Green Economics: International Journal of Islamic and Economic Education
Volume. 2 Nomor. 1 Tahun 2025
e-ISSN : 3063-623X; p-ISSN : 3063-5829, Hal 51-68
DOI: https://doi.org/10.70062/greeneconomics.v2i1.107
Available online at: https://economics.ifrel.org/index.php/GreenEconomics

The Impact of Using Lean Accounting Techniques on Evaluating Sustainable Performance in Economic Units in Iraq

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Abstract*. This study aims to explore the impact of lean accounting techniques (henceforth, LATs) on enhancing sustainable performance in Iraqi economic units. Research has been conducted in the industrial sector because it is the right place to use these technologies. Thus, the Iraqi State Company of Vegetable Oils was chosen as the sample of analysis by randomly selecting 150 employees. To collect data, a questionnaire has been designed. Research design included the analysis of questionnaire data using advanced statistical techniques. Results showed that the application of lean accounting technology contributes significantly to improving the financial, social, and environmental performance of industrial companies in Iraq. The study recommends integrating LATs into economic units and training employees on their use to sustain performance and achieve competitive advantages.*

Keywords: *Lean, Accounting, Sustainability, Performance*

1. INTRODUCTION

In recent years, the global focus on sustainability and efficiency has been constantly increasing. Lean accounting techniques, originating in the manufacturing sector, have become increasingly dependent on various industries due to their ability to streamline processes, reduce waste, and improve overall efficiency. Following Bichou (2006), the integration of the principles of **LATs** can lead to significant improvements in cost management, profitability, and sustainability. Furthermore, Dahlgaard-Park's (2008) study emphasized the importance of adopting a comprehensive approach to sustainability that includes not only financial but also social and environmental aspects. As organizations pursue a competitive advantage, the integration of **LATs** has emerged as a pivotal strategy for enhancing financial performance and sustainable practices. These technologies are based on the principles of lean manufacturing, which is concerned with creating value, reducing waste, and improving financial operations.

In Iraq, the economic landscape presents unique opportunities and challenges that reinforce the need for companies to adopt innovative strategies for sustainable success. **LATs** not only enhance operational efficiency but also align with broader sustainable development goals by improving resource management and reducing surpluses. The implementation of **LATs** in Iraq is particularly important given the need to enhance transparency and efficiency in the country's emerging industries. Also, adopting these technologies can lead to significant improvements in decision-making and strategic planning processes. This study aims to provide empirical evidence of the effectiveness of

Received: Desember 25, 2024; Revised: Januari 09, 2025; Accepted: Januari 28, 2025;
Online Available : Januari 31, 2025

LATs in promoting sustainable development, thereby contributing to their viability and benefits in Middle Eastern economies. By examining the intersection of LATs and sustainable performance, this study seeks to provide valuable insights into improving financial management frameworks in Iraq's economic units. Also, the study aims to provide a comprehensive understanding of how to leverage these technologies to achieve long-term sustainability. These changes play a transformative role in the development of the country's economy.

2. STUDY METHODOLOGY

Research Problem:

Iraq's economic units face significant challenges in achieving sustainable performance due to resource constraints, infrastructure constraints, and a rapidly changing business environment. Although modern technologies have proven effective at improving efficiency, reducing waste, and promoting sustainability in different contexts, their application in Iraq remains limited. Therefore, there is a need to examine how **LATs** impact the assessment of the sustainable performance of Iraq's economic units and understanding their effectiveness in overcoming challenges, The main problem of research is identified in this question

a. What is the impact of **LATs** on assessing the sustainable performance of economic units in Iraq?

Additionally, the following research questions are formulated:

1) What is the impact of **LATs** on assessing the financial performance of economic units in Iraq?
2) What is the impact of **LATs** on assessing the environmental performance of economic units in Iraq?
3) What is the impact of **LATs** on assessing the social performance of economic units in Iraq?

Objectives:

This paper aims to:

a. Identifying the main principles and methods of **LATs** and how they are applied in Iraqi economic units.
b. Analyzing and evaluating the sustainable performance dimensions (financial, social, and environmental)
c. Diagnosing the challenges facing economic units in Iraq when applying lean accounting techniques.

d. Assessing the extent to which **LATs** contribute to improving cost and profitability in Iraqi economic units.
e. Providing practical recommendations to strengthen the application of **LATs** in Iraq

Significance:

This topic can be significant as it:

a. Provides practical insights for economic units in Iraq to use **LATs** to improve efficiency, reduce waste, and increase profitability.
b. Helps policymakers understand the potential benefits of lean accounting techniques, enabling them to develop supportive policies to promote sustainability.
c. Highlights the importance of lean accounting technologies in promoting social and environmental aspects of sustainable performance and contributing to inclusive sustainable development.
d. Enhances awareness of the importance of adopting sustainable practices.
e. Helps improve the management of financial and material resources, enhancing the competitiveness of Iraqi economic units in domestic and international markets.
f. Provides recommendations for improving financial and economic performance against current challenges.
g. Contributes to enriching academic literature on **LATs** and sustainable performance, especially in the Iraqi context, which suffers from a dearth of studies in this area.
h. Presents a theoretical and practical framework for understanding how **LATs** are applied to enhance sustainable performance in low-resourced economic environments.

Hypothesis:

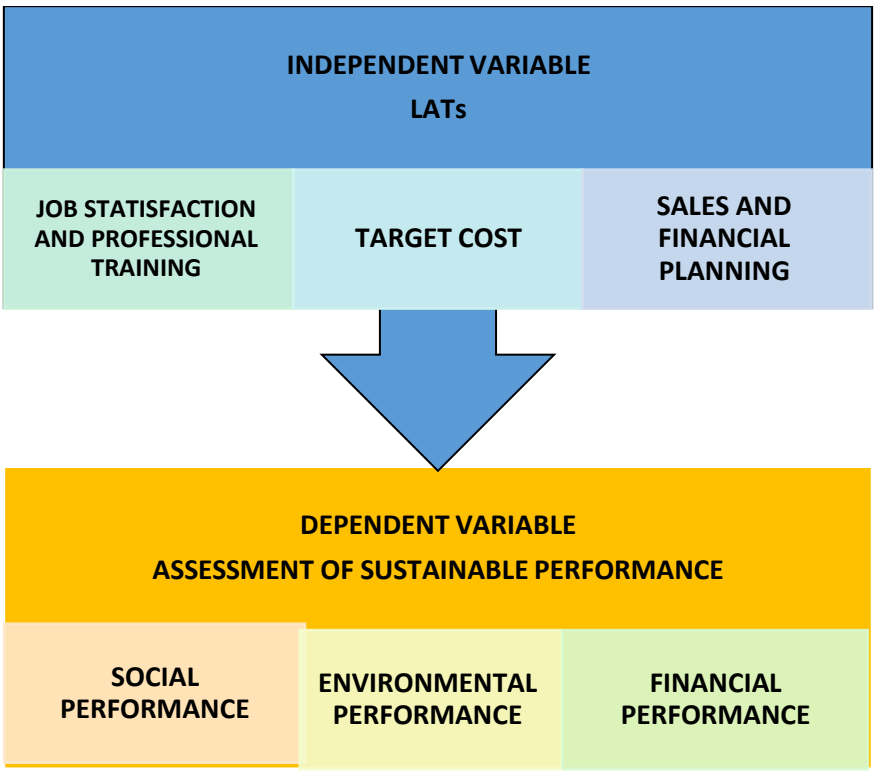
This paper hypothesizes that "There is statistically significant effect at Sig. (0.05) for **LATs** on the assessment of sustainable performance of economic units in Iraq." Moreover, three sub-hypotheses relating to the sustainable performance dimensions of economic units in Iraq have been developed:

a. There is a statistical significance of **LATs** in the assessment of financial performance of economic units in Iraq.
b. There is a statistical significance of **LATs** in the assessment of environmental performance of economic units in Iraq.
c. There is a statistical significance of **LATs** in the assessment of social performance of economic units in Iraq

Research Design:

a. **Independent Variable (X): LATs** (Sales and Financial Planning – Target Cost – Job Satisfaction and Professional Training)

b. **Dependent Variable (Y):** Assessment of Sustainable Performance (Financial Performance - Environmental **Performance** - Social Performance)



Source: Author's contribution

Figure 1. Conceptual Research Design

3. RESEARCH METHODOLOGY

This paper adopts an analytical-descriptive approach to analyze the correlation among variables.

Limits:

The data of this paper will be limited to three main areas:

a. Spatial boundaries: Industrial companies in Baghdad

b. Human boundaries: Employees of industrial companies in Baghdad at different levels

c. Temporal limits: 2023-2024

Data:

The data of analysis is the Iraqi State Company of Vegetable Oils by randomly choosing 150 employees.

Statistical Tool:

In this paper, the SPSS V. 25 software has been used to process data statistically.

4. THEORETICAL FRAMEWORK

Lean Accounting Techniques:

LATs are a set of accounting methods and practices aimed at supporting the principles of rational management (Lean Management) by streamlining accounting processes, improving efficiency, waste reduction, and enhancing value added (Maskell & Baggaley, 2016:45). **LATs** emphasize the value provided to the customer and removing activities that do not add value (Womack & Jones, 2003:67). The table below highlights the main LATs along with their codes.

Table 1. Main models of LATs following Khan and Jain (2017)

Technique	Code
Value stream mapping	VSM
Target Cost	TC
Kaizen	
Performance Measurement Linkage Diagram	PMLD
Value Streams	VS
Balanced Scorecard	BS
Value Stream Performance Boards	VSPB
Clear and Simple Language	CPL
Hoshin Policy	HP
Sales and Financial Planning	SFP
Low Inventory	LI
Transaction Elimination Matrix	TEM
3p Product, Process, People	3pA
Plan, Do, Check, Act	PDCA

Profit Sharing	PS
Employee Satisfaction and Training	ESTS
Sarbanes-Oxley Risks	SOR

Sales and Financial Planning:

It is an integrated planning technology that aligns both demand and supply with financial planning to be managed in an orderly manner in order to introduce new products, produce existing products, integrate new products with current, prepare pre-work analyses, and approve the plan. Also, this technology highlights how to integrate modern technology, such as artificial intelligence and internet of things, into sales planning and operations with financial planning mechanisms. (Fullerton et al., 2021:112).

Target Costing:

The target cost technique has a pivotal role in controlling cost elements at all stages of production from the beginning in the design process, all stages of different production, finished product, and delivery to the customer. Also, this technology provides financial and non-financial information that has an essential and influential role in the decision-making process, thereby helping to optimize the utilization of all resources. Cost management technology aims to:

a. Determining the targeted costs of products or services based on market expectations and customer needs (Cooper & Slagmulder, 2004:92).
b. Helping achieve these costs by improving operations and waste reduction Maskell et al., 2011:102).

Job Satisfaction and Pro Job Satisfaction and Professional Training:

Job satisfaction is the aspiration of every economic unit and represents the interaction of a number of complex factors (working environment, enterprise culture, and leadership type). Job satisfaction can be measured by the happiness and satisfaction of employees with their roles in their jobs. Also, communication between management and staff plays a key role in promoting the satisfaction of economic unit workers. The importance of job satisfaction will remain the element that economic units are betting on for continuity and survival in the market. Job satisfaction can only be achieved through a range of administrative reasons that carry a range of motivations and incentives. Job satisfaction is the main focus that promotes the performance and efficiency of employees within the

organization. Training is the primary means to develop and upgrade employees' skills in order to succeed in providing the best services to customers. Hence, this technology focuses on workers as the mainstay of economic unit success because it helps them to have competitiveness, continuous process efficiency, and waste reduction (Cunningham & Fiume, 2020:35).

Aims of LATs

LATs mainly aim to:

a. Making accounting simply by:

1) Streamlining accounting by removing unnecessary steps (Krajewski et al., 2019:160).
2) Using simplified and easy-to-understand financial reports instead of complex traditional reports (Maskell et al., 2011:89).

b. Visualizing performance metrics through:

1) Using visual boards and key performance indicators (KPIs) to present the financial and non-financial statements clearly and directly (Bicheno & Holweg, 2016:112).
2) Focusing on performance measures that reflect the customer's added value, such as delivery time and product quality (Ohno, 1988:54).

c. Streaming cost valorization through:

1) Cost analysis based on value stream instead of focusing on individual sections or products (Maskell & Baggaley, 2016:78).
2) More accurately allocate costs based on activities that add real value (Krajewski et al., 2019:165).

d. Waste reduction through:

1) Identifying and removing activities that do not add value (Non-Value-Added Activities), such as waiting, overproduction, or errors (Womack & Jones, 2003:45).
2) Adopting tools, such as value stream mapping, to identify sources of waste (Rother & Shook, 2003:33).

e. Processing of flow improvement through:

1) Improved flow of accounting processes to ensure speed and accuracy (Krajewski et al., 2019:170).
2) Using and applying the principles of timely production (Just-In-Time) to reduce losses and improve efficiency (Ohno, 1988:67).

f. Integrated performance reporting through:

1) Consolidating financial and non-financial statements into single reports to provide a comprehensive vision of performance (Maskell & Baggaley, 2016:95).
2) Underscoring metrics such as customer satisfaction, product quality, and process efficiency (Kaplan & Norton, 1996:123).

g. Value stream-based profitability by:

1) Analyzing the profitability of each value stream instead of focusing on the profitability of individual products (Maskell et al., 2011:110).
2) Providing a clearer view of real sources of profitability (Krajewski et al., 2019:175).

h. Value-based planning and control through:

1) Using financial statements to make decisions based on the value added of the customer (Maskell & Baggaley, 2016:78).
2) Focusing on improving operations rather than just reducing costs (Cooper & Slagmulder, 2004:105).

i. Focus on the use of modern technology (technology integration) through:

1) Using advanced accounting systems that support LATS principles (Maskell et al., 2011:120).
2) Applying automated analysis tools and artificial intelligence to improve the accuracy and efficiency of accounting (Krajewski et al., 2019:180).

j. Focus on improving the customer's experience (customer-centric approach): through:

1) Addressing the optimization of client experience by reducing unnecessary costs that do not add value (Womack & Jones, 2003:89)
2) Re-orientating efforts towards the optimization of the quality of products and services.

Sustainable Performance:

It means the organizations' or individuals' ability to achieve high and sustained results in performance, taking into account the balance between economic, social, and environmental dimensions. Therefore, this concept ensures long-term viability without depleting resources or causing social or environmental damages. (Schaltegger & Wagner,2011:230).

Dimensions of Sustainable Performance:

a. Economic Dimension:

This dimension underlines profitability and economic growth while ensuring efficient use of resources. Also, it is concerned with improving productivity, reducing costs, and increasing the value added of products or services. Economic growth must be sustainable, i.e. not dependent on draining natural resources or sacrificing social well-being. (Bansal & Song, 2017:124)

b. Financial Dimension:

It is one of the core dimensions of sustainable performance, focusing on financial stability and economic growth of the organization while ensuring a balance between profitability, social responsibility, and environmental responsibility. This dimension is critical to ensuring the organization's continuity and ability to fulfill its obligations to stakeholders in the long term. (Bebbington & Unerman, 2018:11)

c. Social Dimension:

This dimension is about improving the quality of working life and surrounding society. It includes social justice, workers' rights, equality and community development. Organizations must contribute to the promotion of health, safety, education, and public welfare. (Hahn et al. 2018 :239).

d. Environmental Dimension:

This dimension focuses on reducing negative impacts on the environment by managing natural resources responsibly. Additionally, it targets carbon emission reduction, waste management, and biodiversity conservation. Organizations should rely on environmentally-friendly practices, such as using renewable energy and reducing carbon emissions. (Hart & Dowell, 2023:1469).

e. Application framework:

The sample is the Iraqi State Company of Vegetable Oils. It is a leading Iraqi food industry company founded in 1950 in Baghdad, Iraq. This state company produces, makes, and distributes a wide range of food products, including vegetable oils, tahini, biscuits, and dairy products. This company is one of the largest companies in Iraq and has a good reputation in the local food industry.

Tool

Following a thorough search on relevant literature, a questionnaire has been designed to address the objectives set in this study. This questionnaire included 35 questions: 5

personal questions and 15 questions relating to dimensions of the independent variable, which is lean accounting techniques, as follows:

a. The first dimension: sales and financial planning processes
b. The second dimension: target cost
c. The third dimension: staff satisfaction and professional training

As for the remaining 15 questions, they are concerned with the dimensions of the dependent variable, which is the assessment of sustainable performance, as follows:

a. The first dimension: financial performance
b. The second dimension: environmental performance
c. The third dimension: social performance

200 questionnaires were distributed to achieve the required sample size with a distribution rate of 100%. Out of all these questionnaires, 18 remain unrecoverable, accounting for 9%. Also, 32 forms were found to be invalid due to missing data or similar answers, which is 16%. Valid questionnaires were 150, making 75%. The table below demonstrates these distributions.

Table 2. Distribution of Questionnaire

Data	No.	Frequency %
Total distributed forms	200	100
Unrecovered forms	18	9
Invalid forms	32	16
Valid forms	150	75

Source: Author's contribution

The general rule is that the frequency of lost data is not more than 10% of the total data. If the ratio is lower, the mean-based method can be used to deal with it, and if the ratio is higher, it may be better to delete this data. To ensure that lost data does not affect the results of the analysis, Little's MCAR test can be used. This test assesses the value of Chi-square, freedom scores, and the Sig. of the data. If Sig is less than 0.05, this indicates the impact of lost data on results. In the current study, Chi-Square is 91.31, degree of freedom (DF) is 81, and statistical significance (Sig) is 0.085. As the Sig. is greater than 0.05, this indicates that lost data does not affect the final results of the analysis.

Validity Tests

Internal Consistency:

It is one of the types of validity in scientific research. It indicates the consistency and cohesion of elements or items within the tool (such as questionnaire or test) in measuring the same topic or concept as it is designed to measure. In other words, validity measures the degree of interconnectedness between different elements within the tool and the extent to which it measures the same phenomenon or case harmoniously. The importance of this test is achieved by ensuring the coherence of the tool, improving the quality of the data, and evaluating the effectiveness of the tool. Validity improves internal consistency by ensuring that all questions measure the same topic or concept and delete inconsistent questions: if some questions reduce the value of correlation coefficient, they can be deleted or modified. Also, increasing the number of questions regarding the same topic can improve internal consistency.

Table 3. Validity of internal consistency

No.	Questionnaire	Pearson Correlation	Sig
1	**LATs**	**.775****	0.00
2	**Financial performance**	**.812****	0.00
3	**Environmental performance**	**.761****	0.00
4	**Social performance**	**.790****	0.00

(**) indicates statistical significance at 0.01

Source: Practical survey

As the table above indicates, there is a statistical significance., i.e., the statement is proper and are reliable

Construct Validity

The internal construct validity of the sample form in scientific jargon means that a certain tool designed to measure a specific sample is accurate and honest. In other words, it is to verification that the items or statements contained in the scale measure the intended concept properly.

Table 4. Construct Validity

No.	Dimension and Part	Correlation Method	(SIG)	No. of statements	No. of samples
				30	200
1	LATs	.747**0	.000		
2	Financial performance	.740**0	.000		
3	Environmental performance	.801**0	.000		
4	Social performance	.634**0	.000		

(**) indicates statistical significance at 0.01

Higher Sig. in dimensions indicates the questionnaire is reliable and valid

Source: Author's contribution

Cronbach's Alpha for Reliability

This coefficient is commonly used to estimate reliability by calculating the average correlation between all parts of the elements in the scale, specifically estimating the ratio of variation in the overall result due to the real variation in the structure measured and not the variability of the error. This coefficient ranges from zero to one. Values above 0.7 are generally accepted for research purposes, while values between 0.6 and 0.7 may be acceptable depending on the nature of the study and the specific items measured. Values below 0.6 indicate poor internal consistency. Higher alpha values may indicate repetition in items and may indicate that some items may be removed to improve scale efficiency. The alpha coefficient involves calculating the average diameter items of the contrast matrix divided by the sum of the square standard deviation of each element multiplied by the number of elements minus one, as follows:

$$\alpha = (n / (n - 1)) * ((\Sigma\sigma\_x\hat{}2) / (\Sigma\Sigma s\_xy))$$

In brief, Cronbach's alpha coefficient is an essential tool to measure reliability as it states how reliable the scale is and how effective it is to effectively identify the relevant construct.

Table 5. results of Cronbach's alpha coefficient testing

Dimension	No. of items	Alpha coefficient
LATs	15	0.886
financial performance	5	0.779
environmental performance	5	0.801
social performance	5	0.754
Total scale	30	0.805

Source: SPSS 25 stats

The table above displays higher reliabilities of the relevant dimensions

Average Mean of Forms

The mean and verification value have been utilized as shown in the table below.

Table 6. The mean of answers

No.	Questionnaire	Mean	Verification
1	LATs	1.95	high
2	financial performance	2.03	high
3	environmental performance	2.00	high
4	social performance	2.12	high
General mean		2.02	high

Source: Practical survey

As the table above shows, the general mean average of the dimensions is 2.02, which indicates a higher assessment

Sub-hypotheses Testing

To test hypotheses formulated in this study, the simple linear regression coefficient has been used in order to find out how the independent variable affects the dependent variable. There is a main hypothesis and three sub-hypotheses, as follows:

The main hypothesis:

There is a statistical significance (Sig.) of LATs in the assessment of the sustainable performance in the Iraqi economic units.

Sub-hypothesis 1:

There is a statistical significance (Sig.) of LATs in the assessment of the financial performance in the Iraqi economic units.

Sub-hypothesis 2:

There is a statistical significance (Sig.) of LATs in the assessment of the environmental performance in the Iraqi economic units.

Sub-hypothesis 3:

There is a statistical significance (Sig.) of LATs in the assessment of the social performance in the Iraqi economic units.

Sub-hypothesis 1:

There is a statistical significance (Sig.) of LATs in the assessment of financial performance in Iraqi banks.

SPSS 2.5 software has been utilized.

Table 7. Testing of sub-hypothesis 1

assessment of financial performance	Model indicators					Levels		
	R	**R^2**	**Adjusted R^2**	**F**	**Sig.**	**B**	**t**	Sig.
(Constant)	**0.77**	**0.39**	**0.37**	**16.4**	**0.00**	**2.07**	**3.30**	0.00
lean accounting techniques						**0.37**	**3.69**	0.00

Source: Author's contribution

R: indicates the amount of LATs and the assessment of financial performance. It reached 0.77, i.e. there is a strong correlation.

R^2: indicates the change in "the assessment of social performance" attributable to LATs. It reached 0.39, i.e. 39% of the variance in the assessment of financial performance is explained by the independent variable

F: It is 16.4, which is Sig.

B: The value of B coefficient. It reached 2.07 in the independent variable.

T: It reached 3.30, which is Sig.

The results of the analysis demonstrate a statistical significance (Sig.) LATs in the assessment of financial performance in the Iraqi economic units.

Sub-hypothesis 2:

There is a statistical significance (Sig.) of LATs in the assessment of financial performance in Iraqi banks.

The following findings are concluded;

Table 8. Testing of sub-hypothesis 2

assessment of environmental performance	Model indicators					Levels		
	R	R^2	**Adjusted**	**F**	**Sig.**	**B**	**t**	Sig.
(Constant)	**0.69**	**0.3**	**0.29**	**16.7**	**0.00**	**2.77**	**6.50**	0.00
lean accounting techniques						**0.26**	**3.24**	0.00

Source: Author's contribution

R: indicates the amount of LATs and the assessment of social performance. It reached 0.69, i.e. there is a strong correlation.

R^2: indicates the change in "the assessment of social performance" attributable to LATs. It reached 0.31, i.e. 31% of the variance in the assessment of environmental performance is explained by the independent variable

F: It is 16.7, which is Sig., i.e. there is a significant effect of LATs on the assessment of environmental performance.

B: The value of B for LATs is 2.77.

T: It reached 3.24, which is Sig.

The results of the analysis demonstrate a significant effect of LATs on the assessment of environmental performance in Iraqi banks. As a result of the sub-hypotheses test, we verify the validity of the main hypothesis, i.e. there is a significant effect of LATs on the assessment of sustainable performance in Iraqi economic units.

Sub-hypothesis 3:

There is a statistical significance (Sig.) of LATs in the assessment of social performance in Iraqi banks.

Table 9. Testing of sub-hypothesis 3

assessment of social performance	Model indicators					Levels		
	R	R^2	**Adjusted R^2**	**F**	**Sig.**	**B**	**t**	Sig.
(Constant)	**0.60**	**0.23**	**0.20**	**20.1**	**0.00**	2.66	4.96	0.00
lean accounting techniques						0.39	4.59	0.00

Source: Author's contribution

R: indicates the amount of LATs and the assessment of social performance. It reached 0.60, i.e. there is a good correlation.

R^2: indicates the change in "the assessment of social performance" attributable to LATs. It reached 0.23, i.e. 23% of the variance in the assessment of social performance is explained by the independent variable

F: It is 20.1, which is Sig., i.e. there is a significant effect of LATs on the assessment of social performance.

B: The value of B for LATs is 2.66.

T: It reached 4.96, which is Sig.

The results of the analysis demonstrate a significant effect of LATs on the assessment of financial performance in Iraqi banks. As a result of the sub-hypotheses test, we verify the

validity of the main hypothesis, i.e. there is a significant effect of LATs on the assessment of sustainable performance in Iraqi economic units.

5. CONCLUSIONS

a. The overall average of the study's dimensions was 2.02, indicating a high degree of support for LATs among the respondents in the Iraqi economic units.
b. There is a significant effect of LATs on the assessment of financial performance, with the correlation coefficient amounting to R = 0.77.
c. LATs affect the assessment of environmental performance with the correlation coefficient amounting to R = 0.69.
d. There is a significant effect of LATs on the assessment of social performance, with the correlation coefficient amounting to R = 0.60.
e. The assessment of financial performance came first in terms of impact, then environmental performance, and finally social performance.

RECOMMENDATIONS

a. Employees of economic units should be engaged in continuous training programs on how to use and apply LATs effectively.
b. Advanced workshops and training courses can be presented to enhance staff skills at LATs.
c. Awareness of lean accounting and its importance should be raised among all employees of economic units.
d. Employees should be urged to adopt LATs and should be rewarded for innovation and continuous improvement.
e. Accounting systems should be updated to integrate them with LATs and to facilitate their application.
f. Modern technologies such as artificial intelligence and graphic analysis should be used to support LATs.
g. Social and environmental sides in LATs should be promoted to ensure a comprehensive sustainable performance.
h. Performance indicators for social and environmental sides should be developed and should be regularly monitored to ensure continuous improvement.
i. LATs should be periodically assessed, and their impact on financial, environmental, and social performance should be analyzed.

j. Assessment results can be used to identify strengths and weaknesses and take necessary remedial actions.

k. Collaboration with relevant local and international enterprises should be embarked on to share experiences and enhance best practices.

l. Participation in conferences and seminars should be encouraged to showcase the experiences of Iraqi economic units and take advantage of international experiences.

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