

DESARROLLO DE UN MODELO DE COSTEO POR ACTIVIDADES PARA PEQUEÑAS Y MEDIANAS EMPRESAS

DEVELOPMENT OF AN ACTIVITY-BASED COSTING MODEL FOR SMALL AND MEDIUM ENTERPRISES

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RESUMEN

Las pequeñas y medianas empresas (PYMES) desempeñan un papel fundamental en el desarrollo económico de diversos países, sin embargo, enfrentan desafíos en la determinación precisa de sus costos, lo que puede impactar negativamente en su rentabilidad. En este contexto, surge la necesidad de implementar sistemas de costos más eficientes, como el sistema de costos basado en actividades (ABC). El problema de investigación se da debido a que existen diferencias significativas en la determinación de costos y gastos al utilizar un sistema de costos tradicional en comparación con el sistema ABC. El objetivo es analizar la implementación del sistema de costos ABC en las PYMES de Ecuador, evaluando su impacto como herramienta de apoyo en la toma de decisiones estratégicas. La metodología se basa en un estudio cuantitativo, descriptivo-explicativo y deductivo, utilizando una la técnica de análisis de registros en una mediana empresa del sector productivo, y se aplicaron pruebas estadísticas en Excel para comparar los sistemas de costos tradicional y ABC. Los hallazgos presentan que la implementación del sistema ABC en la empresa PLASTIC S.A. reveló que el sistema tradicional subestimaba el costo de las tarrinas pequeñas (\$66,20 vs \$126,80) y sobrestimaba el costo de las tarrinas medianas (\$61,60 vs \$55,07) y grandes (\$65,98 vs \$54,17). En conclusión, el sistema ABC demostró ser una herramienta efectiva para la optimización de la gestión de costos y la toma de decisiones estratégicas en las PYMES. El sistema ABC permitió a la empresa obtener información financiera y no financiera más precisa, fortaleciendo su capacidad de respuesta ante los desafíos del entorno empresarial.

Palabras clave

Costeo ABC, gestión de costos, toma de decisiones, asignación de costos

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ABSTRACT

Small and medium-sized enterprises (SMEs) play a fundamental role in the economic development of various countries, but they face challenges in accurately determining their costs, which can have a negative impact on their profitability. In this context, the need arises to implement more efficient costing systems, such as the activity-based costing (ABC) system. The research problem arises because there are significant differences in the determination of costs and expenses when using a traditional costing system compared to the ABC system. The objective is to analyze the implementation of the ABC costing system in SMEs in Ecuador, evaluating its impact as a support tool for strategic decision making. The methodology is based on quantitative, descriptive-explanatory and deductive study, using a record analysis technique in a medium-sized company of the productive sector, and statistical tests were applied in Excel to compare the traditional and ABC cost systems. The findings show that the implementation of the ABC system in PLASTIC S.A. revealed that the traditional system underestimated the cost of small tubs (\$66.20 vs. \$126.80) and overestimated the cost of medium (\$61.60 vs. \$55.07) and large tubs (\$65.98 vs. \$54.17). In conclusion, the ABC system proved to be an effective tool for optimizing cost management and strategic decision making in SMEs. The ABC system enabled the company to obtain more accurate financial and non-financial information, strengthening its ability to respond to the challenges of the business environment.

Keywords

ABC costing, cost management, decision making, cost allocation.

INTRODUCTION

The development of an activity-based costing (ABC) model for small and medium-sized enterprises (SMEs) presents itself as a strategic and necessary response to the growing urgency of optimization in the management of costs and expenses in the complex current business environment, since SMEs, which play a fundamental role in the economic fabric of any nation, face a series of significant challenges in the accurate determination of their costs (1).

This situation can have a direct and detrimental impact on their long-term profitability and sustainability. In this context, the central question that guides this research arises: are there significant differences in the determination of costs and expenses when using a traditional costing system compared to an activity-based costing (ABC) system in companies?

The traditional costing approach, which has been the predominant method in the distribution of manufacturing overhead costs to specific products, has been widely used over the years. However, this model presents notable limitations that can compromise its effectiveness, especially in terms of the precision and relevance of the information it generates (2).

As indicated by (3,4), the traditional system tends to assign costs based on production volume or machine hours used, which can give rise to significant distortions in the

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valuation of products and services. Faced with this problem, the ABC system stands as an innovative and effective solution, since it makes it possible to identify and assign costs based on the activities that truly generate value, resulting in a more precise estimation of costs that, in turn, favors more informed and grounded decision-making.

The justification for the implementation of the ABC costing system lies in its inherent capacity to offer greater control and a better determination of costs and expenses, which, in turn, allows companies to adopt more accurate and timely decisions. This approach has a positive and significant impact on the profitability and sustainability of organizations. Authors such as (5,6) emphasize that the ABC system not only facilitates a more exhaustive and in-depth analysis of indirect costs, but also fosters more efficient resource management, which becomes crucial in a business environment characterized by its growing competitiveness and dynamism.

On the other hand, according to (7), the traditional cost system is an accounting method used to distribute production costs to specific products. The method works under the principle that manufacturing overhead costs should be distributed to products based on their volume or machine hours (8).

In Table 1 a more detailed difference between them can be seen.

Table 1. Differences between the Traditional Cost System and ABC Costs.

Traditional Costs	ABC Costs
Uses volume measures: Such as labor as the sole element for the assignment of costs to products.	Uses activities in a hierarchical order as the basis for cost assignment and also uses cost drivers that can be related to volume measures.
For cost assignment, costs are first assigned to an organizational unit or department and then to products.	Cost assignment is first performed to activities and then to products.
The traditional cost system is generally more used in companies that have a functional-type organizational structure.	The ABC cost system can be used in any organizational structure regardless of the activity they perform.
In the traditional system a more technical accounting-financial language is used that in many cases is not understood by people who do not have administrative-accounting training.	In the ABC cost system the language of the "organization" is used, which is characterized by being known by all the collaborators of the company or organization.

Source: (9,10)

Therefore, the general objective of this research is to thoroughly analyze the implementation of the activity-based costing system in small and medium-sized enterprises in Ecuador, evaluating its impact as an essential support tool in strategic decision-making. To achieve this purpose, specific objectives have been formulated that include the collection of secondary historical information on the application of the ABC system in SMEs, the identification of the favorable characteristics that the implementation

of this system presents, as well as the comparison of the information generated by traditional cost accounting and that obtained through the ABC system.

Finally, the present research aims to provide empirical evidence that supports the effectiveness of the ABC model in business practice, thereby contributing to the sustainable development and strengthening of small and medium-sized enterprises in Ecuador, promoting their capacity to adapt to the challenges of the current environment (11).

MATERIALS AND METHODS

Research method

The research to be carried out is based on a quantitative approach, which is characterized by the use of numerical data that will be the object of an exhaustive analysis. A descriptive-explanatory design will be implemented, which will not only focus on describing the identified problem, but will also provide a detailed explanation of the observed differences, as well as possible solutions and improvements that may arise from the implementation of the ABC costing system. This approach will make it possible to highlight the advantages that this system offers in comparison with traditional costing methods. Additionally, a deductive method will be adopted, which facilitates the process of advancing from a general framework toward more specific aspects, which in turn will make it possible to obtain grounded conclusions from the application of the costing systems in the studied context.

Population or sample

The target population of this research will be composed of Small and Medium-sized Enterprises (SMEs), a sector that plays a crucial role in the economic development of various regions. The sample will be selected specifically from the implementation of the ABC costing system in a medium-sized company in the productive sphere. This choice will make it possible to carry out a concrete and practical evaluation of the effectiveness of this system in a real environment, thereby contributing to a deeper understanding of its impact.

Setting

The research will be developed in a business environment that is described in a generic manner, with the objective of representing the common characteristics that SMEs in the productive sector usually present. The concrete location of the company under study will not be specified, with the purpose of maintaining the confidentiality and privacy of the information. This generalized approach will make it possible to offer results that are applicable to a broad spectrum of similar companies, thereby enriching the discussion on the implementation of costing systems.

Measurements

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Regarding data collection, the technique of record analysis will be employed, which implies a meticulous and systematic examination of the financial records and cost sheets of the selected company. The variables that will be considered in this analysis will encompass, among others, total costs, costs broken down by product, and income generated over a determined period. This methodological approach will facilitate an exhaustive evaluation of the incidence of the ABC costing system on the profitability of the company, thereby allowing a more precise and grounded analysis.

Statistical analysis

The data that are collected will be the object of a rigorous analysis in order to determine the significant differences between the use of the traditional costing system and the ABC system. To carry out this analysis, Excel will be used where appropriate statistical tests will be applied that will make it possible to validate the hypotheses posed. This analysis will be fundamental to verify the efficacy in the determination of costs and income, as well as to highlight the importance of having more precise data that positively influence strategic decision-making that impacts the profitability of the company.

RESULTS

To carry out an exhaustive analysis of the data, relevant information was collected from the company PLASTIC S.A., which specializes in the production of plastic tubs designed for food preservation. This company is dedicated to the manufacture of tubs in three different sizes: small, medium, and large, which allows it to meet diverse market needs. With the objective of optimizing its processes, PLASTIC S.A. has decided to implement the ABC (Activity-Based Costing) cost system, and as part of this process, a meticulous comparison is being carried out between the traditional costing method and the ABC system. The purpose of this comparison is to identify which of the two approaches provides greater economic and operational benefits to the organization (12).

In the year 2020, the company succeeded in manufacturing and selling a total of 4,000 units of small tubs, 10,000 units of medium tubs, and 15,000 units of large tubs. Manufacturing overhead costs (CIF) rose to a total of \$922,500.00. Within the framework of the traditional costing system, the organization assigns these costs taking as a base the machine hours, which totaled 37,500 hours. Regarding the cost of direct materials consumed, this reached the figure of \$619,000.00, broken down into \$44,000.00 destined for small tubs, \$200,000.00 for medium tubs, and \$375,000.00 for large tubs. On the other hand, the cost associated with direct labor (MOD) was broken down into \$24,000.00 for small tubs, \$170,000.00 for medium tubs, and \$135,000.00 for large tubs.

Through a deeper investigation within the operational activities of the organization, the following data have been supplied, which are shown below.

Table 2. Hours MOD and machining per unit.

CONCEPT	SMALL	MEDIUM	LARGE
MOD hours per unit	1	2	1.5

Machining hours per unit	2	1	1.3
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Table 2 summarizes the main differences between the traditional cost system and the ABC cost system. We can observe that the traditional system is based on volume measures, such as labor, to assign costs to products, while the ABC system uses a hierarchical approach of activities and cost drivers more related to the actual activities. In addition, the ABC system allows a more precise assignment of costs, first to activities and then to products, unlike the traditional system that assigns costs directly to departments and then to products.

Table 3. Activities, drivers and costs.

ACTIVITIES	DRIVERS	COST \$	No. DRIVERS
Machining	Machining hours	\$378,750	37,500
Change molds	Production batches	\$15,000	30
Receive materials	Receptions	\$217,350	270
Deliver products	Deliveries	\$124,800	32
Plan production	Production orders	\$186,600	50
TOTAL CIF		\$922,500	

Table 3 presents the main activities identified in the company, the corresponding drivers, and the costs associated with each activity. The activities include: machining, changing molds, receiving materials, delivering products, and planning production. Each of these activities has a specific driver that is used to assign manufacturing overhead costs (CIF) to each of the activities, which is fundamental for the ABC cost system.

Table 4. Activity data per product.

CONCEPT	SMALL	MEDIUM	LARGE
Number of products per production batch (units)	200	2,000	3,000
Receive materials (times)	220	35	15
Deliver products (times)	20	3	9
Production orders (orders)	25	10	15

Table 4 shows the details of the activities carried out for each of the three products: small, medium, and large tubs. This detailed information on activities per product is crucial for the implementation of the ABC cost system, since it allows costs to be assigned more precisely to each of them.

SOLUTION – TRADITIONAL SYSTEM

Table 5. Calculations of unit CIF (Traditional System).

CONCEPT	SMALL	MEDIUM	LARGE
CIF rate	\$24.60	\$24.60	\$24.60
Machining hours	2.00	1.00	1.30
Unit CIF	\$49.20	\$24.60	\$31.98

CIF TOTAL / MACHINE HOURS = Rate CIF \$24.60. Table 5 shows the calculations performed to determine the unit manufacturing overhead costs (CIF) using the traditional cost system. A CIF rate of \$24.60 per machining hour is calculated and subsequently the CIF are assigned to each product according to the machining hours required.

Table 6. Direct Material Costs per Unit.

PRODUCTS	TOTAL DIRECT MATERIALS COST	NUMBER OF UNITS	DIRECT MATERIALS COST PER UNIT
SMALL	\$44,000.00	4,000	\$11.00
MEDIUM	\$200,000.00	10,000	\$20.00
LARGE	\$375,000.00	15,000	\$25.00
TOTAL	\$619,000.00		

Table 7. Direct Labor Costs per Unit.

PRODUCTS	TOTAL MOD COST	NUMBER OF UNITS	MOD COST PER UNIT
SMALL	\$24,000.00	4,000	\$6.00
MEDIUM	\$170,000.00	10,000	\$17.00
LARGE	\$135,000.00	15,000	\$9.00

Table 8. Unit Cost per Product (Traditional System).

CONCEPT	SMALL	MEDIUM	LARGE
Direct Materials	\$11.00	\$20.00	\$25.00
Direct Labor (MOD)	\$6.00	\$17.00	\$9.00
CIF	\$49.20	\$24.60	\$31.98
Unit Cost	\$66.20	\$61.60	\$65.98

This table presents the calculation of the unit cost of each product using the traditional cost system. The unit cost of small tubs is \$66.20, that of medium tubs is \$61.60, and that of large tubs is \$65.98.

SOLUTION – ABC COSTING SYSTEM

Table 9. Manufacturing Overhead Costs (ABC System).

ACTIVITIES	DRIVERS	TOTAL ACTIVITY COST \$	No. DRIVERS	COST PER DRIVER \$
Machining	Machine hours	\$378,750.00	37,500	\$10.10
Change molds	Batches	\$15,000.00	30	\$500.00
Receive materials	Receptions	\$217,350.00	270	\$805.00
Deliver products	Deliveries	\$124,800.00	32	\$3,900.00
Plan production	Production orders	\$186,600.00	50	\$3,732.00
TOTAL CIF		\$922,500.00		

Table 10. Unit Cost of Small Tubs (ABC).

COSTO UNITARIO ABC- PRODUCTO PEQUEÑO

FACTOR	CANTIDAD	PRECIO \$	IMPORTE \$	TOTAL \$
Costo de Materiales Directos			\$11,00	
MOD	1	\$6,00	\$6,00	
Maquinar	2	\$10,10	\$20,20	
COSTO UNITARIO			\$37,20	
COSTO POR VOLUMEN	4000	\$37,20		\$148.800,00

COSTO UNITARIO ABC – PRODUCTO PEQUEÑO

Direct Materials: \$11.00 | MOD: $1 \times \$6.00 = \6.00 | Machining: $2 \times \$10.10 = \20.20 | Subtotal unit: \$37.20 | Volume cost (4,000 units): \$148,800.00

Batch costs: Change molds $20 \times \$500 = \$10,000$; Receive materials $220 \times \$805 = \$177,100$; Deliver products $20 \times \$3,900 = \$78,000$; Plan production $25 \times \$3,732 = \$93,300$. Total batch costs: \$358,400.00. Total cost: \$507,200.00. Units produced: 4,000. Unit cost: \$126.80.

COSTO UNITARIO ABC- PRODUCTO PEQUEÑO				
FACTOR	CANTIDAD	PRECIO \$	IMPORTE \$	TOTAL \$
Costo de Materiales Directos			\$11,00	
MOD	1	\$6,00	\$6,00	
Maquinar	2	\$10,10	\$20,20	
COSTO UNITARIO			\$37,20	
COSTO POR VOLUMEN	4000	\$37,20		\$148.800,00

Table 11. Unit Cost of Medium Tubs (ABC).

Direct Materials: \$20.00 | MOD: $2 \times \$8.50 = \17.00 | Machining: $1 \times \$10.10 = \10.10 | Subtotal unit: \$47.10 | Volume cost (10,000): \$471,000.00

Batch costs: Change molds $5 \times \$500 = \$2,500$; Receive materials $35 \times \$805 = \$28,175$; Deliver products $3 \times \$3,900 = \$11,700$; Plan production $10 \times \$3,732 = \$37,320$. Total batch costs: \$79,695.00. Total cost: \$550,695.00. Units: 10,000. Unit cost: \$55.07.

Table 12. Unit Cost of Large Tubs (ABC).

COSTO UNITARIO ABC- PRODUCTO GRANDE				
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FACTOR	CANTIDAD	PRECIO \$	IMPORTE \$	TOTAL \$
Materiales Directos			\$25,00	
MOD			\$9,00	
Maquinar	1,3	\$10,10	\$13,13	
COSTO UNITARIO			\$47,13	
COSTO POR VOLUMEN	15000		\$47,13	\$706.950,00
ACTIVIDADES	INDUCTORES	COSTO DE LA ACTIVIDAD \$	SUB-TOTAL \$	TOTAL \$
Cambiar Moldes	5	\$ 500,00	\$ 2.500,00	
Recibir Materiales	15	\$ 805,00	\$ 12.075,00	
Entregar Productos	9	\$ 3.900,00	\$ 35.100,00	
Planificar Producción	15	\$ 3.732,00	\$ 55.980,00	
COSTOS POR LOTE				\$105.655,00
COSTO TOTAL				\$812.605,00
Unidades Producidas				15.000
COSTO UNITARIO				\$54,17

Direct Materials: \$25.00 | MOD: \$9.00 | Machining: $1.3 \times \$10.10 = \13.13 | Subtotal unit: \$47.13 | Volume cost (15,000): \$706,950.00

Batch costs: Change molds $5 \times \$500 = \$2,500$; Receive materials $15 \times \$805 = \$12,075$; Deliver products $9 \times \$3,900 = \$35,100$; Plan production $15 \times \$3,732 = \$55,980$. Total batch costs: \$105,655.00. Total cost: \$812,605.00. Units: 15,000. Unit cost: \$54.17.

Table 13. Comparison Traditional System vs ABC System.

PRODUCT	QTY	Trad. Unit Cost	Trad. Total Cost	ABC Unit Cost	ABC Total Cost
SMALL	4,000	\$66.20	\$264,800.00	\$126.80	\$507,200.00
MEDIUM	10,000	\$61.60	\$616,000.00	\$55.07	\$550,695.00
LARGE	15,000	\$65.98	\$989,700.00	\$54.17	\$812,605.00
TOTAL COSTS			\$1,870,500.00		\$1,870,500.00

Table 13 presents a comparison of the unit and total costs obtained through the traditional cost system and the ABC cost system. There are significant differences in the unit costs of each product. For small tubs, the ABC system shows a higher unit cost (\$126.80) compared to the traditional system (\$66.20), indicating that the traditional system underestimated the cost of this product. In the case of medium and large tubs, the ABC system yields lower unit costs (\$55.07 and \$54.17, respectively) compared to the traditional system (\$61.60 and \$65.98, respectively), suggesting that the traditional system overestimated the cost of these products. These differences in cost assignment can have a significant impact on the company's strategic decision-making.

DISCUSSION

From the information, it can be deduced that these differences in cost assignment are due mainly to the way in which each system distributes manufacturing overhead costs (CIF) (12). While the traditional system is based on volume criteria, such as machine hours, the ABC system uses more precise drivers, such as direct labor hours, production batches, material receptions, product deliveries, and production orders (13). This more detailed assignment of CIF through key activities allows a better understanding of the resources consumed by each product, which translates into a more precise determination of costs.

In addition, the implementation of the ABC system in PLASTIC S.A. has demonstrated important advantages in comparison with the traditional system. Among them stand out the generation of more exact, reliable, and timely financial and non-financial information, which facilitates more informed strategic decision-making. Likewise, the ABC system has made it possible to identify activities that generate excessive costs, which allows the company to optimize its processes and improve its competitive positioning in the market.

It is fundamental to consider the contingent factors that influence the implementation of cost systems. According to (19,20), aspects such as organizational structure, technology used, and the business environment must be analyzed to guarantee the success of the adoption of the ABC system. The case of PLASTIC S.A. demonstrates that, by adapting the system to its particular characteristics, the company has achieved significant benefits in cost assignment and the improvement of its operational processes.

Furthermore, the profile and training of the personnel in charge of leading the implementation are critical factors for the success of the system. The literature suggests that solid leadership, with knowledge of cost theory and effective communication skills, is essential (21,22). Likewise, the support of external consultants has also been identified as a valuable element during the implementation of new management systems. According to the research of (23,24), these experts can offer an objective perspective and specialized knowledge that facilitate the adaptation of the system to the needs of the company.

Therefore, in the case studied, the implementation of the ABC system has provided more detailed data on the resources used by each product. For example, while the traditional system reported unit costs of \$66.20, \$61.60, and \$65.98 for small, medium, and large tubs, respectively, the ABC system determined unit costs of \$126.80, \$55.07, and \$54.17.

This significant discrepancy indicates that the traditional system underestimated the cost of small tubs and overestimated that of the medium and large ones (see Table 13). This precise information allows the company to make more informed decisions oriented toward the improvement of its operational and financial performance (25,26).

CONCLUSIONS

The development and implementation of the activity-based costing (ABC) system in the company PLASTIC S.A. has demonstrated itself to be an effective and valuable tool for the optimization of cost management and strategic decision-making in the context of small and medium-sized enterprises (SMEs).

In the first place, the comparative analysis between the traditional cost system and the ABC system has revealed significant differences in the assignment of manufacturing overhead costs to the different products. While the traditional system tended to underestimate the cost of small tubs and overestimate the cost of medium and large tubs, the ABC system has provided a more precise assignment of costs, which has allowed the company PLASTIC S.A. to have a clearer and more detailed view of the profitability of each of its products.

In the second place, the implementation of the ABC system has generated tangible benefits for the organization, such as a better understanding of internal processes, greater efficiency in the use of resources, and more solid support for strategic decision-making. This is due to the fact that the ABC system is based on the analysis of the company's key activities and on the identification of the most relevant cost drivers, which has allowed PLASTIC S.A. to optimize its processes and improve its competitive positioning in the market.

Finally, the experience of PLASTIC S.A. demonstrates that the implementation of the ABC system in the context of SMEs is viable and highly recommendable. By adapting the system to the specific characteristics and needs of the organization, the company has succeeded in obtaining more precise and timely financial and non-financial information, which has strengthened its capacity to respond effectively to the challenges of the current business environment.

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