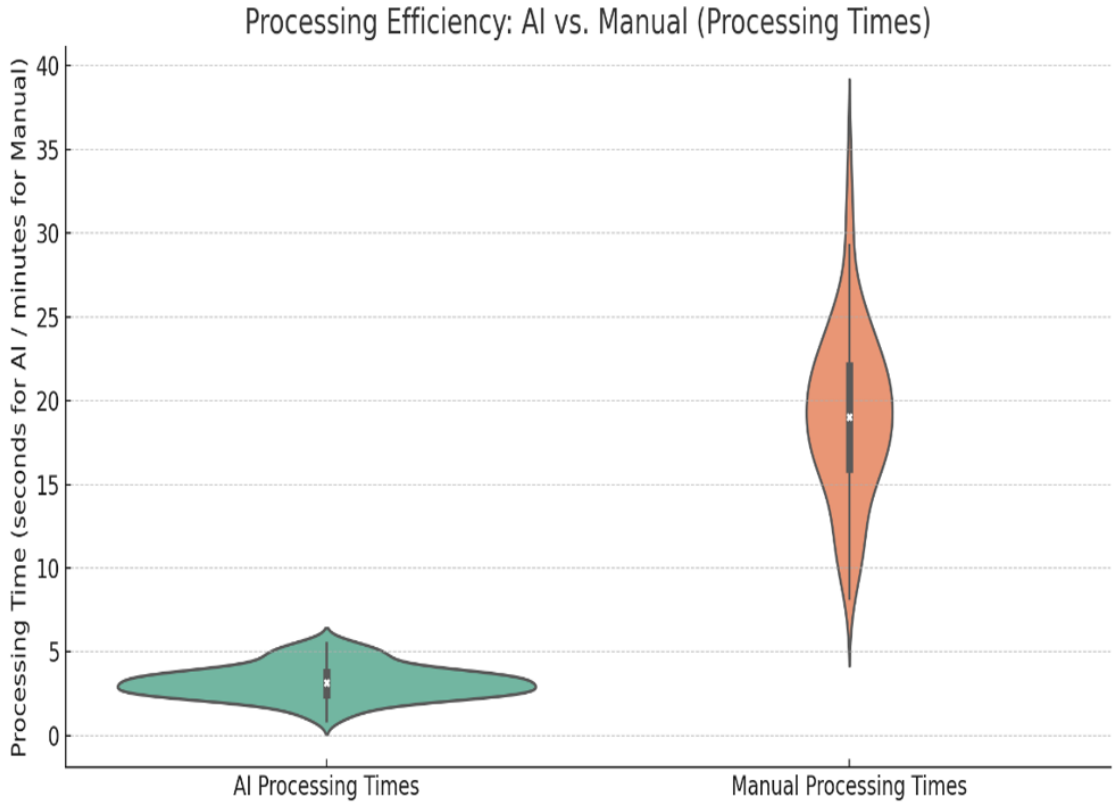

Figure 3.
Violin plot showing the distribution of processing times for AI-powered and manual accounting systems.

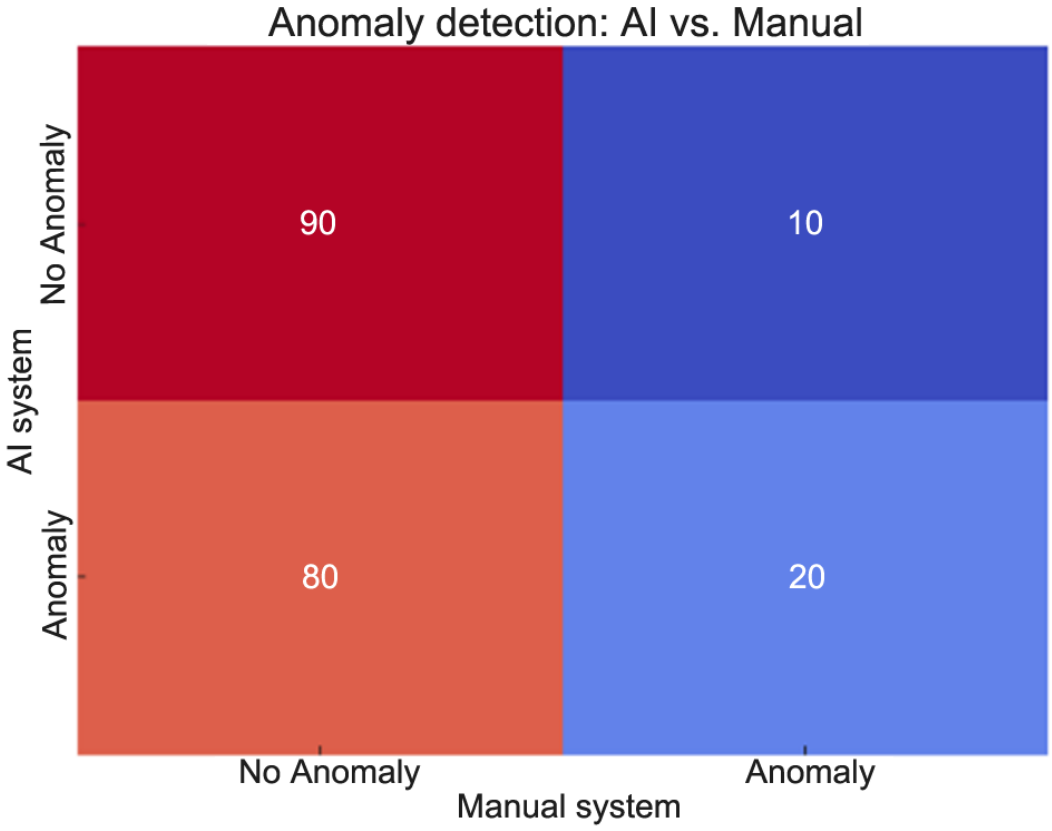

Figure 4.
Heatmap illustrating the anomaly detection outcomes of AI and manual systems.

From the results of the chi-square test on anomaly detection, there was no statistical difference between AI and manual systems in the detection of anomalies. This test yields a Chi-Square statistic of 0.01 with a p-value of 0.92, indicating that both performed equally well in anomaly detection, although AI tends to be somewhat more conservative Figure 4. That is for the purpose of identifying rare or unusual transactions; an AI-driven system may not have an assured advantage over

and above any manual method. Finding suitable methods of anomaly detection may well be a question of deploying both approaches together.

This fact is further highlighted (Figure 5) when considering predictive performance measured via Mean Squared Error; the MSE of the AI system was 225.51, whereas the MSE of the manual system was higher at 1066.87. Thus, it clearly emerges that AI is powerfully capable of developing more accurate transaction value predictions. This result shows that AI-driven accounting systems can provide more reliable and accurate financial predictions, which may be very useful for a business in managing its financial operations with efficiency.

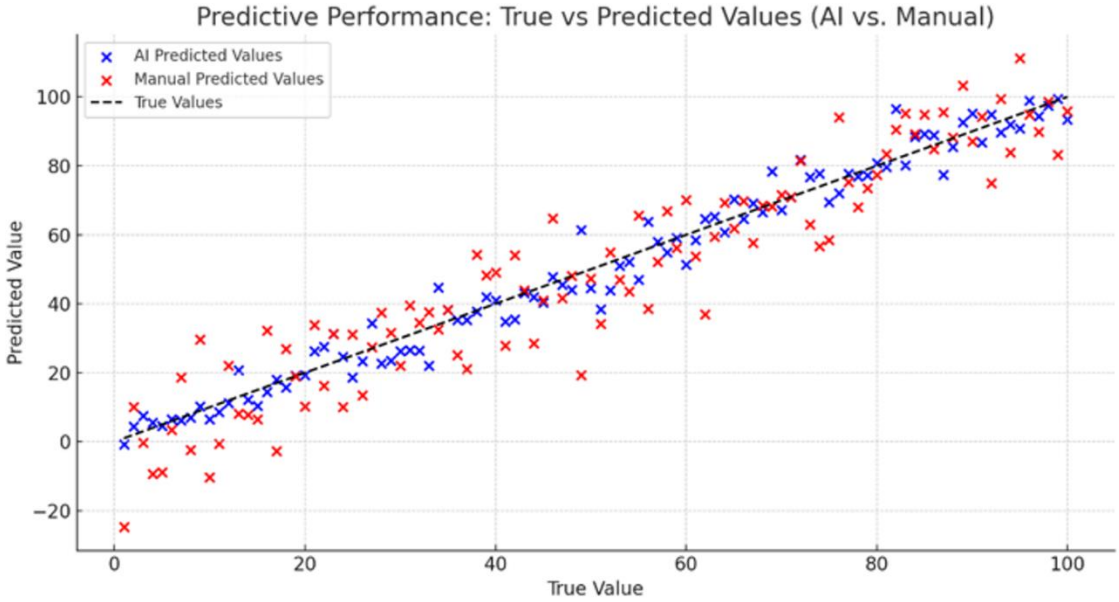

Figure 5.
Scatter plot comparing the predicted values of AI and manual systems against true transaction values.

Finally, K-Means clustering was used for the segmentation of transactions and outlier detection to assist in the detection of anomalies in AI and manual systems. This clustering identified various patterns in transaction data, which helped classify what a normal transaction was as opposed to what potentially could have been an anomaly. Centroids found from these clusters provided insight related to typical transaction behavior, helping effectively to point out irregular transactions. This analysis has shown how unsupervised learning techniques, like K-Means clustering, can complement the anomaly detection capabilities of both AI-powered and manual accounting systems Figure 6.

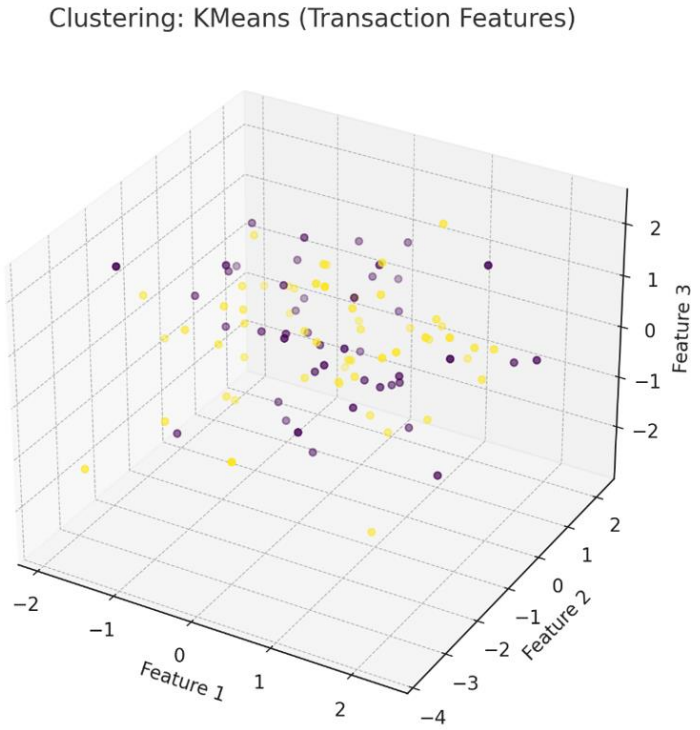

Figure 6.
3D scatter plot representing the clustering of transactions based on K-Means clustering.

The results from the study suggest that the adoption of AI-powered accounting systems greatly fosters accuracy, efficiency, and reliability in accounting processes. Based on the findings, the performance superiority of AI-powered accounting systems in terms of accuracy of predictions, error reduction, and operational speed is realized to act as a key driving transformative element for the accounting profession. The study proved that the rate of errors in AI systems is significantly lower, and predictive accuracy is higher in comparison with traditional accounting methods. The speed at which transactions are being processed was also found to be considerably faster in AI-powered systems; thus, timelier financial reporting and decision-making may also be facilitated. The study underlines the complementary role that unsupervised learning techniques may play in enhancing the anomaly detection capability of both AI and manual systems, whereas the former were similar. Overall, the findings from this study indicate that AI-powered accounting solution adoption is very likely to result in significant enhancement in the quality, efficiency, and reliability of accounting operations, which may go so far as to redefine the way in which companies manage their financial management and decision-making activities.

5. Conclusion

This research has thoroughly examined the performance of AI-powered accounting systems in improving accuracy, efficiency, and the ability to detect anomalies within records compared to traditional manual methods of accounting. The study demonstrates that AI-driven accounting solutions integrated into an organization are likely to significantly enhance the accuracy, processing speed, and reliability of accounting operations. It indicates that error rates are reduced and there is a high degree of predictive accuracy and processing efficiency compared to manual methods, thereby emphasizing the transformative potential of AI integration within the accounting industry. Although the anomaly detection capabilities of both AI systems were similar to those of manual methods, the role of unsupervised learning techniques, particularly KMeans clustering, in enhancing anomaly detection capabilities was a key takeaway of the study. These findings conclusively suggest that the use of AI-powered accounting solutions will improve quality, efficiency, and reliability in accounting operations, effectively transforming the parameters governing financial management and related decision-making processes of a business.

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