

Implementing Target Costing within the Supply Chain to Lean Costs: Case Study in Najaf Cement Factory

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Abstract- This research aims to apply the concepts of the target cost and the supply chain as tools to analyze and lean the cost of activities in Najaf Cement factory, where the traditional cost accounting system applied in the factory is no longer able to provide the appropriate information for management to make needed decisions to enhance customer satisfaction in light of the competition by the Domestic and imported products. The research included discussion of the literature on the related concepts about how to use the target cost within the supply chain to lean costs, to drawing up a basis for conducting the applied study based on the data of Najaf Cement Factory as a case study of the cement factories in Iraq under competition among them. Because the case study factory faces the problem of the high price compared with similar products in the local market and seeks to reduce costs and achieve efficiency and effectiveness in using its resources. The most important results of the research are that the Iraqi industrial companies should abandon the traditional system and the total cost method in the costing, and begin to implement the target cost within the supply chain activities to lean product costs and achieve customer satisfaction in the light of competition.

Keywords – Target Costing, Supply Chain, Lean Costs, Value Chain, Value Engineering

I. INTRODUCTION

Developments in recent years in all economic, social and technological aspects have made the traditional cost accounting system currently applied in Iraqi industrial companies as part of the standardized accounting system to process cost accounts insufficient to deal with complex operations, and it is necessary to apply a new accounting system helping to improve, develop and increase efficiency in order to increase production quality, speed of delivery and reduce cost. Currently, industrial companies that implement lean production all over the world rely on the concepts of lean accounting in measuring their financial performance. The lean production (Foremost represented by Toyota Production system) created by Taiichi Ohno is viewed as the production system of the 21st century [1]. Accordingly, the concept of lean accounting is the key to progress and overcome the problems of traditional accounting, where the concepts of cost accounting and managerial methods have expanded to reflect lean practices based on the analysis of cost activities during the flow of the entire business processes before, during and after production in the form of an extended supply chain involving parties outside the company From suppliers, distributors and customers to eliminate all forms of waste and loss in order to reduce costs, improve product quality, and achieve customer satisfaction. Under target costing, the supply chain incurs whatever costs are necessary to satisfy customers' expectations for quality, functionality, and price [2].

BACKGROUND

Supply chain is an extended system that includes an organization's value chain as well as its suppliers, distributors, and customers. By paying attention to its supply chain, a company can improve its performance by helping the others in the supply chain to improve their performance [3]. Value chain as a term was created by Porter (1985) is one basis for the development of the supply chain. A value chain "disaggregates a firm into its strategically relevant activities in order to understand the behavior of costs and the existing and potential sources of differentiation". Porter's value chain consists of a "set of activities that are performed to design, produce and

market, deliver and support its product” [4]. The value chain (supply chain) is the set of processes that convert inputs into products and services for the firm’s customers. The value chain includes both internal and supplier processes. Managers can use the value chain to determine which activities create customer value as reflected in product/service prices and, thus, revenues earned. By reducing or eliminating activities that add no value within the value chain, firms can become more efficient and effective [5]. The target costing can be integrated as a cost technique to measure and reduce costs with the supply chain to lean costs by identifying activities that create value within the supply chain, and then the target cost can be allocated to these activities according to the value add to the product [6]. The Target Costing was originally introduced in Japan under the name of Genka Kikaku and became popular in the management accounting literature in the 1990s as a broad concept and has been used with a variety of meanings [7]. A target cost is the difference between the sales price needed to capture a predetermined market share and the desired per-unit profit. The sales price reflects the product specifications or functions valued by the customer (referred to as product functionality). If the target cost is less than what is currently achievable, then management must find cost reductions that move the actual cost toward the target cost. Finding those cost reductions is the principal challenge of target costing [8].

I. Problem and Purpose

Based on the above background, this research aims to overcome the problems of the traditional cost accounting system applied in Najaf Cement Factory, which is no longer able to provide relevance information to the management to make proper decisions that enhance customer satisfaction in light of the competition from local and imported products. By applying the concepts of target costing and supply chain as tools to analyze and lean cost by improving activities that add value and eliminating activities that do not add value throughout the supply chain from upstream to downstream of providing a quality product or service satisfying the customers.

LITERATURES REVIEWS

A. Lean Concept

According to Womack, Jones, and Roos (1990), the term “lean” represents a system that utilizes fewer inputs in order to create the same outputs than those created by a traditional mass production system, while increasing the range of different finished goods for the end customer [9]. One of the main features of lean is the focus on eliminating waste or muda (in Japanese) - all things that do not add value to the product or service under the customer point of view by the means of continuous improvement tasks [10]. That is, as Ballard (1998) stated “Lean focused in getting right thing at right place and in the right quantity to improve productivity while reducing waste.” [11]. So, the underlying objective of lean production is the elimination of waste. Berlin and Adams (2017) [12] asserted that “Lean production is all about maximizing value through the optimization of flow and elimination of waste. One way to reduce waste is to decrease the amount of handling associated with materials and parts as they go through the production chain.”

In the Lean production which based on the Toyota Production System, the seven forms of waste in production are [13]:

- (1) production of defective parts,
- (2) production of more parts than required,
- (3) excessive inventories,
- (4) unnecessary processing steps,
- (5) unnecessary movement of workers,
- (6) unnecessary movement and handling of materials, and
- (7) workers waiting.

Successful implementation of lean manufacturing has brought about significant improvements, such as better quality, increased productivity, reduced lead times, major reductions in inventories, reduced setup times, lower manufacturing costs, and increased production rates [7]. At the Dennis (2002) model, the ultimate goal of lean production is customer focus. Customer focus implies the highest quality, at the lowest cost with the shortest lead time by continually eliminating waste. However, today customers have broader expectations than before. Thus, lean companies have added safety, environment, and morale to their core goals [1]. The concept of lean in its focus on customers meets the supply chain in that the purpose of identifying activities is to create value for the customer, and therefore the determination of activities to include only activities that add value to the customer running an operation lean means that an organization stimulates productivity and quality.

B. Supply Chain as a Cost Technique to Lean Cost

1- Supply Chain Concept

A supply chain is the collection of processes and resources required to make and deliver a product to the final customer. [13]

A supply chain defined by [14] as an integrated process wherein a number of various business entities (i.e., suppliers, manufacturers, distributors, and retailers) work together in an effort to: (1) acquire raw materials, (2) convert these raw materials into specified final products, and (3) deliver these final products to retailers. This chain is traditionally characterized by a forward flow of materials and a backward flow of information.

According to the supply chain includes all vendors, service providers, customers, and intermediaries as defined by [16] "the supply chain is the entities, processes, and information flows that involve the movement of materials, funds, and related information through the full logistics process, from the acquisition of raw materials to the delivery of finished products to the end-user."

Within this concept, the supply chain defined as a group of inter-connected participating companies that add value to a stream of transformed inputs from their source of origin to the end products or services as the value-added outputs that are demanded by the designated end-consumers [17].

Fig. 1 illustrates Company-internal supply chain structures related to Porter's value chain. The core ideas of the supply chain concept are: [5]

- a better collaboration between companies in the same supply chain will help to improve delivery service, better manage utilization and save costs particular for holding inventories
- individual businesses can no longer compete as solely autonomous entities, but rather as supply chains.

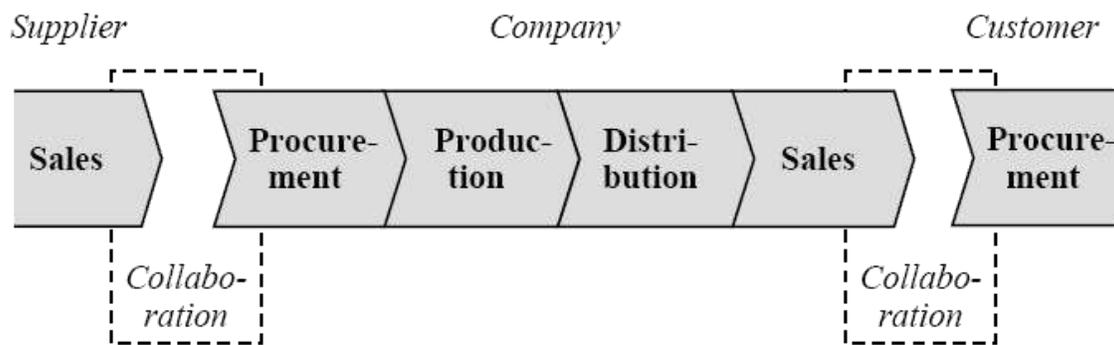


Fig.1 Company-internal supply chain structures [4]

Company's Value Chain Analysis is a useful way of thinking through how to deliver value to customers and reviewing all of the things can do to maximize that value. It takes place as a three-stage process: [18]

- Activity Analysis: identify the activities that contribute to the delivery of product or service.
- Value Analysis: identify the things that customers value in the way of conduct each activity, and then work out the changes that are needed.
- Evaluation and Planning: decide what changes to make and plan how will make them.

The bottom line is that customer value can be created within the supply chain when lean the cost activities that do not add value to the final product and re-created the processes that add value through the efficient flow of resources and information cross-company to maximize output using minimal inputs to achieve reduced cost, efficient delivery, high quality and flexibility with the supply chain

2- Lean in the Supply Chain

Lean management can be adopted by organizations seeking to integrate their supply chain members and activities. Lean in the supply chain aims at applying the lean concepts to the whole functions within the entire supply chain members: suppliers, focal organizations, distributors, and customers. When lean is implemented across the entire supply chain, the supply chain is referred to as a lean supply chain (LSC) [19]. The lean supply chain is a

strategy based on cost reduction and flexibility, focused on processes improvements, through the reduction or elimination of the all “wastes” (nonvalue adding operations). It embraces all the processes through the product life cycle, starting with the product design to the product selling, from the customer order to the delivery [20]. Therefore, a target cost defined as “the maximum amount of cost that can be incurred on a product and the firm can still earn the required profit margin from that product at a particular selling price.” [24]. That is accomplishing through determining costs allover product-life cycle [25]. The difference between target costing and other approaches to product development is profound. Instead of designing the product and then finding out how much it costs, the target cost is set first and then the product is designed so that the target cost is attained [26]. Determination of the target cost of the product depends on numerous factors, some of which are a type of product, technical specifications and production requirements, consumers, market prices, costs, production and more [27]. As a result, considering all these factors in determining the target cost entails studying and analyzing all the functions of the supply chain from the acquisition of raw materials to the delivery of finished products and serve the end-user, to improve delivery service, better manage utilization and save costs in order to achieve the profit target. As Ghafeer et al., (2014) [27] identified one of the target cost characteristics it is a tool for planning and control at both the administrative and accounting levels, through its use in guiding objectives of cost, resources and activities, starting from the stage of planning and design of production and the end of the after-sales service and disposal of the product, in order to reducing the total cost through planning and cost estimation during the design stage of the product, and continued reduction of costs through the other stages of the product life cycle.

1- Target Costing Lean within the supply chain

The concept of target costing is based on the idea that the costs of a future product should be managed in the earliest phases of the product's life cycle because these phases offer the biggest possibilities for significant cost reduction [29]. Target costing, unlike other costing approaches, is imbedded within the firm's product development and introduction process. For this reason, the target costing process requires information pertaining to the firm's competitive, product, and supply chain strategies [2]. This conceptual basis of the target cost is based on lean for the cost activities within the supply chain through the design of the product that satisfies the customer and can be manufactured and delivered as efficiently as possible and at the lowest cost according to the target cost of the product. This can be achieved by reducing the costs of acquisition of resources, production and distribution costs, as well as the costs of disposing of the product and customer service. That means product designs, material choices, specifications and tolerances, buy versus make decisions, process designs, and investment decisions need to be thought through before product design and development decisions are finalized [30, 31]. Thus, the target cost has an integral relationship with the supply chain and each complements the other to lean costs, where a target costing application can be used as an integral effort across the supply chain to diffuses cost reduction efforts by developing a collaborative relationship with suppliers and service providers. At this stage, suppliers and key sub suppliers are involved on the product development through early participation, value engineering and value analysis. As the degree of horizontal integration increases, the role of supplier relations become more critical in the target costing process [7].

The agility of the supply chain and the nature of customer requirements are two of the more important competitive forces affect the target costing for supply chains [32]. In order to ensure effectiveness, [2] argue that these competitive forces partly determine which of three approaches to target-costing should be deployed within supply chain: price-based, value-based, and activity-based cost management (ABCM). A price-based approach to target costing requires that the supply chain operate in a business environment characterized by stability and uniform customer requirements. Thus, is best suited for supply chains whose relationships are characterized by open-market negotiations or simple cooperative arrangements. Value-based target costing is best suited for trading partners whose relationships are characterized by joint efforts to simplify overall supply chain operations. ABCM-based approach to target costing is best suited for trading partners whose relationships are characterized not only by joint efforts to improve the supply chain, but also by joint efforts to develop and improve products. Thus, selection and use of the appropriate target costing approach based upon careful analysis of customer requirements and supply chain relationships should result in higher degrees of customer satisfaction, leading to improved competitiveness, profitability, and long-term sustainability. Blocher et al., (2010) [33] indicate that using target costing at an early phase in the product's life cycle help an organization consider the role of product design (an upstream activity) in reducing costs in the manufacturing and downstream phases of the life cycle to achieve a desired profit while satisfying the customer's expectations for quality and product features. Also, they mentioned that while once managers focused only on manufacturing costs, they now look at costs upstream (before manufacturing) and downstream (after manufacturing) in the product life cycle to get a comprehensive analysis of product cost and profitability. (as Fig. 2 illustrates)

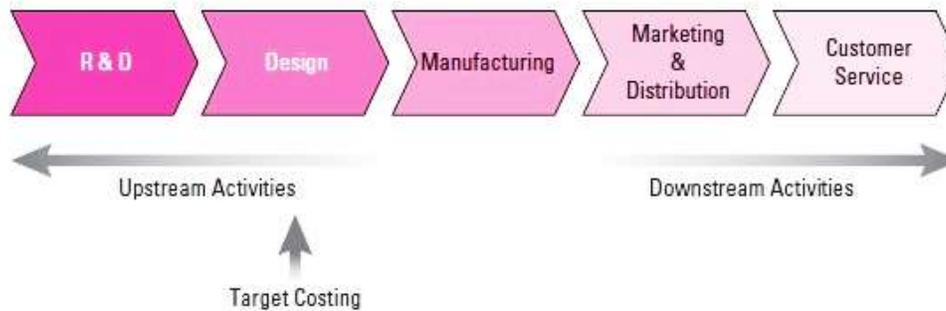


Fig.2 Target Costing in the Cost Life Cycle of a Product or Service [31]

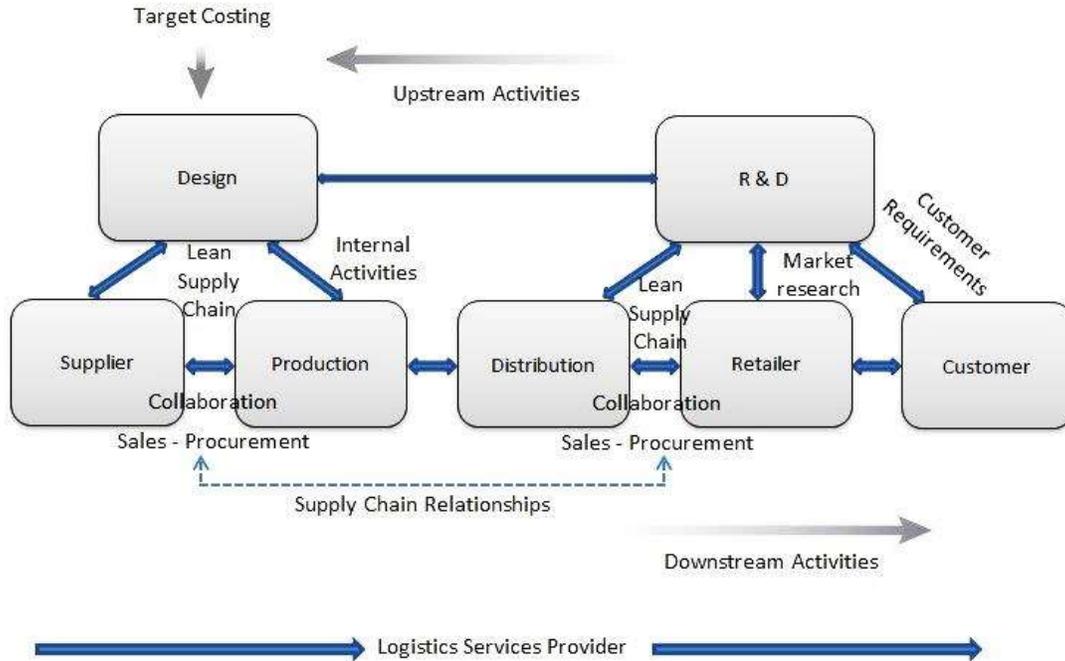
With reference to Datar and Rajan (2008) [34], management accountants use their understanding of the value chain to estimate cost savings, and focuses on design decisions to reduce costs before costs get locked in. However, not all costs are locked in at the design stage, so, managers also use other improvement techniques, to reduce the time it takes to complete a task, eliminate waste, and improve operating efficiency and productivity. Implementing a target costing approach involves the following four steps. Step 1: Develop a Product That Satisfies the Needs of Potential Customers. Managers use customer feedback and market research information about competitors' products to change product features and designs. Step 2: Choose a Target Price. Managers respond aggressively to competitor's expectation to lower the prices by reducing the price and forecasts how much units increase in annual sales. Step 3: Derive a Target Cost per Unit by Subtracting Target Operating Income per Unit from the Target Price. Target operating income per unit is the operating income that a company aims to earn per unit of a product or service sold. Target cost per unit is the estimated long-run cost per unit of a product or service that enables the company to achieve its target operating income per unit when selling at the target price. It is often lower than the existing full cost of the product, and it is really just that—a target—something the company must strive to achieve.

Step 4: Perform Value Engineering to Achieve Target Cost. Value engineering is a systematic evaluation of all aspects of the value chain, with the objective of reducing costs and achieving a quality level that satisfies customers. Value engineering entails improvements in product designs, changes in materials specifications, and modifications in process methods and its distribution and service systems. To implement value engineering, managers distinguish value-added activities and costs from non-value-added activities and costs. This process is vital to management's objective of eliminating non-value-added costs. These are costs of activities that can be eliminated without deterioration of product quality, performance, or perceived value [21]. Figure 3 illustrates the proposed application of these steps to the target cost within the supply chain of the factory case study in order to lean costs and reach a competitive price while maintaining the quality of the product and achieve customer satisfaction.

RESEARCH METHODOLOGY

Najaf Cement Factory is one of the factories affiliated to the General Company for Southern Cement and one of the most important formations of the Ministry of Industry and Minerals, the factory was established in 1975, and currently has a production capacity of 900,000 tons per year with a single production line. It works in the wet way and produces ordinary Portland cement and holds the Iraqi quality certificate.

In order to lean the production cost and improve the value of the cement product for the customers using the target costing within the supply chain, the following steps were taken based on the data obtained from the factory management about the production costs, Company's relations with suppliers, the sales methods and other required data.



Due to the stability and uniform customer requirements, a price-based approach to target costing is used for this case study to ascertain the market prices and profit margins for product and to provide a means for negotiating compensation among trading partners for the performance of supply chain activities.

C. Actual Production Costs Data

The factory uses the unified accounting system in Iraq, which includes in its general framework some principles and bases and cost treatments in addition to financial accounting, which is the basis of the system. The system recommended that the total cost method should be used to determine the cost of the product. In general, the cost centers in the factory according to this system are divided into the following groups:

- Production centers: include three basic production processes that the cement producing is going through: Raw materials acquisition and handling, Blending, and Pyro processing - Making clinker, and Finished cement grinding.
- Production Services Centers: include three main services: Electric power, Mechanical workshops, and Maintenance.
- Marketing services centers: include three main services provided: Warehousing and Logistics, Distribution and Transportation, and Marketing and Sales.
- Administrative Services Centers: include the departments that provide logistics services which are: Finance, Auditing, Quality Control, Human Resources and Research and Development.

In light of this, Table (1) shows the distribution of total costs to the cost centers according to cost records of Najaf Cement Factory for 2018.

Table 1. Total cost and cost per ton of cement for Najaf Cement Factory for 2018

| Cost Centers | Actual Costs (thousand IDa) | Production / Sales Volume (Tons) | Cost per Ton (ID) |
|------------------------------------|-----------------------------|----------------------------------|-------------------|
| Production centers | | | |
| Raw materials acquisition | 11452963 | 676900 | 16920 |
| Making clinker | 10307666 | 676900 | 15228 |
| Finished cement grinding | 8017074 | 676900 | 11844 |
| Production Services Centers | | | |
| Electric power | 7444426 | 676900 | 10998 |
| Mechanical workshops | 6299130 | 676900 | 9306 |
| Maintenance | 3435889 | 676900 | 5076 |

| Marketing and Administrative services centers | | | |
|---|-----------------|---------------|--------------|
| Marketing services | 4581185 | 676900 | 6768 |
| Administrative services | 5726481 | 676900 | 8460 |
| Total cost | 57264814 | 676900 | 84600 |

^aID/ Iraqi Dinars

D. Determine the target cost

The company's management seeks to reduce the selling price in line with the competitive price of the product in the market, where 75000 ID is the price per ton of competitive cement. As a result of the price reduction, the company's management expects an increase in annual production and sales volume to reach annual production capacity. However, the management is not currently able to decide the price reduction according to the data of the total cost method used to determine the cost per ton 84,600 ID, which means selling at a loss.

The company's management also aims to achieve a target profit of 6750 ID per ton of cement, which targets the profitable ratio under the high competition in the market between domestic and imported products, which is 9% of the selling price. However, the current selling price of 85000 ID per ton does not enable the company to achieve the target profit rate after subtracting the total cost of the product.

Therefore, the target cost per ton is 68250 ID, which is lower than the actual total cost per ton of 84600 ID.

Assuming a constant annual production volume of 676900 tons, the total annual cost target would be equal to:

Annual target cost = target cost per ton × annual production

$$46198425000 = 68250 \times 676900$$

Consequently, the management should analyze and evaluate the activities of the supply chain to lean costs by the difference between the total actual cost and the target cost, which is equal to 11066388692 ID:

Annual lean cost = actual annual cost - annual target cost

$$11066388692 = 57264813692 - 46198425000$$

E. Analysis and evaluation of supply chain activities

According to Fig. 3, the supply chain activities of Najaf Cement factory can be divided into:

- 1- Upstream Activities: procurement from external suppliers
- 2- Internal Activities: Product manufacturing
- 3- Downstream Activities: distribution and sales to the customer

According to the cost centers and the cost data in Table 1, the costs of the supply chain activities of the factory should be analyzed according to the table 2:

Table 2. Supply Chain activities Costs according to the total cost of Najaf Cement Factory for 2018

| Supply chain Activities | Actual Costs (thousand IDa) | Production / Sales Volume (Tons) | Cost per Ton (ID) |
|--|--------------------------------|-------------------------------------|----------------------|
| Upstream Activities | | | |
| Raw materials acquisition | 11452963 | 676900 | 16920 |
| Internal Activities | | | |
| Making clinker | 10307666 | 676900 | 15228 |
| Finished cement grinding | 8017074 | 676900 | 11844 |
| Electric power | 7444426 | 676900 | 10998 |
| Mechanical workshops | 6299130 | 676900 | 9306 |
| Maintenance | 3435889 | 676900 | 5076 |
| Downstream Activities | | | |
| Marketing services | 4581185 | 676900 | 6768 |
| Upstream/ Downstream Activities | | | |
| Administrative services | 5726481 | 676900 | 8460 |
| Total cost | 57264814 | 676900 | 84600 |

To lean costs of these activities requires analysis to sub-activities and an assessment of whether they add value or not add value to the product from the customer's point of view, to exclude the costs of activities that do not add value. Thus, the target cost can be allocated to these activities according to the value add to the product.

1- Upstream Activities:

Raw material preparation: this activity of the factory supply chain supplies a variety of raw ingredients needed for the product raw mix through a variety of blending and sizing operations. The cost of these activities is 20% of the total cost. The materials of the basic mixture consist of:

Limestone: the supplying cost of 45% by contracting four companies.

Clay: the supplying cost of 15% by contracting one company.

Iron oxide: the supplying cost of 30% by contracting two companies.

Water: the supplying cost of 10% by contracting two companies.

These materials, excavated from quarries or mines, and purchased from an external supplier, through the contracting of suppliers to extract these materials and transport them to the storage areas inside the factory in preparation for the process of crushing and milling. The total cost of this activity includes a set of direct and indirect costs as shown in Table 3 according to cost records of Najaf Cement Factory for 2018

Table 3. Cost elements of Upstream activities of Najaf Cement Factory for 2018

| Cost elements | Total Actual Costs (thousand ID) | Ratio to total cost % |
|-----------------------------|-------------------------------------|--------------------------|
| Variable costs | | |
| Direct wages | 1259826 | 0.11 |
| Indirect wages | 801707 | 0.07 |
| Commodities supplies | 1947004 | 0.17 |
| Service supplies | 1030767 | 0.09 |
| Other costs | 458118 | 0.04 |
| Total variable costs | 5497422 | 0.48 |
| Fixed costs | | |
| Salaries | 1603415 | 0.14 |
| Commodity Supplies | 13743556 | 0.12 |
| Service supplies | 1145296 | 0.10 |
| Interest and Rents | 1259826 | 0.11 |
| Depreciation | 343589 | 0.03 |
| Other costs | 229059 | 0.02 |
| Total fixed costs | 5955541 | 0.52 |
| Total cost | 11452963 | %100 |

From the analysis and evaluation of the cost elements in Table 3 which represent the most important activity in the supply chain involving the relationship with partners, it is clear that the company's management need to lean many of the cost elements, the most important of which:

- The high percentage of fixed costs, especially salaries, which means that the production is charged with idle capacity costs which do not add value to the customer, so management has to abandon the total cost method in pricing.
- Commodity supplies represent the costs of obtaining raw materials and other supplies necessary for the operation, such as fuel, spare parts, electricity, and any other supplies. It is noticeable that the percentage of fixed commodity supplies costs is high compared to the percentage of its variable costs, because the management depends on contracts in supplying of raw materials and does not do that for the fuel and spare tools, and therefore the management must rely on suppliers and negotiate to get fuel and other supplies needed at lower prices.
- Service supplies represent maintenance costs, rental of equipment, transportation, travel, hospitality, telecommunications, and insurance. It is noticeable the high percentage of variable costs due to higher maintenance costs. The management can also rely on negotiating to get these services from external suppliers at short or medium-term contracts to ensure the quality of service at more appropriate prices instead of doing it directly.
- Increased salary rates 14% and indirect wages 7% compared to direct wages 11%, due to the number of permanent employees versus temporary workers at daily wages. The difference in wages rate represents costs do not add value if assuming that all workers permanent and temporary performing the same tasks are paid the same wage rate.

So, in order to lean the costs of this activity from the supply chain, the company's management must seek to improve activities that add value and exclude activities that do not add value in order to enhance the value of the product through:

- Eliminate idle capacity costs.
- Reduce the acquisition cost of raw materials and other supplies.
- Reduce the costs of other services such as maintenance and transportation by getting them from the services providers instead of directly providing.
- Improve productivity and reduce the number of workers.

2- Internal Activities:

These activities focus on the cement production process and are represented by basic two-step processes where clinker is first produced from raw materials. In the second step, cement is produced from the clinker. To complete these steps optimally, the production process requires a set of support services concentrated in three main activities are: the supply of electric power, mechanical workshop services, and maintenance.

Internal manufacturing activities: these activities include heated of processed raw materials after blending and homogenization in a special kiln for a wet way in cement manufacturing, where this method consumes a lot of energy in several processes of melting raw materials and converted to clinker. Next, it is transferred to the ball mills and add gypsum by almost 5%, then grind the mixture to produce cement. The management of the company does not depend on any of the suppliers for the supplying of gypsum or any other supplies required by these production processes. Table 4 shows the total cost elements of the two-step process.

Table 4. Cost elements of Internal Production activities of Najaf Cement Factory for 2018

| Cost elements | Making clinker | | Finished cement grinding | |
|-----------------------------|-------------------------------------|--------------------------|-------------------------------------|--------------------------|
| | Total Actual Costs (thousand ID) | Ratio to total cost % | Total Actual Costs (thousand ID) | Ratio to total cost % |
| Variable costs | | | | |
| Direct wages | 824613 | 0.08 | 1683586 | 0.21 |
| Indirect wages | 618460 | 0.06 | 1282732 | 0.16 |
| Commodities supplies | 1339997 | 0.13 | 1202561 | 0.15 |
| Service supplies | 824613 | 0.08 | 881878 | 0.11 |
| Other costs | 309230 | 0.03 | 160341 | 0.02 |
| Total variable costs | 3916913 | 0.38 | 5211098 | 0.65 |
| Fixed costs | | | | |
| Salaries | 2164610 | 0.21 | 801707 | 0.10 |
| Commodity Supplies | 1546150 | 0.15 | 721537 | 0.09 |
| Service supplies | 1236920 | 0.12 | 641366 | 0.08 |
| Interest and Rents | 618460 | 0.06 | 240512 | 0.03 |
| Depreciation | 515383 | 0.05 | 320683 | 0.04 |
| Other costs | 309230 | 0.03 | 80171 | 0.01 |
| Total fixed costs | 6390753 | 0.62 | 2805976 | 0.35 |
| Total cost | 10307666 | %100 | 8017074 | %100 |

From the analysis and evaluation of the cost elements in Table 4, the most important cost items need to lean can be diagnosed as follows:

- Although the production processes depend on mechanization and kilns, whether in clinker or cement manufacturing, it is noted the high rates of salaries and wages. The company adopts the salary system according to the functional gradient in Iraqi law, and because of the increase in the number of permanent employees from engineers, technicians and skilled workers, the proportion of fixed salaries high in both production activities, this increases the burden of idle capacity and activities that do not add value to the product. They should be excluded and the activity's share of the target cost for labor should be determined by the value it adds.
- As a result of the adoption of the traditional system in costs distribution, the commodity supplies and the needed fuel and spare parts are distributed to various activities according to the number of machines hours not according to the operating capacity for the machinery or appropriate cost drivers, and thus arbitrarily consider a large part of these costs fixed, which are also relatively expensive because of direct suppling.
- Gypsum is supplying by direct purchase as needed. The management does not approve contracting with suppliers as the quantity added with clinker for cement production is small.
- There is not a small percentage ranging from 3-6% of other costs distributed between fixed and variable costs such as loss of assets or accidental incidents, which should not be charged as production costs as they do not add value.

Therefore, leaning the costs of internal production activities of the factory supply chain requires management to abandon the traditional cost distribution system and doing further analyze the sub-activities within each major activity and track costs on a cause-and-effect basis. So, it is possible to determine the share of these activities from the target cost based on the value-added by each sub-activity and thus can be lean the costs through:

- Increase production and reduce idle capacity.
- Achieving work flexibility by training employees and the adoption of team works to increase productivity and reduce downtime.

- Outsourcing of gypsum, rather than obtained directly.
- Improved negotiation with suppliers to obtain production supplies in larger quantities to benefit from lower prices commensurate with the target cost.
- Improve performance and maintain assets to reduce other and incidental costs.

Internal Support Services activities: according to the traditional costing system applied in the factory, the completion of production activities requires support services activities, these activities are provided through independent cost centers redistributed its costs to manufacturing activities according to a single applied rate commensurate with the nature of the service provided. The total actual costs of these activities are 17179445 ID, or 30% of the total cost (17179445/57264814), which are indirect costs that the most amount of it represents engineers and technicians' salaries, in addition to equipment depreciation or rent and other materials or supplies used. Therefore, are almost fixed or semi-fixed costs. The rate 30% of these costs are considered high, requiring evaluation or value engineering and modifications in the details of the completed activities and linking them to the cost pool using ABC instead of aggregating them in a specific cost center, so, it can be leaning the costs of removable activities without affecting the performance of the production process or product quality.

3- Downstream Activities

According to the definitions of the traditional cost system adopted in the factory, the marketing service centers carry out marketing research and product selling, storage services, product packaging, transportation, and distribution. The administrative service centers are the centers that undertake all administrative and financial tasks and exercise supervision and internal control and follow-up. The marketing costs of Najaf Cement Factory constitute 8% of the total cost, and the administrative costs constitute 10%. This means that the customer will be charged these costs even though they may not add value in most of their activities. The factory markets cement with two types of nonpacked and packed cement, often the nonpacked cement is directly supplied by the factory to the construction sites of government projects according to special needs and prices in coordination with government agencies or implementing private companies. Packed cement supplying to end customers through a group of agents approved by the management. However, the marketing and transportation costs were not assigned to the first type and the packing costs for the second type, rather the cost of producing one ton was calculated in aggregate, this mean the customers of both types bear costs that do not add value to them.

The management of the factory consists of a large number of employees exceeding 50 in charge of payments, accounting and financial management in addition to the tasks of internal control, research and development, and quality control. The management has no perceptions on how to design the supply chain to coordinate and lean these activities, for example through the following:

- Transportation logistics and reduce costs.
- Careful selection of sales agents and negotiate with them on the method of payment whether cash or deferred to meet the supplier's payment.
- On-time delivery to reduce inventory costs to a minimum.
- Improving the financial system and information flow by using of IT system.
- Concern to the efficiency of personnel and opting between permanent employee or outsourcing, especially for quality inspection and product development.

RESULTS

As a result of the previous analysis of the factory supply chain activities, and to have a basis for management to lean cost, the first step proposed by this research is to apportion the total target cost on the supply chain activities according to the ratio of the costs of each activity to the total cost. Consequently, based on value engineering and evaluation of supply chain activities, management can determine which reduction or elimination for non-add value activities can lean costs within supply chain activities in proportion to the value that activities create when performing. Assuming the actual cost and production data for 2018, the amount of cost lean per ton per activity as shown in Table 5 will be as follows:

Target Cost of Activity = Total Target Cost x Actual Cost of Activity / Total Actual Costs

Cost lean = actual cost - target cost

Cost lean per ton = Cost lean / volume of production

Table 5. Apportion the total target cost on the supply chain activities of Najaf Cement Factory for 2018

| Supply chain Activities | Actual Costs (thousand ID) | Target Costs (thousand ID) | Cost lean (thousand ID) | Cost lean per Ton (ID) |
|--|-------------------------------|-------------------------------|----------------------------|---------------------------|
| Upstream Activities | | | | |
| Raw materials acquisition | 11452963 | 9239685 | 2213278 | 3270 |
| Internal Activities | | | | |
| Making clinker | 10307666 | 8315717 | 1991949 | 2943 |
| Finished cement grinding | 8017074 | 6467780 | 1549294 | 2289 |
| Electric power | 7444426 | 6005795 | 1438631 | 2125 |
| Mechanical workshops | 6299130 | 5081827 | 1217303 | 1798 |
| Maintenance | 3435889 | 2771905 | 663984 | 981 |
| Downstream Activities | | | | |
| Marketing services | 4581185 | 3695874 | 885311 | 1308 |
| Upstream/ Downstream Activities | | | | |
| Administrative services | 5726481 | 4619843 | 1106638 | 1635 |
| Total cost | 57264814 | 46198426 | 11066388 | 16349 |

The amount of cost lean per ton achieved in Table 5 will be the basis for the implementation of the target cost within the supply chain activities that can be accomplished at the cost allowed according to the value engineering results of each activity to eliminate non-add value activities equal to the total amount of lean for each activity according to the volume of production expected to be achieved due to cost lean. Table 6 shows the total proposed amount of lean for each activity within the supply chain of Najaf Cement Factory to achieve the management expected increase in production volume up to the goal of achieving production capacity according to the following equation:

$$\text{Total cost lean per activity} = \text{cost lean per ton} \times \text{target production volume}$$

Table 6. Proposed cost lean per activity within the supply chain of Najaf Cement factory based on production capacity

| Supply chain Activities | Cost lean per Ton (ID) | Target Production/ Sales Volume (Tons) | Proposed cost lean per activity (thousand ID) |
|--|---------------------------|---|---|
| Upstream Activities | | | |
| Raw materials acquisition | 3270 | 900000 | 2943000 |
| Internal Activities | | | |
| Making clinker | 2943 | 900000 | 2648700 |
| Finished cement grinding | 2289 | 900000 | 2060100 |
| Electric power | 2125 | 900000 | 1912500 |
| Mechanical workshops | 1798 | 900000 | 1618200 |
| Maintenance | 981 | 900000 | 882900 |
| Downstream Activities | | | |
| Marketing services | 1308 | 900000 | 1177200 |
| Upstream/ Downstream Activities | | | |
| Administrative services | 1635 | 900000 | 1471500 |
| Total cost | 16349 | 900000 | 14714100 |

Then, for management to take any proposals for cost lean, it must determine which of the supply chain activities can be carried out at its target cost based on relationships with all external or internal partners and then determine the amount of both fixed and variable cost elements based on the value that it adds.

CONCLUSION AND DISCUSSION

Iraqi industrial companies should abandon the traditional system and the total cost method in costing, as it does not meet the information flow requirements necessary for management to make decisions to achieve customer satisfaction, especially satisfaction with the price of the product under competition. The implementation of the target cost within the supply chain activities will achieve lean in product cost based on the competitive selling price in a manner that helps to improve and increase the efficiency of the entire business processes before, during and after production by coordinating the relationship with all parties within the supply chain and determining which of them (eg suppliers and distributors) have the ability to perform supply chain activities at target cost in order to maximize the value created to the customer.

Cost management tools aimed at reducing costs such as value engineering and activity-based costing are necessary to implement target costing to lean the cost of supply chain activities that do not add value, the most important are:

- Eliminate idle capacity costs.

- Reduce the cost of acquisition of raw materials and other supplies.
- Reduce transportation and other services and eliminate accidental costs.
- Improve productivity and reduce downtime.
- Reduce interest costs and coordinate cash and term payment methods.
- Minimize inventory costs.

Based on the results and discussion of this research, the following recommendations can be summarized which can be taken by the management of Najaf Cement Factory to lean product cost and reach a competitive price in the light of the quality of the product that satisfies the customer:

- Adopting the target costing as a basis in determining the cost of each activity within the supply chain according to the value-added by each activity, thus eliminating the idle capacity costs in each activity.
- Reduce the costs of procurement of raw materials and other supplies through direct negotiations with suppliers and conduct contracts in proportion to the cost allowed for each activity within the target cost.
- Careful selection of suppliers in terms of price, quality and delivery time.
- The cost of materials used in cement production can also be lean by conducting value engineering of the product and determining whether it can be replaced by waste materials or by-products from other manufacturing processes, to the extent that such replacement can be carried out without adversely affecting plant operations, product quality or the environment.
- Negotiation can also be conducted with suppliers of other services, such as maintenance and transportation and obtaining them at differential prices rather than providing directly.
- Improve productivity and increase work efficiency for permanent workers to reduce the number of temporary workers.

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