

Impact of using value stream as one of the tools of lean accounting to reduce costs

(A field study of Ibn Majid Industrial Company)

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Abstract

The aim of the current research is to identify the concept of lean accounting, its objectives, principles, and steps in addition to the tools used and to determine the steps for applying lean accounting to reduce costs and create value for the customer and eliminate the shortcomings in traditional accounting through the use of the value stream, which is one of the tools for lean accounting. To achieve the objectives of the study, the researcher conducted his study on Ibn Majed Industrial Company, one of the public sector companies, by using a questionnaire form as well as observations and personal interviews. The study reached a set of conclusions as well as a number of recommendations, namely, the study sample company should think about switching to lean production and apply the value stream tool because of its direct impact on reducing costs and contributing to providing the necessary information for the decision-making process. It enhances the competitiveness of the company.

Keywords: lean accounting, value stream, cost reduction.

INTRODUCTION:

As a result of the technological developments that occurred in recent years and the increase in competition between industrial companies and the impact of industrial companies with these developments, and directing industrial companies towards thinking and lean production, traditional accounting has become inappropriate in achieving the goals of industrial companies that operate in light of these technological developments. Therefore, companies shifted from large-scale production systems to the application of the lean production system, which is originally a Japanese approach that Toyota Motor Manufacturing Company applied to its production system, which in turn led to the emergence of lean accounting. It is one of the modern concepts and is the key to progress and overcoming the traditional accounting problems.

Lean accounting works to support and assist lean production by focusing on the value stream instead of focusing on products and extracting the costs of the value stream and numbers of income statements for the value stream by relying on the profit of the value stream that represents (the revenues attained during a certain period of time minus the costs of value stream). Lean accounting is a factor in making better decisions and provides rational continuous improvement with providing useful info to the company management to help it make lean decisions to reduce damage and loss in the production process. Lean accounting tools and methods seek to focus on the value of customers and their requirements and continuous improvement, and these decisions lead to a reduction in production time and cost.

The first axis - Research Methodology:

The research methodology is represented in the research problem, hypotheses, importance and objectives, as well as limits.

1 - Research problem:

As a result of technological developments, the development of lean production systems, intense competition between public and private industrial companies, and the limitations of applying traditional accounting in providing accounting information, reducing damage and waste, reducing time through its traditional methods and tools, and developing production systems and methods. Therefore, the research problem can be formulated with the following question:

Does lean accounting by using the value stream contribute to reducing costs in Ibn Majid Public Industrial Company?

2 - Research hypothesis:

Main hypothesis: There is a statistically significant relationship and an effect between the use of lean accounting and the value stream in reducing costs.

The following sub-hypotheses emerge from this hypothesis:

The first sub-hypothesis: There is a statistically significant relationship and an effect between the use of lean accounting and cost reduction.

The second sub-hypothesis: There is a statistically significant relationship, and an effect between the use of the value stream and the reduction of costs

3 - Research Significance:

The Significance of this research stems from the following:

A - Achieving more modern approaches and methods of calculating the cost of products more accurately.

B - The lean accounting approach contributes to utilizing the available resources of the company in a more efficient and effective way in terms of time and product production.

C - The lean accounting approach excludes unnecessary operational processes that in turn reduce the cost of products and maximize the profits of industrial companies.

D - It provides the company with an effective control and implementation tool that contributes to identifying strengths and weaknesses in the production process and methods of dealing with them.

4- Research Objective:

The research objectives are as follows:

A - identifying the concept, objectives and requirements of lean accounting and its tools used to reduce the cost of products.

B - Determine the steps for implementing a lean accounting tool, the value stream, to reduce costs.

C - Eliminate deficiencies in traditional accounting.

D- Provide recommendations to help Ibn Majid Industrial Company reduce costs and enhance the company competitiveness.

5- Research limitations:

Research limits are spatial and temporal as follows:

* Spatial limits: Ibn Majed Public Industrial Company.

* Temporal limits: 2020.

6- The research sample: The research sample was selected from the departments of cost accounting, finance, auditing, production and quality engineers and management in the company. 70 questionnaires were distributed to the study sample and 8 questionnaires were excluded because some of the sample members did not answer and there were errors in some of the forms in using the sample method, because it is one of the statistical methods in scientific research to study variables and tables (1) and (2) illustrate the functional and scientific levels of the research sample.

Table (1) distributing research sample according to employment level

%16	10	Dept. Mamagement
%84	52	Personnel
% 100	62	Total

Table (2) distributing research sample according to scientific level

Percentage %	No.	Academic achievement
%13	8	Higher studies
%48	30	B.A
%39	24	Diploma
%100	62	Total

The second erasure - the theoretical framework of the study:**First - the concept of lean accounting:**

The concept of lean accounting is one of the modern concepts and the concept of lean accounting emerged as a result of the industrial companies shift from using traditional cost accounting to using strategic cost management (Altınbay, 2006, P.119). Lean accounting techniques are a necessary part of solving US companies problems related to increasing industrialization, productivity, profitability, and global competitiveness. (Cunningham & Fiume, 2003, P: 65).

Lean accounting methods and reports effectively support flexible transformation, and that the financial and non-financial information and financial reports it provides reflect the overall flow of value stream and continuous improvement. This information is used to enhance customer's relationships, product design, pricing products, and lean improvements. (Maskell & Baggaley, 2006, pp.35-34). The traditional cost accounting methods of measurement systems are not only designed to support lean production, but rather designed to support mass production. Therefore, lean accounting should replace traditional measurement systems (Roya, et al. 2012, p. 39). As for (Rosa & Cardoso, 2012, P.988), they indicated that the success of the lean transformation in companies depends on their application in the whole company and that accounting is the main source for decision-making. The need for lean accounting arises as is the case in lean which focuses on simplifying operations and reducing damage and loss in production.

So, lean accounting should keep the accounting, monitoring and evaluation systems simplified. Lawrence(2005, P.19) believes that lean accounting organizes work management and stimulates the elimination of damage and loss and continuously improves performance in accounting and manufacturing operations. Solomon and Fullerton(2007, p.37) defined lean accounting as "accounting processes that use a set of lean tools and methods to reduce and decrease the consumption of resources that do not add any value to a product or service in the customer's view. Lean accounting focuses on accuracy and providing information to users and to stay away from transactions and reports with historical data.

Lean accounting is a new accounting method that appeared with the emergence of interest in the culture of lean thinking. The lean accounting system aims to measure the financial impact of implementing lean improvement projects, and traditional cost accounting works better when applied in production environment that supports mass production. When it comes to the lean transformation, traditional cost accounting becomes anti-lean, and since lean accounting methods are not consistent with the rules of mass production, many industrial companies have failed to see the effects associated with lean improvements on their financial statements. One of the reasons behind the gap between traditional accounting and lean accounting is that the traditional accounting ignored the measures of non-financial performance such as on-time delivery and customer satisfaction (Woehrle et al, 2010, P. 71).

The term "lean accounting" should be divided into two areas that are closely related to each other, namely:

1- Lean accounting focuses on the accounting product in terms of type and scope. Accounting information is adapted and used by managers at all different levels in lean projects.

2 - Lean accounting focuses on accounting operations in terms of using lean management tools, in order to ensure and ensure that the accounting operations are effective and deliver the expected products. (310 Kennedy & Widener, 2008, P.)

Lean accounting was defined as "a modern accounting approach that emerged with the along the interest in the culture of lean thinking that increases the benefit of work and productivity. Lean accounting aims to measure the financial impact of implementing lean improvement measures (Woehrle et al, 2010, p. 71). It was also known as "a business strategy that seeks to support companies trying to move to a new system that measures and stimulates best practices in companies instead of using traditional accounting

methods" (Womack & Jones, 2003, P.263). Kroll (2004, PP.69-77) indicates that lean accounting is a "strategy designed to accomplish as short a production cycle as possible by eliminating damage and loss, and that the goal of lean accounting is to reduce inventory and production and done according to customer's requirements."

(Eldenburg & Wolcott, 2011, P.521) believe that lean accounting is "a set of principles, practices and tools that support a lean production system, and help to stimulate a process of continuous improvement within economic units and focuses on cost management rather than focusing on traditional cost accounting that distorts product costs and does not encourage continuous improvement efforts." Lean accounting is defined as "a comprehensive framework of teamwork that directs to continuous improvement through elimination of damage and loss in light of customer's needs. (Swank, 2003, p.124) Lean accounting should enhance internal control in companies. This principle is based on phases and process maps that illustrate the control elements required to improve the risk reduction process (Kateryna, et al., 2017, P.22). The application of flexible thinking in accounting is viewed conversely to the traditional accounting and the ABC system, which relies on the basis of cost, while the lean accounting depends on the basis of the cost entry (Manjunath & Bargerstock, 2011, P.48).

Secondly - Objectives of Lean Accounting:

The objective of lean accounting is the following: (Kocamiş, 2015, P.8)

(Maskell & Baggaley, 2006, P.36).

1- Lean accounting helps to measure the performance of companies and contributes to providing information on the cost of the value stream to management to help them effectively control the value stream and support continuous improvement.

2 - Provides information in the form of reports on costs and performance measurement to the company senior officials.

3- Lean accounting aims to provide useful information about the company business activities to implement the stages of manufacturing lean production.

5- Providing accurate and easy-to-understand information in a timely manner for decision-making purposes.

6- Helps motivate company personnel to adopt a homogeneous culture.

7 - Using lean methods that remove damage and loss from all areas of work.

Third: The advantages of lean accounting:

The advantages and benefits of lean accounting are the following: (Davis, 2012, P.340 & Davis)

1 - Lean accounting contributes to reducing accounting operations and limiting loss in a way that allows personnel to implement the company strategies with the help of the company and makes them more effective and active through the use of its tools.

2 - Supporting company corporates with lean culture by motivating employees, providing appropriate information, and encouraging the application of continuous improvement at every level in industrial companies.

3- Full compliance with the generally accepted accounting principles GAAP when preparing internal or external financial reports.

4- Lean accounting contributes to increasing the sales value and providing appropriate information for lean decision making such as value stream and cost management

5- Lean accounting contributes to saving money for companies by reducing the cost of products and reducing the cases of damage and loss during production

6- Lean accounting stimulates lean improvement in the long run through the use of lean tools and measures

Fourth - Steps of lean accounting:

There are several important steps to using lean accounting: (Huntzinger, 2007, PP.10-320)

1 - Linking the flow of value stream with strategic goals.

2- Analyze cost data to support lean accounting operations.

3 - Eliminate complex transactions from financial operations.

4 - Developing and improving pricing for value stream and profits and identifying places of value flow loss.

5- Pricing is based on cost calculation, break-even and competitive markets.

6 - Training all employees at all levels to participate in the company's operations.

7 - Training and development of company officials on the lean accounting system.

8- Train managers and financial staff for the value stream strategy for the decision-making process, using lean accounting tools.

Fifthly: Lean Accounting Principles:

The principles of lean accounting are: (Maskell & Kennedy, 2007, p.60), (Enoch, 2013, P. 510)

- 1- Simplify the accounting process - this is done by applying a lean methodology in the accounting process.
- 2- Adopting an accounting system that supports lean conversion. Lean conversion requires companies to change methods and approaches of cost estimation with a focus on improving productivity, enhancing flexibility and increasing customer's value.
- 3- Presenting understandable and timely accounting information where the financial reports must be easy to understand by all employees in the company.
- 4- Planning based on lean thinking, management decisions should be based on a long-term philosophy in line with lean principles, methods and approaches.
- 5- Strengthening the internal accounting control and this is done by ensuring that this control works within the company.

Sixth: The difference between traditional accounting and lean accounting:

The differences between traditional accounting and lean accounting are as follows: (Qingmin & Wang, 2014, P.231),(Carnes & Hedin, 2005, P.31-32)

Lean accounting	Traditional accounting	Facets the difference
Flow value stream	the product	Cost target
Continuous improvement approach to assist in making decisions	Differential analysis to aid in making decisions	Cost analysis
based on the basis of cooperation and equality	based on control and leadership	The culture of economic unity
The basis used is the value stream	The basis used is direct action	Allocation of indirect costs
Information is communicated in parallel between managers	Information is communicated from senior management to managers	Communicate the information
Focuses on financial and operating performance	Focuses on financial performance	Concentration
Do not rely on standard cost due to the multiplicity of product styles	Based on standard cost	Standard cost
There is almost no stock	The stock is large	Inventory
The environment is competitive and changing that adapts to customers	The environment is stable and the production is large	The environment

Seventh - Lean Accounting Tools:

The application of effective lean accounting tools should be chosen on the basis of the same lean management tools that have been successfully applied to production, operations and operational management for a long time (Ewelina & Marcin, 2013, PP.136-156). Lean accounting tools are as follows:

1 - Value Stream

The value stream is a major tool in lean production and lean manufacturing companies. It is the starting point for lean manufacturing and lean accounting which whereby helps to understand and view the flowing of product operations. It refers to the level of required operational and financial data and to the place of damage and loss within the product operation. Costs in the value stream is collected and these costs should be clearly defined in the value stream maps and take into account all the steps and activities within the value stream and not just the production steps.

Both Hansen & Mowen (2007, P726.) argue that value stream analysis helps managers to identify damage and waste. The functions and activities in the value stream are divided into value-adding and non-value-adding activities. Damaged resources, which are naturally divided into activities that can be avoided

in the short term and activities that cannot be avoided in the short term, and they return to the current technology and production methods. Avoiding them in the short term requires more time and effort. Baggaley (2003, P.159) indicates that the value stream is charged with all associated costs including wage cost, material cost, support costs, machine and equipment cost, external treatment cost, utility cost, other costs) directly. Thus, there are not many indirect costs and the allocation of costs is within very narrow limits. Thus, the issue of cost allocation is overcome which one of the greatest problems caused by traditional cost systems.

(Karen ,2004, P.2) defines the value stream as the flow of activities required to transform raw materials or information into a product or service for use by customers. The lean accounting system determines the cost of the product using all the activities included in the value stream, i.e. the actual direct cost of manufacturing the product. These costs include the following: (Salah & Zaki, 2013, P.91), (Maskell, et, al , 2007, p.37).

A- Actual cost of materials used in the value stream: The cost of actual materials used by the value stream is calculated on the basis of actual purchases or on the basis of the actual issue of materials from stores.

B - The actual cost of workers assigned to the value stream: These costs are allocated to the value stream according to the number of people working in the value stream. The work of each individual within the value stream is considered a "direct" work, so each employee is allocated to a specific value stream.

C - Costs of machinery and equipment: This includes the costs of spare parts, repairs and expenses related to machinery and their regression in the value stream.

D- The external costs of the company: the external costs of the value stream represent all the actual costs of the work performed by individuals or contracting companies.

E - Facilitation costs: These costs include rent, regression, maintenance of the company building, guarding and protection of the company, etc. These costs are charged on the basis of space, where this is the only basis used in lean industrial companies because this basis stimulates a work team of value stream to reduce the space used by the value stream.

F - Other costs: This paragraph includes all direct costs that are allocated directly to the value stream, such as suppliers, travel costs, backup tools, office supplies, etc.

Gordon (2010, P.14) indicates that the average product cost is calculated by dividing the total costs of the value stream by the number of units shipped and not produced, because calculating the rate on the basis of the units produced encourages the availability of stock in the company. The value stream is simple because it collects cost details at the level of the value stream as a whole and not at the level of a production order or product itself. For example, "raw material costs are allocated to the value stream based on" on the purchase quantities during a week or month since no system related to keeping track of materials is used as long as the stock level is low and under control.

As for (Huntzinger ,2007 P.186), he sees that there is no need for a large number of cost centers and the division of cost components (materials, wages and indirect costs). Instead, costs are grouped on the basis of the value stream. While both (Maskell & Baggaley ,2004, P. 147) emphasized that there is another simplification of the value stream method as it removes the need to use the indirect industrial cost charging method, which in turn makes the information uncomplicated, simple and clear at all levels in the industrial company.

2 - Target Cost

The target costs approach appeared in Japan during the sixties, and in 1995, the interest in this approach increased by the developed countries of the world after the experiments of its application in Japan demonstrated great successes by design and production engineers in their endeavor to design and develop the product within a standard framework. The quality and cost that meets the requirements of customers and the conditions of competition prevailing in the market and there are several concepts of the target cost, as the target cost was defined as "an entry that helps to reduce costs in the design stage of the new product or when the design model for the current product is completely changed or when a partial modification is made to The model (Monden & Hamada, 1991, p.16).

(Horngren, et al, 2012, p. 461) defined target cost as "part of the overall management system for strategic cost management at the unit level of product or service." (Brausch, 1994, P. 45) defined the target cost approach as "one of the strategic tools that reduce the costs of products during their life cycle. The target costing system aims mainly at reducing costs and developing products and achieving the following sub-goals: (Lee, 1994, P. 68) and (Ansari, 1997, P.72).

A - Fulfilling the customers' desires and satisfying their needs by providing advanced products of reasonable quality and price.

B - Achieving the objectives of the company's top management in terms of profits and competition in the long run despite economic and technological changes and despite the needs of the renewable market and internal and external pressures.

C - Creating a balance between cost, price and invested capital, because when a new product is produced using the target costs. The cost of that product is determined by subtracting the required profits from the price at which it will be sold and determined on the basis of market conditions, potential and available projects.

3-Kaizen (Continuous Improvement)

It is a method which is similar to the target cost in terms of cost reduction, but it focuses on reducing costs during the production phase of the total product life cycle. Kaizen means making changes for the better and continuously, and it is a Japanese terminology known when it was applied in 1946 and adopted by Toshiba, as well as it was applied in 1951 by Toyota. This philosophy was created and developed as a result of the urgent and necessary need felt by the Japanese for excellence and success in global markets, and (Blocher et al., 2002, P.160) defined continuous improvement (Kaizen) as "the continuous search for new ways to reduce costs in the production process.

Nair(1993, P.17) defined kaizen as "a process of gradual change that focuses on performing or executing the existing tasks in a more effective way and working continuously to achieve some improvements, even if they are minor. Continuous improvement (kaizin) achieves several goals, represented by the following: (Hilton, 1999, P.20).

1- Costs reduction: Kaizen contributes to the continuous reduction of the costs of activities that do not add value and reduce damage and loss during the manufacturing process, which in turn contribute to reducing costs.

2- Improving the quality of production: Kaizen philosophy contributes to producing high quality goods and services.

3- Customer's Satisfaction: Kaizen seeks to achieve customer satisfaction and satisfy the customers' desires to retain existing customers and to gain new customers.

4 - Value Chain:

(Rayport & Sviokla, 1995, p.39) defined the value chain as "amodel that describes company activities adding value by linking inward supplies and production processes with supplies outward through value chain operations for the purpose of operating efficiently to utilize available resources.

(Horngren et al, 1999, P.13) refer to the value chain as "a group of functions and activities that add value to products and services in a company, and that those functions and activities are research and development, product design, production, marketing, distribution, and customer service.

(Blocher,2010. P.27) deals with the value chain as the strategic analysis tool that the company uses in diagnosing areas of benefit or value for customers, as well as "reducing product costs during the product life cycle in order to obtain better understanding of the company competitive advantage and linking it with its suppliers and customers. Atkinson at el, (2002, P.4) believe that the value chain is characterized by reducing the costs of activities and operations, which helps companies in arranging their performance and determining performance indicators helping them in making decisions.

(Horngren at el, 2012, p29) defines the successive activities and functions in the value chain as:

A- Research and development: It is intended to collect modern ideas for developing new products, services, or processes.

B - Design: intended to develop detailed and engineering planning for new products, services, or processes.

C - Production: It is the process of physically transforming ideas and design into reality in the form of physical products or services provided to customers.

D - Marketing: It is the process of contacting individuals or groups for the purpose of introducing them to the characteristics of new products or services offered by companies and encouraging them to purchase products and services.

E - Distribution: It is the mechanism by which products or services are delivered through various distribution channels.

F - Customer service: It is the additional services that the company provides to its customers after sales, such as warranty and maintenance.

Based on the aforementioned, the value stream is a series of activities and processes through which raw materials are converted into a final product. The cost management of the value stream is the essence of the success of many companies by emphasizing the elimination of damageand losses while creating high-quality operations. The researcher then adopted the value stream in its application in Ibn Majid Industrial Company for the study sample.

The third axis: presenting and analyzing the results of the field study**First - a brief overview of “the company” the study sample:**

Ibn Majed Public Company was established in 1990, built by Iraqi companies and equipped for two years with machinery and equipment imported from outside Iraq. Ibn Majed public Company is one of the companies specialized in manufacturing heavy engineering equipment to meet the requirements of the oil sector companies in addition to both the electricity sector and the industrial sector. With its specialization in the manufacture of marine vessels, river sections and iron dams, it specializes in the manufacture of structures, bridges and steel sections. The company possesses all the human capabilities and technical expertise necessary to implement the on-site construction and rehabilitation of oil projects, power stations, iron bridges and iron platforms for the export of oil and the construction of caravans of all kinds, school, residential and office.

Secondly - presenting and analyzing results:**1- Reliability**

The researcher relied on a number of measures to measure the validity and reliability of the study sample answers. The reliability of the internal consistency of the variables was assessed using the Cronbach alpha and Composite reliability. Internal consistency is a form of consistency that is used to judge the consistency of results across items in the same test to determine whether the component measures are similar in results (Hair et al, 2017). Although the Cronbach alpha scale and composite reliability are the two measures of internal consistency, the composite reliability scale differs from the Cronbach alpha scale in that it takes into account the external load factor of the indicators. Unlike the Cronbach Alpha scale which is based on the assumption that the load parameters are equal to the indicators.

Table (3) presents the values of Cronbach alpha and composite reliability. Herr et al. (2017) indicated that each of the two measures, Cronbach Alpha or Composite reliability, must exceed a value of 0.70 in order for the scale to be acceptable, which is achieved in all the scales used.

Table (3) values of Cronbach Alpha and composite reliability

Composite Reliability	Cronbach Alpha	Measure
0.885	0.845	Lean Accounting
0.959	0.954	Value stream
0.885	0.832	Cost reduction

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Table (3) shows the values of Cronbach alpha and Composite reliability. From the results of the table and according to what the researcher (Hair et al, 2017) indicated that both measures Cronbach Alpha or compound stability must exceed a value of 0.70 in order for the scale to be acceptable, which is achieved, i.e. There is consistency in the sample answers searching for all paragraphs of the questionnaire.

2- Validity

Convergent validity was measured using the average variance extracted for the measures (Average Variance Extracted). This measure reflects the degree to which the underlying variable explains the variance in its indicators. Haire et al. (2017) explained that the average variance extracted (AVE) must be higher than 0.5 to be acceptable. Table (4) shows the average interpreted variance of the study measures that all measures exceeded that ratio.

Table (4) the average variance extracted for the variable

(average variance extracted)AVE	Study variables
0.588	Lean accounting
0.562	Value stream
0.571	Cost reduction

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Discriminant Validity of the scales used in the study. Hair et al. (2017) describe differential validity as the extent to which a variable is differentiated from other variables in terms of the degree to which its indicators are related to other variables. The indicators of the variable correlate with it must be more than with other variables. Table (5) illustrates this using the Fornell-Larcker criterion, as well as Table (6)

showing Heterotrait Monotrait Ratio, which must not exceed 0.9 to be acceptable indicating the variables do not overlap. This is what had been achieved in the metrics.

Table (5) Fornell-Larcker criterion for measuring discriminatory validity

	Moderating Effect 1	Moderating Effect 2	Lean accounting	Value stream	Costs reduction
Moderating Effect 1	1.000				
Moderating Effect 2	0.596	1.000			
Lean accounting	0.009	-0.091	0.769		
Value stream	-0.044	-0.189	0.934	0.865	
Costs reduction	0.019	-0.049	0.691	0.580	0.711

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Table (5) shows the results of the Fornell-Larcker criterion for discriminatory validity, and according to this scale, the ratio of the scale value must not exceed 0.9 to be acceptable. This value indicates that there is no overlap in the items of the tool for collecting data

Table (6) HTMT (Heterotrait Monotrait Ratio)

	Moderating Effect 1	Moderating Effect 2	Lean accounting	Value stream	Costs reduction
Moderating Effect 1					
Moderating Effect 2	0.596				
Lean accounting	0.156	0.154			
Value stream	0.145	0.224			
Costs reduction	0.098	0.139	0.786	0.686	
	0.086	0.098	0.816	0.727	0.776

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Also, Table (6) shows a Heterotrait Monotrait Ratio, which must not exceed 0.9 to be acceptable and indicates that the variables do not overlap, which is what was achieved in the measures.

3-Collinearity

The extent of overlap between the variables was measured using the Variance Inflation Factor scale. According to Hair et al.(2017), the value of (VIF) must be less than (5) in order to be acceptable. Table No. (7) shows the values of (VIF) for the study variables, and as it appears Table, the (VIF) values of the study variables range between (1.6) and (2.453), which are within the acceptable limits.

Table (7) values of (VIF) for the study variables

	Moderating Effect 1	Moderating Effect 2	Lean accounting	Value stream	Costs reduction
Moderating Effect 1			1.600		
Moderating Effect 2			1.671		
Lean accounting					
Value stream			2.453		1.930
Costs reduction			2.051		1.930

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As shown in Table (7), the (VIF) values of the study variables range between (1.6) and (2.453), which are within acceptable limits.

Descriptive statistics

Some statistical indicators were calculated for the study sample responses towards the respondents sample and the items of the questionnaire, as shown in the tables below.

The study sample answers for the paragraphs of lean accounting:

Table (8) shows the answers of the study sample for the paragraphs of lean accounting.

Table (8)

Relative importance	coefficient of variation	Standard deviation	Mean	Clauses
65%	22%	0.89	3.98	The traditional accounting has become inappropriate in achieving corporate goals in light of lean thinking and lean production
83%	27%	1.01	3.74	The concept of lean accounting is a modern concept that depends on the use of strategic cost management
70%	16%	0.65	4.00	Lean accounting is a set of practices and tools that support a lean production system
80%	22%	0.83	3.82	Lean accounting provides accurate information for decision making and increases growth and customer value.
65%	20%	0.76	3.77	Lean accounting increases sales because it provides the best cost information for decision makers
90%	28%	1.06	3.82	Lean accounting clearly shows the financial impact on lean improvements
63%	24%	0.88	3.74	Lean accounting drives flexible improvement over the long term
75%	25%	0.91	3.71	Lean accounting is a strategy designed to complete a production cycle as short as possible
67%	23%	0.88	3.81	Lean accounting aims to eliminate damage and loss and reduce inventory
77%	24%	0.93	3.81	Lean accounting contributes in a way that allows individuals to implement the company strategies and make them more effective and active through the use of its tools
65%	24%	0.94	3.85	The lean calculator aims to provide useful information about the company activities to implement the manufacturing stages of lean production
82%	29%	1.07	3.74	Lean accounting contributes to simplifying the accounting process by applying a flexible methodology in the accounting process by presenting accounting information on costs that is understandable and timely.
75%	27%	1.00	3.73	Lean accounting means control, measurement and management methods that reflect the reality of flexible thinking and correct practices

Prepared by the researcher depending on the Spss v.22

The lowest arithmetic mean appeared with clause (3.71). This value indicates that the research sample is heading in agreement with the lean accounting clauses. Through the standard deviation and coefficient of variation, we find that there is homogeneity in the answers of the study sample, as we note through a scale of answer intensity is that there is an understanding and awareness of the lean accounting clauses through the answers of the study sample.

The study sample answers for the value stream clauses:

Table (9) shows the answers of the study sample for the paragraphs of the value stream. Through the table we note the following:

Table (9)

Relative importance	Coefficient variation	Standard Deviation	Mean	Clauses
67%	18%	0.70	4.00	The value stream is the flow of activities required to transform raw materials or information into a product or service for use by customers
95%	12%	0.51	4.33	The value stream is a major tool in lean production and lean manufacturing
95%	12%	0.51	4.33	Value stream analysis helps managers to identify damage and loss and monitor activities that result in damage and loss in order to address them
95%	12%	0.54	4.39	The functions and activities in the value stream are divided into value-adding and non-value-adding activities
98%	12%	0.51	4.44	The value stream helps in indicating the required financial and operational information and the locations of damage and loss in production processes
93%	13%	0.57	4.42	The value stream is charged with all related costs from the cost of materials, wages and other additional costs
93%	12%	0.53	4.32	The value stream supports lean thinking and continuous improvement and shows the true impact of companies transformation into lean companies
90%	14%	0.60	4.39	The value stream provides information about the cost and profitability of each value stream within the company
95%	12%	0.55	4.44	The value stream represents all the activities that companies must undertake in order to reach the desired value by customers

Prepared by the researcher depending on the Spss v. 22

The lowest arithmetic mean appeared with clause (4) indicating that the research sample is heading in agreement with the clauses of the value stream. Through the standard deviation and coefficient of variation, we find that there is homogeneity in the answers of the study sample, as we note through a scale of intensity of the answer is that there is an understanding and awareness of the value stream items through the study sample answers.

The study sample answers to the clauses of cost reduction:

Table (10) shows the answers of the study sample for the clauses of cost reduction. Through the table we note the following:

Table (10)

Relative importance	Coefficient of variation	Standard Deviation	Mean	Clauses
80%	25%	0.94	3.81	Cost reduction means that costs move from the current cost level to a lower level
78%	21%	0.86	4.05	Reducing costs can be by changing the work system as a way to eliminate lost time, reduce the cost of overtime, or reduce costs by reducing waste in materials and other supplies.
77%	27%	0.99	3.74	Lean accounting contributes to reducing costs and eliminating damage and loss in production
80%	32%	1.19	3.74	The use of lean accounting contributes to the analysis of cost data with an emphasis on cost management to support lean accounting processes
73%	29%	1.04	3.63	The lean transformation of companies requires changing the methods and methods of allocating costs with a focus on improving productivity and increasing customer value
73%	25%	0.91	3.61	The costs must be clearly defined in the value stream maps and take into account all steps and activities within the value stream
82%	32%	1.15	3.58	The lean accounting system determines the cost of the product using all the activities included in the value stream the actual direct cost of manufacturing the product and cripples the following:
78%	34%	1.24	3.63	The cost of actual materials used by the value stream is based on the actual purchases or actual exports of materials from stores
83%	28%	1.04	3.73	Actual cost of working value stream according to "the number of people employed in the value stream."
80%	29%	1.06	3.61	Machinery and equipment costs include costs of spare parts, maintenance and regression present in the value stream
87%	27%	1.02	3.77	External costs include the external costs of the stream of value for work performed by companies and individuals
77%	29%	1.06	3.66	Facilitation costs include the costs of renting, planting and maintaining the company building, and the costs are distributed on the basis of area
87%	24%	0.94	3.90	Other costs include all direct costs that are directly allocated to the value stream, such as suppliers, travel costs, back-up tools and office supplies

Prepared by the researcher depending on the Spss v .22

The lowest arithmetic mean appeared with clause (3.58) indicating that the research sample heads in agreement with the clause of cost reduction. Through the standard deviation and coefficient of variation, we find that there is homogeneity in the answers of the study sample, as we note through a scale of intensity of the answer is that there is an understanding and awareness of the value stream items through the study sample answers.

Testing Hypotheses

First: multiple linear regressions:

Main hypothesis: There is a statistically significant and influential relationship between the use of value stream and lean accounting as independent variables and reducing costs as a dependent variable.

Table (11) Show the result of Multiple linear regression analysis .

sig	fcalculated	Determinant coefficient	ttabular	sig	Parameters	
0.000	261.955**	0.91	1.66	0.211	0.320	B0
				0.00	.14	B1
			2.37	0.00	.20	B2

Prepared by the researcher depending on the Spss v . 22

From the above table, we conclude the following:

The table above shows the multiple linear regression relationship of the lean accounting variables, the value stream and the cost reduction. Through this table, we conclude the following

1- The model parameters illustrate:

A- ($B_0 = 0.320$) is the value of the cost reduction variable when the independent variables have zero value.

B- ($B_2 = 0.20$), ($B_1 = 0.14$) through these values we conclude that when the lean accounting changes by (0.14) and the value stream by (0.20) then the costs reduction change by one unit.

2- The probability value (sig) of the independent variables, after comparing them with the level of significance (0.05)

A- The value of B_0 is not significant, i.e. the statistical hypothesis has been accepted that indicates that the value of the parameter B_0 is a value that does not differ significantly from zero, and this indicates that the value of cost reduction in the case of the independent variables is zeros whose value is (zero).

B- Parameter (B_1) is a significant value, indicating that the value of parameter B_1 differs from zero significantly incorporeally. The change in the lean accounting variable leads to changes in reducing costs.

C- Parameter (B_2) is a significant value, indicating that the value of the parameter B_2 differs significantly from zero incorporeally. The change in the value stream variable leads to changes in reducing costs.

3- The value of the determination coefficient reached (0.91) showing the importance of the independent variables in the adopted variable, as these variables were explained (91%) of the changes in the cost reduction variable and left only (9%) for other variables which were no taken in the model and for errors in the inspection. We can deduce the importance of this model.

4- The calculated value of (f) reached (261.955), and by comparing it with the probability value (sig) for this test with the suggested level of significance (0.05). We note that the level of significance is greater than (sig). Thus, we accept the main hypothesis which indicates the existence of a statistically significant relationship and an effect between the use of lean accounting and the value stream as independent variables and the reduction of costs as a dependent variable.

Second: simple linear regression

The first sub-hypothesis: There is a statistically significant and influential relationship between the use of lean accounting as an independent variable and reducing costs as a dependent variable

1- The simple linear regression relationship between lean accounting as an independent variable and cost reduction as a dependent variable.

Table No. (12) shows the results of the simple linear regression analysis

sig	fcalculated	Determinant coefficient	Sig	Parameters	
0.000	466.098	0.86	0.000	0.327	B0
			0.000	0.899	B1

Prepared by the researcher depending on the Spss v.22

From the table above, we conclude the following:

1- The model parameters refer to the following

A- ($B_0 = 0.327$), which is the value of reducing costs when the value of lean accounting is zero.

B - ($B_1 = 0.899$) this value indicates that the value of cost reduction changes and one unit when lean accounting changes this value.

2- Significance of the parameters: By comparing the default level of significance (0.05) with the probability value (sig) to test the significance of the model parameters, we conclude the following.

A- The parameter B0 is a significant incorporeally parameter, that its value differs from zero. This means that the value of cost reduction is not equal to zero when the value of lean accounting is zero.

B- The parameter B1 is a significant value, and from this we conclude that the change in the lean accounting parameter changes the cost reduction significantly.

3- Determination coefficient: The correction factor for the relationship between cost reduction and lean accounting reached (86%), and this indicates that the percentage of change in cost reduction that was explained using this model reached (86%). of the total changes and the remaining (14%) of the changes to other variables. By this indicator we note the importance of the lean accounting variable in explaining the change in cost reduction.

4- The calculated (f) value: When comparing the default level of significance (0.05) with the probability value (sig), we conclude that the model represented by the lean accounting variable as an independent variable and costs reduction as a dependent variable which is a significant incorporeal model statistically. There is a statistically significant effect of the lean accounting variable on reducing costs.

The second sub-hypothesis: There is a statistically significant and influential relationship between using the value stream as an independent variable and reducing costs as a dependent variable.

Table (13) shows the results of the simple linear regression analysis

sig	fcalculated	Determinant coefficient	Sig	Parameters	
0.000	219.567	0.75	0.000	0.647	B0
			0.000	0.807	B1

Prepared by the researcher depending on the Spss v.22

From the table above, we conclude the following:

1- The model parameters refer to the following

T- (B0 = 0.647), which is the value of reducing the mass when the value of the current value is zero.

a) (B1 = 0.807) this value indicates that the value of the cost reduction changes and one unit when the value current changes by this value.

2- Significance of the parameters: By comparing the probability value (sig) with the level of significance (0.05) to test the significance of the model parameters, we conclude the following.

A- The parameter B0 is a significant incorporeal parameter where its value differs from zero. This means that the value of cost reduction is not equal to zero when the cost value is zero.

B- The parameter B1 is a significant value, and from this we conclude that the change in the parameter value stream changes the cost reduction significantly.

3- Determination coefficient: The corrected determination coefficient for the relationship between cost reduction and value stream reached (75%). This indicates that the percentage change in cost reduction, which was explained using this model, reached (75%). From the total changes and the remaining 25% of the changes to other variables, and through this indicator we note the importance of the value stream variable in explaining the change in cost reduction

4- The calculated (f) value: When comparing the default level of significance (0.05) with the probability value (sig), we conclude that the model represented by the value stream variable as an independent variable and the cost reduction as a dependent variable is the significant incorporeal model statistically. That is, there is a statistically significant effect of the value stream variable on the cost reduction variable.

Results Discussion: Through the previous theoretical and analytical review adopted by the researcher using the questionnaire method, a set of conclusions and recommendations were reached:

Firstly - conclusions:

1- The previous analysis showed the clear interest of all the respondents from among the company members, the study sample, in the independent variables represented by the lean accounting, the value stream, and the dependent variable to reduce costs. This confirms the importance of the topic of the modern concept of lean accounting and one of its tools to reduce costs represented by the value stream.

2- It is evident from the answers of the study sample that there is complete compatibility with the clauses of the questionnaire, which is evident from the values of the arithmetic mean being greater than the hypothetical arithmetic mean (3). This confirms the interest of the sample members in the questionnaire axes represented in lean accounting, value stream and cost reduction.

3- It appears through the statistical measures of dispersion ((standard deviation and coefficient of variation)). The study sample answers show homogeneity and consistency through the small values of these measures.

4- Through the previous analysis, it is clear from the measurement of the intensity of the answer that there is an awareness and vision of the sample members of the questionnaire questions. This is what we conclude through the large values of this scale.

5- Through the analysis of the independent variable, lean accounting and the dependent variable, reducing costs, and through the responses of the sample members, it was revealed that there is a response by the sample members with a clear effect of lean accounting in reducing costs.

6- The analysis of the independent variable, the value stream and the dependent variable of cost reduction and through the responses of the sample members, it was found that there is a response by the sample members with the presence of an effect of the independent variable, the value stream, in reducing costs.

7- It was found through the previous analysis and through the responses of the study sample individuals that the lean accounting variable was at the forefront on the value stream variable in influencing the cost reduction variable by comparing the determination factor in the two models.

Secondly - Recommendations:

The researcher also reached a set of recommendations that can be identified as follows:

1 - The management of the company and the study sample should think seriously about switching to lean production, and the accompanying adoption of the modern concept of accounting represented in lean accounting and striving to achieve the new goals represented by the optimal use of resources and the reduction of waste and damage.

2 - The need to emphasize the use of one of the lean accounting tools, especially the value stream tool, because it provides the necessary information to make decisions and prepare reports clearly and easily in a timely manner.

3 - The management of the company and the study sample, according to the modern concepts, must set up training courses or scientific workshops for all employees and supervisors of the production process in the company to present the concepts and importance of lean production, lean accounting, and the mechanism of applying lean accounting tools.

4 - Industrial companies should internally re-arrange their production departments in order to reduce flow times for transferring materials and products within the production section or between departments to achieve the best flexibility within the company.

5 - The necessity for the company management to give the study sample a great attention to qualifying the accounting cadre within the company through the establishment of specialized training courses as well as scientific and practical qualification in a way that helps acquire skills and knowledge in the field of the possibility of applying lean accounting tools, striving to reduce costs and provide information Necessary for the decision-making process.

Reference :

- 1 – Altınbay, A. (2006). *Kaizen Maliyetleme Sistemi: Dinamik Maliyet Yönetim Sistemi.*» Afyon Kocatepe Üniversitesi, İ.İ.B.F. Dergisi. 103-121.
- 2 -Ansari, S., B .(1997). *Target Cost Core group Target Costing. Management Accounting.*
- 3– Atkinson, B, K,& Young . (2002). *Management Accounting. 2nd Ed, The McGraw-Hill Companies.*
- 4– Baggaley. B. (2003). *Costing by Value Stream. Journal of cost Management , Vol 17 , No 3.*
- 5– Blocher , E& Chem , K& Lin, T . (2002). *Cost Management: A Strategic Emphasis. McGraw – Hill.*
- 6– Blocher, E. (2010). *Cost Management: A Strategic Emphasis". 5th Revised edition Editio.*
- 7–Brausch,J. (1994). *Target Costing for Profit Enhancement" , Management Accounting ,Vol (76), No(5).*
- 8– Cunningham, J.& Fiume, O. (2003). *Real numbers: Management accounting in a lean organization. Durham. NC: Managing Times Press.*
- 9- Carnes, K, & Hedin, S. (2005). *Accounting for Lean Manufacturing another Missed Opportunity. Management Accounting Journal, Vol.(7), No.1.*
- 10 – Davis , C.& Elizabeth. D. (N/D). *Accounting. John Wiley and Sons Inc , USA* 11 – Eldenburg. L. & Wolcott, S. (2011). *Cost management : Mesuring , Monitoring and Motivating Performanc. Second Edition , John wiley and Sons , Inc , USA.*
- 12– Enoch, O.K. (2013). *Lean accounting and lean business philosophy in Nigeria: an exploratory research. International journal of economics , finance and management.*

- 13 – Ewelina, Z. & Marcin M. (2013). *Implementing lean accounting principles to design and improve accounting processes – a case study from a Shared Service Centre*. Zeszyty Teoretyczne Rachunkowości.
- 14 – Gorden, G. (2010). *Value Stream Costing as a Management Strategy for Operational Improvement*. Journal of Cost Management, Vol.24, No 1.
- 15– Hansen, R. & Mowen, M. M. (2007). *Managerial Accounting*, Eight Edition, South Western, China.
- 16– Hilton, R. (1999). *Managerial Accounting*. 4th Ed, Mc Graw – Hill, Inc, New York, U.S.A.
- 17– Horngren, C. T & Sunden, G. L. & William, O. S. (1999). *Introduction to management Accounting*, 11th ed., Prentice Hall Inc.
- 18– Horngren, C. T. & Rajan, M. V & Deter, Srikant M. (2012). *Cost Accounting: A Managerial Emphasis*. 14th Ed. Prentice-Hill, Inc., New Jersey.
- 19– Huntzinger, J. R. (2007). *Lean cost management-Accounting for Lean by Establishing Flow*. Ross Publishing, 1st edition, USA.
- 20– Karen M. K. (2004). *The Lowdown on Lean Accounting*. Journal of Accounting.
- 21 – Kateryna. O. & Muhammad A.S & Yumeng S. (2027). *Value Creation with Lean Accounting*. Master Program in Accounting and Finance Accounting and Management Control.
- 22 – Kennedy F. A. & Widener S. K. (2008). *A control framework: Insights from evidence on lean accounting*. Management Accounting Research, vol. 19, pp. 301–323.
- 23– Kocamiş, T. U. (2015). *Lean Accounting Method for Reduction in Production Costs in Companies* ", Vol. 6, No. 9(1).
- 24– Kroll, K. (2004). *The Lowdown on Lean Accounting*. Journal of Accountancy, pp69-77, Available at www.proquest.com.
- 25– Lee, J. (1994). *Use Target Costing to Improve your Bottom Line* ", CPA Journal, US – Japan, Vol. 64, No.1.
- 26– Lawrence, P. & Grasso. (2005). *Are ABC and RCA Accounting System Compatible with Lean Management*. Management Accounting Journal.
- 27– Manjunath, H.S. & Bargerstock, A. (2011). *Exploring the role of standard costing in lean manufacturing enterprises: a structuration theory approach*. Management accounting quarterly.
- 28– Maskell, B. H. & Baggaley, B. L. (2006). *Lean Accounting: What's It All About?*, Target magazine, 22(1). p35-43. Retrieved from <http://leanaccountingsummit.com/>
- 29– Maskell, B.H. & Baggaley, B.L. (2006). *Lean accounting: what's it all about*. Target magazine.
- 30 – Maskell, B.H. & Kennedy, F.A. (2007). *Why do we need lean accounting and how does it work?* " Journal of corporate accounting & finance.
- 31– Monden, Y. & Hamada, K. (1991). *Target costing and kaizen costing in Japanese automobile companies*. Journal of management accounting research.
- 32 – Maskell, B. H & Baggaley, B. & Nick K. & David. P. & Susan Lilly. (2007). *The lean Business Management System* " 1st edition, BMA Inc, USA.
- 33 – Maskell, B. & Baggaley, B. (2004). *Practical lean Accounting* " 1st edition, Congress Publication Data, USA.
- 34– Nair, C. (1993). *Inter Dependence and control : Traditional Vs Activity Based Responsibility Accounting*. Journal of Cost Management.
- 35– Nair, C. J & Leibfried, K. H. (1992). *Benchmarking: A Tool for Continuous Improvement*. John Wiley & Sons.
- 36– Qingmin, Y. & Wang, L. (2009). *Lean Accounting Based On Lean Production*", Management School, Tianjin University of Technology, China.
- 37– Rayport, J. F. & Sviokla, J. J. (1995). *Exploiting the Virtual Value chain*". Journal of Cost Management.
- 38 – Rosa, A. Raposo & Cardoso, M. João. (2012). *Lean Accounting : Accounting contribution for Lean Management Philosophy*. Tourism and Management Studies International Conference Algarve vol.3, ISBN 978-989-8472-25-0.
- 39– Darabi, R. (2012). *Barriers to Implementation of Lean Accounting in Manufacturing Companies*. International Journal of Business and Commerce Vol. 1, No.(9).
- 40 – Salah, W. & Zaki, H. (2013). *Product costing in lean manufacturing organisations*. Research journal of finance and accounting.
- 41 – Solomon, J., & Fullerton, R. (2007). *Accounting for world-class operations: A practical guide for providing relevant information in support of the lean enterprise*. Fort Wayne, IN: WCM Associates.

- 42 – Woehrle, S. L. & Abou-Shady, L. (2010) *Using Dynamic Value Stream Mapping and Lean Accounting Box Scores to Support Lean Implementation*. *American Journal of Business Education*, Volume 3, Number 8.
- 43– Swank, C.K. (2003). *The Lean Service Machine*. *Harvard Business Review*.
- 44– Womack, J. & Jones, D. (2003). *Lean Thinking*. 2nd Edition, Simon & Schuster Inc, USA.