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Time Driven Product Life Cycle Costing as A Cost Reduction Techniques: An Empirical Study in The General Company for Electrical and Electronic Industries

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Abstract

The cost reduction of a product or service is one of the most important means by which economic units operate to cope with the competitive situation in the current business environment. Cost management is based on modern techniques to reduce costs, and perhaps the most important of these modern techniques is the time driven product life cycle costing techniques (TD-PLCC). This paper seeks to focus on TD-PLCC techniques as one of the modern costs and management accounting techniques that have been developed in response to developments and changes that have occurred in the current business environment. The paper also aims to show how to benefit from it by the economic unit that seeks to manage cost by reducing it and enhancing competitive advantage, by finding ways and methods that contribute to reducing product costs. The results show that TD-PLCC techniques provides more reliable information by identifying unused capacity (idle) and its costs and not loading it on the product. This, in turn, leads to the optimal use of capacity by the administration. Therefore, modern techniques should be adopted to calculate the cost and administration to keep pace with developments and changes in the current business environment.

Keywords: *TD-PLCC – TD-ABC, Product Life cycle, Product Cost, Cost Reduction.*

Introduction

The developments taking place in the modern business environment at the present time, which are reflected by intense competition, technological progress, openness of markets, and short product life cycle due to the continuous change in customer tastes and their need for products that meet their requirements with high quality and low prices. It has led the economic units to consider rethinking the traditional accounting systems and approaches applied in them to the increasing criticism leveled at them. The reason for this is due to its inability to provide information that reflects the developments taking place in the business environment because the core of its focus is the internal environment of these units and the search for modern strategic technologies in the field of cost and administrative accounting, which meet the needs of customers. In addition, it seeks to help in managing costs by reducing them while improving product quality. As a result, it supports the competitive advantage of economic unity. The most prominent of these technologies is the life-time cost of the product. The rapid developments in the modern business environment, most notably intense competition, have made traditional systems and approaches to cost and administrative accounting unable to provide information that helps economic units in general and Iraqi in particular in meeting information needs (Khaghaany, Kbelah, & Almagtome, 2019). Therefore, it was self-evident that these units, if they wanted to continue in the conditions of this environment and the evolving developments in the application of modern accounting techniques concerned with managing the cost of reducing it while maintaining the quality of the product. Thus, it supports the competitive advantages of these units in the market. The most important of these technologies is the time-driven product life-cycle costing techniques. This method works on the principle of optimizing the use of resources by allocating the cost on the basis of each stage of the product life cycle, taking into account the time consumed by each of these stages. Therefore, the current study aims to clarify how to benefit from the techniques (TD-PLCC) in reducing the cost of a 1/4 HP motor power product in the factory.

1. **Time Driven Product Life Cycle Costing**

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The interest in the concept of the product life cycle cost emerged in the year 1960 by the US Department of Defense, which was the first to apply this technique to assess the costs in the long term that affect purchase decisions (Wang, 2012). In 1976 the life-cycle cost concept was implemented as an aid to decision-making for the US Department of Health and Education (Kbelah, Almusawi, & Almagtome, 2019). In the mid-1980s, there were attempts to implement product life-cycle cost techniques in the private sector, specifically in the field of investment construction (Gluch & Baumann, 2004). The Japanese are the first to expand the implementation of product life-cycle cost techniques in terms of employing it in the field of cost management (Emblemsvåg, 2003).

Regarding the concept of the product life-cycle cost techniques concept, the literature addresses this concept by providing several definitions of it. In this context Hansen and Mowen (2009) define the product lifecycle cost as all the costs related to the product during its life cycle which are the development stage (planning, design, and testing), the production stage (conversion processes), the support phase (Advertising, distribution, and warranty). In the same context, Datar and Rajan (2018) define the cost of a product's life cycle as tracking and aggregating the cost associated with each product through the value chain from the beginning of initial research and development to the end of after-sales services to customers. Whereas, Drury (2018) defines the cost of a product's life cycle as an estimate of the costs along the product's life cycle in order to indicate whether the profits made during the manufacturing phase will cover its cost during the pre-production and post-production stages.

The product life cycle cost is a technique for measuring the cost based on cost allocation throughout the product life cycle stages that collectively represent the total cost of the product. Almusawi, Almagtome, and Shaker (2019) indicate that adopting the principle of linking the cost to each stage of the product life cycle may be more important and valuable if time is taken into consideration as a cost guide in the process of determining the cost for each stage. Adopting time as a guideline in determining the cost for each stage of a product's life cycle may be more important in allocating the cost of resources to the cost goal represented by each stage of the product's life cycle, which in its entirety represents the cost of the final cost goal that is the product, and then it is said that the cost of each stage of the life cycle is time-driven. This implies the emergence of a time-driven product cost-of-life techniques. Accordingly, the time-driven product life-costing techniques can be defined from the researcher's point of view as one of the strategic cost management techniques that focuses on the use of time as a primary cost guide in allocating the cost of resources to the cost goals represented by each stage of the product life cycle, which in total represents the cost of the product. In other words, it represents:

A. It is a time-based technique as the main vector in allocating the cost of resources to the stages that the product goes through during its life cycle.
B. The product cost includes the total cost of its life cycle during the stages it goes through.
C. The cost of each stage the product goes through is the total cost of activities to be carried out.
D. This technique is considered as a method to control the cost of the product life cycle.
E. This technique helps provide detailed product information to decision makers.

Many studies on the product life cycle indicate that the product may go through several stages that together make up its life cycle. These stages differ according to views, whether related to the market, production or the customer. From the point of view of the customer, Blocher, Stout, and Cokins (2010) and Hansen and Mowen (2009) show that the product goes through the following stages:

A. **Product Rendering Stage**: This stage is characterized by limited competition. This leads to a decrease in the percentage of sales as a result of a decrease in the percentage of demand for the product, until it is known by the customers and its compatibility with their desires. This results in an increase in the cost of sales as well as research and development costs and marketing costs
B. **Growth Stage**: It is the stage in which the product spreads more in the market, accompanied by an increase in the percentage of sales if the product outperforms the needs and requirements of customers. Moreover, this stage is characterized by increased intensity of competition, on the basis of which the price begins to decline.
C. **Maturity Stage**: At this stage the image of competition is determined, and the product may have a fixed share with the increase in sales continuing, but at lower rates, and dependence on cost and quality in competition (Krajewski, Malhotra, Ritzman, Malhotra, & Ritzman, 2010).
D. **The Stage of Deterioration and Decay**: This stage marks the beginning of a decrease in the market share of the product as a result of the change in consumer tastes and intensity of competition. The product may replace new products, which leads to lower sales. It may reach zero or settle to the lowest level as customers of the product decline gradually if nothing is taken about it.

From the foregoing it becomes clear that the focus of management in the first stage revolves around differentiation, design and marketing, and then its focus in the second stage shifts to developing new products, and pricing them with the increasing pace of competition. In the third and fourth phases, the management's focus in it shifts to cost, quality and service control as competition in the market continues. Therefore, the strategy pursued by the company towards the product or service changes during the life cycle of the market from differentiation in the first stages to an increase in the cost in the final stages. Whereas, the stages of the product life cycle from the customer's point of view begin with the stage of acquisition or purchase, then operation, then maintenance phase, and finally the phase of abandonment or replacement of the product. Here the focus is on product performance and quality vis-a-vis the price paid (Datar & Rajan, 2018). Finally, from the production

point of view, the product life cycle stages include the stage of research and development, then the design stage, to be followed by the production stage, then the marketing and distribution stage, and finally the after-sales service stage for customers (Blocher et al., 2010).

Many studies and literature related to accounting affairs indicate that attempting to link the cost to each stage of the product's life cycle with time is a signal of the product's time-driven cost-of-life techniques techniques, which can achieve the following goals if they are applied:

A- Provides information on the capacity used, indicating the time needed to complete each stage (Lourenco, 2013: 23).
B- Providing the different verbal information that managers depend on in the field of cost management more effectively, as it focuses on cost at every stage of the product life cycle (ElKelety, 2006: 437).
C- Creating the information, the administration needs in making operational and strategic decisions (Sievanen & Tornberg, 2002: 3).
D- Provides information on the cost of the product life cycle and its stages in order to improve the value of the product to suit the requirements and needs of customers (Stelling, et., Al., 2010: 2239).

Dejnega (2011), Gayle (1996), and Hussein (2019) indicate that TD-PLCC technical steps can be identified if the time is adopted as a guide in their application as follows:

A. Defining the resource groups related to the product life cycle: In this step, the resource groups related to the stages that the product goes through during its life cycle are identified.
B. Determining the total cost of resources for each stage of the product life cycle: the cost of resources is the direct and indirect costs, as direct costs include the wages and salaries of workers, while indirect costs include indirect industrial costs except for direct materials.
C. Determine the practical capacity of each resource group: The working capacity includes the hours or time required to produce the product. 80% of theoretical capacity is approved, as a result of excluding downtime, repairing and maintaining machines, or instructing workers and others that are not related to the actual work of performance. (Szychta, 2010).
D. Determining the unit cost of time for each set of resources related to product operations: This step is accomplished by dividing the total operational costs represented by direct and indirect costs by practical capacity.
E. Defining and grouping the activities related to the stages of the product life cycle and the time required for each activity: In this step, the time equation for the activities of each resource group is prepared, but the formulation is as follows:

$$Tj, k = \beta o + \beta 1\ X1 + \beta 2\ X2 + \beta 3\ X3 + \ldots. + \beta p\ Xp$$

Where:
Tj, k = the time needed to complete event j for activity k
=o = constant amount of activity k
B1 = the time consumed for one unit of the time wave x1
X1 = Time vector 1, X2 = Time vector 2, ... Xp = Time vector p
P = the number of time vectors or triggers that determine the time required to perform the activity k

F. Multiplying the unit cost of time for each resource group at the time of activity activities: In this step, the unit of time cost per group is multiplied by the result of the time equation for each activity. The product of the multiplication process represents the operational cost of each activity.
G. Calculating the total cost of the product life cycle stages: This is the last step in applying the technical steps in which the total cost is calculated for the stages the product goes through during its life cycle after adding the input materials and other costs to the operational costs. Figure 1 shows the steps for implementing (TD-PLCC).

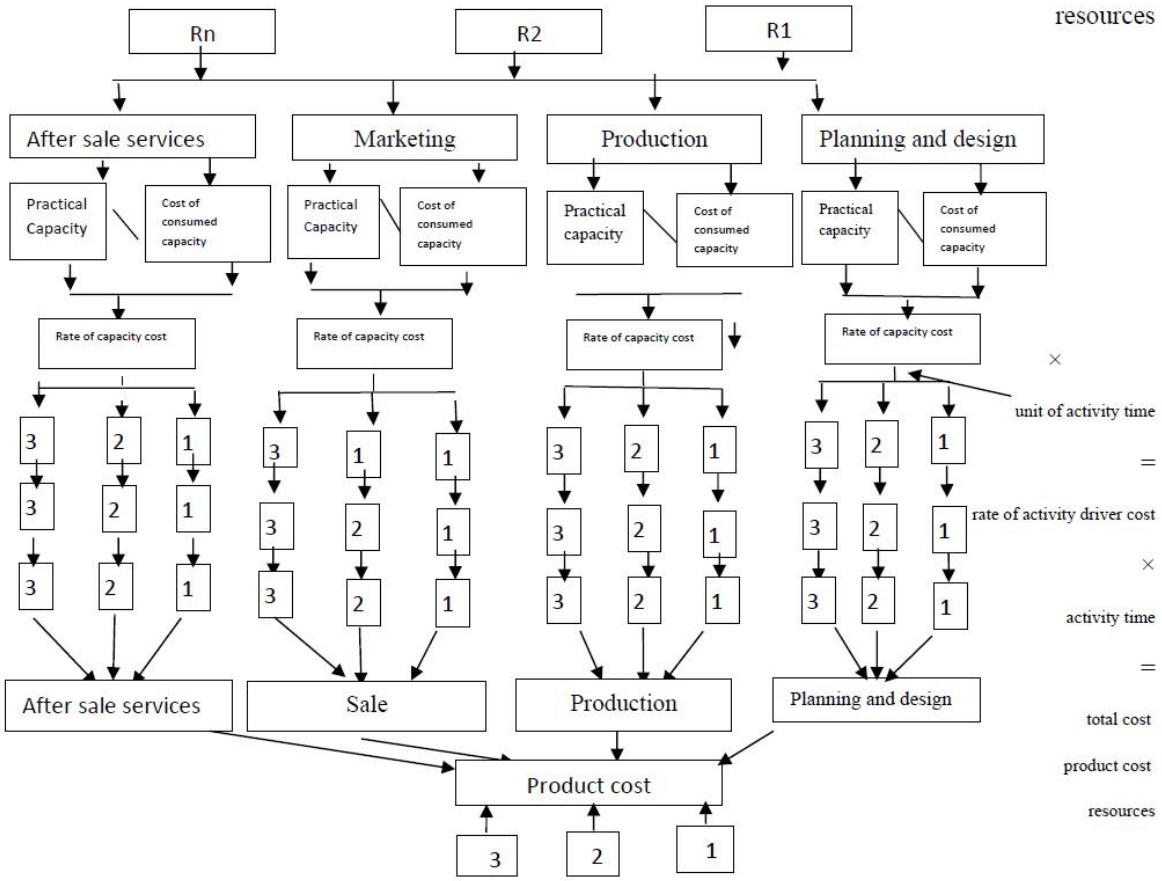

Figure 1. Implementation steps of TD-PLCC

2. Methodology

The paper uses a quantitative approach through a case study in one of the factories of the General Company for Electrical and Electronic Industries in Baghdad / Al-Waziriya. This factory is a 1/4 hp air-cooled motor production plant. Therefore, the company as a research community and the factory are preparing it to implement the research hypothesis for the effectiveness and role of the company in producing electrical and electronic devices that directly affect the needs of customers. One of the reasons for choosing the factory is that the company faces the problem of high costs of its products and intense competition as a result of the country's openness to global markets and the entry of various products with low prices.

3. Results

In this section of the research, the steps related to the product life-cycle cost techniques are applied in the sample motor's cryogenic production plant, as well as explaining its role in reducing costs. Because the factory suffers from the research sample in particular and the rest of the factories of the General Company for Electrical and Electronic Industries in Baghdad as a community for research in general from the increase in production costs. In addition to the emergence of an element of intense competition in the markets after the changes that occurred in the Iraqi business environment after 2003, which contributed to a significant decrease in its sales. The 1/4 horsepower motor product was chosen for the purpose of applying the research topic for the following reasons:

1) The increase in the selling price of a Pneumatic coolant motor product compared to competing products.
2) Increasing the competitive challenges on the motor product cooled by the imported products more than the other products of the company.
3) The high cost of this product in light of the application of traditional cost entrances that are unable to determine the cost and manage it efficiently while identifying the untapped capacity in the resources consumed.

3.1. Pneumatic coolant motor production phases (1/4 HP)

The production of the air-cooled motor (1/4 hp) in the factory passes the research sample in several stages that represent the entire life cycle, as a reflection of the departments and divisions in which these stages are accomplished, namely:

1- **The Planning and Design Stage**: It is the first stage of the life cycle stages of the product, and it begins with planning for the production and design of the product while studying the available technical capabilities, raw materials and production requirements specific to the factory. As well as studying the market's need for the factory's products for a certain period or the principle of production according to the demand.

2- **Production Stage**: This stage passes through five sub-stages implemented by the following divisions:

A - **Stator Division**: This division handles the stator production process. It begins with the organization by this division of an application form for the withdrawal of raw materials represented by pallet and other types of iron from the warehouse. Then it is installed on a special tape installed in a machine dedicated to this purpose, the materials in order to prevent the tape from lateral movement and then pass the tape in rotating cylinders in order to modify any warp in the tape, if any. Then it is inserted into the piston for operation in order to complete the steps of producing the tape which is represented by the stator. The factory stator is then checked by the quality control department to ensure that it matches the design map, and then it is sent to the assembly division.

B- **Division of The Revolving Part**: This division begins its work by receiving the work order issued by the Technical Affairs Department. Under this order, the materials for the manufacture of this part that are inserted into special axes shall be requested. To be arranged in iron boxes, and each box accommodates (12) axes of the rotating part plates distributed on the basis of six on the bottom and six on the top. These boxes are then inserted into the fermentation furnace located above the conveyor belt. Then the inspection of the part is carried out by the quality control. Then the rotor part boxes are pushed to the plumbing unit by conveyor belt for plumbing process. Then these plates, which represent the rotating part, are assembled in preparation for being sent to the assembly division after being examined by the quality control to ensure that the rotating part matches its design map.

C - **Division of The Front and Back Covers**: The work of this division begins with the receipt of the order of manufacturing the front and back covers, according to which the material application form (aluminum alloy) from which these covers are manufactured is organized. This is by conducting plumbing operations according to their molds and perforating them, provided that they are examined by the quality control to ensure their conformity with their design map in preparation for sending them to the Collection Division.

D - **Board Swage Division**: The work of this division begins with the receipt of the work order for this division, according to which raw materials are requested from the warehouse to complete the assembly of the parts of the connection panel and install them in the assembly machine. Then it is examined by the Quality Control Department in preparation for sending it to the Collection Division.

E - **The Assembly Division**: After the completion of the production of the motor parts by the aforementioned productive divisions, they are sent to the Assembly Division to begin the assembly procedures for all parts, according to the motor's design map, provided that the assembly process is carried out on a conveyor belt designated for this purpose. Then the motor is subject to quality control procedures in preparation for sending it to the full production warehouses after filling and packaging.

3 - **Marketing Stage**: In this stage, the market need for factory products is studied, and marketing policies related to finding distribution outlets are implemented with the assistance of the company's management, which contributes an active contribution to the marketing of all factory products. In addition to the factory contributing to the development of its products and the introduction of new models.

4- **After-Sales Services Stage**: It is the last stage in the life cycle of the Pneumatic coolant motor that passes after its marketing. At this stage, the services for repairing the motor after it is sold are called maintenance services or (after sales services). Noting that providing these services is during the warranty period, which is one year or less, without charging any amount (except in cases of misuse). In addition to the factory repairing the product after the warranty period in return for sums of money.

3.2. Services Departments to support production

The company includes many departments as follows:

A- Technical Affairs Department: It is the department responsible for monitoring the nature of work in the company's factories, finding solutions to production obstacles, designing molds and tools, following up the work of equipment and machinery and tightening control over them. Associated with it is the Division: Design, Production Techniques and Tools.

B- The Financial Affairs Department: This section is concerned with the financial policy of the company through applying financial regulations and instructions, stating its financial position, preparing discretionary "lists, setting budgets," carrying out economic studies, and performing "financial analysis" operations.

C - Administrative Affairs Department: This section is concerned with all administrative aspects and preparing the administrative and technical staff in the company, as well as its responsibility in following up personnel affairs in terms of appointment, transfer and others.

D - Planning Department: This section is concerned with setting production plans for the company's products and following the movement of materials, noting that there are some divisions that are related to this section such as the Production Planning Division and the Material Planning Division.

E- Maintenance Department: This section is concerned with multiple tasks such as maintenance of machines and equipment and maintenance of buildings as well as providing technical and motorering services with reference to the people that are related to this section are the Technical Services Division, the Mechanical Maintenance Division and the Electrical Maintenance Division.

F - Quality Control Department: This section is concerned with detecting faults by examining the parts and following them up so that they are suitable for the production process, and to avoid any internal or external failure.

G- Warehouse Department: This section is concerned with following up procedures for storing materials.

H- Marketing Department: This department is concerned with conducting the marketing studies needed for the product, whether at the product design and development stage or the selling stage as well as other marketing operations.

3.3. The reality of the cost and pricing system in the factory

After reviewing the reality of the accounting system applied in the factory, the research sample showed that there is a system of costs based on the unified accounting system. In us, it is related to the process of pricing a Pneumatic coolant motor product, as it goes through several stages. In the first, the cost calculations division receives the work order in which the technological behavior of the motor coolant product is explained in terms of the quantities and types of materials needed in the production process and working times. Then, to determine the total cost of the product according to the cost elements related to the product that the cost system provides. These costs include the cost components of the refrigerant motor direct materials whose prices are determined by the Warehouse Accounts Division and by adopting the weighted average method. As for the share of the motor of the cooled motor, the cost of work is determined by dividing the workers 'salaries by the number of motors that are produced. While the percentage of indirect industrial costs is charged to a Pneumatic coolant motor product, based on the number of workers in the factory, the sample of the research. As for marketing and administrative costs, they are distributed according to the ratio of each to the total cost of production. In the second stage, an initial sale price for the motor is determined after adding a profit margin for the total cost of the motor, which ranges between 10% - 15% by the Board of Directors. Then, the initial sale price is sent to the Marketing Department with the aim of studying it in terms of its compatibility with the reality of the market and submitting proposals to increase or decrease it. In the third stage, the board of directors approves the selling price after studying the marketing department's proposals for approval. Table (1) shows the cost per motor of the pneumatic coolant motor (1/4 hp) and its selling price for the year 2018.

Table 1. The cost and the selling price of Pneumatic coolant motor (4/1 hp)

Details	cost of the motor
Raw materials and packaging	31653
Backup tools	25
Other variable cost	42
Total variable cost	31720
Cost of work	12593
Extinction	809
Another fixed cost	327
Total fixed cost	13729
Cost of manufacture	45449
Marketing costs 8%	3635.92
Administrative costs 5%	2272.45
Total cost	49993.9
Profit margin (10%)	4999.39
Sale price of a Pneumatic coolant motor	54993.29

From the foregoing, it is clear that there is a costing system in the factory that contains some of the components of the cost system. However, the information on this system does not depend on it to manage the cost, achieve control over it, and make the various decisions that depend on it. In addition, there are some observations that the researcher was able to diagnose when studying the system of costs applied in the factory as follows:

1. The process of collecting cost elements "is not carried out according to the correct scientific method, when preparing the lists of" cost in terms of classification according to their known "elements, which are direct materials, direct" wages, "and indirect industrial costs.
2. The inability of the accounting system applied in the factory, the research sample, to determine the stages related to the product, which represent its life cycle, and calculate or calculate the cost based on it.
3. The cost system applied in the factory ignores the research sample "the relationship of cost to the product when calculating the cost of a cooled motor in that it is" direct or indirect and how to link "the cost to the time required to complete it.
4. The factory, with its various cadres, lacks the culture of managing the cost of the product by reducing it while ensuring the preservation of its quality, and its reflection in achieving the competitive advantage of the factory. In addition to the lack of knowledge of people based on "applying the accounting system with modern techniques that are concerned with cost management, such as the product-oriented product life-cycle cost techniques, because the qualifications they possess are essentially far from the specialty of cost accounting and administration.

3.4. Implementation Of TD-PLCC In the Factory

The steps to implement this technique are as follows:

1) Defining the resource groups related to the stages of the product life cycle: In this step, the resource groups related to the stages of the life cycle of the air cooled motor in the factory are determined by the research sample, which is implemented by the departments, including the divisions that were mentioned in the previous research.
2) Determining the total cost of resources for each stage of the product life cycle: The total cost for each stage of the product life cycle related to the engine production process in the factory is the research sample, each of the elements of direct costs represented in the salaries and wages of workers in the factory and indirect costs that include Elements of indirect industrial costs, as shown in Tables (2) and (3).
3) Determine the practical capacity for each group of resource groups: This step is to define the practical capacity that is represented in the hours of work or the time required to complete each stage in which the product passes, with a reference to the fact that practical capacity has been determined on the basis of (80%) Of theoretical capacity. This takes into account cases of stops that occur as a result of maintenance and repair, and others. The results of the interviews with the factory engineers show that the research sample did not reach this percentage in his work. Therefore, the above ratio is part of the factory's procedures if the change is made to what the factory should be. In addition, the capabilities available in the factory confirm the ability of the factory to reach the aforementioned rate if modern technologies are applied to manage costs, the most important of which is the research presented by the techniques.
4) Determining the unit cost of time for each resource group related to product operations: This step is to determine the unit cost of time for each of the stages that are related to the production of the engine coolant in the research sample as shown in Tables (2), (3), by Dividing the total direct or indirect cost that corresponds to the performance of activities practiced by all persons who contribute to the production of a coolant engine (1/4 horse) by the practical capacity represented by the necessary hours of work. This is to accomplish each stage related to the engine coolant product, which is implemented in the relevant departments.

Table 2. Unit cost per minute of production stages

The Stage	The monthly direct cost for the stage official	One-minute cost	Direct monthly cost per worker `	One-minute cost	Monthly indirect cost	One-minute cost
The planning and design stage (19 workers)	1250000	169.102	750250	101.494	8478302.4	60.366
Production stage						
Stator Division (39) workers	1325100	179.261	651020	88.071	12010928.4	41.662
Division of the rotating part (18) workers	950000	128.517	625400	84.604	10597878	79.649
Division of front and back covers (20) workers	1292120	174.799	633450	85.693	9184827.6	62.126
Board Swage Division (5) workers	1164250	157.501	666200	90.124	7065252	191.159
Collection Division (15) workers	1211200	163.852	601250	81.337	9891352.8	89.207
Marketing stage (12) workers	1127781	152.567	786298	106.371	5652201.6	63.719
After sales services stage (13) workers	1224600	165.665	700119	94.713	7771777.2	80.875

Table 2 above shows that the calculation of the cost per minute was done by dividing the monthly direct cost numbers for the stage official or the employee in it, which the department undertakes or indirectly performs by the practical capacity, which in turn is calculated according to the following:

• - As for the direct cost of the stage official or one worker:

Working Capacity = 7) Working hours per day in the factory x 22 working days per month excluding holidays x 60 minutes / hour) x 80% = 7392 minutes

• - As for the indirect costs, the practical capacity is calculated as follows:

Working capacity = 7) working hours per day x 22 days per month x number of stage workers x 60 minutes / hour) x 80%

The following clarification shows the process of calculating the cost per minute shown in the above-mentioned schedule for the planning and design stage:

- - the one-minute cost of the stage official = the monthly direct cost of the stage official العملية practical capacity
  = 1,250,000 dinars 39 7392 minutes
  = 169.102 d / min
- - per minute cost per worker = monthly direct cost per worker العملية practical capacity
  = 750,250 dinars 39 7392 minutes
  = 101.494 d / min
- - indirect cost per minute = monthly indirect cost العملية practical capacity
  = 8478302.4 dinars ÷ 140448 minutes
  = 60.366 d / min

As for determining the unit cost of time per minute, which is related to service and administrative cost centers, it can be explained in Table (3).

Table 3. The cost of time unit for service and administrative centers

Cost center	Total cost (1)	Annual workers hours (2)	Annual minutes (3)	Workers Capacity (80%) (4)	Cost per minute 5 (4/1)
Technical Affairs (35) workers	75936068	64680	3880800	3104640	85.209
Transportation (10) workers	75936068	18480	1108800	887040	85.606
Stores (12) workers	75936068	22176	1330560	1064448	87.098
Maintenance (15) workers	75936068	27720	1663200	1330560	79.366
Factory management (20 workers)	75936068	36960	2217600	1774080	72.941
Quality control (13) workers	75936068	24024	1441440	1153152	86.121

5) Defining and grouping activities related to the stages of the product life cycle and the times of each activity: through the field coexistence of the researcher and access to the reality of the production of the pneumatic coolant engine and interviews with some engineers in the factory of the research. Activities related to the stages of the product life cycle have been identified with the timing of the occurrence of these activities and the party responsible for each event and trying to collect them in Cost Pools:

A- Determine the activities related to the planning and design stage and the times of each activity: The activities for the planning and design stage and the time of each activity in it are shown in Appendix 1, noting that it is through time information. The time equation explained in the third topic of the second semester can be applied. This is for the activities of each stage in preparation for preparing the operating cost. The equation of time for the planning and design stage is as follows:

Planning and design stage time (minutes) = 0.9 (issuance of production order + preparation of work order) + 2.6 (receipt of work order and ordering materials + product planning and design) + 0.4 (signature of document) +1.2 (receipt of raw materials + preliminary examination and testing) +1.3 (Transfer of materials + send execution order) + 0.5 (. Final examination and test)

The time equation can be prepared in the same way for the rest of the stages.

6) Multiplying the unit cost of time for each resource group at the time of activity events: In this step, a process of multiplying the unit cost of time for each resource group is shown in Tables (2) and (3), at the time that was calculated according to the time equation shown in paragraph (Fifth) The output represents the total operating cost of each stage as follows:

A - Calculating the operating cost of the planning and design stage: Table (4) shows the results of the process of calculating the operating cost for the planning and design stage.

Table 4. Operating cost in the planning and design stage

#	Activity (1)	Activity Event Time (min) (2)	Unit Time Cost (d / min) (3)	Operating cost (4) (2 x 3)

1	Issuing the production order + preparing the work order	0.9	85.209	76.6881
2	Receipt of work order and material request + planning and design	2.6	229.468	596.6168
3	Sign the document	0.4	87.098	34.8392
4	Receipt of raw materials + preliminary examination and testing	1.2	161.86	194.232
5	Transfer items + send an order	1.3	85.606	111.2878
6	Final examination and test	0.5	86.121	43.0605
Total				1056.724

When calculating the operating cost of the remaining stages in the same way above, we get the following results:

Table 5. Results of operating costs

1	The cost of operating the stator division	1550.131
2	The cost of operating the rotor section	1726.41
3	The cost of operating the front and rear covers division	1558.097
4	The cost of operating the Board Division	1090.972
5	The cost of operating the assembly division	1248.906
6	The cost of operating the marketing stage	385.467
7	The cost of operating the after-sales service stage	874.027

7) Calculating the total cost of the product (the engine of the coolant) in the factory: After calculating the operating cost of the stages related to the product of the engine of the coolant, the total cost of each stage is determined. This is done by adding direct materials as well as administrative costs as shown in Table (5).

Table 6. The total cost of the relevant stages of the pneumatic cooler motor

Stage	Cost of Materials (1)	Operating Cost (2)	Manufacturing Cost 1 + 2 (3)	Administrative costs (5%) (4)	Total cost (3 + 4) (5)
The planning and design stage	1650	1056.724	2706.724	135.336	2842.06
Production stage					
Stator division	9360	1550.131	10910.131	545.506	11455.64
Division of the revolving segment	7761	1726.41	9487.41	474.37	9961.78
Division of front and rear covers	5671	1558.097	7229.097	361.454	7590.551
Board Swage Division	250	1090.972	1340.972	67.048	1408.02
Assembly Division	3386	1248.906	4634.906	231.745	4866.651
Marketing stage	1250	385.467	1635.467	81.773	1717.24
After sales services	2325	874.027	3199.027	159.951	3358.978
Total					43200.92

It is noted from the above table that the total cost of the pneumatic cooler drive of the factory of the research sample has become (43200.92). This is according to the application of TD-PLCC techniques, while the reality of the cost applied in the factory reflects the research sample, that the cost of a single engine is (49993.9). This indicates a reduction in the cost of one engine by (6792.98). Accordingly, it is clear the important role of applying the product-oriented product life cycle cost techniques in cost management by reducing the cost of the product (pneumatic coolant drive) for the factory research and achieving competitive advantage. This is through the ability of this techniques to determine the unexploited capacity and its cost when linking the cost of the various resource pools to the actual capacity.

4. Conclusions and Discussion

The developments taking place in the modern business environment at the present time, which are reflected by intense competition, technological progress, openness of markets, and short product life cycle due to the continuous change in customer tastes and their need for products that meet their requirements with high quality and low prices. It has led economic units to consider reconsidering the traditional accounting systems and approaches applied in them to the increasing criticism leveled at them due to their inability to provide information that reflects developments in the business environment. The essence of its focus is the internal environment of these units and the search for modern strategic techniques in the field of cost accounting and administration, which meet the needs of customers as well as assistance in cost management, by reducing them while improving product quality. As a result, it supports the competitive advantage of economic unity. The most prominent of these technologies is the life-time cost of the product. These technologies operate on the principle of optimal utilization of resources by allocating costs on the basis of each stage of the product's life cycle, taking into account the time each of these stages consumes. Therefore, the research seeks to clarify how to benefit from the techniques (TD-PLCC) in reducing the cost of a 1/4 hp motor power product in the factory. The sample is a factory of the production of a cooled motor, one of the factories of the General Company for Electrical and Electronic Industries in Baghdad

The results show that traditional cost systems do not meet management requirements and goals. It is no longer able to provide accurate data that helps management make decisions as a result of changes and developments in the business environment, most notably intense competition. Accordingly, new technologies emerged in the field of cost management capable of keeping pace with these changes and developments, the most important of which is the techniques of the product-oriented life-cycle cost. Conventional cost systems that calculate the cost of a product or service may not be appropriate to determine the price of a product or service. The reason for this, there are some shortcomings, they do not take into account the costs that occur before, after service or production. The focus of time-driven product life-cycle costing techniques on the amount of resources contributing to product production at every stage it passes and on the basis of time as a primary cost guide, makes it a modern techniques in cost and management accounting that is characterized by accurate cost accounting and efficient management. Failure to recognize the traditional cost entries of unexploited (idle) capacity and cost, which is charged to the product, leading to inaccuracy in the cost measurement. Time-of-life product cost-of-life techniques provides more reliable information, by identifying unexploited capacity and its cost and not charging it to the stages the product goes through, with the aim of helping management optimize capacity use as well as contributing to determining the share of resource pools from costs. Moreover, managers can rely on time-driven product life-cycle costing techniques to achieve effective resource control and management, by adopting a cause-and-effect approach in charging resource pools cost to production divisions. The results of the application of the time-driven product life-costing techniques have demonstrated the possibility of reducing costs for the stages through which a Pneumatic coolant motor product passes to the research sample during its life cycle by (6792.98) dinars. The results of the customer and customer feedback survey show the Pneumatic coolant motor product of the factory. The reduction in the production of a Pneumatic coolant motor product is due to the low sales due to the reluctance of customers to buy this product, due to the high price and the lack of specifications that meet their needs and which they find in the competing products. There is unexploited capacity at every stage of the life cycle of a cryogenic motor product, due to more manpower than the factory should have for the research sample. The role that the application of the time-driven product life-costing techniques plays, as one of the modern cost-management and accounting techniques, should not be overlooked, because it helps economic units to keep abreast of ongoing developments and changes in the business environment, due to the ability of this techniques to manage resources and its dependence on practical capacity without capacity the theory . The process of applying the time-driven product life-costing techniques should also be supported by the factory, the research sample because of its role in managing costs by reducing them, supporting competitive advantages, and assisting in decisions related to this. Economic units must pay attention to the resources available to them in order to make good use of them and indicate the amount of capacity needed by the producing unit for each of these resources, while taking advantage of the information provided by the time-driven product life-costing techniques in determining the capacity of these resources and developing plans related to them and directing plans Future towards the utilization of unused (idle) capacity. Moreover, focus should be placed on market studies, searching for new marketing outlets and opening sales fairs in the main commercial markets close to residential areas, to increase the amount of sales, the effects of which are reflected in the result in increasing production and taking advantage of unused capacity in most of the factory. Finally, it is important to emphasize reducing the number of manpower in the factory or creating new production lines to exploit untapped capacity.

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