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Determining the optimal product cost using the ABCII Attribute-based costing technique: A case study at the ENICAB electrical cable manufacturing company in Biskra

Dr. Khelaifa Rayhana [1]

[1] Department of Finance and Accounting, University of El Oued, Algeria
Laboratory of Economics of Renewable Energy and its Role in Achieving Sustainable Development, University of EL-Oued, Algeria
Correspondence: khelaifa-rayhana@univ-eloued.dz

Abstract---This study aims to propose a conceptual model for applying the ABCII Attribute-based costing system, this research was conducted at ENICABan electrical cable manufacturing company in Biskra, as an alternative to the cost system applied at this company. It was carried out during field visits and personal interviews with the target parties within the company,focusing on Product H07V-U205mm2 450/750v medium voltage type domestic cable, with a production capacity 320000 meters. We determined the cost of this product according to the ABCII system to be 32.758 DZD/meter. Compared to the applied cost system, the cost per meter was determined to be 33.75 DZD/meter, with a negative difference of- 1.062. This proves that determining the cost of a product using the ABCII Attribute-based costing system is capable of identifying the true optimal cost of the products that the customer wishes to obtain according to their needs and desires within their financial means.

Keywords---Cost, Activities, Activity-based costing system (ABC), Attribute-based costing system (ABCII), ENICAB Cable Manufacturing Company.

1. Introduction

The current industrial environment differs from the traditional environment as a result of changes in the cost systems of institutions with varying degrees of competitiveness. Rapid technological changes

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that have become so significant that they undermine the cost information provided by traditional cost systems. This has exposed them to severe criticism, particularly in the area of distributing and allocating indirect industrial costs to products, for example: The number of hours the machine is in operation, direct working hours, and indirect costs such as product design costs, machine preparation… etc.This leads to distortions in the measurement of product costs.On this basis, institutions have adopted a market-oriented policy founded on the principle of producing what can be sold rather than attempting to sell what has been produced. This approach enables them to strengthen their market presence by offering the best value and thereby gaining the trust of their customers.This requires the extrapolation and development of cost systems in a way that allows institutions to control and reduce production costs. In turn, this enables them to fulfill their strategic objectives, encompassing gaining customer trust and satisfaction, while maintaining the value of their products alongside competing offerings in the market.

Hence, it is necessary to pay attention to strategic management techniques, especially the ABCII Attribute-Based Costing system. This system is designed to provide detailed information for determining product specifications by dividing the product into specific attribute packages that translate customer needs and desires into measurable cost elements, Accordingly, the cost of the product is determined based on its specifications, Therefore, this system came as a complement to the activity-based costing system (ABC), which provides important detailed information, including the identification of resources, activities, cost drivers, and other important information. Despite the importance of this system, it overlooks a significant aspect, focusing on satisfying customer needs and requirements according to the specific specifications of the product the customer wishes to obtain. The first step is to analyze the realities of the market in order to determine the different types and categories of customers and consumers.It also includes studying consumer preferences and determining product specifications, whether these are existing specifications that customers wish to see improved or new characteristics that distinguish the product from competing offerings in the market, all while ensuring the lowest possible cost and an appropriate price level.Like other industrial companies both inside and outside Algeria, ENICAB, an electrical cable manufacturer, is seeking appropriate solutions to reduce industrial costs. Therefore, we propose a model for an ABCII attribute-based costing system that is suited to the nature of the information and data provided by the company under study. Hence we pose the following main question:

To what extent does the Attribute-based costing system contribute to determining the optimal cost of ENICAB's electrical cable manufacturing products in Biskra?

This study is based on the main hypothesis that ABCII attribute-based costing system contributes to the optimal determination of costs for ENICAB's electrical cable manufacturing products in Biskra, helping the company achieve its objectives in terms of maintaining the value of its products within the limits of meeting the needs and requirements of its customers.

The objective of this study is to determine the cost of the product H07V-U205mm2 450/750v using the ABCII attribute-based costing system, through which we can develop an optimal cost management strategy and conclude that the ABCII system is indeed capable of reducing the actual cost of the product.

A study by **(Kaplan & Robin, 1992)**on the design and use of the Activity-Based Costing (ABC) system, one of the modern methods of cost management compared to traditional volume-based approaches such as direct labor or machine hours, concluded that ABC is more effective in determining product costs. This prompted organizations with excellent traditional costing systems to develop their approaches and adopt the ABC system so that they could link the costs of direct organizational activities to products and customers. This study was applied to "Hewlett-Packard" as one of the organizations that adopted the ABC system to determine the accumulated costs for each production stage and allocated these costs to products while identifying the cost driver for each process. This

system was developed to provide cost information to help production engineers monitor production performance and design products at the lowest cost and price. While a study by **(Bromwich M. , 1990)**concluded that a model should be presented to compare products in terms of the specifications that distinguish them and their selling price in line with customer requirements and within the required price range, This study was based on two economic theories: The first focuses on the basic characteristics of products and suggests that management accountants need to consider the cost structure not only of their own organization but of all organizations in the market in which they participate,the second theory is based on the principle that if an organization's cost structure allows for strategic sustainability to face its competitors. This theory reaffirms the intertwining of demand and cost forces, taking into account new cost behavior with the technological manufacturing environment.A study by**(Walker, 1999)** points to the contribution of the ABCII attribute-based costing system to the necessary decision-making process by relying on the ABC activity-based costing system, which in turn leads to the analysis of internal and external cost elements and then the analysis of specification costs so that the economic unit can determine the target cost. According to its findings, this study proved that the ABCII costing system is capable of providing more accurate and efficient detailed information about administrative decisions related to cost control decisions, classifying customers and products according to priority and importance, as well as decisions related to the production of new products or the development of product features, in addition to pricing decisions. Furthermore, a study conducted by**(Inglis & Clift, 2008)** aimed to provide a conceptual framework on market orientation and customer-oriented accounting and to identify the link between them in order to make financial and non-financial decisions related to the product, such as: (the true cost of the product, specifications, customer preferences, sales volume, quality control… etc) by conducting an exploratory study at DS, a printer manufacturing company in Australia, in the form of a written interview with a series of questions addressed to decision-makers and department heads to collect data, information, and issues related to the study and analysis of costs within the company, A study by **(Lateef & and, 2019)** aimed to determine the integration between the product life cycle (LCC) and the ABCII system and their role in reducing industrial costs, as well as to determine the role of each in reducing unnecessary costs while maintaining the quality of the economic enterprise's products.A study by **(khelaifa & Metidji, 2023)** aimed to present a method for constructing a conceptual model of the ABCII system to rationalize production costs in Algerian economic institutions. This study was applied at the level of GOURAEMBALLAGE, a corrugated cardboard manufacturer, as a model for rationalizing production costs. This research proved that the ABCII system is capable of achieving costs in a rational and reasonable manner.

These studies indicate that the ABCII attribute-based costing system contributes significantly to reducing the costs of the specifications that make up any product. Although this system plays a major role in the ability to distinguish products in terms of form or content, it has remained confined to academic studies in the form of conceptual models.

2. Theoretical literature on ABCII specification-based costing systems

2.1. Introduction to Activity-Based Costing (ABC):

In the late 20th century, Bromwich developed the strategic management accounting system in 1990 and took an early interest in technology based on specifications, which is abbreviated to (Attributes Based Costing) and the symbol (II) means binary Latin enumeration, This is a result of the system's discrimination (ABCII) against the (ABC) system, which is short for Activity Based Costing**(Kadhim & Al-Ghezi, 2021).**The system was developed by Kaplan and Cooper in 1988, based on their studies and research in the field of cost accounting, and it was they who gave it this name. The real reason for the emergence of this system was due to doubts about the accuracy of product cost calculations and their inconsistency with actual resource consumption **(Adas & EL khalef, 2013, p. 170**).Therefore, many large institutions around the world, particularly in the United States, were pioneers in implementing the ABC system.These include Farrall INC, T & AT Communications in 1991, Evans Medical in the UK,

and Ordinatix in France, one of the most prominent institutions in the media field. All of these institutions were suffering from the specter of inflated industrial or service costs, so they demonstrated their urgent need to implement the ABC system, which is considered the most suitable alternative for achieving cost objectives **(Hidazzi & Malim, 2013, pp. 123-129)**. The ABC system was regarded as the most advanced costing method of its time because of its focus on indirect costs. However, it was soon applied in other administrative areas as well, owing to its philosophy of using activities as the basis for cost calculation. This system is based on the fundamental idea that cost objects consume activities rather than resources, and that it is the activities which, in turn, consume resources (Bekkoch, 2022, p. 8)**,**Therefore, the ABC system emphasizes the accurate allocation of costs. This is done through the accurate tracking of activity cost groups by cost drivers, which measure the value of your resource consumption by cost element, thereby determining the cost of each production element **(Hsien Tsai & and, 2014, p. 2)**. Alcouffe defined it as "a system based on aggregating indirect costs within the organization into cost objects to be distributed to the final product by cost drivers in order to arrive at the true cost of the final product, thereby supporting sound management decisions." **(Alcouffe & Mallerret, 2004, p. 157)**. It is also recognized by the International Union of Advanced Manufacturing Companies (CAM-I): A statement of the cost basis for each activity by measuring the performance of activities from products and services and the amount of resources consumed for each activity **(The Institute of Company Secretaries of India, 2014).**

The ABC activity-based costing system was introduced to solve the problem of allocating indirect costs. This type of cost is divided into a series of steps, which are as follows: **(Abd ELatif, 2024, p. 28)**.

- Dividing the company into a group of activities;
- Determining the cost of each activity;
- Identifying the cause or driver of the activity's cost;
- Determining the activity cost loading rate (by dividing the activity cost by the activity cost driver volume) ;
- Using the activity cost loading rate to determine the share of indirect costs allocated to products or production orders (by multiplying the activity cost loading rate by the amount consumed from the activity cost driver);
- Adding the share of indirect products to their direct costs to find the total cost;
- Finding the average unit cost (by dividing the total cost by the number of units);
- Determining the unit selling price.

2.2. Introduction to ABCII attribute-based costing system

In reality, every product has a set of specifications that are unique when seen or used for the first time. Therefore, it is necessary to develop strategies that allow customers to express the characteristics and specifications they actually desire in the products they wish to purchase. Thus, numerous companies that fail to invest in the features desired by customers risk losing a significant portion of their customer base, whereas companies that focus heavily on investing in these specifications often incur substantial financial losses, To achieve a balance between the product specifications and the needs and desires of customers, it is important for the company to understand that the tastes of customers and consumers are constantly changing. Accordingly, it is necessary to track and evaluate these dynamic changes among customer segments on the one hand and product specifications on the other **(MacMillan & McGrath, 1996).**

Therefore, specifications refer to attributesthe general characteristics that define the properties of a product. These attributes influence consumer behavior toward the product and can be considered key factors motivating consumers to choose and purchase it from among the competing products available in the market."**(Djabbar, 2019, p. 452)**.

Thus, the ABCII specification-based costing system was introduced as a complement to the ABC activity-based costing system. This was proven by JesseK, Cecily, and Michael, who considered it to be a system that performs a detailed analysis of costs and returns based on information obtained from customers about their needs and requirements in terms of **(Barfold, 2003, p. 146)** (specifications, product performance: such as reliability, durability, etc.) . In addition to the costs of improvements required gradually to obtain the necessary specifications according to the requirements of the ABCII system.**Cokin**s considers it to be an accounting system that focuses on the costs of the final specifications of the product.**(ELardawy, 2020, p. 98)**, **Walkar** emphasizes that this system focuses on meeting customer needs as a result of continuous improvements in product specifications, rather than traditional methods that completely neglect the requirements and specifications that customers want in a product**(Barfold, 2003, p. 146)**.

2.3. Requirements for applying the attribute-based costing system according to Bromwich:

The ABCII attribute-based costing systemis based on several requirements, as stated by **(Bromwich M. , 1990, p. 30)** which he summarized into four (04) important requirements, namely:

- A set of basic product specifications that meet customer needs and requirements;
- There are a number of achievement levels for each of the product's basic specifications;
- The ability to measure the cost and return of the product at each level of completion;
- The ability to determine the optimal combination of achievement levels in the form of a matrix that achieves the best return for the organization while meeting customer requirements.

As for the steps involved in implementing the ABCII costing system, we will limit our presentation to the case study of ENICAB, a manufacturer of electrical cables in Biskra.

2.4. Classification of activities to facilitate cost analysis based on specifications:

Walker proposes a path to facilitate support for specification-based cost analysis by identifying and dividing activities into activity centers that require activities to be classified as follows: (Bekkoch, 2022, p. 122)

- **Infrastructure activities:** These are activities associated with the creation and maintenance of the organization's infrastructure and cannot be related to a specific product, i.e., their costs must be treated as recoverable from product contributions.
- **Estimated activities:** These are activities that are determined once, such as research and development, as part of a development project that has specific objectives, such as improving performance, with the need to capitalize the costs of estimated activities in development projects and bear them on products throughout their life cycle or improvement period, rather than treating them as direct costs. To achieve planning objectives, it is necessary to isolate these costs, as the expected return on investment in each project can be determined.
- **Operating activities**: These are activities that can create a product or service, including purchasing, design, production scheduling, system adoption, manufacturing, storage, delivery, and after-sales service. They also include sales costs, delivery, and overhead expenses, etc. etc., which are treated within traditional cost systems as a percentage of manufacturing cost. By determining the cost of the activity, the activity that creates each feature of the product specifications is determined.

2.5 Attribute-based costing systemas as a tool for cost control and monitoring:

The ABCII specification-based costing system is based on the fundamental principle of breaking down a product into a set of specifications in order to accurately determine and measure the cost of fulfilling each specification. This enables the organization to obtain detailed information that facilitates effective planning and cost control.

As a result of what the ABCII system does, it provides more details about cost-benefit analysis geared toward meeting customer needs **(Emblemsvag, 2003, p. 40).**The goal is to improve the effectiveness and performance of the activities that make up each level of achievement and production constraints, as well as bottlenecks, unused capacity, and the resulting avoidable costs (Bekkoch, 2022, p. 125). On this basis, the ABCII system focuses more on analyzing variable costs, which account for between 60 and 80% of the costs determined at the product design stage, in accordance with the ABC system approach to determining the cost of specifications **(Emblemsvag, 2003, p. 40).** The following figure shows the trends in determining specification costs according to the ABCII specification-based costing system as follows:

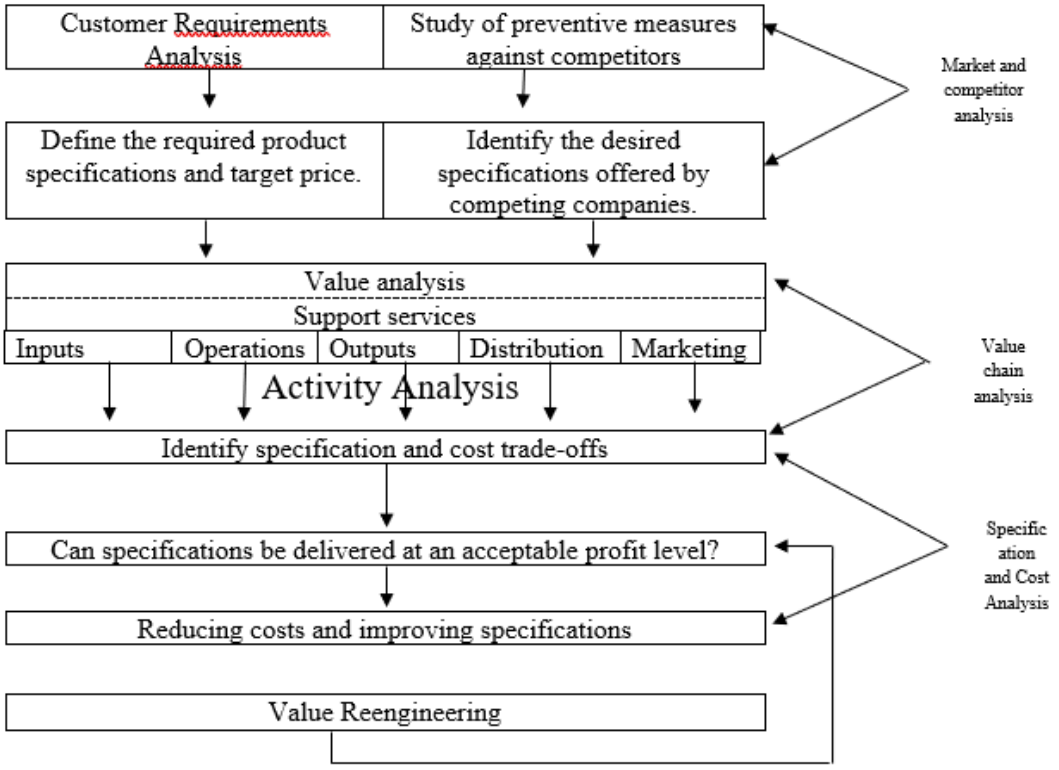

Figure 1: Study of cost trends according to the ABCII system
Source: (Djasem, 2015, p. 454)

3. ENICAB applied study for the electrical cable industry – Biskra

3.1 Introduction to the institution:

ENICAB, a manufacturer of electrical cables based in Biskra, is one of Algeria's leading companies in its field, both nationally and across Africa. It specializes in the manufacture of electrical cables of all shapes and types, with up to 400 different varieties, and has a capital of 1,010,000,000 dinars, and an estimated production capacity of 11,288 tons per year, It employs approximately 610 workers divided into several departments, The company is located in the industrial zone west of the city of Biskra in Algeria, covering an area of 42 hectares distributed across several facilities.

This institution is considered one of the most important institutions in Algeria and even in Africa in the field of electrical cable manufacturing. It has made great strides in achieving significant coverage in Algeria and even globally. Despite the many challenges it has faced, it has never faltered, thanks to the determination and resolve of its managers to achieve their vision and goals. The customer is the strength of the company, and it works to meet their needs according to the required specifications, no matter what the cost,. Therefore, it was necessary to create distinctive strategies to accompany its activities throughout to ensure that it remained competitive in its environment. We chose a household cable product symbolized by the code H07V-U 2.5mm2 450/750V R100AV, which is used to connect electricity. It is composed of two materials, the first of which is copper, which needs no introduction, and the second is PVC insulation material, This is one of the most in-demand products and has a bunch of specs and features that let us apply the ABCII cost model based on specs. It has an estimated production capacity of 320,000 meters per month.

3.2 Stages of implementing the ABCII specification-based costing system at ENICAB, an electrical cable manufacturing company in Biskra

❖ Step 1: Identify customer needs and desires

ENICAB Cable Manufacturing Company – Biskra – identifies the needs and desires of its customers based on the requirements they submit to the company, depending on the type of cable product they need and that matches their usage needs. The company takes these specifications into account and translates them into a product with a set of characteristics and specifications that meet the customer's desires, in accordance with a carefully studied and pre-determined strategic plan.

❖ Step 2: Define the basic specifications of the product

Specification determination is a stage that precedes the production process. Therefore, ENICAB determines the set of specifications specified by its customers, which are:

Table 01: Shows the set of specifications that make up the product H07V-U 2.5mm2 450/750V

Specification	Definition of the specification	Preference score by relationship matrix			
		Nature of importance	Degree of importance		
			Very strong	Average	Weak
Quality	Conforms to international quality standards.	Very necessary	X	-	-
Pressure	Cables are categorized into three sections: High Pressure, Medium Pressure, and Low Pressure.	Very necessary	X	-	-
Cost	It's rational in terms of costing.	Very necessary	X	-	-
Type	Products are divided into families, with each family of cables having different characteristics and specifications that differ from the other families of cables they produce.	Very necessary	X	-	-
Usage	Each type of cable is used according to the nature and place of use and according to the need or necessity for it.	Very necessary	X	-	-
Color	Colors of cables are determined by customer preference.	Very necessary	X	-	-
Marketing	Cable products are marketed according to the forces of demand and supply.	Very necessary	X	-	-
Design	The cable is customized to the customer's preference.	Very necessary	X	-	-
Thickness	Its thickness ranges from 1 millimeter to 1000 millimeters.	Very necessary	X	-	-

Source: Prepared by the researcher based on an interview with the head of the production department.

Determine the relative importance of customer requirements and needs:

The relative importance of applying the conjoint analysis method is determined as a result of customers specifying the type of specifications they want in a cable product.Therefore, the five-point Likert scale was used, and the weights presented in the questionnaire directed to the respondents were determined using the following weights:**(very necessary, necessary, somewhat necessary, not necessary, somewhat not necessary)**, To determine the relative importance of each specification, it is necessary to determine the weight, which is calculated according to the following relationship:

Weighting = sum of duplicates for each scale x scale score on the scale

Pressure specification weighting = (5x30) + (5x4)

- **Weighted total**

The weighted sum is calculated according to the following relationship:
Weighted sum = sum of the product of the first scale + sum of the product of the second scale + ... + sum of the product of n
The weighted sum of the pressure specification is calculated as follows: ⇨ Pressure specification weighted sum = (150)+(20) = 170

- **Calculating relative importance:** Is calculated according to the following relationship:

Relative importance = weighted sum of each required specification / weighted sum of all specifications

Relative importance of pressure specification = 170 / 1140 x 100 = 15%
After calculating the weighted average and relative importance of each attribute of the specification, we now proceed to determine the cost of each component of the specification according to the relationship matrix for the product unit component, which gives each relationship a score:(a very strong relationship (9 points), anaveragerelationship (3 points), and a weak relationship (1 point).(Fiorenzo, 2002, p. 56).After each component is shown in the fulfillment of each product attribute, the symbols are then converted to scalar quantities using the following relationship:

Relative importance of each component = Direct Material Component Contribution x Preference Score of the Standard Achievement Level

Determining the relative importance of a pressure specification= 15X1.35 /100 =%

Table 02: The Relative Importance of Production Unit Components in Achieving Product Specification H07V-U 2.5mm2 450/750V

Direct material / Specifications	1 Quality	2 Pressure	3 Cost	4 Type	5 Usage	9 Color	7 Marketing	8 Design	6 Thickness	The relative importance of the cost of each component of the specification
Relative importance	**15%**	**15%**	**12%**	**12%**	**12%**	**05%**	**11%**	**06%**	**13%**	**100%**
Copper material	1.342	1.342	1.089	1.066	1.058	-	0.316	0.553	0.125	**6.891%**
PVC material	1.342	1.342	1.089	0.355	1.058	0.474	-	0.061	0.125	**5.847%**

Source: Prepared by the researcher based on Table no: 01 and relationship matrix.

Step three: Determine the cost of accomplishing each attribute of product specification H07V-U 2.5mm2 450/750V

The cost of accomplishing each product specification is determined according to the following relationship:

Cost per Specification of direct material used = Component cost X Relative importance of the Cost of each Component of the Specification

- **Costs related to production volume:**It is calculated according to the following relationship:

Cost per specification of direct material used = % relative importance of each specification X total uses of each direct material used

Example: Calculate the cost of the direct material pressure specification for product H07V-U 2.5mm2 450/750V

It is calculated as follows:

Cost per specification of direct material used= (Relative importance of the cost of a pressure specification X Total Uses of Copper/ Relative importance of the cost of each copper material component)+ (Relative importance of the cost of a pressure specification X Total Uses of material PVC /Total relative importance of the cost of each PVC material component)

614484.46) = (1628692.31) + (141038.29)X1.342/%5.847) + (8362749.521.342X/%6.891= (

⟹ **1769730.6** DZR

The table below shows the costs associated with the volume of production as follows:

Table 03: indicates the costs associated with production volume

Direct material	Specifications / Amounts	1 Quality	2 Pressure	3 Cost	4 Type	5 Usage	9 Color	7 Marketing	8 Design	6 Thickness
Copper material	8362749.52	1628692.3	1628692.3	1322114.93	1293373.31	1283792.76	-	383221.72	670638.01	152224.18
PVC material	614484.46	141038.29	141038.28	114489.9	37333.67	111171.36	49778.22	-	6452.73	13182.01
Production costs per specification	8977233.98	1769730.6	1769730.59	1436604.8	1330706.98	1394964.12	49778.22	383221.72	677090.74	165406.19

Source: Prepared by the researcher based on Table 02 and Appendix 01.

❖ **Costs associated with the activity**

Activity-specific costs for each product specification are determined based on costs that change with the size and type of production and the amount of time it takes to accomplish each specification: Industrial indirect costs and labor (labor costs). The following table shows the total time required to accomplish the main activities of the product as follows:

Table 04: Shows the total time required to accomplish the major activities for product H07V-U 2.5mm2 450/750V

Main activities	The time period specified for completing one meter in each production activity
	H07V-U 2.5mm² 450/750V
Mole	0.22 seconds
Grouping	-
Nail	-
Insulation	0.75 seconds
Winding	0.03 seconds
Observation	0.05 seconds
Packaging	0.03 seconds
Total	**1.08 seconds**
Total time to complete the meter	0.018minutes
Quantity produced	320,000 meters
Time duration in minutes	5760 minutes
60 minutes/hour	60 minutes
Number of working hours	96hours

Source: Prepared by the researcher based on an interview with the head of planning and production.

The following table shows the amount of time required to fulfill each product specification:

Table 05: The total time required to accomplish each product specification

Specifications	Relative importance	**H07V-U 2.5mm² 450/750V**	
	%	Time	
Quality	**15%**	95	14.316
Pressure	**15%**	95	14.316
Cost	**12%**	95	11.621
Type	**12%**	95	11.368
Usage	**12%**	95	11.284
Color	**5%**	95	5.0526
Marketing	**11%**	95	10.105
Design	**6%**	95	5.8947
Thickness	**13%**	95	12.042
Total	**100%**	**95**	**96**

Source: Prepared by the researcher based on Table 04

- **Determine labor costs for each product specification:**

Labor costs are determined based on the following:
Average daily wage for a worker=Average monthly salary/Number of days worked
70000/30days = **2333.33 DZA**

Average hourly wage= Average daily wage/ Number of daily working hours = 2333.33/8 hour = **291.667 DZA/h.**

Hence, the cost is determined based on the amount of time required to accomplish a given specification, as shown in the following table.

Table 06: Shows the labor costs required to accomplish each product specification

Specifications	**Quality**	**Pressure**	**Cost**	**Type**	**Usage**	**Color**	**Marketing**	**Design**	**Thickness**
wage rate da/h	**291.67**	**291.67**	**291.67**	**291.67**	**291.67**	**291.67**	**291.67**	**291.67**	**291.67**
Time for each specification	14.316	14.316	11.621	11.368	11.284	5.0526	10.105	5.895	12.042
Labor Cost per Specification	4175.44	4175.439	3389.474	3315.789	3291.228	1473.69	2947.368	1719.30	3512.281

Source: Prepared by the researcher based on Table 05.

The cost of labor for each specification is calculated according to the following relationship:

Labor cost per standard = The time size of each specification X Wage rate/ hour.

Example: Calculating the cost of a pressure specification:

Labor cost for pressure specification = Pressure specification time scale XWage rate/ hour

14.316 X 291.67 = **4175.439**DZA

- **Determining Indirect Industrial Costs:**

The industrial indirect costs for product H07V-U 2.5mm2 450/750V are distributed as shown in the following table:

Table 07: Illustrates the distribution of indirect costs across all product specifications

Arrangement	Specifications	Relative importance	**H07V-U 2.5mm² 450/750V**	
			Indirect industrial costs(**'2**)	Industrial indirect costsper specification **'3 = (1 * '2)**
1	Quality	**15%**	166122.37	24772.634
2	Pressure	**15%**	166122.37	24772.634
3	Cost	**12%**	166122.37	20109.550
4	Type	**12%**	166122.37	19672.386
5	Usage	**12%**	166122.37	19526.665
9	Color	**5%**	166122.37	8743.283
8	Marketing	**11%**	166122.37	17486.565
7	Design	**6%**	166122.37	10200.496
6	Thickness	**13%**	166122.37	20838.157
Total		**100%**	**166122.37**	**166122.37**

Source: Prepared by the researcher based on Table No. (06).

Indirect industrial costs are calculated according to the following relationship:

Indirect industrial costs per specification = %**Relative importance of the specification X Total indirect industrial costs for the specific product**

Example: Calculating indirect industrial costs for a pressure specification

Indirect industrial costs of pressure specification = %Relative importance of pressure specification X Total Industrial Indirect Costs for Product H07V-U 2.5mm2 450/750V

0.149122807 X 166122.37 = **24772.634 DZA**

The following table shows the total costs associated with the volume of activity:

Table 08: Total costs associated with the size of the activity

Specifications	H07V-U 2.5mm2 450/750V		
	Labor costs for each specification/ da '1	Indirect industrial costs per specification 2'	Activity costs for each specification 3'=(' 1 + '2)
Quality	4175.439	24772.634	**28948.073**
Pressure	4175.439	24772.634	**28948.073**
Cost	3389.474	20109.550	**23499.024**
Type	3315.789	19672.386	**22988.175**
Usage	3291.228	19526.665	**22817.893**
Color	1473.684	8743.283	**10216.967**
Marketing	2947.368	17486.565	**20433.933**
Design	1719.298	10200.496	**11919.794**
Thickness	3512.281	20838.157	**24350.438**
Total	**28000**	**166122.37**	**194122.37**

Source: Prepared by the researcher using Table 06 and Table 07.

Example: To determine the activity cost for a pressure specification

Activity costs for pressure specification = Labor costs for pressure specification + Indirect industrial costs of pressure specification

4175.439 + 24772.634 = **28948.073DZA**

- **Energy-related costs**

The energy costs related to product H07V-U2.5mm2 450/750V, according to the ENICAB electrical cable manufacturing company, include costs resulting from depreciation expenses as well as electricity and water expenses, which are distributed based on the relative importance of each specification, as shown in the table below:

Table 09: Shows the determination of energy-related costs for each specification

Direct material	**Specifications** / **Amounts**	**1** **Quality**	**2** **Pressure**	**3** **Cost**	**4** **Type**	**5** **Usage**	**9** **Color**	**7** **Marketing**	**8** **Design**	**6** **Thickness**
Electricity and water	**83203.24**	12407.5	12407.5	10071.97	9853.02	9780.03	4379.12	8758.24	5108.97	10436.9

Depreciation	**128286.9**	19130.5	19130.5	15529.46	15191.86	15079.34	6751.94	13503.88	128286.9	19130.5
Total energy costs	**211490.1**	**31538**	**31537.10**	**25601.43**	**25044.88**	**24859.4**	**11131.06**	**22262.12**	**12986.23**	**26529.02**

Source: Prepared by the researcher based on Appendix No. (01).

Example: Energy costs for pressure specifications are calculated as follows:
Energy-related costs for the pressure specification of this product = (Total electricity and water costs X %Relative importance of pressure specification)+ (Total depreciation costsX %Relative importance of pressure specification).

DZA 31537.10=) +(12407.5) 19130.583203.24) =(X) +(0.149122807128286.9X0.149122807 (

- **Costs associated with the decision:**

According to ENICAB, a manufacturer of electrical cables, the costs of the decision include costs related to administrative decisions and are indirectly borne by its products, as illustrated in the following table:

Table 10: Demonstrates the total costs associated with the decision for each product specification

Specifications	**Relative importance**	**Administrative costs of the product H07V-U 2.5mm² 450/750V**
Amounts		**1099722**
Quality	163993.6	163993.6
Pressure	163993.6	163993.6
Cost	133124.2	133124.2
Type	130230.2	130230.2
Usage	129265.5	129265.5
Color	57880.09	57880.09
Marketing	115760.2	115760.2
Design	67526.77	67526.77
Thickness	137947.5	137947.5
Total	**1099722.63**	**1099722**

Source: Prepared by the researcher based on Appendix No: (01).

For example: The costs associated with the decision to specify pressure are calculated according to the following relationship:
The cost of the decision to specify the pressure for this product = (Other indirect costs X %Relative importance of pressure specification)+ (Total cost of external services X %Relative importance of pressure specification)+ (Total indirect labor costs X %Relative importance of pressure specification) +(%Relative importance of pressure specification XTotal cost of taxes and fees)+ (%Relative importance of pressure specification X Total interest expense).
(97033.68 X 0.149122807)+(1419.58 X0.149122807)+(910200.57X0.149122807)+(11824.95X 0.149122807) + (109242.85 X 0.149122807).
= (14469.94) + (211.69) + (135731.66) + (1763.37)+ (16290.60) = **163993.58 DZA**

❖ **Step 4: Determine the final cost of the product:**

The final cost of the H07V-U 2.5mm2 450/750V product is determined according to the cost system based on the ABCII specifications shown in the following table:

Table 11: Shows the final cost of product specifications H07V-U 2.5mm2 450/750V

Arrangement	**Specifications**	Costs associated with production volume(1)	Costs associated with the activity (2)	Energy-related costs (3)	Costs associated with the decision (4)	Total specification costs (1+2+3+4) =5
1	Quality	1769730.6	28948.07	10.31538	163993.58	**1994210.25**
2	Pressure	1769730.6	28948.07	31537.10	163993.58	**1994210.24**
3	Cost	1436604.83	23499.024	25601.44	133124.11	**1618829.49**
4	Type	1330706.98	22988.18	25044.88	130230.19	**1508970.23**
5	Usage	1394964.12	22817.89	24859.37	129265.53	**1571906.9**
9	Color	49778.22	10216.97	11131.06	57880.09	**129006.33**
8	Marketing	383221.72	20433.93	22262.12	115760.17	**541677.94**
7	Design	677090.74	11919.80	12986.24	67526.77	**769523.54**
6	Thickness	165406.19	24350.44	26529.02	137947.54	**354233.19**
Total		**8977233.98**	**194122.4**	**211490.11**	**1099721.63**	**10482568.09**
Total production						**320000 m**
Cost of production per meter						**32.758 DZA**

Source: Prepared by the researcher based on Table No. (03), Table No. (08), Table No. (09) and Table No. (10).

❖ **Determine the cost based on the specifications of the product H07V-U 2.5mm2 450/750V**

The final cost of the product H07V-U 2.5mm2 450/750V is calculated according to the following formula:

Total costs for each product specification based on ABCII specifications = Cost associated with production volume + cost associated with activity+ Energy-related cost + decision-related cost.

= (1769730.6163993.58+10.31538 +28948.07 +)+ (1769730.6 + 28948.07 + 31537.10 + 163993.58)+ (1436604.83 + 23499.024 + 25601.44 + 133124.11)+ (1330706.98 +22988.18 +25044.88 +130230.19) + (1394964.12 +22817.89 + 24859.37 + 129265.53) + (49778.22 + 10216.97+11131.06 + 57880.09)+ (383221.72 + 20433.93 + 22262.12 + 115760.17) + (677090.19 + 11919.80 +12986.24 + 67526.77)+ (165406.19 + 24350.44 +26529.02 + 137947.54) = 10482568.09 DA

10482568.09 / 320000= 32.758DZA

- **The cost per meter of H07V-U 2.5mm2 450/750V cables is estimated at:**

❖ Determining the production cost of the H07V-U 2.5mm2 450/750V product according to the cost system applied by ENICAB, a manufacturer of electrical cables.

The cost of production is calculated according to the following formula:

Production cost = Cost of purchasing consumable raw materials +Direct production costs+ Indirect production expenses.

8977233.99 **+** 9546046.33 **+** 1309137.43 **= 10855184.25 DZA**

Cost of production per meter = Total cost of the product / Quantity produced

10855184.25 **/**320000 **= 33.92 DZD/meter**

4. Conclusion

Based on the numerical values shown in Table 11, which presents the cost of producing one meter of the H07V-U 2.5mm² 450/750V product, the ABCII cost system estimated the cost per meter at 32.758 DZD. In comparison, the cost system applied at ENICAB estimated the cost at 33.92 DZD. This resulted in a negative difference of 1.162 DZD.This proves that the ABCII system is capable of achieving the optimal cost for the product in accordance with the characteristics and specifications that the customer desires after purchasing this product. Hence, we reached the following conclusions:

- The organization under study does not take into account the application of the ABCII system, relying solely on traditional methods to determine production costs. This prevents it from meeting the requirements and desires of its customers for the specifications of the desired products within their target cost range.
- The ABCII system at ENICAB, a manufacturer of electrical cables, has proven its ability to reduce industrial costs throughout the product life cycle. It also works to determine costs in an optimal manner that meets customer requirements within the limits of what the customer can afford. This is evident from the actual costs calculated by the researcher in Table 11.
- The ABCII system analyzes specification costs based on information and data provided by ENICAB, the cable manufacturing association, as shown in Table 11.
- The implementation of the ABCII system contributes to the complete satisfaction of customers with the products produced by theCable as a result of translating their requests into products that meet these specifications.
- The ABCII system takes into account all the advantages that ENICAB seeks to achieve, including determining the true cost of the product, tracking the product life cycle, and continuously improving specifications and features according to consumer needs and desires.
- The proposed ABCII model, applied according to data and information provided by ENICAB, a manufacturer of electrical cables, is capable of determining and measuring the optimal cost for each level of achievement, aimed at achieving the objectives of planning and cost control.
- The ABCII system determines the costs of the benefits that products provide to customers, considering that these benefits are the main driver of cost. It is believed that the product is a combination of specifications that the customer desires in order to satisfy their needs.

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