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ARTIFICIAL INTELLIGENCE APPLICATIONS AND THEIR IMPACT ON IMPROVING STRATEGIC COST MANAGEMENT TECHNIQUES

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Abstract:

The study aims to explore the role of artificial intelligence applications in improving strategic costing techniques. With competition and rapid development, companies seek to respond to changes in the business environment by relying on artificial intelligence applications to improve performance and enhance production processes. This is in addition to improving decision-making processes and generating alternatives to maintain market value, confront competitors, and improve their strategies, particularly in the field of cost accounting, which is one of the key and important factors determining success. A descriptive analytical approach was used, represented by a questionnaire distributed to a sample of specialists, including academics, producers, and businessmen. The study reached a set of conclusions, the most important of which is that there is a significant relationship between artificial intelligence applications and cost and administrative accounting, which contributes to enhancing the efficiency of production and operations within companies, as well as decision-making, accuracy, ease of access to information, and cost reduction.

Keywords: Artificial intelligence, cost management techniques, Expert systems, Deep Learning, Decision support systems.

INTRODUCTION

The business environment for companies has witnessed significant developments over the past decade, characterized by the complexity of data volumes and increasing competition. This has made improving strategic costing techniques critical to companies' success. Here, artificial intelligence applications play a crucial role in overcoming challenges and problems, for many reasons. The most important of these is that artificial intelligence has entered all fields of science, particularly accounting, where it contributes to analyzing data with speed and high accuracy, and providing strategic directions and forecasts based on the way its applications operate. Furthermore, it has the ability to provide immediate and specialized answers, whether for administrative decisions, production processes, or development, compared to the time required by human workers. This contributes to increasing work efficiency and improving companies' response to opportunities and threats. Artificial intelligence has become an indispensable reality, as it is an important partner in all areas of life, particularly in the field of cost and administrative accounting, and a key element in decision-making and providing alternatives.

1- Research Methodology

1-1 Research Problem

The research problem is represented by companies' desire to keep pace with the rapid development of the business environment amidst competition. This presents them with challenges and difficulties represented by increased research and development costs and increased investment costs in modern fields. This requires selecting appropriate technologies for cost management and the factors that contribute to the development of these technologies. From here, the following questions can be posed:

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• Can artificial intelligence contribute to raising the performance level of strategic cost management technologies?
• Can companies learn about artificial intelligence technologies and transition to new strategies that contribute to confronting the continuous development of the business market?

1-2 Research Objective

• To study the scientific and cognitive foundations of artificial intelligence applications that can operate in the field of accounting in general and strategic cost management in particular.
• To identify the potential impacts of artificial intelligence applications on strategic cost management techniques.

1-3 Research Importance

Due to rapid technological advancements, studying artificial intelligence applications has become essential in the field of accounting to understand the challenges and exploit the opportunities available to companies. It can enhance their ability to provide products that suit all parties, both producers and customers. This contributes to enhancing competitiveness, adding value to products, and achieving success.

1-4 Research Hypothesis

The research is based on the main hypothesis that artificial intelligence applications can have a statistically significant correlation with strategic cost management techniques, contributing to improving and developing companies' operational capabilities.

2- Artificial Intelligence

Artificial intelligence was first discussed by John McCarthy in 1956, but the first step toward the idea that machines could think had already begun. In 1945, Bush proposed that machines could function as humans think and proposed a system that could enhance the machine's understanding, as well as its ability to mimic humans. (Smith et al. 2006:4) From here, its actual development began, and it began to seek to simulate intelligent behavior in humans with machines, assisting them in their work, and becoming an addition to many areas of life and business, as it increases companies' ability to compete (Weber, 2020:49). Artificial intelligence is a branch of computer science that is concerned with the study and development of computer systems to make them distinguished by the ability to provide useful conclusions and solutions to problems (Al-Sheikh, 2018:83). In other words, artificial intelligence is the ability of computer systems to simulate and perform tasks similar to human intelligence processes. This includes learning and previous experiences, decision-making, inference and reasoning, and the accumulation of experience to improve performance. Artificial intelligence has become used in many fields, most notably data analysis, image analysis and recognition, and planning to improve the performance of robots and automated systems. (Jin, et al. 2022:570) Therefore, artificial intelligence was defined as a set of applications and systems that simulate human mental abilities such as learning, thinking, and problem solving with the aim of enabling machines to carry out complex tasks that require human effort, time, and intelligence (Saleh, 2005:39).

2-1 Goals of Artificial Intelligence

The goal of artificial intelligence is ongoing and never-ending. The current goal is to achieve systems that think and act like humans. The next stage is to achieve systems that outperform human thinking and action. Experimental research is working to achieve this goal through advanced technologies. (Honavar, 2006:9) There are other goals that most researchers agree upon, including: (Shaima, 2021:58)

• Achieving inference through storing and interpreting information.
• Addressing problems by acquiring and renewing human knowledge.
• Addressing problems related to loss and forgetting through the optimal use of knowledge.
• Making decisions through developing the use of accumulated experiences.

2-2 Advantages of Artificial Intelligence

The advantages of artificial intelligence are numerous, given its application in many areas of life. Researchers have agreed on the following: (Kour, 2013:348) (Keswani, 2012:6-7)

• Decisions are based on facts and information, not emotions; that is, emotions do not interfere with decision-making.
• Machines with artificial intelligence differ from those with humans, as they operate without fatigue or downtime.
• Experience and knowledge are transferred to machines as programs, thus reducing wasted time and reducing training time for humans.
• Providing answers to repetitive decisions and processes.
• Retaining large amounts of information that cannot be forgotten.
• Increasing efficiency by reducing the time required to solve problems.

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• Reducing the risk of stress and injury to humans through intelligent industrial machines.
• Reducing time and resources.

2-3 Applications of Artificial Intelligence

There are many applications of artificial intelligence. This research will present applications that may be relevant to the field of accounting and research variables.

2-3-1 Expert systems

They are programs that simulate human thought processes in various situations and solve problems. They store knowledge extracted from human experts. Thus, the simulation process appears to mimic human action. In other words, they are programs that store knowledge extracted from human experts to replicate the behavior and decisions of experts and develop this behavior, accepting it as a basis for formulating another intelligent method. (Abed, 2023:6) Expert systems are considered a part of artificial intelligence, specializing in how to compute the expertise of the human mind, rather than searching for it in books designed to help humans learn (Moursund, 2006:51).

2-3-2 Machine Learning and Deep Learning

Machine learning is a scientific field that explores data patterns and develops systems capable of learning from them. It is the process by which computers learn to think and recognize with minimal human interaction. In other words, it focuses on directing machines to perform tasks without the need for full programming. Deep learning is a branch of machine learning that specializes in teaching computers to think using matrices designed to mimic human thinking. (Weheba, 2024:1214)

2-3-3 Decision support systems

A decision support system (DSS) is a computer system that assists in the decision-making process. It is an interactive, adaptable, and versatile system designed to help solve a management problem with irregular data and improve the decision-making process. This system has the ability to identify the alternatives and outcomes necessary for making an intelligent decision. It was designed to automate the decision-making process. This system does not replace the decision maker, but rather presents options, decisions, and their consequences (Zemankova, 2019: 583).

3- The concept and definition of strategic cost management:

Strategic cost management is an analytical approach to cost data within the framework of strategic factors to achieve competitiveness (Al-Ghaban, 2015:4). This approach is achieved through the optimal use of resources, which reduces areas of waste and misuse, and directs costs to those necessary activities that add value to the service provided. Even more important is achieving customer satisfaction by providing services of the required quality and specifications at the lowest possible price. This is because the traditional costing system focuses on an internal view of costs, and this view is incapable of supporting competitiveness, especially in light of the intense competition that characterizes contemporary economies. (Al-Adly, 2012: 105)

Accounting literature indicates that there are differences in definitions of cost management. Drury Colin defined cost management as "management actions aimed at achieving continuous cost reduction and customer satisfaction" (Drury Colin, 2000: 89). Horngren agrees with Drury Colin in defining cost management, focusing on it as a set of procedures and practices implemented by management to continuously reduce and control costs to achieve customer satisfaction (Horngren, C, et al, 2003: 47). Strategic cost management is also defined as: "the complete distinction between the importance of the cost relationships of activities in the value chain and the process of managing these cost relationships for the benefit of the economic unit" (Hilton, 2008: 24).

3-1 The Importance of Strategic Cost Management

The importance of cost management for the unit can be explained in a number of points, the most important of which are (Sofat, et al., 2016: 47) and (David, 2017: 33):

• Cost management supports strategic management decision-making by identifying the unit's strengths and weaknesses and identifying the best ways to utilize or improve these strengths or eliminate them.
• Supporting and protecting competitiveness by adopting strategic thinking that achieves a comprehensive vision of the unit using strategic analysis tools.
• Identifying, measuring, collecting, and analyzing information related to key success factors (both financial and non-financial) in a reliable manner and in an appropriate manner to support the decision-making process.
• Achieving profitability in the short term and maintaining a competitive position in the long term, along with improving quality, customer satisfaction, and the timeliness of information to aid in strategic decision-making.
• Competitor analysis in strategic cost management will contribute to creating competitiveness for the unit and

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achieving a balance between product cost and quality by using more accurate cost-effective production techniques.

3-2 Strategic Cost Management Techniques:

Companies rely on strategic cost management techniques to improve their strategic position and create a competitive advantage. The following are some of the techniques that the research seeks to document their relationship with artificial intelligence applications.

3-2-1 Activity-Based Costing

A modern and advanced technique, this technique is based on tracking the origination of costs and limiting them to specific activities. These costs are then allocated to final products based on a set of factors called cost drivers, which are linked to the occurrence of these costs (Al-Takriti, 2008: 155). The activity-based costing (ABC) approach requires the following steps (Garrison and Noren, 2000: 345): Analyzing the value of the process, identifying activity centers, tracking activity center costs, and selecting cost drivers.

3-2-2 Continuous Improvement

A management philosophy that aims to continually improve processes and activities related to machinery, materials, personnel, and production methods. It is one of the pillars of the Total Quality Management methodology, which requires the support of senior management. The characteristics of the continuous improvement technique include the following: (Lizarelli & Toledo, 2016: 3-4)

- It works continuously and systematically to reduce costs to lower levels.
- It helps produce products that meet customer expectations.
- It works to gain competitiveness and intensify efforts to maintain and develop it in accordance with competitive market requirements.

3-2-3 Product Life Cycle Costing

Any costing that involves collecting and managing costs across the various stages of a product's life cycle, from marketing, distribution, and after-sales service to delivery to the customer (Al-Moussawi, 2006: 78). The purpose of this technique is to reduce after-sales service costs and product disposal costs, and to direct the savings toward improving the quality of service provided, warranty, and safety. It also seeks to reduce the costs of product failure for the customer and find appropriate solutions for them (Blocher, & Other, 2002; 157). This means that losing these customers would cause the economic unit to lose a significant portion of its market share and associated profits, jeopardizing its competitive position (Atkinson & Caplan, 2007; 608-612).

4- The Role of Artificial Intelligence Applications in Improving Strategic Costing Techniques

Ezenwa's study revealed that the application of artificial intelligence in the field of accounting has positive effects because it is likely to become a fundamental component of all businesses. It explained that artificial intelligence improves traditional accounting methods and processes using technology, as it has the ability to process large amounts of financial data more accurately and quickly and provide detailed financial reports. It also avoids human error, which saves time and costs in preparing reports compared to submitting them manually (Ezenwa & h.nkem, 2021: 16). In the same context, in the era of artificial intelligence, some complex accounting functions will be left to computers because they have the ability to simulate the human mind. This will lead to improved accounting efficiency, reduced work errors, and enhanced competitiveness (Li & Zheng, 2012, 813).

Baldwin emphasized that companies must work to combine disciplines to ensure success and development. One of these partnerships is in the field of accounting with AI application specialists. This will enhance the development of artificial intelligence in the field of accounting and shift it from accounting to accounting. From traditional to innovative accounting. (Baldwin, et al, 2006:78)

4-1 Deep Learning and Strategic Cost Management

Data analysis is of great importance in corporate management, as management's role involves using appropriate analytical methods to arrive at the best decision for the company. Data analysis methods have undergone a major transformation in recent years due to the development of artificial intelligence applications such as deep learning. Through deep artificial neural networks (ANN), predictive performance can be increased compared to traditional methods. In the context of cost estimation, the potential offered by artificial neural networks has been identified. When applied, it has been shown that they achieve lower deviations and greater efficiency in cost estimation than traditional estimation methods (Bodendorf & Franke, 2024).

These systems can be integrated into the activity-based costing (ABC) and time-driven activity-based costing (TDABC) techniques in cost estimation and finding loading rates that ensure lower deviation and more efficient allocation of costs. (Ning et al. 2020) confirmed that rapid

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and accurate estimation of product costs can improve a company's competitiveness. Due to the constantly changing functions, complexity of product parts, and overlapping work activities, the cost estimation process using traditional methods is difficult, and the relationship between linking and estimation differs from what it would be if deep learning technology was used. This technology is characterized by the ability to learn estimation and allocation relationships and the characteristics of highly complex data by training and developing two-dimensional and three-dimensional neural networks and voxel data to estimate the cost of the manufacturing process. It was found that its application shows better performance in cost estimation.

4-2 Expert Systems and Strategic Cost Management

Expert systems are one of the applications of artificial intelligence and one of the most important systems applied in the field of accounting. They are computer programs that store knowledge from an expert and simulate their thinking processes when solving a specific problem. They are used in the field of financial and management accounting, where they are involved in planning, obtaining evidence, and assessing risks. They can also be used in designing accounting information systems and evaluating standards. In cost accounting, expert systems are used to evaluate inventory, analyze cost variances, diagnose control systems, and make investment decisions (Baldwin et al., 2006). From the above, we conclude that expert systems can be incorporated into continuous improvement technology. This technology aims to develop all company activities, from products to machinery and resources. Therefore, expert systems help present ideas, provide alternatives, provide multiple options, define requirements, and calculate results.

4-3 Decision Support Systems and Strategic Cost Management

Decision support systems are distinguished from information systems by their analytical capabilities to arrive at sound decisions that are in the best interest of the company. These systems are designed to include models for data analysis and the use of simulation programs. These systems are interactive, operating according to the user's request by asking questions, changing hypotheses, and entering new data (Qandliji, 2005). Among the capabilities of decision support systems are their ability to support decisions that occur once or more, harness analytical tools and databases, and assist in the administrative decision-making process. They present results in the form of simplified and easy-to-use tables or charts, and provide timely reports to the decision maker (Al-Alwan, 2019).

5- The Impact of Artificial Intelligence Applications on Improving Strategic Cost Management

The applied aspect of the research relied on a questionnaire designed to test the research hypotheses and achieve its objectives. The questionnaire was distributed to a group of academics, accountants, businessmen, and specialists in the field of computer science. The questionnaire included (10) general questions on both the accounting and computer science axes. A five-point Likert scale was used, with scores ranging from one point, indicating "I disagree," to five points, indicating "I completely agree." The following is a sample questionnaire and the results it reached.

5-1- Independent internal consistency

Table (1)

sequence	Paragraph	Correlation coefficient	Significance level (sig)
1	Artificial intelligence applications have become one of the success factors in companies.	.826**	**.000**
2	Artificial intelligence applications have the ability to display analyses and calculate results in real time.	.815**	**.000**
3	Artificial intelligence applications are capable of making and acting on decisions without referring to a human expert.	.763**	**.000**
4	Artificial intelligence applications are an audit tool for all activities in the company.	.740**	**.000**

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5	Artificial intelligence applications are neutral and not affected by emotions.	.852**	**.000**

Person transactions values (0.852, 0.826, 0.815, 0.763, 0.740), all of which are high statistical significance at P = .000, indicates the presence of a very strong internal consistency between the items and the total degree of the scale; Every value exceeds the 0.74 barrier is evidence of a clear conceptual homogeneity, which confirms that the items measure the dimension itself with high dependence and contribute directly to raising the total stability coefficient of the tool. With this, the results demonstrate the credibility of the measured structure, and support the maintenance of the items without modification because it adds complementary and not repeated information, and reinforces confidence in the ability of the scale to provide reliable data in field applications.

5-2 variable consistency

Table (2)

sequence	Paragraph	Correlation coefficient	Significance level (sig)
1	The use of artificial intelligence applications helps improve the confirmatory value of information and ensure it is free of errors.	.736	**.000**
2	Artificial intelligence applications in accounting provide more efficient predictive value	.835	**.000**
3	Artificial intelligence applications give companies the ability to consider multiple alternatives and measure the results of each alternative.	.613	**.000**
4	Artificial intelligence applications enable companies to identify opportunities and threats and study investment opportunities.	.762	**.000**
5	Artificial intelligence applications help accountants and decision makers track production costs.	.826	**.000**

Person transactions (0.736, 0.835, 0.613, 0.762, 0.826) with significance level P = .000 that the affiliated items are strong and consistent with the total variable, as all values are located above the acceptable consistency (0.50) and ranges between a "strong" and "high - strength" level. This high association reflects a clear conceptual homogeneity and reinforces the reliability of the scale; A value of 0.613 value indicates good strength, while values indicate 0.736 and 0.762 to strong relationships, and values show 0.826 and 0.835 very high relationships that effectively contribute to the interpretation of the difference in grades. The full statistical indication confirms that these relationships are not random, which justifies the retention of the items as they are and confirms its validity in measuring the changing affiliated with the honesty and consistency, and thus enhancing confidence in the results of the analysis and conclusions based on it.

5-3- Structural honesty

Table (3)

Axes	Correlation coefficient	Significance level
X	.963	**.000**
Y	.960	**.001**

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The values of correlation are 0.963 of the X and 0.960 axis of Y, with moral levels P = .000 and P = .001, respectively, indicates that there is a high -strength positive relationship between each axis and the total variable. This reflects a very high homogeneity in the responses of sample and confirms that the two axes contribute greatly to the interpretation of the studied phenomenon; Both explain more than 92 % of the contrast of grades (RB ≈ 0.92 -0.93). Although these results reinforce the credibility of the scale, the high association to this extent may indicate a severe convergence or conceptual interference (Multicollinearity) between the two axes; Therefore, it is advisable to perform an additional discriminatory analysis (such as the analysis of confirmed factors or VIF values to ensure that each axis adds a unique explanatory value before they are included together in multi -variable statistical models.

5-4- Alpha Cronbach

Table (4)

Reliability Statistics	
Cronbach's Alpha	N of Items
.928	10

The value of the Cronbach alpha laboratory of 0.928 (with 10 items) indicates a very high reliable level; The common threshold of accreditation exceeds (0.70) and even enters the scope of "excellent internal consistency" (> 0.90). This means that the ten items measure one conceptual dimension homogeneously, and the tool can be relied upon to analyze data and statistical reasoning with confidence. Despite the positive of this number, the approach of the alpha of 0.95 sometimes indicates the possibility of a great repetition or similarity between some items; Therefore, it is advisable, as an additional verification step, to check each clause to the total and α if the item is deleted to ensure that each item adds a unique explanatory value and the content of others is not repeated. If almost identical items are found, they can be combined or reformulated to improve the efficiency of the scale without damaging its reliability.

5-5- RESULTS ANALYSIS

Table (5)

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
X1	64.829	59	.000	4.38333	4.2480	4.5186
X2	64.752	59	.000	4.25000	4.1187	4.3813
X3	70.053	59	.000	4.35000	4.2257	4.4743
X4	68.502	59	.000	4.26667	4.1420	4.3913
X5	65.088	59	.000	4.36667	4.2324	4.5009

The X1 -X5 items of the X1 -X5 items appeared very high for the (T) laboratories (between 64.8 and 70.1) with a freedom of 59, all of which have a high statistical morale at P <001. The intermediate difference ranges from the reference value between 4.25 and 4.38 within the five -year -old Laker scale, while confidence breaks came at a relatively narrow level of 95 % (about ± 0.13), indicating the accuracy of appreciation and stability of answers. These indicators reflect a strong and consistent agreement between members of the sample that the five terms of the five items are clearly supporting the hypothesis that the application of effective manufacturing contributes fundamentally to improving cost management.

Table (6)

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Y1	65.088	59	.000	4.36667	4.2324	4.5009
Y2	65.088	59	.000	4.36667	4.2324	4.5009
Y3	73.013	59	.000	4.28333	4.1659	4.4007

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Y4	65.423	59	.000	4.35000	4.2170	4.4830
Y5	61.351	59	.000	4.36667	4.2242	4.5091

The results of the (T) -sample test for the Y1 -y5 items confirm the power of agreement between members of the sample on the effectiveness of (the dependent variable); The values (T) came very high (between 61.35 and 73.01) at a freedom of 59, with decisive statistical moral p <.001 for each item. The average differences ranged from the reference value between 4.28 and 4.37 on the five -year -old Laker scale, while confidence breaks looked 95 %narrow (nearly 0.14), which reflects great stability in opinions and accuracy of appreciation. Although the Y3 item recorded the lowest average (4.28), it achieved the highest value (T) thanks to the decrease in the contrast. Through the table, the research hypothesis that stipulates (artificial intelligence applications can have a statistically significant correlation with strategic cost management techniques, contributing to improving and developing companies' operational capabilities.) was proven

5-6- The relationship between the independent variable and the dependent variable

Table (7)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.848[a]	.719	.714	1.11798

The multiple correlation coefficient R = 0.848 indicates a strong relationship between independent and variable changes in the model. RORI = 0.719 shows that the model explains about 71.9 % of the variation in the dependent variable, a high percentage that shows a significant explanatory capacity. As for the average r = 0.714, it takes into account the number of entered changes and the size of the sample, which indicates that the efficiency of the model remains high even after correcting the potential amplification factor. Finally, the standard estimate error = 1.118 indicates that the average deviation of the expected values from actual values is close to one unit, which is a relatively acceptable error margin in light of the high percentage of interpreted contrast. In general, this model reflects a good suitability for predicting.

Table (8)

ANOVA[a]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	185.690	1	185.690	148.566	.000[b]
	Residual	72.493	58	1.250		
	Total	258.183	59			
a. Dependent Variable:						
b. Predictors: (Constant),						

The results of the contrast analysis (Anova) showed that the sterile model has a high statistical significance; The total slope box reached 185.69 out of 258.18, or about 72 % of the total contrast, which is consistent with the ROM value = 0.719. The value of the calculated f also recorded 148,566 with the degree of freedom (1, 58), while the level of significance P came = 0.,000, which means that the possibility of this difference appears by chance is very small and confirms the impact of the independent variable on the interpretation of the variable of the dependent variable. In addition, the average remaining square of 1.250 indicates that the deviation of the expected values from the actual is limited, which enhances the accuracy of the model and its suitability to predict,

Through the tables, the research hypothesis that stipulates (artificial intelligence applications can have a statistically significant correlation with strategic cost management techniques, contributing to improving and developing companies' operational capabilities) was proven.

CONCLUSIONS

- There is a significant relationship between AI applications and cost and management accounting, contributing to enhancing the efficiency of companies' production and operations, decision-making, accuracy, ease of access to information, and cost reduction.

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• AI applications have become essential in the field of accounting to understand challenges and exploit opportunities available to companies. It can enhance their ability to provide products that suit all parties, including producers and customers.
• AI is the ability of computer systems to simulate and perform tasks similar to human intelligence processes. This includes learning and previous experience, decision-making, inference and reasoning, and the accumulation of experience to improve performance.
• The results of the single-sample t-test for AI applications showed very high values, all of which were highly statistically significant. The confidence intervals at the 95% level were relatively narrow, indicating the accuracy of the estimate and the stability of the answers. These indicators reflect strong and consistent agreement among sample members that the aspects measured by the five items clearly support the hypothesis that implementing efficient manufacturing contributes significantly to improving cost management.
• The results of a one-sample t-test confirm the strong agreement among sample members on the effectiveness of the dependent variable. The t-values were very high, with statistical significance for each item. The mean differences from the reference value on the five-point Likert scale ranged

Recommendations

• Identify and study artificial intelligence techniques, and collaborate between accounting and computer science disciplines to maximize benefits and enhance the ability to enhance accounting operations.
• There are many problems and challenges facing companies that limit their capabilities. Artificial intelligence applications have proven their ability to simulate these challenges and work to reach solutions that benefit companies.
• Expert systems are one of the artificial intelligence techniques capable of mimicking the human mind and thus can be incorporated into corporate operations. Expert systems are used in inventory valuation, cost variance analysis, control system diagnosis, and investment decision-making.
• Decision support systems differ from information systems in that they have analytical capabilities to reach sound decisions that serve the company's best interests. These systems are designed to include models for data analysis and the use of simulation programs.

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