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**LEAN ACCOUNTING AND ITS IMPACT ON REDUCING PRODUCTION COSTS IN INDUSTRIAL COMPANIES: A FIELD STUDY ON INDUSTRIAL COMPANIES OPERATING IN THE STATE OF KHARTOUM/SUDAN**


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**ABSTRACT**

Lean accounting was defined as the costs that are prepared and organized according to the concept of the value chain, which combines both financial and non-financial information in order to provide the organization with financial reports that reflect performance using financial and non-financial information. This study aimed to demonstrate the impact of lean accounting on reducing the cost of production in industrial companies. The analytical descriptive approach has been used in this study and it also tested the basic hypothesis which was the presence of any a statistical impact of lean accounting on reducing production costs. The study has come up with several results, including the presence of an impact of lean accounting on cost reduction. The study recommended several Recommendations, including the need for industrial companies to pay attention to continuous improvement, employees, and the performance linking scheme in order to contribute to reducing costs and pricing, beside competition locally and abroad.

**Keywords:** Lean accounting, Cost reduction, Industrial companies, Khartoum

**JEL Classification Codes:** O47, O53, E13, R11.

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## 1. INTRODUCTION

The impact of the great development in the economic, technological, and social aspects, the intense competition, and the scarcity of capital, has affected the traditional accounting systems that have become unable to meet the requirements of modern manufacturing activities, so it has become necessary to implement a new accounting system represented in lean accounting that improves, develops, and increases. Efficiency and reducing production costs in addition to increasing the quality of production and making rational decisions.

### 1.1. The Study Problem

Because it contains a large number of losses and waste in resources and time, the application of traditional accounting is often accompanied by a lack of information about costs in order to make decisions, and with the steady development in industrial production processes, industrial establishments had to find new accounting systems that keep pace with these developments and seek to solve industrial problems. By adopting lean accounting and what it will provide in terms of reducing production costs in order to make rational decisions, where the problem of the study was formulated through the main question, is there a statistical effect of lean accounting on reducing costs, and it is divided into the following questions.

- Is there a statistical effect of continuous improvement on cost reduction?
- Is there a statistical effect of employee satisfaction on cost reduction?
- Is there a statistical effect of the performance linking scheme on cost reduction?

### 1.2. Objectives of the Study

The objectives of the study were as follows:

- State the impact of continuous improvement on reducing production costs.
- Highlighting the impact of employee satisfaction on cost reduction.
- Show the impact of the performance link scheme on cost reduction.

### 1.3. The scientific and practical importance of study:

The scientific and practical importance of the study is as follows:

*Scientific importance:* The scientific importance of the study was represented in the following:

- The scientific enrichment of libraries due to the scarcity of studies that dealt with this subject (lean accounting).
- Studying the impact of lean accounting to provide appropriate information that helps in making rational decisions.

*Practical importance:* The practical importance of the study was represented in the following:

- Solving industrial problems by finding modern costing methods.
- Contribute to providing high quality information with the aim of making decisions by managers.

### 1.4. Study Methodology

This study relied on the historical and descriptive analytical method for the purpose of collecting data and information from its primary and secondary sources such as references, previous studies, publications on the Internet, and the questionnaire.

### 1.5. Study Hypotheses

Based on the study problem and its objectives, the following hypotheses were put forward:

- The first hypothesis: There is a statistical effect of continuous improvement on cost reduction.
- The second hypothesis: There is a statistical effect of employee satisfaction on cost reduction.
- The third hypothesis: There is a statistical effect of the performance link scheme on cost reduction.



## 1.6. Study Structure

The subject of the study was addressed through three main axes:

- The first axis: introduction and previous studies.
- The second axis: the theoretical framework and dealing with lean accounting, reducing production costs.
- The third axis: the field study.

Conclusion: It includes findings and recommendations.

## 2. PREVIOUS STUDIES

Safaa (2015 AD, p. 60) the study aimed to determine the role of lean accounting in improving the overall performance of the establishments by following specific agility methods and procedures for this approach. Fundamental differences between the traditional accounting system and the lean accounting system, where the lean accounting system can only be applied in an environment that produces lean thinking, and lean accounting is committed to complying with the systems and requirements of the accounting profession.

Israa (2016 AD.) the study aimed to determine the extent to which rational accounting is used to achieve a competitive advantage in light of the comprehensive quality management approach. The study was applied in Bank of Palestine and its branches. It uses lean accounting tools, so the relative computational average reached 85%, and the most applied lean accounting tools in order are (target cost tool, value stream maps, and employee satisfaction tool) and that the rest of the variables have a weak effect. The study recommended the need for a gradual approach to applying Lean accounting system and take advantage of its multiple advantages.

Jamal (2017 AD, p. 243) the study aimed to study the impact of adopting the components of intellectual capital in building the lean accounting method in Jordanian industrial companies, in order to achieve radical, pioneering changes in their manufacturing business. The study concluded that there is a statistically significant effect In order to adopt the components of intellectual capital in its various dimensions in building the foundations of the lean accounting method in these companies, the study recommended the need for industrial public shareholding companies to focus on applying all lean accounting tools and their integration with the different dimensions of intellectual capital, to reach an increase in the level of application of lean accounting because of its impact on Reducing production costs.

Mumpuni (2018, p. 166-175) the problem of the study was to identify the factors that affect the application of lean accounting in Indonesian companies, the study aimed to identify the factors that affect the application of lean accounting in the companies of Astra International and Tbk Group in Indonesia, tested The study hypotheses the following hypotheses: the application of the continuous improvement method leads to the implementation of lean accounting, the application of the value stream cost method leads to the activation of lean accounting, the application of the just-in-time production method leads to the implementation of..

Emmanuel Emeakponuzo, Patience Etimp (2018, p 1-11) the study aimed to determine the level of awareness of the usefulness of lean accounting principles in the management of process waste in the beverage industry, especially in Nigeria, and to study the impact of lean accounting principles in waste management in the private beverage industry in Nigeria. The study hypotheses the following: The application of lean accounting affects waste management in the beverage industry, the study sample. Nigerian industrial companies adopt the lean accounting method. This whole concept and from this result, the study concluded that there is no significant effect of the practice of lean accounting on waste management in the private drink industry for the study sample in Nigeria. It aims to effectively manage waste to provide good quality of its products which will ultimately add value to all stakeholders in the long term.

Suleiman El-Dalahmeh (2018, p. 390-406) the study aimed to determine the extent to which the cost approach is implemented to reduce the costs of public shareholding companies in Jordan, and to determine the availability of components for implementing the target cost approach for food industries in Jordan and to identify the extent to which Jordanian shareholding companies are aware of industries Concepts, principles and importance of target costing and the extent to which Jordanian companies contributing to food industries companies use cost to improve profitability and the extent to which Jordanian shareholding companies in food industries use value engineering to reduce the cost of their products to reach the target cost, and to identify the difficulties that impede the adoption



of target cost engineering and value engineering in joint stock companies Jordanian food industries in Jordan, the study discussed the following hypotheses: The Jordanian joint stock companies for food industries do not have the components necessary to apply the target cost approach, the Jordanian joint stock companies for food industries do not understand the concept, principles and importance of applying the target cost approach, the Jordanian joint stock companies for food industries do not use cost management Targeted to improve its profitability, the use of value engineering does not reduce costs to reach the target cost in the Jordanian shareholding companies for food industries, there are no difficulties in adopting the cost goal and value engineering in the Jordanian shareholding companies for food industries, the study concluded that improving profits depends on the availability of cost application components Targeted costs, and companies' awareness of these concepts and principles, and companies use value engineering to achieve cost to reach target costs, and the results showed that there are some difficulties that impede the application of target costs and value engineering in Jordanian joint stock companies specialized in food industries. The most significant difficulties were: Lack of sufficient knowledge of company management on how to implement target costing and value engineering. Lack of research related to cost benefits target and value engineering. The application costs are greater than the expected benefits, the study recommended that there is a need for more research in this regard due to the lack of sufficient knowledge of the company's management on how to implement the target cost and value engineering and the lack of research and publication related to the benefit cost and the target value of engineering and the application costs are greater than the expected benefits.

Enaam, Akeel, Ameer Shaker (2019, p 589) the study aimed to search for the impact of lean accounting information on the financial performance of health care institutions and analyze the impact of the value stream cost as a simple accounting tool in improving financial performance indicators for health care institutions. The study tested The following hypotheses: There is a statistical relationship between the application of lean accounting and increased profitability, there is a statistical relationship between the cost of value and the discrimination between activities, there is a statistically significant relationship between estimating value-added and competitive advantage, there is a statistical relationship between estimating the cost of value and added value, saving resources and eliminating their waste, The study concluded that the implementation of value estimation costing enables administrators to distinguish between value-added activities and non-value-added activities, thus eliminating waste and providing available resources for more effective use. Therefore, health care managers can benefit from accounting information to determine the true cost of their services, and then improve Financial performance indicators, and the study concluded that analyzing activities into value-added and non-value-added activities allows managers to improve competitive advantage by taking advantage of reducing the earned cost, and estimating the cost of value to determine a lower price for their services, as there is little literature that discusses the relationship between Estimating the costs of value and financial performance in the health care environment, and it also provides health care managers with the necessary information to improve both competitive advantage and financial performance by revealing the real cost of hospital services. The study recommended the need to apply these results to private hospitals in Iraq and other developing countries to improve their advantage competitiveness at the international level.

Raed (2019 AD, p. 329) the study aimed to know the modern methods of costing and then how to apply them, due to the difference between traditional and lean methods in both financial accounting and rational costing. The study concluded that the development in the use of lean accounting helps in the aspect The supervisory and strategic reports of the economic units, and its financial statements and administrative and cost-related reports are in a brief style, and can be understood by everyone and ready upon request at any time by higher managements and other practices that help in decision-making.

Ruqaya ( 2019 AD, p. 589) the study aimed to demonstrate the role that the application of lean accounting plays in achieving leadership by focusing on two tools, which are continuous improvement and employee satisfaction. I reached results, including that the application of lean accounting represents a bridge to reach leadership. And it achieves a competitive advantage and new innovation in higher education institutions. The study recommended recommendations, including the necessity of consolidating the quality strategy that achieves leadership. Continuous improvements must be added and future studies should be done to measure the role of lean accounting tools.

Walid et al. (2020, pg. 73) the study aimed to identify the availability of the possibility of applying value stream analysis as one of the lean accounting tools in the institutions under study, and to achieve the objectives of the study, a questionnaire was designed with the subject and objectives of the study. A random sample of 90 managers



was chosen. And the managers and accountants of the institutions in the state of the Valley, I came to the conclusion that the capabilities are available for these institutions to transform into the application of lean accounting, and the most important tool of its tools is the analysis of the value stream.

Walid Mirghani and Zakaria Damdum (2022 AD, p. 189) The study aimed to highlight the role of lean accounting as a modern approach to controlling costs and reducing waste in resources, which helps organizations to enhance their competitive strategy. The study relied on the analytical descriptive approach, as it reached the study indicates that there is a tangible effect of lean accounting practices on the competitive strategy based on the lowest cost in the Algerian business environment.

Jabbar Kazem (2022 AD, p. 135) this study aims to determine the numerical value of errors, waste and loss of time and various resources in the approved accounting work for the salary unit. Resources (human, service, commodity, time) through the elimination of wasted time by exploiting the wasted time for the unit of records, which is characterized by efficiency on the quality of information.

### **3. THEORETICAL FRAMEWORK**

This axis includes lean accounting and reducing production costs.

#### **3.1. Lean Accounting**

##### **3.1.1. The Concept of Lean Accounting**

There is a set of definitions related to lean accounting, as some writers mentioned them (Mohammadi and Al-Mahdi, 2018 AD, p. 125). Lean accounting was defined as the costs that are prepared and organized according to the concept of the value chain, which combines both financial and non-financial information in order to provide the organization with financial reports that reflect performance using financial and non-financial information. Agile and lean production that provide appropriate foundations for the use of accounting information that supports the accounting systems applied in the institution.

Lean accounting was also defined as a set of principles and methods to reduce costs by simplifying procedures and processes and identifying useless activities that do not add value, and then deleting them in a way that saves effort and cost (Khalid, 2015 AD, p. 7).

Until the year 2006 AD, lean accounting practices were not clear-cut because they were developed by different individuals and different industrial establishments. In September 2005 AD, the first conference titled Lean Accounting was held in Detroit in the United States of America. And given the development of lean accounting practices in the past ten years that are still developing, the need has emerged to document modern accounting solutions that include lean accounting principles, practices and tools (Sirwan and Muhammad, 2015 AD, pp. 119 and 120).

##### **3.1.2. Goals of Lean Accounting**

Lean accounting aims at the following (Haider and Ali, p. 117):

- a. Elimination and development: that is, eliminating activities that do not add value and improving customer service and control with the participation of everyone.
- c. Increasing sales: It provides more information for decision-making, because the use of standard costs to make pricing decisions, product quality, profitability, and capital investment is often wrong, so the organization needs lean accounting tools such as the value stream to make a better decision.
- c. Clear identification of the financial impact of lean improvements: It clearly defines lean improvements because using traditional models to evaluate the benefits of lean improvement does not achieve the goal.
- d. Encouraging lean improvement.
- e. Providing appropriate information: Lean accounting provides accurate, timely and understandable information, which leads to motivation towards lean transformation and helps in making decisions, which leads to increased customer value and growth in profitability.



f. Commitment to international accounting principles: Lean accounting is fully consistent with accounting principles and external and internal reporting systems.

Lean accounting also seeks to achieve a number of other goals (Khalil and Riyadh, 2015 AD, pg. 5), which are as follows:

- a. Provide timely, relevant and understandable information to stimulate the transition to a lean production system across the region and assist in the decision-making process.
- b. Using streamlining tools to eliminate waste in accounting treatments while maintaining comprehensive financial control.
- c. Compliance with generally accepted accounting principles.
- d. Reporting of external regulations and internal reporting requirements.
- e. Support a lean culture by stimulating investment, providing information, and enabling continuous improvement at every level of the organization

### **3.1.3. The Importance of Lean Accounting**

The importance of lean accounting lies in the fact that it is (Bazqari and Bin Sahel, 2018 AD, pg. 97):

- a. Availability of information to make better decisions that lead to improved profitability.
- b. Reducing time and cost and eliminating waste by eliminating unnecessary operations.
- c. Determine the necessary financial benefits expected from applying the idea of wasted and wasted manufacturing.
- d. Encouraging improvements by providing information and statistics.

### **3.1.4. Advantages, Obstacles and Requirements for the Application of Lean Accounting.**

Lean accounting has advantages, obstacles and requirements as follows (Mozarin and Khalaf Allah, 2019 AD, pp. 12-13):

#### *Advantages of applying lean accounting*

- I. Assistance in reducing losses in accounting operations in a way that liberates the time of financial and operational personnel and makes them more effective and active with the help of the economic institution and the implementation of its strategies.
- II. Supporting a lean culture by stimulating and providing appropriate information and encouraging continuous improvement at all levels of the economic enterprise.
- III. Compliance with generally accepted accounting principles with regard to preparing internal and external reports.

#### *Obstacles*

The obstacles that hinder lean accounting are as follows:

- I. Lack of training and lack of understanding of production processes, because the current situation of rapidly changing operational processes requires accountants to gather all the correct accounting skills for the purpose of understanding the work and the ability to gain full knowledge of the initial operations and follow up on all commercial releases.
- II. It requires the management accountant to link all the figures he obtains to the financial statements and leave the historical cost process in preparing its financial statements for the institution.
- III. Feeling of professional superiority: Some professional institutions of lean accounting withhold information and periodic reports to spread the culture of lean accounting.
- IV. There is a basic tenet of lean manufacturing. Anything that does not add or improve value should be discarded.

#### *Requirements for applying lean accounting*





There are basic requirements for the application of lean accounting are:

- I. Creation of job indicators and information reports about Licensing Department.
- II. Linking these indicators and value streams to the strategic objectives.
- III. Establish a pricing system for value products and listings within the value streams.
- IV. Develop a financial, operational and sales plan.
- V. Applying rationalization methods in the financial and other departments.

### **3.1.5. Lean Accounting As a Performance to Reduce Costs**

The lean accounting system works to reduce the need for reports and measures of values that are almost negligible, and this indicates that the operations have become smaller and that there are no differences in the costs of production, operations, employees, equipment and demand, and as a result, the lean accounting system works to reduce waste And the loss in resources and activities that do not add any value to the production process, and the system works to provide more space to work on increasing productivity and improving and raising the value and quality of the product, and companies that use the lean accounting system are expected to reduce the processing time of orders and reduce damage in the production process And increasing the possibility of using resources, improving the value of the product, increasing productivity, reducing costs (Linda and Babiker, 2019 AD, p. 111).

### **3.1.6. Principles of Lean Accounting**

There is a set of different principles on which lean accounting are based, including (Haider and Ali, 2014 AD, p. 116):

- a. Agile accounting business.
- b. Accounting operations that support the transition to agility.
- c. Communicate information clearly and in a timely manner.
- d. Planning from the perspective of agility.
- e. Strengthening internal accounting control.

One of the most important basic principles of lean accounting is measurement and bias. Measurements of lean accounting are positive gains by initiating lean alternatives in several ways, such as reducing inventory, reducing production cycle time, improving production, and then increasing total capacities. On the other hand, accounting motivates companies to continue promoting their lean initiatives instead of providing numbers as traditional accounting works (Raed and Saad, 2013 AD, pg. 294).

### **3.1.7. Lean Accounting Tools**

There are tools for lean accounting, which are as follows:

*Value stream maps:*

It is considered one of the basic tools in lean accounting, as the value streams of products in lean companies constitute an advanced stage in the transition to lean management. Where there are reasons to adopt the performance of the value stream, including (Slah, Waff & Zaki, 2013, p 90):

- I. Information and tools can be collected quickly and simply, and value stream costs are collected on a weekly basis in order to be simple and understandable.
- II. The information provided by the value stream is direct information and promises the lowest costs, as the cost information is immediately understandable when used by decision makers.
- III. The information provided by the value stream is relevant and actionable by the value stream managers, as the value stream management is responsible for the revenues, costs and profits of the value stream.

*Performance Measurement Link Scheme:* Where performance measures are divided into two types, which are cell performance measures and value stream performance measures as follows (Bahadir, 2011, p25).



*Cell performance metrics:* By implementing agile principles on accounting practices, new performance measures are required to support the manufacturing of agile operations, as they provide appropriate information for decision-makers with control over operations within agile cells, as these measures are collected and used by individuals in the cell that displays the first steps taken in The right time, where there are four measures of value performance are:

- I. Effectiveness of operational equipment.
- II. Quality report the first time.
- III. Hourly daily report.
- IV. Report production under actual operation to production under standard operation.

As for the performance measures of the value stream, the goal is to It is to push one or more teams for continuous improvement in operations within the value stream, and unnecessary operations are excluded. It is used on a weekly basis to indicate the financial impact and operational capacity and measure it to obtain performance results and current profitability.

*Target cost:* This approach is based on an idea that determines the price of the product, and improvement processes, taking into account the needs of customers and the price they want to pay. Its main goal is to clarify the needs and value of customers and it aims to reduce costs during the product life cycle to improve the provision of a product that fits the needs of the target consumer (Al -Kabeji, 2014, p. 172).

*Kizen (Continuous improvement):* Continuous improvement is known as continuous improvements in place, materials, work, and production methods by encouraging suggestions and ideas by work teams in the economic unit or the factory, and aims to raise the level of quality, performance and reduce cost (Kazem, 2011, p. 188).

*H-points box:* It is a report that appears weekly through the performance of the value current that is used to assess the financial impact and make decisions to improve the improvement, and the main purpose of this report is to focus the interest of the value stream team on the areas that can benefit from continuous improvement efforts, and improvement of the results of the weekly value current can be tracked As an indication of the effectiveness of continuous improvement efforts (Maskell & Kenddy 2007, p. 59)

### **3.2. Reducing Production Costs**

#### **3.2.1. The Concept of Production Costs**

The cost reduction was defined as a positive plan developed to improve efficiency by excluding loss or excessive production, and increasing efficiency in all fields using advanced means to reduce this extravagance (Ben Bira, 2021, p. 128),

It is the transition from the current cost level to a lower level of it, as this requires taking measures that lead to changing the operating conditions so that the facility can produce the same product but at a lower cost (loyalty to Ali, 2011, p. 2), as it is intended to move from the level of costs Currently to the level of costs less than it, for example, a new machine that performs the same processes at a lower cost, or gives greater production at the same cost, immortal, 2015, p. 7).

#### **3.2.2. Goals to reduce cost**

The main goal of reducing the cost is the following (Zakaria, 2009, p. 3):

- a. Economic and optimal use of available resources, which reduces the areas of excessive and misuse.
- b. Increased competition ability.
- c. Achieving consumer satisfaction by providing a product with the quality and specifications required and at the lowest possible price.

#### **3.2.3. The Importance of Cost Reduction**

The importance of cost reduction can be highlighted through the following points (Loay, 2021, p. 13):





- a. Supporting the competitive position of the establishment, because the progress of the economic units depends on the ability of these units to sell at moderate prices in order to be able to compete with other units.
- b. Increasing profits by reducing the cost of production, which leads to strengthening its capital, and then it can carry out expansions in economic activity plans by providing the achieved financial abundance towards new horizons for society and the economy.
- c. Care and economy in the use of production elements and the elimination of waste and extravagance and the reduction of losses, which leads to an increase in production efficiency.
- d. The reduction represents a shield and immunity for the establishment to face future changes resulting from external sources, for the issuance of a law to increase the tax rate imposed on the establishment or to increase the guarantee share in which the establishment contributes.
- e. Reducing costs represents a goal or incentive that workers seek to achieve, especially if the reduction process is associated with granting incentive rewards to people who cooperated or achieved the reduction process.

#### **3.2.4. Types of Cost Reduction**

The following types of cost can be distinguished (Rashid, 2015 AD, p. 12):

a) Distinction over the stability of the establishment, which is represented in:

- Reducing the dwell cost

This reduction is applied in the event that the conditions of the facility are stable and depend on one level of production with the stability of the external conditions of the facility.

- Reducing the movement cost.

This method applies in the event that the establishment relies on unique production levels, each of which is commensurate with the prevailing conditions and the surrounding market conditions. This method is effective in the case of activities costs for which it is difficult to set specific standards, such as sales and maintenance activities.

b) Discrimination on the basis of the purpose of the investigation:

It means those operations that focus on organizing profits and reducing the share of the unit without prejudice to the total costs. This reduction is achieved by the following methods:

- Increase production.
- Increase in selling prices.
- The impact of central state decisions.
- The impact of internal decisions of the facility.
- Real cost reduction.

#### **3.2.5. Reducing and Controlling Costs**

The process of reducing costs requires methods and procedures that differ from those used in control, because cost control is the establishment of a control system over the operations and activities of the facility on planning budgets, whether fixed or flexible, and standard costs, which in turn gives differences from the plans drawn when comparing the performance achieved with them. It provides management with an effective cost control tool, i.e. the ability to subject costs to planned behavior. The goal of control methods is to find a measure to control and improve work efficiency while it lacks dynamism due to several factors affecting costs, while the reduction process depends on the method of continuous challenge to the cost reality by comparing it with Continuously established standards in light of the changes that occur as a result of filling the time required by the cost planning process in reducing a dynamic process as a result of technological developments, production processes, product design, marketing, procedures, manpower, and the study of time and movement and its distinction (Swilam, 2009 AD, p. 73).



### **3.2.6. Methods of Cost Reduction**

The traditional method of cost reduction appeared in European companies, and this method is based on designing the product first, then determining the cost, and finally knowing whether the product can be sold first. If the cost is too high, the product is returned for redesign, and under this traditional method, cost reduction activities begin. At a late stage in the product life cycle, where this method aims to reduce the dimensional costs of the current products, it does not seek a specific cost goal, but only to reduce the cost periodically and not continuously, there are also other ways to reduce the cost in the manufacturing or purchasing stage, These methods focus on reducing the cost of current products through the use of systems to exclude familiarity, reduce the cost of activities associated with manufacturing, and through the use of modern manufacturing systems (Ali Jaber, 2013 AD, p. 249).

### **3.2.7. Principles of Cost Reduction**

There are principles and foundations that must be taken into account when reducing costs, which are (Nabih, 1997 AD, p. 249):

- a. Focusing first on the elements that bear the largest reduction in costs with the least efforts compared to other elements.
- b. The study and analysis of costs and the implementation of proposals should not be greater than the reduction in costs.
- c. The reduction in costs does not lead to a reduction in quality, which affects the total revenues.
- d. Cost reduction should not lead to wrong decisions such as dispensing with a fixed asset that the project may need in the near future.
- e. Reducing costs should not lead to weakening the morale of workers, which affects productivity.

### **3.2.8. Factors That Lead to Cost Reduction**

Among the most prominent factors that lead to cost reduction (Ahmed, 2021 AD, pp. 184-185) are:

- a. Savings achieved from increasing the curve of experience and learning among employees.
- b. Less investment in raw materials with advanced storage systems.
- c. Upgrading the level of utilization of the available energies in the company's assets to reduce the impact of fixed costs on the total cost per unit of production.
- d. Adopting a distribution policy that is consistent with the specificity of the product and preserving it and its safety from damage.

### **3.2.9. The Advantages of Reducing The Cost of Production**

Reducing the cost of production is represented in the following (Yusra, 2018 AD, p. 107):

- a. It provides the facility with protection for its products against the competitive forces that it may be exposed to, whether in the local or international markets.
- b. Supporting research activities as a more effective tool to achieve cost reduction in any facility through innovative research or research to develop the characteristics of existing products in order to achieve the facility's production excellence feature.
- c. The facility's ability to provide the product with the highest required quality, at the lowest competitive rate, and then at the lowest competitive price.
- d. Responding to technological developments, especially advanced manufacturing technology, and thus working to update the product.

### **3.2.10. Reducing Costs in Light of Lean Accounting**

The entrance to lean accounting reflects the philosophy of management in stability and survival in the competitive market and increasing its market share by achieving short and long-term goals, maximizing the value provided to



customers, and strengthening mutual relations between the parties in the value chain. The lean accounting method works to reduce waste, and loss in resources and getting rid of activities that do not add value to the production process. Lean accounting also contributes to providing space for work and making good use of it, and to increasing productivity and improving the quality of the product (Issa, 2021, p. 188).

#### **4. FIELD STUDY**

##### **4.1. The Study Population and Sample**

The study population consists of all companies operating in the state of Khartoum, while the study sample included (55), and (55) questionnaires were distributed to the study sample, and 49 were collected, or 89%.

##### **4.2. Tool of the Study**

To obtain data and information for this study, the researcher designed a questionnaire for the study entitled "Lean Accounting and its Impact on Reducing Production Costs for Industrial Companies." It consisted of two parts. And the second section included the basic study phrases represented by the study axes through which the study variables are identified. The arithmetic of this scale is (3) and therefore the response levels are as follows:

1. from 4 to greater than 3.5 positive approvals.
2. from 3.5 to greater than 3 average degree of approval (leaning to positive).
3. From 3 to greater than 2.5, moderate degree of non-positivity (leaning towards negativity).
4. Disagreement (negative) from 2.5 to greater than 2.
5. Less than 2 strongly disagree (very negative).

The study sample was also asked to determine their response to what each phrase describes in the questionnaire related to the subject of the study, represented by (18) phrases. These phrases were distributed into two variables as follows:

**Table 1.** Shows the variables and the number of their expressions

	<b>Variables (axes)</b>	<b>Number of phrases</b>
1	The first dimension of the first axis	5
2	The second dimension of the first axis	4
3	The third dimension of the first axis	4
4	The second axis	5
Total		18

**Source:** prepared by the researcher from the data of the field study 2023 AD.



#### 4.3. The Statistical Analysis Method Used in the Study

The researcher used the following statistical tools:

1. Descriptive statistics methods.
2. Statistical treatments.

*Descriptive statistics methods:* to describe the characteristics of the study sample's vocabulary by making frequency tables that include frequencies and percentages of the personal data of the respondents to identify the general trend of the sample's vocabulary for each single variable as in the tables shown below:

**Table 2.** Shows the frequency and relative distribution of the study sample according to the academic qualification

	Frequency	Percent	Valid Percent	Cumulative Percent
Pre-university	4	8.2	8.2	8.2
Collegiate	37	75.5	75.5	83.7
Above university	8	16.3	16.3	100.0
Total	49	100.0	100.0	

**Source:** prepared by the researcher from the data of the field study 2023 AD.

It is clear from Table No. (2) above that the majority of the respondents are university students, as they numbered (37) individuals at a rate of 75.5%, and (8) of them were postgraduates at a rate of 16.3% and (4) before university at a rate of 8.2%, and this indicates that the sample Those to whom the questionnaire was distributed are scientifically qualified and provide opinions that increase the strength of the study.

**Table 3.** Shows the frequency and relative distribution of the study sample according to scientific specialization

	Frequency	Percent	Valid Percent	Cumulative Percent
Accounting	19	38.8	38.8	8.2
Administration	9	18.4	18.4	83.7
Economy	10	20.4	20.4	100.0
Administrative costs and accounting	5	10.2	10.2	
Banking studies	6	12.2	12.2	
Total		100.0	100.0	

**Source:** prepared by the researcher from the data of the field study 2023 AD.

It is noted from Table No. -3- above that the questionnaire was distributed to individuals related to the subject of the study, and this contributes to the quality of the results.

**Table 4.** Shows the frequency and relative distribution of the study sample according to job title

	Frequency	Percent	Valid Percent	Cumulative Percent
Director of Department	19	38.8	38.8	38.8
Financial Manager	10	20.4	20.4	59.2
Accountant	9	18.4	18.4	77.6
Internal Auditor	5	10.2	10.2	87.8
Cost Accountant	6	12.2	12.2	100.0
Total	49	100.0	100.0	

**Source:** prepared by the researcher from the data of the field study 2023 AD.

It is clear from Table No. (4) Above that most of the respondents have a job related to the subject of the study, and this is useful in knowing and understanding the vocabulary and phrases of the study and answering them clearly.



**Table 5.** Shows the frequency and relative distribution of the study sample according to experience

	Frequency	Percent	Valid Percent	Cumulative Percent
5 years and less	1	2.0	2.0	2.0
6-10 years old	6	12.2	12.2	14.3
11-15 years old	10	20.4	20.4	34.7
16-20 years old	11	22.4	22.4	57.1
21-25 years old	16	32.7	32.7	89.8
26 years and over	5	10.2	10.2	100.0
Total	49	100.0	100.0	

**Source:** prepared by the researcher from the data of the field study 2023 AD.

It is clear from Table (5) that most of the respondents have appropriate practical experience, and this helps in the accuracy of the answers they give and increases the strength of the study.

#### *Statistical Treatments*

The study data was collected through a questionnaire that has two axes, where the second axis consists of five dimensions. The questionnaire covered these axes. Among the most important statistical treatments are the following:

- The arithmetic mean and standard deviation to find out the direction of the study sample's opinions about the statements of the study axes.
- The multiple regression test and the reason for choosing it over other measures is because it is a measure that tests the effect between variables.

The arithmetic mean and standard deviation: It is used to find out the direction of the study sample's opinions about the statements of the study axes, so the researchers calculated the arithmetic average of the statements of each dimension of the study axes to know the direction of the respondents' answers, which are as follows:

**Table 6.** Arithmetic means and standard deviation

Expressions	Arithmetic mean	Standard deviation	Decision
The company is interested in training its employees in order to reduce waste in costs	4.3878	.53293	Accepted
The company seeks to reduce wastage in time to the lowest possible extent	4.4898	.68076	Accepted
There is no surplus labor in this company	4.0816	.93177	Accepted
The products offered in the market are able to meet the desires of the consumer.	4.3469	.87918	Accepted
The products of this company are competitive in the market	4.4490	.81806	Accepted

**Source:** prepared by the researcher from the data of the field study 2023 AD.

It is clear from Table No. (6) that:

- There is high agreement by the respondents on the statements of the first dimension of the first axis, because the average of those statements exceeded the hypothetical mean (3).
- The highest statement in terms of arrangement that the respondents strongly agreed on in this dimension is the second statement, with an arithmetic mean of 4.4898 and a standard deviation of (.68076), followed by the fifth statement, then the first statement, then the fourth, and then the third statement.
- The lowest statement in terms of arrangement agreed upon by the respondents in this dimension is the third statement, with an arithmetic mean of (4.0816) and a standard deviation of (.93177), and this indicates that most of the respondents agree with the statements of the first dimension of the first axis.



**Table 7.** The arithmetic mean of the expressions of the second dimension of the first axis

Expressions	Arithmetic mean	Standard deviation	Decision
The company is keen to pay reasonable wages to its employees.	4.4286	.67700	Accepted
The company is keen to provide free treatment services to employees	3.9796	.85366	Accepted
The company compensates workers when they are injured during work.	4.4286	.81650	Accepted
Bonuses paid by the company to employees after the end of the service period are good and contribute to employee satisfaction	4.3265	.80072	Accepted

**Source:** prepared by the researcher from the data of the field study 2023 AD.

From the above table no. (7) It is clear that:

1/ There is high agreement by the respondents on the statements of the second dimension of the first axis, because the average of those statements exceeded the hypothetical mean (3).

2/ The highest statement in terms of arrangement that was strongly agreed upon by the respondents in this dimension are the first and third statements, as their arithmetic average was (4.4286), followed by the fourth statement, and then the third statement.

3/ The lowest phrase in terms of arrangement agreed upon by the respondents in this dimension is the third phrase, with an arithmetic mean of (3.9796) and a standard deviation of (.85366), and this indicates that most of the respondents agree with the statements of this dimension.

**Table 8.** The arithmetic mean of the expressions of the third dimension of the first axis

Expressions	Arithmetic mean	Standard deviation	Decision
The company has good information to make pricing decisions	4.6531	.63084	Accepted
The company prepares daily reports on the results of its work	4.4490	.86750	Accepted
The company is keen to exclude unnecessary operations in its business	4.3265	.80072	Accepted
The company is keen to evaluate its profitability periodically	4.2857	.95743	Accepted

**Source:** prepared by the researcher from the data of the field study 2023 AD.

From the above table no. (8) it is clear that:

1/ There is high agreement by the respondents on the statements of the third dimension of the first axis, because the average of those statements exceeded the hypothetical mean (3).

2/ The highest statement in terms of arrangement that was strongly agreed upon by the respondents in this dimension is the first statement, with an arithmetic mean of (4.6531) and a standard deviation of (.63084), followed by the second statement, then the third, then the fourth statement.

3/ The lowest phrase in terms of arrangement agreed upon by the respondents in this dimension is the fourth phrase, with an arithmetic mean of (4.2857) and a standard deviation of (.95743), and this indicates that most of the respondents agree with the statements of this dimension

**Table 9.** The arithmetic average of the phrases of the second axis

Expressions	Arithmetic mean	Standard deviation	Decision
The company's management is interested in constantly raising the efficiency of employees	4.4898	.81961	Accepted
The company's employees are interested in reducing the cost of production without compromising the quality of the final product	4.2449	.72257	Accepted
The products of this company are marketed for their low price and high quality	3.9796	.90115	Accepted
The company's senior management is interested in cost reduction policies, as it follows up on the implementation of other departments	4.3469	1.03181	Accepted
Low-cost production has the ability to compete externally	4.3061	.89452	Accepted

**Source:** prepared by the researcher from the data of the field study 2023 AD.





From the above table no. (9) it is clear that:

1/ There is high agreement by the respondents on the statements of the second axis, because the average of those statements exceeded the hypothetical mean (3).

2/ The highest statement in terms of arrangement that was strongly agreed upon by the respondents in this axis is the first statement, with an arithmetic mean of (4.4898) and a standard deviation of (.81961), followed by the fourth statement, then the fifth statement, then the second, then the third statement.

3/ The lowest phrase in terms of arrangement agreed upon by the respondents in this axis is the third phrase, with an arithmetic mean of (3.9796) and a standard deviation of (.90115), and this indicates that most of the respondents agree with the statements of this axis.

#### *Multiple regression analysis*

This measure is used to find out the direction of influence between the variables, in order to find out the effect or lack of influence of each independent variable on the dependent variable, as well as knowing the size of this effect, and the following tables show that.

**A- Testing the first hypothesis:** There is a significant effect of continuous improvement on reducing production costs.

**Table 10.** Corrected coefficient of determination ( $R^2$ ) for the first hypothesis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.235 <sup>a</sup>	.055	.035	.44603

a. Predictors: (Constant)

**Source:** prepared by the researcher from the data of the field study 2023 AD.

It is clear from Table No. (10) above that the corrected coefficient of determination is .035 It represents the ability of the independent variable (continuous improvement) to interpret and explain the total change in the values of the dependent variable (reducing production costs), and the rest of the percentage is attributed to random error in estimation, or to the failure to include other independent variables that could have been included in the model.

**Table 11.** Shows the results of the analysis of variance test for the first hypothesis

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.545	1	.545	2.741	.104 <sup>b</sup>
	Residual	9.350	47	.199		
	Total	9.896	48			

a. Dependent Variable

b. Predictors: (Constant)

**Source:** prepared by the researcher from the data of the field study 2023 AD.

We note from the above table No. (11) that the calculated value of F amounted to 2.741, and that the level of significance sig reached .104, which is greater than the level of significance 0.05, which indicates the non-significance of the statistical model used, and confirms the impact of the independent variable on the dependent variable in a non-significant manner. In the sense that continuous improvement has an immaterial effect on reducing production costs.

**Table 12.** Shows the results of the regression model coefficients for the first hypothesis

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1					
(constant)	3.073	.728		4.221	.000
continuous improvement	.276	.167	.235	1.656	.104

a. Dependent Variable

**Source:** prepared by the researcher from the data of the field study 2023 AD.

We note from the above table no. (12) that the calculated T value amounted to 1.656, and that the level of significance sig reached .104, which is greater than the level of significance 0.05, which indicates the non-significance of the statistical model used, and confirms the non-significant effect of the independent variable on



the dependent variable. In the sense that continuous improvement has an immaterial effect on reducing production costs.

**B- Testing the second hypothesis:** There is a significant effect of employee satisfaction on reducing production costs.

**Table 13.** The corrected coefficient of determination ( $R^2$ ) for the second hypothesis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.441 <sup>a</sup>	.195	.178	.41176

a. Predictors: (Constant)

Source: prepared by the researcher from the data of the field study 2023 AD.

It is clear from Table No. (13) Above that the corrected coefficient of determination is 178. It represents the ability of the independent variable (employee's satisfaction) to interpret and explain the total change in the values of the dependent variable (reducing production costs). Other independent could have been included within the model.

**Table 14.** Shows the results of the analysis of variance test for the second hypothesis

Model	Sum of Squares	Df	Mean Square	F	Sig.	
1	Regression	1.927	1	1.927	11.364	.002 <sup>b</sup>
	Residual	7.969	47	.170		
	Total	9.896	48			

a. Dependent Variable:

b. Predictors: (Constant),

Source: prepared by the researcher from the data of the field study 2023 AD.

We note from the above table no. (14) that the calculated value of F amounted to 11.364, and that the level of significance sig amounted to .002, which is less than the level of significance 0.05, which indicates the significance of the statistical model used, and confirms the significant effect of the independent variable on the dependent variable, meaning that Employee satisfaction has a significant impact on reducing production costs.

**Table 15.** Shows the results of the regression model coefficients for the second hypothesis.

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.306	.586		3.933	.000
	employee satisfaction	.458	.136	.441	3.371	.002

a. Dependent Variable

Source: prepared by the researcher from the data of the field study 2023 AD.

We note from the above table no. (15) that the calculated T value amounted to 3.371, and that the level of significance sig amounted to .002, which is less than the level of significance 0.05, which indicates the significance of the statistical model used, and confirms the effect of the independent variable on the dependent variable statistically, meaning Employee satisfaction has a significant impact on reducing production costs.

**C- Testing the third hypothesis:** There is a significant effect of the performance linking scheme on reducing production costs.

**Table 16.** Corrected coefficient of determination ( $R^2$ ) for the third hypothesis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.200 <sup>a</sup>	.040	.019	.44961

Source: prepared by the researcher from the data of the field study 2023 AD.

It is clear from Table No. (16) above that the corrected coefficient of determination is .019, which represents the ability of the independent variable (performance linkage scheme) to interpret and explain the total change in the values of the dependent variable (reducing production costs), and the rest of the percentage is due to random error in estimation, or For not including other independent variables that could have been included in the model.



**Table 17.** Shows the results of the analysis of variance test for the third hypothesis.

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.395	1	.395	1.952	.169 <sup>b</sup>
	Residual	9.501	47	.202		
	Total	9.896	48			

**Source:** prepared by the researcher from the data of the field study 2023 AD.

We note from the above table no. (17) that the calculated value of F amounted to 1.952, and that the level of significance sig reached 0.169, which is greater than the level of significance 0.05, which indicates the non-significance of the statistical model used, and confirms the impact of the independent variable on the dependent variable in a non-significant manner, meaning The performance link scheme has a non-significant effect on reducing production costs.

**Table 18.** Shows the results of the regression model coefficients for the third hypothesis.

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.284	.711		4.618	.000
	Linking performance	.223	.160	.200	1.397	.169

a. Dependent Variable:

**Source:** prepared by the researcher from the data of the field study 2023 AD.

We note from the above table no. (18) that the calculated T value amounted to 1.397, and that the level of significance sig amounted to .169, which is greater than the level of significance 0.05, which indicates the non-significance of the statistical model used, and confirms the effect of the independent variable on the dependent variable, which has a non-statistical effect In the sense that the performance link scheme has a non-significant effect on reducing production costs.

## 5. CONCLUSION

It includes findings and recommendations.

### 5.1. Results

Based on the field study, the following results were reached:

1. There is a non-significant effect of continuous improvement as one of the lean cost dimensions on reducing production costs.
2. There is a significant impact of employee satisfaction as one of the lean cost dimensions on reducing production costs.
3. There is a non-significant effect of the performance linking scheme as one of the lean cost dimensions on reducing production costs.
4. Most of the study sample companies are interested in training their employees in order to reduce waste in costs, and they also seek to reduce wastage in time to the lowest possible extent.
5. The study sample companies are keen to pay reasonable wages to their employees, and they also compensate them when they are injured during work.
6. The surveyed companies prepare daily reports on the results of their work, and they have good information to make pricing decisions.
7. The management of the surveyed companies is interested in continuously raising the efficiency of the employees, and the employees are also interested in reducing the cost of production without compromising the quality of the final product.

### 5.2. Recommendations

Based on the previous results, the study recommended the following:



1. The need for industrial companies to pay attention to continuous improvement in their products and all stages of production, because of its importance in reducing costs and thus the ability to compete.
2. The need for industrial companies to pay attention to employees and link performance so that this will reflect positively on their products and costs in order to ensure their continuity and achieve greater profits.
3. Industrial companies should pay attention to all means that reduce costs in order to ensure competition in the local and foreign markets.
4. Industrial companies should develop their products and maintain their quality in order to reduce costs and prices.

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