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## VALUE CHAIN ANALYSIS AND ITS IMPORTANCE IN REDUCING COST AND IMPROVEMENT OF THE PROCESSES' PERFORMANCE : APPLIED STUDY

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**ABSTRACT**

The research aims to analyze the value chain of the economic unit and indicate the importance of this in reducing the cost of non-value added activities to both the economic unit and the customer, in addition to improving the processes' performance in order to achieve competitive advantages in terms of improving indicators of cost, quality and time in a manner that is commensurate with the requirements of the modern manufacturing environment and the accompanying rapid and successive changes and developments. The research dealt with the knowledge bases of the value chain and the importance of analyzing them in economic units, as the focus was on reducing the unnecessary costs associated with non-value added activities in addition to improving the performance of processes by eliminating defective and unjustified stops while carrying out various production processes in the economic unit, and the research was applied in Al-Mothanna Cement Factory for the financial years 2015, 2016 and 2017. The research reached a set of conclusions, the most important of which was that there is a possibility to analyze the value chain of the plant, the research sample, with the possibility of using this analysis to reduce cost in addition to improving the process's performance.

**Keywords:** *Value Chain, Value Chain Analysis, Cost Reduction, Improvement of the Processes' Performance*

**INTRODUCTION**

Introduction:

The modern manufacturing environment has been accompanied by many rapid and successive changes and developments, which were the main reason for pushing economic units to search for appropriate cost and administrative methods that would enable them to reduce their costs and improve their performance in order to help confront competitors and overcome them and thus achieve competitive advantage. One of these techniques is Value Chain Analysis, which is a set of

interrelated activities that add value to both the economic unit and the customer, and the value chain consists of six activities that start with research and development and end with customer service after sales through design, production, marketing and distribution, and the primary purpose of value chain analysis is to achieve the strategic objectives of the economic unit represented by reducing the costs associated with non-value added activities in addition to improving quality and reducing response time for the customer and thus improving the processes

performance of this unit, therefore, the value chain analysis focuses on identifying the most important sources available to the economic unit that enable it to achieve and maintain competitive advantage, and this is done by gathering activities different activities and identifying their strengths and weaknesses as well as working on reinforcing the strengths and addressing weaknesses in a way that helps improve the performance of the economic unit in general. The research seeks to address and analyze the knowledge bases of the value chain and demonstrate the importance of this analysis in reducing costs and improving the performance of the processes of the economic unit.

### **Study Methodology**

During this paragraph, the research problem, objectives, importance, hypothesis, scientific method adopted and sample will be addressed.

### **Research Problem:**

The problem of the research lies in the high costs of processes and products of Iraqi economic units as a result of the presence of many non-value added activities to these units and customers, which requires the search for appropriate cost and administrative methods through which these activities can be identified and worked on deleting them or merging them with other activities in a way that helps in

reducing cost and improving processes performance, one of these methods is value chain analysis, which is a strategic tool to achieve this purpose. The research problem can be expressed through the following questions:

- 1) What is meant by value chain analysis? Is it possible to analyze the value chain of the Iraqi economic units in a way that suits the requirements of the modern manufacturing environment and the accompanying changes and developments?
- 2) Does the economic unit value chain analysis help reduce the unjustified costs associated with non-value added activities in addition to improving the performance of processes and thus helping to achieve competitive advantage?

### **Research Objectives:**

The research aims to address the knowledge bases of the value chain with a focus on analyzing this chain and showing the importance of this in reducing costs associated with non-value added activities to both the economic unit and the customer, in addition to improving the performance of processes and improving indicators of cost, quality and time in a way that helps in excellence and superiority on other competitors thus

helping to achieve a competitive advantage.

**Research Importance:**

The importance of the research comes from the importance of the value chain and the analysis of its activities in order to distinguish the value-added activities from non-value added activities, and work to get rid of the non-value added activities by deleting or merging them with other activities without negatively affecting the quality of the product and the process, taking into account reducing costs and improving processes performance in a way that enables the economic unit to achieve and maintain a competitive advantage.

**Research Hypothesis:**

The research is based on the following hypothesis: (The analysis of the value chain helps the economic unit to reduce the cost of unjustified non-value added activities in addition to improving the performance of processes).

**Research Approach:**

The research depends on two scientific approaches, namely the descriptive approach and the analytical approach. The descriptive approach was used in the theoretical aspect of the research based on books, courses, theses and university theses, while the analytical approach was used in the applied aspect of the research

to analyze the data extracted from the records of the research sample.

**Research Sample:**

Al-Mothanna Cement Factory/one of the formations of the Southern Cement Company was chosen due to the high costs of this plant as a result of the presence of many activities that do not add value, in addition to the factory's need to improve the performance of its processes, and the search for fiscal years 2015, 2016 and 2017 was applied.

**LITERATURE REVIEW**

Previous studies related to the current research topic can be clarified through the following:

1. Study of (Al-Saffar, 2009), Developing the Strategic Perspective of Management Accounting Using Value Chain Analysis: The study aims to use the value chain analysis method in order to develop the strategic perspective of managerial accounting in a way that helps economic units in making strategic decisions. The study reached a set of conclusions the most important of which is that the value chain analysis will help the management of the economic unit in taking

appropriate decisions that will help reduce costs and improve quality.

2. Study of (Abdul Karim, 2010), Value Chains Modeling Using Quantitative Methods to Support Decision-Making: The study aims to use quantitative methods in order to model value chains in a way that helps in maximizing the value of the economic unit. The study reached a set of conclusions, the most important of which was that value chains modeling using quantitative methods can help in making appropriate decisions to maximize the value of the economic unit from the customer's point of view by reducing costs, maximizing profit and improving the quality of both design and conformance.
3. Study of (Warmest, 2014), Value Chain Analysis in Manufacturing Companies: The research aims to lay the appropriate foundations for analyzing the value chain in industrial companies and work to identify non-value added activities from the point of view of the economic unit and the customer, and the study reached a set of conclusions, the most important of which was that storage, maintenance and failure assessment

activities are non-value added activities that must be eliminated in order to reduce costs associated with these activities as well as improve the value of products from the point of view of both the business unit and the customer.

4. Study of (Elbert, 2016), Using Value Chain Analysis for Implementing the Marketing Policies: The study aims to use the method of analyzing the value chain of the economic unit in making decisions regarding the implementation of marketing strategies and policies in order to attract customers to the products of the economic unit and distinguish from competitors, and the study reached a set of conclusions, the most important of which was the possibility of implementing marketing strategies based on the method of value chain analysis directed towards the customer in order to meet his needs, desires and requirements.

#### **CONTRIBUTION OF THE CURRENT RESEARCH AND THE EXTENT OF ITS DIFFERENCE FROM PREVIOUS STUDIES:**

The contribution of the current research and its difference from previous studies can be explained through the following:

- 1) The current research dealt with the topic of value chain analysis in order to identify and distinguish the value-added activities from non-value added activities, and work to reduce the unjustified costs associated with the non-value added activities in addition to improving the performance of the processes of the economic unit.
- 2) Contributing to laying down a logical basis for analyzing the value chain in the Iraqi economic units in a way that helps these units reduce their costs and improve the performance of their processes, and thus help differentiate and outperform competitors by improving indicators of cost, quality and time.

## THEORETICAL FRAMEWORK OF THE RESEARCH

### Concept of Value Chain:

The value chain is seen as a set of interrelated activities that add value to both the economic unit and the customer, starting from the product being an idea during the research and development stage until marketing this product to the customer and providing after-sales services to him (Horngren et al. 2015), and thus the value chain is a set of successive activities directed to achieve the strategic objectives

of cost management in terms of understanding the behavior of cost elements in order to reduce cost and help in the search for sources of creativity and excellence, whether at the present or in the future (Hoque, 2003), and the value chain focuses on value-added activities for the economic unit and the customer, as these activities are strengthened and focus on improving the quality of the product and the production process (Feller et al.2009) , and the main key to the concept of the value chain is to strive to add and improve value at every stage of the product life cycle, and this can be measured by identifying the costs of non-value added activities and work to eliminate them in addition to improving the profitability and quality of products (Reid & Sander, 2012). The value chain aims to improve the processes and products of the economic unit and reduce its costs as well as improving quality through making the products more suitable for the customer's use and their conformity to the specified specifications and standards, starting from research and development through to design, production, marketing and distribution (El-Kelety, 2006). The value chain consists of the following activities:

**First: Research and Development:** It is the collection and testing of ideas for the processes, products and services of the economic unit, which are within its

available capabilities. The research and development activity consists of a group of sub-activities, the most important of which were training and qualifying workers, research services, consulting, travel and scholarships for the purposes of training and study (Williams et al.2008).

**Second: Design:** It is to carry out detailed engineering planning for the processes, products and services of the economic unit in a way that is compatible with the needs of customers and the requirements of the competitive market, where the design engineers review the designs developed from time to time and modify them according to the available resources and capabilities and developments in the competitive market in a way that is consistent with the competitive strategy followed (Drury, 2008).

**Third: Production:** It is the process of converting inputs into outputs through the physical transformation of ideas and designs into reality on the ground in the form of physical products or services provided to customers, and in industrial economic units, production activities take the largest share of costs because they include the cost of raw materials and molding cost (Horngren et al.2015).

**Fourth: Marketing:** It is the contact with individuals and groups in order to introduce them to the products and services of the current and new economic

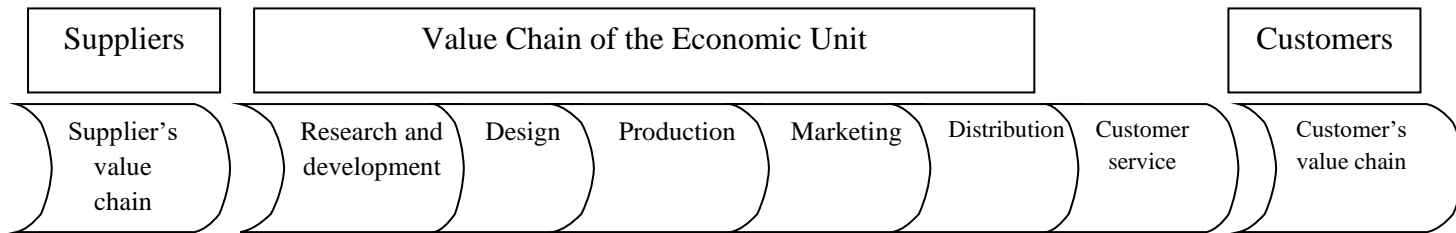
unit, as well as to familiarize them with the features and characteristics of these products and services. The marketing activity includes a collection of sub-activities represented in advertising activities, packaging activities, printing and publication activities and etc (Elbert, 2016).

**Fifth: Distribution:** It is the appropriate mechanism followed by the economic unit in order to deliver its products to customers through various distribution channels, whether these customers are individuals or groups. The distribution activity includes a collection of activities including the activities of leasing and maintaining transportation means in addition to the wages of the individuals working in different distribution channels (El-Kelety, 2006).

**Sixth: After-sales services:** They are the services that the economic unit provides to its customers after completing the process of selling products to them. These services are related to the installation and repair of products, in addition to answering customers' inquiries and questions, free calls with customers, as well as providing warranty requirements to them to make the products more suitable for their use (Maher et al.2008).

The value chain of the economic unit can be illustrated by the following figure:

Figure (1): Value Chain of the Economic Unit



Source: (Drury, 2008)(Garrison et al.2011), (Horngren et al.2015)

Accordingly, the value chain is nothing but an interconnected set of activities related to research and development, design, production, marketing and distribution directed towards achieving the strategic objectives of the economic unit through its focus on value-added activities to both the economic unit and the customer with the aim of providing products with low cost and high quality.

#### **Value Chain Analysis and Its Importance for Economic Units:**

Value chain analysis means the testing each of its activities and determining whether it adds value or not, and an indication of whether these activities represent a competitive advantage or not. Value-added activities can help achieve competitive advantage, while non-value added activities must be eliminated by deleting or merging them with other activities (Kinney et al , 2006), so the value chain analysis focuses on identifying the sources of competitive advantage for the economic unit by gathering the various activities and events and determining

whether they represent strengths or weaknesses, whether at the present time or in the future (Feller et al , 2009), and accordingly, the focus will be on activities that add value to both the economic unit and the customer and work to strengthen them, and on the other hand, the non-value added activities will be reduced or completely eliminated, which results in a reduction in the unjustified costs associated with these activities (Sweeney, 2009), the value chain analysis is concerned with the costs of all activities, starting from research and development to customer service, in order to provide a clear vision that can help in understanding and analyzing all elements of costs, especially indirect costs, in order to work on a real reduction (Hoque, 2003) and therefore the value chain analysis is only an important strategic tool that can be used to achieve the best understanding of competitive advantage, achieve and maintain it in a way that is consistent with the competitive strategy followed by the economic unit, and (Blocher) sees that



there are Another division of value chain activities, which are as follows: (Blocher et al , 2010)

- 1) Upstream activities: Are the activities related to research and development activities and design activities in the economic unit and represent the starting point in the value chain.
- 2) Activities of Operational Processes: Are the activities related to transforming inputs into outputs through carrying out various production processes.
- 3) Downstream activities: Are activities related to marketing activities and distribution activities in addition to activities related to after-sales services to customers.

The division of value chain activities into upstream, operational and downstream activities makes value chain analysis the ideal way to achieve strategic goals (Reid & Sander, 2012:78). The decisions related to the deletion of a part of sub-activities for a value chain are considered strategic decisions that have an effective impact in achieving the economic unit's objectives concerning the reduction of its costs and improvement of the quality of its processes and products in addition to reducing design and manufacturing time as a result of eliminating non-value added activities (Hilton et al , 2006).

Accordingly, the value chain analysis is a set of activities carried out by the economic unit in order to identify the value-added activities and distinguish them from non-value added activities in a way that helps in the production of low-cost, high-quality products in the shortest possible time and thus help achieve the strategic objectives of the unit economic advantage by outperforming competitors and achieving competitive advantage.

As for the importance of value chain analysis, it can be clarified through the following:

- 1) Reducing costs associated with non-value added activities to both the economic unit and the customer, and eliminating these activities does not negatively affect the quality of products (Feller et al , 2009).
- 2) Improving the quality of design and the quality of conformity and thus providing products that can match the needs, desires and requirements of customers better than what competitors offer (Maher et al , 2008).
- 3) Improving production processes in the economic unit by reducing wastage of time and waste of resources, as well as helping to manage tasks effectively and efficiently (Lu , 2011)

- 4) Reducing the development time of existing products or new products as a result of adopting the best possible means by focusing on value-added activities (Aniki & Charles, 2014).
- 5) Helping to understand the activities that cause additional costs, which helps to reach the competitive price through which it can attract customers (Brown, 2009).
- 6) Helping to stand out from competitors and thus achieving competitive advantage as a result of reducing costs, improving quality and reducing design and manufacturing time (Johnson et al., 2006).

Based on the foregoing, it can be said that the value chain analysis is one of the important strategic tools that help the economic unit achieve its goals related to achieving competitive advantage, and therefore this analysis is more appropriate to the requirements of the modern manufacturing environment and the accompanying rapid and successive changes and developments.

#### **Importance of Value Chain Analysis in Reducing Cost:**

Cost management and reduction is one of the modern approaches that economic units rely on to achieve their goals in order to implement their competitive strategy

effectively and efficiently, and the matter is more important if the competitive strategy used is a cost leadership strategy (Blocher et al., 2010), and this strategy depends on the assumption that the economic unit has a competitive advantage that enables it to carry out design, manufacturing, marketing and customer service processes at the lowest possible cost compared to competitors in the market, which helps this unit to sell its products and services to customers at competitive prices that are lower than the prices offered by its competitors, which leads to an increase in all of sales and market share (Wang et al., 2011), and value chain analysis helps reduce costs by determining the costs of the main activities and the costs of the sub-activities that make up them, starting from research and development to customer service, and costs are reduced by eliminating non-value added activities, and non-value added activities can be identified through the possibility of deleting them or merging them with other activities without negatively affecting the quality and time. Production processes in the economic unit (Lu, 2011), and the analysis of the costs of value chain activities helps in identifying how much the cost of each activity represents to the total cost of the product, and therefore it is possible to focus on high-cost activities in order to reduce the

costs associated with these activities (Feller et al.2009).

Many researchers pointed out that non-value added activities do not affect costs only, but also affect the quality of production processes (Hemmatfar et al.2010), and since quality is inexpensive, lower quality than the required level will cost the economic unit additional costs that are indispensable. Such as evaluation costs and internal and external failure (Wang et al.2011), and therefore it is required to analyze and direct the value chain activities towards the customer and this is done by following the best methods for designing, producing and marketing products to customers in the best possible way and then providing the best after-sales services, taking into account the acceptable quality in each of the processes and products of the economic unit, which helps in reducing quality costs, especially evaluation and failure costs, and thus reducing the total costs of the product (Hill, 2000).

In addition, the increase in the time of production processes as a result of the presence of non-value added activities will lead to an increase in the costs of these processes and consequently higher costs of products, and the reason for this is the waste of time as a result of unplanned pauses, which results in an increase in maintenance costs and storage costs of

both raw materials and work in progress and full production (Aniki & Charles, 2014), and therefore the value chain analysis will help in reducing the time of production processes by eliminating non-value added activities, which helps in reducing costs associated with both maintenance, storage and etc (Elbert, 2016).

We conclude from the above, that the value chain analysis can help reduce the cost associated with non-value added activities, in addition to improving quality and reducing time will help reduce costs as well, and the most important costs that will be reduced as a result of their association with non-value added activities, can be summarized as follows:

- 1) Costs associated with the storage activities of raw materials, work in progress and full production.
- 2) Costs associated with inspection and testing activities, especially when carried out during the production process.
- 3) Costs associated with unscheduled maintenance activities.
- 4) Costs associated with failure analysis activities, whether inside or outside the economic unit.

### **Importance of Value Chain Analysis in Improving the Processes Performance:**

Improving the performance of processes is related to achieving the competitive priorities of the economic unit, because they represent long-term goals that this unit seeks to achieve, and thus help in creating a unique competitive advantage when compared with competition (Heizer & Render, 2003:33), and therefore it is a translation of the needs of customers, competitive market requirements and long-term objectives of economic unit refers into efforts, activities and events that are consistent with the competitive strategy pursued by the economic unit (Krajewski & Ritzman, 2005:37), and (Schroder) sees the improvement of processes performance as improving the quantitative measures applicable on the ground in order to reach the desired results in the short and long terms (Schroder, 2000:23), improving the performance of processes is linked to the competitive priorities related to cost, quality and time (Slack et al.2004:44), and the role of value chain analysis in improving the performance of processes can be clarified through the following:

#### ***First: Role of Value Chain Analysis in Reducing Processes Cost:***

The value chain analysis helps reduce the cost of processes by eliminating the non-value added activities while carrying out the various production processes in the

unit, and that reducing the cost of processes will positively affect the total cost of the product, and thus this reduction will help in the application of the lowest cost strategy efficiently (Slack et al. , 2004), as for cost indicators, they are improved when the selling price exceeds the total cost of the product, provided that that price is lower than the prices offered by competitors in the competition market and that the product is of higher quality, so work must be done to reduce unnecessary and unjustified costs associated with non-value added activities or resources, taking into account the improvement of the quality of both the product and the process, given that quality is inexpensive (Sweeney, 2009), so the value chain analysis will focus on reducing the following costs (Al-Lami and Al-Bayati, 2008).

- 1) Reducing the cost of facilities, technology, installation and maintenance of machinery and equipment.
- 2) Reducing the cost of storing materials in addition to reducing the cost of consumables and their areas of consumption.

***Second: Role of Value Chain Analysis in Improving the Processes Quality:***

The analysis of the value chain helps in improving the quality of design and the quality of conformity, and thus help in providing products that can conform to the needs and desires of customers (Aniki & Charles, 2014), and the continuous quality improvement processes must be offset by a reduction in cost, considering that quality is inexpensive, especially with regard to It relates to activities that do not add value, and therefore costs will decrease and market share will increase (Heizer & Render, 2003). As for quality indicators, there are many indicators that are directly related to the quality of processes and products, and they are input indicators that focus on measuring the quality of materials and parts coming from the suppliers, and control indicators during operation that focuses on quality control during production to ensure compliance with the required quality standards and specifications. In addition, there are customer satisfaction indicators that focus on driving the customer's view of each of the products and services of the economic unit, identifying the most important problems that he faces and seeking to solve them , value chain analysis helps in improving the performance of processes through the following: (Krajewski & Ritzman, 2005)

- 1) Providing a high-quality design for the economic unit processes, and thus the quality of the design will be improved.
- 2) Providing products that are free from defects and problems during use and thus the conformance quality will improve.

***Third: Role of Value Chain Analysis in Reducing the Processes Time***

Value chain analysis helps reduce time, especially the time of production processes, as reducing time is a competitive advantage that enables the exploitation of available investment opportunities, in addition to the speed of delivery of the idea to the market as a result of the short product life cycle (Hemmatfar et al ,2010), and value chain analysis helps in reducing time that does not add value to the customer, especially the waiting time, examination, testing, preparation, handling and storage (Blocher et al , 2010), and as for time indicators, they are the response time to the customer and performance on time, the response time to the customer represents the time extended from the customer's issuance of the purchase order until the delivery of the product to him including the time of production processes, either on-time performance represents cases in which products or services are delivered to customers at the scheduled or planned time

for delivery without any delay (Horngren et al , 2012), and value chain analysis helps in improving the performance of processes through the following: (Handfield, 1995)

- 1) Reducing both the waste of time and effort spent on repairing defective or returned products.
- 2) Reducing the storage time of materials, which results in a reduction in damage and risks generated as a result of carrying out storage processes.

Based on the above, it can be said that the value chain analysis can help improve the performance of processes and achieve long-term objectives of creating a unique competitive advantage when compared to competitors, and this is done by reducing the cost of processes and improving their quality in addition to reducing the time of design, production, marketing and distribution time, which helps to outperform competitors, and thus help achieve competitive advantage in terms of improving indicators of cost, quality and time.

## **APPLIED ASPECT OF THE RESEARCH**

### **Brief about Al-Mothanna Cement Factory:**

Al-Mothanna Cement Factory is one of the formations of the General Company for

the Southern Cement Industry of the Iraqi Ministry of Industry and Minerals. The factory was established in 1984 with the aim of supporting the national economy and meeting the needs of customers of ordinary and resistant cement. The factory is located in Al-Mothanna Governorate/Al-Salman District, and the design capacity of the factory has 1,959,000 tons of cement annually, as the cement that is produced conforms to the Iraqi specification No.5 of 1984, and although the products produced by the factory compete with foreign products in terms of quality, they are not exported outside the State for reasons related to export laws and high cost, and there are several factors that push the factory to develop its production, the most important of which is that the factory possesses qualified administrative, engineering and technical faculties that follow the latest technological and industrial developments in the field of cement industry, in addition to conducting periodic market research in order to identify the actual needs of customers, and for the accounting system followed in the factory, it is the unified accounting system, as the chapters from 5 to 9 are allocated to cost accounts divided between production centers and service centers, and cost accountants in the factory prepare the cost statements in order to determine the cost of the unit produced (tons) based on the

actual costing system in light of the financial data provided by the financial affairs department in the factory. Then, cost statements are submitted to the Management which in turn submits these statements to the pricing committees in the factor for determining the appropriate selling prices for the products.

### **Value Chain Analysis in Al-Mothanna Cement Factory:**

The cement industry is one of the strategic industries in all countries of the world, despite that, this industry is still simple compared to other industries because it depends on uncomplicated production processes and simple components, and for the purpose of analyzing the value chain in Al-Mothanna Cement Factory, the main activities of the value chain and its sub-activities should be determined. The main activities of the value chain are research and development activities, design activities, production activities, marketing activities, distribution activities, in addition to activities related to after-sales services. The value chain activities of Al-Mothanna Cement Factory can be illustrated through the following:

### ***First: Research and Development Activities:***

Al-Mothanna Cement Factory has many activities related to collecting and experimenting with ideas related to the processes and products of the Factory. The nature of cement industry makes the research and development processes very limited, so the development wheel of this industry spins slowly as a result of doing uncomplicated production process, however, new techniques for the cement industry appeared. These techniques are the shift from wet production to dry production in which the levels of spoilage in production are reduced and time losses are reduced as well as achieving accuracy in controlling the mixing of raw materials and thus improving the quality of the product. The research and development activities in the factory consist of a group of sub-activities which are training, qualification, research and consulting services, travel and scholarships for the purposes of training and study. The costs of research and development activities for Al-Mothanna Cement Factory can be clarified through table (1).

*Table (1): Costs of Research and Development Activities (Amounts in Thousand Dinars)*

Sr. No.	Years Costs	2015	2016	2017
1	Training and qualification	2,668,952	3,409,721	3,004,118
2	Researches and consultancies services	3,202,743	2,854,653	3,989,224
3	Travel and scholarships for the purposes of training	762,558	634,366	843,138
4	Travel and scholarships for the purposes of study	991,325	1,030,845	1,275,348
	<b>Total costs of research and development activities</b>	<b>7,625,578</b>	<b>7,929,585</b>	<b>9,111,828</b>

Source: Prepared by the researcher based on the data available in the factory

It is evident from the above table that the costs of research and development activities for the years 2015, 2016 and 2017 amounted to 7,625,578, 7,929,585 and 9,111,828 dinars, respectively, and that these costs were spent in order to search for new ideas aimed at developing production processes to help transform the factory from wet production to dry production in order to improve the utilization of production capacity and reduce spoilage and waste of resources and time in addition to achieving sufficient accuracy in controlling the mixing of raw materials and thus improving the quality of the product.

Design engineers in the factory carry out detailed and engineering planning for production processes and develop their appropriate designs. The designs developed from time to time are reviewed and modified according to the resources and capabilities available for work, competitive market developments, and the needs and desires of customers in a manner consistent with the competitive strategy followed. The costs of design activities can be clarified through the following table:

**Second: Design activities:**

*Table (2): Costs of design activities (amounts in thousands dinars)*

Sr. No.	Years Costs	2015	2016	2017
1	Engineering planning of processes	580,156	213,243	815,448
2	Detailed planning of processes	779,860	332,314	1,011,815
3	Salaries of design engineers	2,178,737	2,369,302	2,910,415
4	Consultancies of external designers	818,720	554,334	729,419
	<b>Total costs of design activities</b>	<b>4,357,473</b>	<b>3,468,193</b>	<b>5,467,097</b>

Source: Prepared by the researcher based on the data available in the factory



It is noted from the above table that the costs of design activities for the years 2015, 2016 and 2017 amounted to 7,625,578, 7,929,585 and 9,111,828 dinars respectively. It is also noted from this table that the salaries of design engineers over the three years of research were greater than the amounts of the other paragraphs, as these years amounted to 2,178,737, 2,369,302 and 2,910,415 dinars respectively. This indicates the factory management's interest in design activity, as the design engineers are experienced and competent at work.

### **Third: Production Activities:**

The production processes in the factory are conducted according to agreed mechanisms in the field of cement industry, where there is a set of successive stages, which are the stage of crushing and mixing raw materials, the grinding stage, the burning stage, the drying stage, and finally the packaging stage, as for the stage of crushing and mixing raw materials,

during which the raw materials are introduced (represented by limestone, gypsum stone, standard sand, bauxite dust, iron oxides and chemicals) to special crushers that smooth and sift these materials, then they are stored in the form of piles and transferred to the grinding stage, and during the grinding stage, the piles of raw materials are mixed with water to prevent dust volatilization and the grinding process continues until these piles reach a high degree of fineness and are then placed in special basins and sent to the incineration stage, and during the burning stage, the raw materials are pulled into rotary kilns at a temperature of 1500 m° in order to break up the bonds of calcium carbonate to obtain clinker, which is the material that makes up cement. After extracting this material, it will be dried during the drying stage, and then sent to the packaging stage for storage in storage silos or packing with special bags, and the costs of the most active can be clarified production through the following table:

**Table (3): Costs of Production Activities (Amounts in thousands dinars)**

Sr. No.	Years	2015	2016	2017
	<b>Costs</b>			
	<b>Direct materials:</b>			
1	Limestone	2,532,781	2,237,516	3,546,991
2	Gypsum stone	1,924,914	2,042,949	2,280,209
3	Standard sand	1,317,046	1,361,966	1,900,174
4	Bauxite dust	1,215,002	1,459,249	1,266,784
5	Iron oxides	911,274	680,983	1,013,426
6	Chemicals	2,230,107	1,945,666	2,660,242
	<b>Total</b>	<b>10,131,124</b>	<b>9,728,329</b>	<b>12,667,826</b>
	<b>Direct wages:</b>			
1	Wages of production workers	10,806,533	11,645,309	13,026,844
	<b>Total</b>	<b>10,806,533</b>	<b>11,645,309</b>	<b>13,026,844</b>
	<b>Indirect industrial costs:</b>			

Black oil	1,026,621	515,978	1,022,409
Oils and lubricants	898,293	589,689	681,606
Steel balls	384,983	147,422	511,204
Container liners	256,655	221,133	624,805
Spare tools	1,154,948	442,266	170,402
Supplies and tasks	759,966	663,400	397,603
Medical materials	449,147	110,567	681,606
Irrigation water	192,491	257,989	1,022,409
Public communications	705,802	331,700	227,202
Transfer of workers	577,474	405,411	340,803
Depreciation of machines	384,983	147,422	369,203
Maintenance of machines	256,655	221,133	198,802
Storage of raw materials	641,638	737,111	681,609
Storage of work in progress	1,283,276	368,555	1,079,209
Storage of full production	769,966	294,844	624,805
Inspection and testing of raw materials	513,310	442,266	397,603
Inspection and testing of processes during production	834,129	257,989	681,606
Inspection and final testing	449,147	479,122	511,204
Maintenance of examination equipment	898,293	221,133	761,126
Failure analysis	384,982	515,977	374,882
Total	12,832,759	7,371,107	11,360,098
Total costs of production activities	33,770,416	28,744,745	37,054,768

Source: Prepared by the researcher based on the data available in the factory

It is noted from the table (3), that the cost of direct materials for the years 2015, 2016 and 2017 amounted 10,131,124, 9,728,329 and 12,667,826 dinars respectively, either direct wages were for these years amounted 10,806,533, 11,645,309 and 13,026,844 respectively, while the indirect industrial costs amounted to 12,832,759, 7,371,107 and 11,360,098 dinars respectively, and therefore the total costs of production activities for the three research years will be 33,770,416, 28,744,745 and 37,054,768 dinars respectively, and after this analysis it is noted that indirect industrial costs rise as a result of the presence of sub-activities that do not add value, and these activities are represented by storage activities and

inspection activities and testing and failure analysis activities so it is necessary to eliminate these sub-activities to eliminate the costs associated with them.

#### **Fourth: Marketing Activities:**

Cement marketing processes are carried out in two methods. The first method is related to the bulk cement that is marketed to the concrete factories, as it is transported by special tank cars that are filled and then weighed with a special scale. The second method is related to the bagged cement, which is filled with special bags, weighing 50 kg, and they are sold to customers, and the costs of marketing activities in the factory, the research sample, can be clarified through the following table:

*Table (4): Costs of marketing activities (amounts in thousands dinars)*

Sr. No.	Years	2015	2016	2017
	Costs			
1	Advertising	653,197	1,846,488	415,308
2	Packaging materials	1,143,837	998,114	1,004,227
3	Publication and printing	571,919	465,077	502,661
4	Wages of marketing workers	1,443,836	1,646,312	1,722,536
	<b>Total costs of marketing activities</b>	<b>3,812,789</b>	<b>4,955,991</b>	<b>3,644,732</b>

Source: Prepared by the researcher based on the data available in the factory

It is evident from the above table, that the costs of marketing activities for the years 2015, 2016 and 2017 have reached 3,812,789, 4,955,991 and 3,644,732 dinars respectively, and after deliberation with the officials of the marketing department regarding the importance of marketing activities, it was found that these activities are necessary and therefore they are value-added activities.

#### ***Fifth: Distribution Activities:***

The factory, the research sample, follows a specific mechanism for delivering its products to customers. The distribution activities include a set of sub-activities, which can be clarified with the associated costs through the following table:

*Table (5): Costs of distribution activities (amounts in thousands dinars)*

Sr. No.	Years	2015	2016	2017
	Costs			
1	Lease of transportation means	490,216	520,379	425,219
2	Maintenance of transportation means	588,259	624,455	516,337
3	Depreciation of transportation means	882,388	936,682	728,946
4	Wages of distribution workers	1,307,242	1,387,678	1,366,774
	<b>Total costs of distribution activities</b>	<b>3,268,105</b>	<b>3,469,194</b>	<b>3,037,276</b>

Source: Prepared by the researcher based on the data available in the factory

It is clear from the table (5), that the costs of distribution activities for the years 2015, 2016 and 2017 amounted to 3,268,105, 3,469,194 and 3,037,276 dinars, respectively, and that these costs were spent on renting transportation means

in addition to the maintenance and extinction of transportation and transportation means, as well as the wages of distribution workers. These costs are necessary to carry out the tasks of distributing the factory's products to

customers through various distribution channels.

**Sixth: After-sales service activities:**

The factory provides some services to customers after selling the products, such as making free calls with customers in addition to delivering the products to them,

and although the products of the factory are of high quality, but sometimes there are damaged products as a result of storage or due to moisture or other reasons, which led to poor quality, and the costs of after-sales services activities can be illustrated through the following table:

**Table (6): Costs of after-sale services activities (amounts in thousands dinars)**

Sr. No.	Years	2015	2016	2017
	<b>Costs</b>			
1	<b>Compensations and fines</b>	<b>653,621</b>	<b>346,919</b>	<b>728,946</b>
2	<b>Free calls with customers</b>	<b>245,108</b>	<b>99,120</b>	<b>364,473</b>
3	<b>Delivering the products to customers</b>	<b>163,405</b>	<b>148,680</b>	<b>680,350</b>
4	<b>Sales returns due to poor quality</b>	<b>571,919</b>	<b>396,479</b>	<b>656,052</b>
	<b>Total costs of after-sale services activities</b>	<b>1,634,053</b>	<b>991,198</b>	<b>2,429,821</b>

*Source: Prepared by the researcher based on the data available in the factory*

It is noted from the above table that the costs of after-sales services activities for the years 2015, 2016 and 2017 amounted to 1,634,053, 991,198 and 2,429,821 dinars, respectively, and it is noted that compensation and fines for these years amounted to 653,621, 346,919, 728,946 dinars, respectively, while the sales returns due to poor quality reached for these years 571,919, 396,479 and 656,052 dinars respectively, which requires reducing the

costs of compensation, fines and sales returns due to poor quality by searching for the real causes that lead to the emergence of these costs and working to reduce them.

After identifying the main activities of Al-Mothanna Cement Factory value chain and the activities that comprise them and determining the associated costs, the costs of the value chain activities for the plant as a whole can be determined through the following table:

Table (7): Costs of value chain activities (amounts in thousands dinars)

Sr. No.	Years Costs	2015		2016		2017	
		Cost	%	Cost	%	Cost	%
1	Research and development activities	7,625,578	14%	7,929,585	16%	9,111,828	15%
2	Design activities	4,357,473	8%	3,469,193	7%	5,467,097	9%
3	Production activities	33,770,416	62%	28,744,745	58%	37,054,768	61%
4	Marketing activities	3,812,789	7%	4,955,991	10%	3,644,732	6%
5	Distribution activities	3,268,105	6%	3,469,194	7%	3,037,276	5%
6	After-sale services activities	1,634,053	3%	991,198	2%	2,429,821	4%
	Total costs of value chain activities	54,468,414	100%	49,559,906	100%	60,745,522	100%

Source: Prepared by the researcher based on the previous tables

The table (7) shows the costs of the value chain activities of Al-Mothanna Cement Factory, as these costs for the years 2015, 2016 and 2017 in the amount of 54,468,414, 49,559,906 and 60,745,522 dinars, respectively, and as it is noted from this table that the costs of production activities have taken the largest share of the cost where its percentage to the total cost during the years of research reached 62%, 58% and 61% respectively, which requires to search for costs associated with the sub-activities of production non-value added activities to both the factory and customers, and it is also noted that the costs of after-sales services activities constituted the lowest percentage of total costs where it reached 3%, 2% and 4% for the three years of research respectively, which indicates the factory's lack of interest in after-sales services despite the factory bearing unjustified costs related to non-value added activities.

### Reducing Cost by Using Value Chain Analysis in Al-Mothanna Cement Factory

For the purpose of reducing the cost by using the value chain analysis in Al-Mothanna Cement Factory, it is required to identify the non-value added activities to both the factory and its customers, and then eliminating these activities, taking into account that there is no negative impact on the quality of both the product and the process, and after researching the activities of the factory, it was found that there is a group of non-value added activities and that are supposed to be eliminated, and these activities are the activities of storage, inspection, testing, maintenance and failure analysis in addition to compensation, fines and sales returns due to poor quality, and the costs associated with these activities can be clarified through the following table:

Table (8): Costs related to non-value added activities (amounts in thousands dinars)

Sr. No.	Years	2015	2016	2017
	Costs			
1	<b><u>Production activities:</u></b>			
	<b><u>Storage activities:</u></b>			
	Storage of raw materials	641,638	737,111	681,609
	Storage of work in progress	1,283,276	368,555	1,079,209
	Storage of full production	769,966	294,844	624,805
	<b>Total</b>	<b>2,694,880</b>	<b>1,400,510</b>	<b>2,385,623</b>
	<b><u>Inspection and testing activities:</u></b>			
	Inspection and testing of raw material	513,310	442,266	397,603
	Inspection and testing of work in progress	834,129	257,989	681,606
	Final inspection and testing	449,147	479,122	511,204
	<b>Total</b>	<b>1,796,586</b>	<b>1,179,377</b>	<b>1,590,413</b>
	<b><u>Maintenance and failure analysis activities:</u></b>			
	Inspection equipment maintenance	898,293	221,133	761,126
	Failure analysis	384,982	515,977	374,882
	<b>Total</b>	<b>1,283,275</b>	<b>737,110</b>	<b>1,136,008</b>
	<b>Total costs of production activities</b>	<b>5,774,741</b>	<b>3,316,997</b>	<b>5,112,044</b>
2	<b><u>After-sale services activities:</u></b>			
	Compensations and fines	653,621	346,919	728,946
	Sales returns due to poor quality	571,919	396,479	656,052
	<b>Total</b>	<b>7,000,281</b>	<b>4,060,395</b>	<b>6,497,042</b>

Source: Prepared by the researcher based on the data available in the factory

It is clear from the table (8), that the costs associated with non-value added activities within the production activities were for the years 2015, 2016 and 2017 in the amount of 5,774,741, 3,316,997 and 5,112,044 dinars, respectively, which are costs associated with the activities of storage, inspection, testing, maintenance and failure analysis, and in addition, the costs associated with non-value added activities within the after-sales services

activities were for the research years in the amount of 1,225,540, 743,398 and 1,384,998 dinars, respectively, which are costs associated with compensation, fines and sales returns due to poor quality, so the total costs associated with non-value added activities were in the amount of 7,000,281, 4,060,395 and 6,497,042 dinars respectively, and therefore eliminating non-value added activities will help reduce costs, as shown in the following table:

*Table (9): Reduction of costs of production activities and after-sale services activities (amounts in thousands dinars)*

Sr. No.	Years Costs	2015	2016	2017
		<b>1</b>	<b><u>Costs of production activities</u></b>	
	Before reduction	33,770,416	28,744,745	37,054,768
	- Amount of cost reduction	(5,774,741)	(3,316,997)	(5,112,044)
	Costs of production activities after cost reduction	27,995,675	25,427,748	31,942,724
<b>2</b>	<b><u>Costs of after-sales services activities</u></b>			
	Before reduction	1,634,053	991,198	2,429,821
	Amount of cost reduction	(1,225,540)	(743,398)	(1,384,998)
	Costs of after-sales activities after cost reduction	408,513	247,800	1,044,823

Source: Prepared by the researcher based on the data available in the factory

It is noted from the above table, that the costs of production activities can decrease for the years 2015, 2016 and 2017 to reach the amount of 27,995,675, 25,427,748 and 31,942,724 dinars, respectively, while the

costs of after-sales services activities can decrease to reach the amount of 408,513, 247,800 and 1,044,823 respectively, the following table shows the costs of value chain activities after cost reduction:

*Table (10): Costs of value chain activities after cost reduction (amounts in thousands dinars)*

Sr. No.	Years Costs	2015		2016		2017	
		Cost	%	Cost	%	Cost	%
1	Research and development activities	7,625,578	16%	7,929,585	17%	9,111,828	17%
2	Design activities	4,357,473	9%	3,469,193	7%	5,467,097	10%
3	Production activities	27,995,675	59%	25,427,748	56%	31,942,724	59%
4	Marketing activities	3,812,789	8%	4,955,991	11%	3,644,732	7%
5	Distribution activities	3,268,105	7%	3,469,194	8%	3,037,276	5%
6	After-sale services activities	408,513	1%	247,800	1%	1,044,823	2%
	Total costs of value chain activities	47,468,133	100%	45,499,511	100%	54,248,480	100%

Source: Prepared by the researcher based on the previous tables

It is clear from the above table that the costs of value chain activities will become after reducing the cost for the years 2015, 2016 and 2017 by 47,468,133, 45,499,511 and 54,248,480 dinars, respectively, after they were 54,468,414, 49,559,906 and 60,745,522 dinars, respectively, which indicates the importance of value chain analysis in reducing costs in Al-Mothanna cement factory, the research sample.

#### **Improvement of the Processes Performance by Using Value Chain Analysis in Al-Mothanna Cement Factory:**

Improving the performance of processes is related to the competitive priorities related to cost, quality and time. The role

of value chain analysis in improving the performance of Al Muthanna Cement Factory processes can be clarified through the following:

**First: Reducing Processes Cost:** The value chain analysis helped reduce the costs of the factory value chain activities, the research sample, for the years 2015, 2016 and 2017 which will become in the amount of 47,468,133, 45,499,511 and 54,248,480 dinars respectively, which will lead to improving cost indicators as a result of the selling price exceeding the total cost of the product, thus, increasing the net profit. The net profit before and after the value chain analysis in Al-Mothanna Cement Factory can be clarified through the following table:

*Table (11): Net profit before and after value chain analysis (amounts in thousands dinars)*

Sr. No.	Years	2015	2016	2017
	<b>Costs</b>			
<b>1</b>	<b><u>Before value chain analysis:</u></b>			
	Revenues	63,000,000	58,500,000	67,500,000
	-Total costs	(54,468,414)	(49,559,906)	(60,745,522)
	Net profit	8,531,586	8,940,094	6,754,478
	÷ Number of units produced (ton)	÷700,000	÷650,000	÷750,000
	= Profit per ton	12.188	13.754	9.006
<b>2</b>	<b><u>After value chain analysis:</u></b>			
	Revenues	63,000,000	58,500,000	67,500,000
	-Total costs	(47,468,133)	(45,499,511)	(54,248,480)
	Net profit	15,531,867	13,000,489	13,251,520
	÷Number of units produced (ton)	÷700,000	÷ 650,000	÷ 750,000
	= Profit per ton	22.188	20.001	17.669
	Amount of increase in profit per ton	10.000	6.247	8.663

Source: Prepared by the researcher depended on the two tables (7) and (10).



Through the above table, it is noted that the profitability per ton of cement for the years 2015, 2016 and 2017 was before the value chain analysis by the amount of 12,188, 13,754 and 9,006 dinars respectively, and after the value chain analysis became 22,188, 20,001 and 17,669 dinars respectively, which indicates the amount of increase in the profitability per the ton of cement was 10,000, 6,247 and 8,663 dinars respectively.

***Second: Improving Processes Quality:***

The value chain analysis helped to improve the quality of design and the quality of conformance, and thus help in providing products that can conform to the needs of customers as a result of providing high-quality design of processes and providing products without defects.

***Third: Reducing Processes Time:*** The value chain analysis helped reduce the time of production currencies as a result of reducing the time that does not add value to the customer, especially waiting time, inspection and testing time, preparation time, handling time and storage time.

Thus, it can be said that value chain analysis in Al-Mothanna Cement Factory can help reduce undue costs associated with non-value adding activities in addition to improving processes performance.

## CONCLUSIONS AND RECOMMENDATIONS

### Conclusions:

Through the theoretical and applied study, the following conclusions were reached:

- 1) The value chain is an interconnected group of activities directed towards achieving strategic goals by focusing on value-added activities. The value chain consists of six activities that start with research and development and end with after-sale customer service through design, production, marketing and distribution activities.
- 2) Value chain analysis is a set of activities and efforts undertaken by the economic unit in order to identify the value-added activities and distinguish them from non-value added activities in a way that helps in producing low-cost, high-quality products in the shortest possible time.
- 3) The value chain analysis helps reduce the cost associated with non-value added activities, in addition to improving quality and reducing time, it will help reduce costs as well, and among the costs that will be reduced are the costs of storage, inspection, testing, maintenance and failure analysis.

- 4) Value chain analysis helps improve the performance of processes and achieve long-term objectives of creating a unique competitive advantage when compared to competitors, and this is done by reducing the cost of processes and improving their quality in addition to reducing design and production time, marketing and distribution time.
- 5) There is potential for value chain analysis in Al-Mothanna Cement Factory, in addition to benefiting from it in reducing costs and improving processes performance, and thus a set of results can be achieved, which are as follows:
  - A. The costs of the value chain activities of the laboratory, the research sample, during the years 2015, 2016 and 2017 reached 54,468,414, 49,559,906 and 60,645,522 dinars, respectively.
  - B. The value chain analysis helped reduce production costs for the years 2015, 2016 and 2017 by 5,774,741, 3,316,997 and 5,112,004 dinars, respectively, and the costs of after-sales services were reduced by 1,225,540, 743,398 and 1,384,998 dinars, respectively.
  - C. The costs of value chain activities after reducing costs for the years 2015, 2016 and 2017 reached 47,468,133, 45,499,511 and 54,248,480 dinars, respectively.
  - D. The analysis of the factory value chain, the research sample, helped in improving the performance of processes by reducing the cost of processes and improving their quality in addition to reducing the time for these processes.

#### **Recommendations:**

In light of the conclusions reached by the research, we list the most important recommendations, which are as follows:

- 1) Developing cost systems in a way that fits with the requirements of the business environment and benefiting from cost and administrative methods, the most important of which is value chain analysis to help reduce unnecessary and unjustified costs associated with non-value added activities in addition to improving processes performance.
- 2) Using the value chain analysis method and working to identify the value-added activities and distinguish them from non-value added activities, and focus efforts to produce products with low cost and high quality in the shortest

possible time and better than what competitors offer in the market.

- 3) Benefiting from value chain analysis in reducing the costs associated with non-value added activities, improving the quality of processes and products, as well as eliminating non-value added activities and reducing the costs associated with them, such as the costs of storage, inspection, testing, maintenance and failure analysis.
- 4) Using value chain analysis to improve the performance of processes in addition to achieving the strategic objectives of the economic unit in order to achieve and maintain competitive

advantage, by reducing the cost of processes, improving their quality and reducing design and production time, marketing and distribution time.

- 5) The dependence of the General Company for the Southern Cement Industry in general and Al-Mothanna Cement Factory in particular on the data of this research and following the specific methodology and initial steps to use the value chain analysis method in reducing costs associated with non-value added activities in addition to improving processes performance.

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