COST MANAGEMENT:

COST APPROACH AS A MANAGEMENT TOOL

THEORY AND PRACTICE

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Currently, he is collaborating in various research groups in the research lines: Artificial Intelligence applied to education (ChatGPT, Utaut2), digital transformation, digital wallets, financial education, and pedagogical innovation.

He is interested in publishing in high impact journals at international level, so he is collaborating in research projects that aim to disseminate in high impact journals indexed in major databases such as Scopus, Web of Science, Springer, and Taylor & Francis

Dedication

This research work is dedicated to all those interested in improving their cost management skills in the determination of their income projections, costs and expenses through the application of mathematical, statistical and financial tools, as well as the valuation and analysis of costs in relation to the historical as a basis, strategies that serve to induce an effective direction in decision making.

It is also oriented to the micro-enterprise sector, MSMEs, because, as there are managerial approaches, it allows the economic and financial strengthening, which leads to the sustainability of small and medium enterprises, for which is necessary the review and application of these financial instruments.

To the university community to whom this work will surely serve as reference material, bibliographic source, and guide for individual or group work due to the cases presented in the book.

To the former students of the different careers of the Metropolitan University of Ecuador, who for different circumstances are currently part of the financial, accounting, cost and inventory departments, this compendium will be a guide for their valuation methods, or at least to contrast the way in which those are determined.

We know that each company is different and that their accounting policies are managed according to how they have been established within the organization, no matter the form, the essence is the same.

Acknowledgment

We thank God for providing the wisdom and relevance necessary for this compendium to be the basic resource, as a guide for the sustainability of the entrepreneur, micro-entrepreneur or SME, since, in many cases, having little knowledge in business management, limits effective decision making, generating unforeseen economic situations. This book exposes different scenarios such as investment alternatives, pricing direction, establishing the profitability margin, the correct classification of costs that help to dispel doubts that generally arise in a running business. Hoping that this instrument counts with a gadget and that it allows to make assertive decisions.

Even when this material was being initiated, our hope was to finish it, but as our faith never fainted since our strength is Jesus, he was in charge of opening roads and made our dreams possible.

To my family, Marcelo, Marcela, Maddy, María Florinda Natividad (+), Elsa María (+), Humberto and my dear brothers and sisters who, even though this material is enriching knowledge, took time away from their lives and their sharing.

MKCG

To my mother, the woman to whom I owe my life, my friend, my mentor, an example of persistence, to my siblings who with their moral support strengthened in me the desire to continue without stopping.

JCMB

We thank our dear students who were the driving force in every concern developed within the class where more alternative answers were generated to guide the entrepreneur.

To all the experts who, through questions asked to the different accounting departments, were able to contribute with their experience and reveal in this paper.

To the academic and research management for being the ones who gave us indispensable parameters in the publication process.

JARC

Dedicated to my parents, my partner and my true friends. Thank you for your support in this academic journey.

BAE

Prologue

This book has been created with the purpose of developing relevant criteria concerning costs and how cost elements are classified and how do they behave. For this purpose, the work presents the application of tools as instruments for business sustainability. It also states that it is composed of 7 chapters, which will be fundamental for the reader and contribute to the improvement of microentrepreneurs' management.

The first chapter of this book represents a general induction into accounting and cost accounting, allowing a theoretical understanding of the different approaches and authors perspectives in the field. These theories will be fundamental for business management.

The second part emphasizes the importance of cost usage, where its purpose is the charge or allocation in each process and activity carried out in the transformation of goods or services and to provide effective information for decision-making by administrators or microentrepreneurs.

The third chapter, no less relevant, refers to the components or elements of costs, such as direct raw materials, direct labor, also known as production payroll; indirect manufacturing costs: indirect materials and indirect labor, and other overhead costs formed by disbursements resulting from the organization's operations such as payments for insurance, patents, contributions, among others.

The fourth chapter details the Classification of cost elements and their behavior, including direct and indirect costs; fixed and variable costs; relevant costs; irrelevant costs; discretionary costs; non-discretionary costs, etc. This is done in order that the reader can analyze each problem

posed and according to the established conditions, and can specify their respective classification.

The fifth chapter emphasizes the use of costs focused on managerial decision- making, where mathematical tools are detailed and applied through different formulas for break-even point, profit margin, operating income, desired profit in units produced, cost volume, opportunity cost, prime cost, conversion cost, product cost, period cost, opportunity cost, cost-benefit, among others.

The sixth chapter contributes to the measurement of profits through the methods of direct or variable cost valuation and absorption costing.

The seventh chapter establishes the variability of estimated costs and actual costs, where the cash balance revealed through the master budget is determined, showing future flows from its operational activities and allowing to know whether or not the project is feasible in relation to its investment.

Finally, the eighth chapter covers the environmental problems generated by discarded tires, the factors that affect their lifespan, the models to predict and control their wear, the sustainable management strategies implemented, and the proposals to improve such management in Ecuador. Specifically, it explains that tires are a source of pollution for being non-biodegradable and generating microplastics. Then, environmental, driving, maintenance, and technological aspects impacting the longevity of tires are detailed. Mathematical models for wear control are also reviewed. Regarding strategies, circular economy, advanced recycling, and the comparison between material recycling and energy recovery are mentioned.

CHAPTER I

Characteristic of Accounting and Cost Accounting

Accounting Definitions

Accounting is the preeminent information system, tasked with identifying, measuring, and recording economic phenomena affecting entities. The information it provides can cater to two distinct types of recipients: “external users” and “internal users,” who will utilize the information for various objectives using techniques and content tailored to their reality (Cartier and Osorio, 1992).

Regardless of whether it is considered a technique, an art, or a science, accounting constitutes an information system integrated into the business, with functions to identify, measure, classify, record, interpret, analyze, evaluate, and report the operations of both economic and non-economic entities in a clear, complete, and reliable manner.

The activities of classification and recording are routine and repetitive in nature and do not constitute the final functions of accounting. The development and systematization of accounting have freed the accountant from this phase of the process, allowing more time to be dedicated in more significant tasks, such as analysis, interpretation, and alternatives improvement proposals that contribute to the company’s sustainability (Crespo, M. et al, 2019).

The body of knowledge, whose application allows the understanding of the economic and financial situation of the company as well as the results of business management, reflects the true image of the company and informs the users of accounting about business management.

Traditional Approach

Only from the professional practice, from the actions of the practitioner with a legalistic criterion associated with the record, starting mainly from recognition.

Utility Approach

As an information system and, consequently, as a control system, which serves to provide useful information for economic decision-making.

Environmental Recognition Approach

Emphasis on the environment considers not only economic and financial aspects but also social aspects, recognizing within the core of accounting knowledge a character of social, ethical, and moral responsibility, attributing the essence to the accounting books.

Perceptions of Accounting:

Financial Accounting

Results are concretized in the Financial Statements

- Subject to compliance with norms issued by professional or state bodies.

- Mainly based on historical information.

- Oriented towards external users.

Managerial or Management Accounting

Managerial accounting measures, analyzes, and reports financial and non- financial information to assist managers in decision-making.

Managers use information from managerial accounting to develop, communicate, and implement strategies.

It coordinates product design, production, and marketing decisions and evaluates the performance.

The information and reports of managerial accounting are not required to follow established rules or principles. The questions are:

1. How will this information help managers do their job better?, and

2. Do the benefits of generating such information exceed the costs?

Cost Accounting

Cost accounting measures, analyzes, and reports financial and non-financial information related to the costs of acquiring or using resources within an organization.

For example, the calculation of the cost of a product is a function of cost accounting, which meets the needs of inventory valuation of financial accounting. As well as the need for decision-making of managerial accounting (for example, the decision on how to price products, and the choice of which ones should be promoted).

Analysis of Accounting Performance

The use of the information they provide, and the differences between them.

Table 1

Similarities in accounting

Management or Administrative Accounting.	**Financial Accounting**	**Cost Accounting**
Provide information.	Provide information.	
The information is reasonable in relation to its assets.	The information is reasonable in relation to its assets.	Provide information.
It is determined over a period of time.	It is determined over a period of time.	The information is reasonable in relation to its assets.
Its results determine the reality of the company.	Its results determine the reality of the company.	It is determined over a period of time.

Note: own elaboration

Table 2.

Differences between the accounts

Analysis detail	Management or Administrative Accounting.	Financial Accounting	Cost Accounting
Purpose of information.	Helps managers make decisions for the achievement of an organization's objectives.	Communicates the organization's financial position to investors, banks, regulators and other external parties.	Determines costs in relation to processes and activities.
Primary users	Manager of the organization.	External users such as investors, banks, regulators and suppliers.	Generates alternatives to reduce mudas and bottlenecks.
Focus and emphasis	Forward-looking (budget for 2024 prepared in 2023).	Backward-looking (2023 performance reports prepared in 2024).	Determines consumed costs.
Measurement and reporting rules	Internal measures and reports based on cost-benefit analysis.	Financial statements must be prepared in accordance with financial reporting standards and must be audited by independent external auditors.	Cost adjustment measures involve the production manager, managers and financials.

Time span and type of reports	It varies from hourly to 1 to 5 years of information, with financial and non-financial reports on products, departments, territories and strategies.	Annual and quarterly financial reports, mainly on the company as a whole.	Accrued, monthly, quarterly and annual cost reports.
Behavioral implications	It is designed to influence the behavior of managers and other employees.	It mainly reports on economic events, although it also influences behavior, because the manager's remuneration is often based on the reported financial results.	The profitability margin resulting from cost optimization contributes to invest and distribute profits, improving the salary scale.

Note: own elaboration

Characteristics of Cost Accounting

Cost accounting definitions:

It is an organized process that utilizes general accounting principles to record the operational costs of a business, in such a way that, with production and sales data, accounts according to the activity performed are channeled, which participate in the process of transforming a good or service into a finished product, as well as identifying whether they fall within production costs, distribution costs, and costs of various

other charges of negotiation, all in relation to the volume of production. (Ramírez, 2015) states that “it is an information system that classifies, accumulates,controls, and assigns costs to determine the value of activities, processes, and products, thereby facilitating decision-making and administrative control”, deducing the unit cost and total costs, with the purpose of providing management with reasonable and relevant information that contributes to timely decision-making.

Cost accounting generates information for internal use for department heads and organizational directors as detailed in the previous paragraph, it is also considered for external use as it provides information to different control bodies, such as the Internal Revenue Service, municipality, fire department, Superintendence of Companies, and financial institutions with which it is intrinsically related to the invoiced units and with determining the cost of the product, or when providing a service. In its essence (Galia, 2007) refers to it as “provides the essential data for internal and external reports, the basis of decisions inside and outside organizations.” The internal reports, regular and exceptional, guide short and long- term choices for leaders. On the other hand, reports for the external public provide data for decisions of shareholders, suppliers, financial institutions, regulators, the government, and the general public, according to their relationship with the organization.

Uses of cost accounting: cost accounting determines through its records the inventories of production in processes, finished goods, materials, and supplies both unitary and total, which are reflected in the financial situation statement, the cost of sales, distribution costs. Establishing the state of costs of products sold, in order to calculate sales, costs that determine profits or losses in a certain period and are revealed in the comprehensive income statement. Control the cost consumed in each of the different lines of manufactured goods. Reports that must necessarily be extended

in detail, to cover each of the items or orders that form a product and determining their improper uses and their unnecessary hours. Optimize profits with the savings obtained by avoiding waste. Likewise, identify the areas, processes, and activities that increase the product cost or generate difficulty in obtaining an affordable and timely product. Provide executives and managers with financial tools that contribute to administrative management that allow effective planning and control. Provide timely and sufficient information on the cost of manufactured products. Establish and facilitate alternatives to add or eliminate production lines, to accept or not new orders, to acquire new machinery, to expand in the productive area, to improve the combination of products or services, not for their characteristics but rather for priority needs. Contribute to the elaboration of the company's budgets, production, sales, and financing programs.

According to (Neuner, 2000), cost accounting is a phase of the general accounting procedure, through which the details of costs of material, labor, indirect charges, and non-production related costs necessary to produce and sell an item are recorded, summarized, analyzed, and interpreted. Another of the considerations revealed are the expenses related to the business operation functions.

This informational data is useful, as it shows the facts, how it was done, and what it cost to do it, how much it was sold, and the profitability margin that was obtained, which ultimately shows the profit, with this data the possibilities of sustainability through increasing production, or diversification of new lines related or not to the product are analyzed. For this reason, cost accounting serves as a useful end, progressively aiding in increasing production, providing a complete and reliable record of business transactions.

The System is considered as the aspect on which emphasis is placed on

a set of coordinated parts and in interaction to achieve an objective. A group of interrelated components that work together towards a common goal, through the acceptance of inputs and generating outputs in an organized transformation process.

The Accounting system adapts the requirements based on the needs of accounting and the determination of costs, adding value to the mentioned system, by providing information segmented by processes and activities that are later fed for the integration of information.

Cost systems can be significant sources of information for company managers. In this scenario, managers can understand the deficiencies and limitations of the accounting systems and attribute their participation concerning their needs, requirements, and proposals that generate improvements in the information provided by the system for the refinement of control, planning, and adequate projection of cost allocations. It is considered a set of procedures, techniques, records, and reports structured based on the double-entry theory and other technical principles to determine the unit or total costs and control manufacturing operations.

Additionally, cost accounting also assists in evaluating the efficiency and effectiveness of various company departments. This form of accounting ensures that the cost of production is measured not just in terms of raw materials and labor used, but also it includes overhead and indirect costs such as utility expenses and management salaries. This comprehensive costing approach provides a clearer financial picture that enables managers to make more informed decisions about where to cut costs, invest in resources, or alter production processes.

The methodology employed in cost accounting is versatile, allowing it to be adapted for a wide range of industries, from manufacturing to services,

by adjusting its focus on various cost elements and on the complexity of operations. Its adaptability means can provide detailed insights into each phase of the business process, whether it involves the initial procurement of materials, the operational phases of manufacturing, or the final stages of product delivery and post-sale services.

Furthermore, the integration of cost accounting with modern information systems has revolutionized its capabilities, making it not just a tool for tracking and recording costs, but also a strategic advisor that helps in forecasting future trends. These systems facilitate real-time data analysis, enabling proactive management of costs and operational efficiency. Advanced analytics can predict patterns, identify cost-saving opportunities, and help in optimizing resource allocation.

By maintaining rigorous financial oversight, cost accounting plays a pivotal role in enhancing operational accountability and transparency. It acts as a check against financial mismanagement and inefficiencies, thus safeguarding a company's profitability and sustainability in the long term. This strategic role highlights its importance not only as a function of accounting but as a critical element of overall business management.

In essence, cost accounting is indispensable in the architecture of financial management within a company. It extends beyond mere accounting to act as a cornerstone for strategic planning, providing the essential data needed to support decisions and foster a competitive advantage in the marketplace. As companies continue to evolve and the business environment becomes ever more complex, the role of cost accounting is likely to expand, becoming more integral to achieving business success and operational excellence.

Classification of cost systems

Cost systems can be classified into:

According to the treatment of fixed costs: absorption cost systems and variable or direct cost systems.

According to the way of concentrating costs: by orders of production and by processes.

According to the time in which they are incurred or consumed or in which they are projected, which are part of a system of historical costs and a system of predetermined costs.

What are costs?

They are expenditures or allocations of economic resources that are made to carry out an activity, production, or service. These expenditures may include the cost of direct raw materials, direct labor, manufacturing overhead, among others.

Costs as a perspective in business management.

The use of costs is essential in business and economic management, as it provides indispensable information for decision-making. Another aspect to improve is the control of expenses; by determining necessary corrective measures that contribute to increasing profitability for this financial planning is an indispensable tool that guides the business owner to subsequently perform a comparative analysis between the estimated and the real. It is stated that effective cost management can make a difference between increasing liquidity or illiquidity.

Considerations of relevant aspects of how costs establish influence:

Business decision-making: costs provide essential information for decision-making in an organization by knowing the costs of production, distribution, and other costs related to their operations, and thus establish actions on pricing, expansion, investment in new projects, and operational efficiency.

Expense control: monitoring and controlling costs is essential to ensure operational efficiency and profitability of a company. By knowing the costs, organizations can identify areas where they can reduce unnecessary expenses, through the elimination of wastes in Gemba and improve their profitability.

Price determination: costs also play an important role in setting prices for products or services. Microentrepreneurs must consider their costs to set prices that allow them to cover expenses/expenses and obtain adequate profits.

Investment project evaluation: before undertaking a new project or investment, it is necessary to perform a cost analysis in order to evaluate its financial viability. This involves estimating the costs associated with the project and comparing them with the potential benefits.

Profitability evaluation: costs are also essential for evaluating company profitability over time. Calculating profit margins, financial ratios, and comparing costs with revenues help measure an organization financial health.

Budgeting: costs are a fundamental part in the preparation of budgets. By knowing the projected costs, companies can plan their expenses, investments, and short and long-term strategies.

Regulatory and tax compliance: in many countries, companies must keep accurate records of their costs for tax and regulatory purposes. Proper use of costs is essential to meet legal and tax obligations.

Cost Accounting from an Academic Perspective

It allows understanding the importance of costs and the effective way of using them, contributing to the administrative management of the company. It also highlights the benefits and significant contributions for students, professors, and researchers in the field of accounting and business management direction. Here are some of the advantages and possibilities it offers:

- Understanding of fundamental concepts: cost accounting provides a solid foundation for students to understand fundamental accounting concepts such as fixed costs, variable costs, direct and indirect costs, contribution margin, among others. These will be studied in depth in subsequent chapters.

- Practical application: cost accounting offers students the opportunity to apply accounting concepts in practical business situations. Through case studies, projects, where they can develop practical skills for cost management.

- Preparation for decision-making: students learn to use cost information in order to make informed business decisions. This is essential for their future career in management, as many business decisions are related to cost control, pricing, and resource optimization.

- Development of analytical skills: cost accounting requires

the analysis of financial data and the interpretation of results. Students acquire analytical skills that are valuable in a variety of professional fields.

- Academic research: cost accounting is a broad area that truly deserves to be described and analyzed, for which it is necessary to conduct academic research in areas such as improving operational efficiency, evaluating investment projects, managing value/supply chains, and cost innovation, results that are shown through books, presentations, scientific articles, among others.

- Interdisciplinary approach: cost accounting often relates to other academic fields, such as economics, business management, industrial engineering, and statistics. This encourages an interdisciplinary approach that can enrich the understanding of costs and their impact on organizations.

- Preparation for professional certification: for those students who wish to obtain a professional certification in accounting, such as Certified Public Accountant (CPA).

In summary, the chapter addressed the characteristics of general, financial, administrative, and cost accounting, emphasizing costs and their influence in the business environment, generating a positive effect for entrepreneurs. Additionally, the costs and their impact from an academic perspective were epistemologically analyzed.

This overview of the role of cost accounting in both academic and practical settings underscores its multifaceted contributions to business management and education. By dissecting these elements, we can

see not only the utilitarian benefits but also the broader educational advantages it offers:

1. **Foundational Knowledge:** cost accounting serves as a crucial educational foundation, introducing students to key accounting principles. These concepts are not merely theoretical; they are essential for understanding the financial dynamics that govern business operations. This foundational knowledge is critical as students progress through their academic careers and encounter more complex accounting challenges.

2. **Practical Skills:** the application of cost accounting in real-world scenarios bridges the gap between theoretical studies and practical application. Engaging with real business cases, students not only learn how to apply these concepts in practice but also understand the consequences of financial decisions in a business context. This hands-on experience is invaluable in cultivating a practical understanding of cost management.

3. **Decision-Making Tools:** Cost accounting equips students with the skills to utilize cost data effectively, enhancing their decision-making capabilities. This preparation is essential for future roles in management, where decision-making is often tied to cost optimization and financial strategy. The ability to analyze financial information and make informed decisions is a critical skill in any business leader's toolkit.

4. **Analytical Development:** through the detailed analysis of financial data, students develop robust analytical skills. These skills are applicable in various contexts beyond accounting, including market analysis, financial forecasting, and strategic

planning. This analytical prowess is essential for navigating the complexities of modern business environments.

5. **Research Opportunities:** the academic exploration of cost accounting encourages rigorous research into its principles and applications. This research can lead to significant advancements in operational efficiency and strategic financial management, contributing to the academic community through publications, presentations, and scholarly articles.

6. **Interdisciplinary Learning:** cost accounting relevance extends beyond the accounting department, intersecting with fields like economics, business management, and industrial engineering. This interdisciplinary approach not only enriches students learning experiences but also fosters a more comprehensive understanding of business operations from multiple perspectives.

7. **Certification Preparation:** for students aspiring to obtain professional certifications such as the CPA (Certified Public Accountant), cost accounting is integral. It not only forms a significant part of the curriculum but also prepares students for the complex financial problem-solving required in their professional exams and future careers.

By highlighting these aspects, the text elucidates the pivotal role of cost accounting in shaping competent, versatile business professionals and informed academics. It demonstrates that cost accounting is not just a subset of accounting but a critical, expansive field that influences numerous aspects of business strategy and academic inquiry, fostering a deeper understanding of financial management within the broader

business ecosystem. This comprehensive approach ensures that students and professionals alike are well-equipped to meet the challenges of the contemporary business environment.

CHAPTER II

Distribution and Allocation of Costs According to the Activities and Processes Involved in the Transformation of a Product

The main purpose of costs is the distribution or allocation in each phase and in the activities involved in the conversion of a product or service. These costs are usually referred to as production or manufacturing costs. Their purpose is to calculate the full cost of manufacturing a good or providing a service and they are apportioned among the various stages and tasks that make up the production cycle. The key elements of production costs encompass direct material costs, direct labor compensation, indirect labor costs, as well as manufacturing overhead costs, which encompass production-related overhead and other corporate overhead costs that are allocated to production, research and development costs.

Case:

Picadilly S.A. company is engaged in the manufacture of women's shoes, the transformation of its product divides it into 3 process: A-design and cut; B-glued; C- baked; Process A has a cost of $130,000; process B has a cost of $24000 and process C has a cost of $19200; the data are of a monthly production. The volume of production of process A- design and cut, beginning delivering to process B (gluing) 60,000 units, leaving 12,000 units with 60% of advance to its finishing; process A has a cost of transformation of direct material for $ 90,000; in MOD 28,000 and in CIF

12,000; process B has a cost incurred in the transformation process of MOD$ 14,400 in labor; 9600 in CIF; in relation to the quantities produced and delivered. Process B (cut) has 36,000 units of which 24,000 units are in process and with a 40% advance in finishing. In process C with a manufacturing cost in direct labor of $12,000 and other indirect manufacturing costs of $9600; 20,000 finished units are delivered to the warehouse, leaving 16,000 units in production process with an advance of 25% of its finishing in process C.

We are asked to determine the following cost elements

Table 3

Process *costs*

	Cost Elements			Total, by Department
Processes	MD	MOD	CIF	
Design-cut	90.000,00	28.000,00	12.000,00	**130.000,00**
Gluing		14.400,00	9.600,00	**24.000,00**
Baked		12.000,00	7.200,00	**19.200,00**
Totals	90.000,00	54.400,00	28.800,00	
Sum	173.200,00			

Note: own elaboration

Analysis

According to table 1, it is revealed that the costs per process amount to $137,200.00, where the design and cutting process is evidenced with 75.06% in relation to the costs per process; it is also denoted the identification of the cost elements in each process, being the most significant the direct material that represents 51.96% in relation to the total cost.

The purpose of this chapter is the proper accounting of its costs, aimed at providing information for managerial decision making, establishing the solution in the determination of different elements and cost indicators of the company, designated as financial tools, the data provided by the company allowed the calculation of a total income of $3. 420,000.00; costs and expenses total $2,085,447.83, considering cost elements such as MPD, MOD and CIF, as well as the classification by fixed/variable and direct/indirect costs, another determining factor is the break-even point in units produced of 2,987 and monetary terms of $1,135,014.69. In this context, Picadilly makes an adequate use of resources, to the extent that the accounts imply that the institution retains about 39.02% of its income, discounting costs and expenses. The evaluation of profitability and efficient management of resources in an organization is revealed.

It is important for the reader to increase their knowledge and improve their differentiation regarding the criteria of process costing and activity-based costing systems. First, the process costing system is considered an essential tool in various industries. Its origins date back to the 18th and 19th centuries as a result of the Industrial Revolution, improving resource control up to the present day. Due to the accelerated growth of businesses, the need to control costs arose, a theory that still holds true. Its application in textile, transportation, automotive, and production

sectors has allowed for precise quantification because it focuses on identifying and measuring direct and indirect costs at each stage of production, providing a clear view of costs and allowing efficient management of available resources in continuous production. Likewise, process costing is considered an accounting methodology in order to understand and distribute the accumulated costs in each production phase.

From the perspective of activity-based costing, it is evident that it is applicable to pharmaceutical, chemical, and food factories, focusing on determining time and units produced, better treatment of indirect manufacturing costs, and activities that consume resources. It identifies defective units and losses resulting from waste with greater precision.

When delving deeper into the professional comparative analysis of process costing an activity-based costing, it can be seen that process costing yields a more realistic and higher value of expenses compared to activity-based costing. However, in social reality, profits, costs, and assets depend not only on the method or systems but rather on effective management in terms of decision-making and the influence of context, whether due to internal or external factors. Nevertheless, it is reflected that process costing provides better opportunities in terms of accounting dynamism.

With the introduction of technology and integration of machinery in production processes, there was a need to make large-scale decisions in search of operational efficiency, even more so when globalization occurred through technological communication tools, allowing for greater commercial fluidity and increased competitiveness at the business level. This led to criteria such as lean manufacturing, quality management, and operational research, reflecting a continuous evolution in decision-

making regarding the redistribution and distribution of resources, which are immersed in the organization's financial statements.

CHAPTER III

Costs and Their Elements

Costs are the values incurred by an organization for the transformation of goods or services until the product is available for sale. (Sánchez, 2015) In addition to managing the prior and concurrent control of the resources required for production, it informs about the evolution of historical costs and can generate data that will allow management to observe current scenarios, such as knowing the break- even point, or if desired, can use the cost-volume relationship to plan profits.

All costs are susceptible to classification and depend on the operational activity of the company; they are considered the fundamental basis for the correct classification of the three elements of cost. These are direct raw materials or direct materials/supplies, direct labor or known as production payroll, and indirect manufacturing costs.

The identification of costs according to their elements is important, considering there is a need to know the cost of each element that will be part of a product, as well as its valuation, being indispensable for the administrative control of operations. According to (Palacios, 2013).

Direct Raw Materials or Direct Materials and sometimes known as supplies

It is the cost of any material that becomes part of the manufactured product. These materials are easily identifiable and become an integral

part of the final product. Within this context, it can be summarized that it is the cost of any work done with the product that changes the shape, appearance, or nature of the material that enters into the product, such as:

1. Wood used in furniture manufacturing.

2. Fabric used in the making of clothing.

3. Steel used in the manufacturing of automobiles.

4. Ingredients used in food preparation.

The management of direct raw materials is important to ensure an adequate supply, control costs, and maintain the quality of the final product. This attributes to the selection of reliable suppliers, monitoring inventory levels, and optimizing production processes.

Material is considered the first cost element because without material, the transformation process, whether by stages or by order requirements, cannot be initiated, much less can manufacturing occur. According to (Molinares, 2010), the resources that are consumed, employed, or used in the production of products, in which the causation, accumulation, and allocation of costs originate and are founded, are known in the accounting and economic jargon as cost elements.

Direct Labor

Direct labor is the physical and intellectual effort that a worker applies in a production process or in a service provision, and their participation is direct. Crespo refers to the workers who directly participate in the

production process of a product or service. These workers are directly involved in the transformation of raw materials, and their work can be specifically traced in the cost of the final product.

Production payroll, on the other hand, refers to the recording and control of salaries and benefits paid to employees who are part of the direct labor in the production process. This payroll may include basic salary, overtime, bonuses, and other production-related benefits.

The management of direct labor and production payroll is important to control labor costs and ensure an adequate allocation of human resources in the production process. This involves planning and scheduling labor, monitoring labor costs, and implementing measures to improve the efficiency and productivity of workers.

Labor is considered the second element in costs because without it, the shape, appearance, or nature of the material cannot be changed, added value cannot be generated, and its utility cannot be increased. (Vicente, 2010) refers to the wages of employees during the period they are involved in the specific tasks of changing or improving raw materials or direct materials used in the manufacturing of products and that can be associated with a production group, are considered as part of the direct labor force.

Indirect Manufacturing Costs

Indirect manufacturing costs, also known as manufacturing overhead or indirect production costs, are the costs related to production that cannot be directly attributed to a specific product. These costs are not directly related to raw materials or direct labor but are necessary for the manufacturing process.

The management of indirect manufacturing costs is important for controlling and optimizing production-related expenses and ensuring an adequate allocation of costs to the final products. This involves monitoring and controlling expenses, identifying areas for improvement, and implementing measures to reduce indirect costs where possible.

All other manufacturing costs are classified as the third element, and it is a cost in which generally other determined costs, such as materials, are incurred, which are applied and executed in the transformation until reaching the finished product. Therefore, a workplace must be furnished, tools provided, work supervised, and numerous other costs incurred before it is possible to work with the raw material available. According to (Olivares, 2017), if the production process requires the intervention of supervisors, machinery that depreciates, keeping the production plant clean, paying the rent for the premises, etc., without these expenses production would not be possible or would not meet the requested standards.

Indirect Material. Includes all materials not used as an immediate part of the product being manufactured. Examples can include supplies, such as lubricants used on machinery, electric light bulbs, sandpaper, needles, fuel oil, coal, electricity consumption.

Occasionally, it is necessary to include under this heading materials used in such small quantities that it is impossible to charge their cost directly to the product. An example is the thread used to sew signatures in books during binding.

Indirect Labor. Includes all supervisory, recording, and assistance work not directly employed in the manufactured product. Among these costs are the wages of foremen, cleaning personnel, truck drivers, unskilled

apprentices, cost department employees, reception department employees, warehouse staff, and others similar. This element also includes, even though frequently shown separately in the financial statements, the salaries of executive officers of the factory, such as the manager, superintendents, purchasing agents, engineers, and others. In some industries, there are also types of direct labor where the time required on an order is so small that it cannot be charged to one specifically and can only be absorbed into the cost of products by classifying it as indirect labor.

Other Indirect Costs. Are all those not caused by the manufactured product but generally benefit the entire plant or part of it. Among them are electric light and power, telephone, water supply, repairs, insurance, and similar others. A new subdivision of indirect costs includes fixed charges necessary for the protection or maintenance of the capital invested in industrial properties, such as depreciation, insurance, and taxes. Considered as other costs necessary in the operation of the factory, but of a general nature so that they can be charged directly to the product cost.

For the readers understanding, the identification of accounts that make up the cost elements according to the company activity is proposed. For this purpose, case one is presented: Crespo SAS, a company dedicated to providing higher education services, which provides the following information generated as a result of the aforementioned company operations.

Supplies: markers, reams of paper for teaching classes, part of the Direct Material element.

Electricity consumption: part of the Direct Material element.

Payment for classroom rent: part of the Direct Material element as physical structure necessary for teaching classes.

Payment for office supplies: part of the Indirect Material element.

Payment to teaching staff under employment relationship, part of the element Direct Labor.

Payment for maintenance and repair of computer equipment: Direct Labor, for laboratory or virtual classes.

Administrative staff: secretary, security guards, statistics: part of the Indirect Labor Element.

Payment of fiscal taxes: part of the element Other Indirect Manufacturing Costs.

Payment of patent: part of the element Other Indirect Manufacturing Costs.

Next, case two is presented, based on the identification of cost elements. Rebcres Cia. Ltda., a company dedicated to contracting medical services, has the following information.

Supplies: anesthesia, part of the element: Direct Material.

Payment of professional fees: to doctors, part of the element: Direct Labor.

Payment for contracted services or professional fees: anesthesiologists for operation processes, part of the element: Direct Labor.

Acquisition of office supplies: ream of paper, for scheduling appointments, medical certificates, part of the element: Indirect Material.

Payment of salaries to administrative staff: secretary, messenger, cleaning, security guard, part of the element: Indirect Labor.

Payment of property taxes: Other Indirect Manufacturing Costs.

Payment of patent: part of the element Other Indirect Manufacturing Costs.

Payment of fiscal taxes: part of the element Other Indirect Manufacturing Costs.

Finally, a third case is presented for quality services in medical laboratory testing, allowing for an increase in knowledge regarding the identification of cost elements according to the company activity and therefore the nature of its elements in the provision of quality services.

Staff training and development: part of the Direct Labor element.

Quality management expense: Supplies, part of the Direct Material element.

Failure prevention expense: physical monitoring, part of the Direct Labor element.

Payment for equipment maintenance: temporary staff, part of the Direct Labor element.

Payment for equipment calibration: temporary staff, part of the Direct Labor element.

Payment of salaries to laboratory technicians: part of the Direct Labor element.

Payment of salaries to company administration: part of the Indirect Labor element.

Audits of the quality system and departmental performance: part of the Indirect Labor element.

Payment for tracking and monitoring customer satisfaction level: part of the Indirect Labor element.

CHAPTER IV

Classification of Cost Elements

The classification into direct and indirect costs is important because it provides the means to charge costs to different stages of production. Proper classification of costs is essential in business management, as it offers a clear view of how financial resources are distributed and allows for focused decisions to improve efficiency and profitability. In this scenario, it is indispensable to clarify that direct and indirect costs are part of the elements of the production cost and can be subclassified into direct and indirect costs.

Direct Charges. Direct costs are those incurred first and can be identified as part of the cost of a specific product. These costs are incurred directly in the production process. The manufacturer in the manufacture of a particular product can easily charge at the time of identifying or quantifying the cost of a specific product. Other direct costs might include special tools used exclusively for that product.

Indirect Costs. Are of a more general nature, which is complex, but not impossible to identify as a fundamental part of the cost of a specific product, but without which the latter could not be manufactured. Indirect costs that must be allocated and mainly distributed to the product, using approximate equitable methods. According to (Montoya, 2010), they can be known for the entire factory but cannot be identified for each department, therefore, they are called Indirect. For example, the consumption of electricity can be known for the entire factory; however, it cannot be identified for each department.

1. Rent or lease expenses of the production plant.
2. Maintenance and repair costs of machinery and equipment.
3. Electricity and water expenses used in the production process.
4. Depreciation costs of machinery and equipment.
5. Insurance and security expenses in the production plant.
6. Administrative expenses related to production.
7. Telephone, when its activity does not depend on the service consumption.
8. Water, as long as its activity does not depend on the consumption of the mentioned item.
9. Electricity, as long as its activity does not depend on the consumption of kilowatts.
10. Depreciation of buildings.
11. Machinery depreciation.
12. Insurance.
13. Property taxes.

Table 4

Classification of cost elements according to their identification and behavior, this is an example of a transportation services company.

CLASSIFICATION OF COST ELEMENTS IN TRANSPORTATION	VARIABLES	FIXED	DIRECT	INDIRECT
MPD				
TICKET PAPER	$0,32000000		$0,32000000	
PRINTER INK	$0,08515800		$0,08515800	
FUEL	$1,60000000		$1,60000000	
ELECTRIC POWER		$0,23418400	$0,23418400	
INTERNET		$0,07451300	$0,07451300	
MOD				
CHAUFFEURS	$0,02000000		$0,02000000	
HOSTESSES	$0,01777990		$0,01777990	
CIF				
CLEANING SUPPLIES				
DETERGENT	$0,00711068		$0,00711068	
CHLORINE	$0,19160518		$0,19160518	
COVERS	$0,01064473		$0,01064473	
REFRIGERATORS	$1,34123624		$1,34123624	
GARAGE		$0,15967098	$0,15967098	
HOSPICE		$0,60674973	$0,60674973	
VEHICLE CLEANING	$0,31934196		$0,31934196	
PIURA-TUMBES COUPLERS	$0,95802589		$0,95802589	
LUGGAGE LOADER	$0,06386839		$0,06386839	
VEHICLE MAINTENANCE AND SPARE PARTS	$0,42578928		$0,42578928	
MOI				
SECRETARY, ACCOUNTING ASSISTANT, BOOKKEEPER, ACCOUNTANT, COLLECTION, CALL CENTER, DISPATCHERS, PARCEL DELIVERY		$0,02960000		$0,02960000
OTHER CIF				
DEPRECIATION		$2,68162792		$2,68162792
DEPRECIATION		$0,01209629		$0,01209629
SUM OF UNIT COSTS	**$5,36000000**	**$3,80000000**	**$6,44000000**	**$2,72000000**
UNIT COST	**$9,16000000**		**$9,16000000**	

Note: own elaboration

Departmental costs

Once the cost elements have been classified into direct and indirect, the latter can be subclassified into departmental costs. An industrial establishment, as indeed any enterprise, can easily be visualized as several separate departments of operations, each of which has certain characteristics that distinguish it from the others. Indirect costs are caused by the operation of these departments. Logically, indirect costs can be classified according to the departments that cause them. Once this is done, when the result is combined with the departmental direct labor, the operating cost of each department is obtained. The principle of departmental costs is one of the distinctive features of cost accounting and makes possible the allocation of indirect costs to the different products manufactured.

1. Direct costs.
2. Indirect costs.
3. Other indirect costs.
4. Fixed costs.
5. Variable costs.
6. Mixed costs.
7. Discretionary costs.
8. Relevant costs.

CHAPTER V

Costs Focused on Decision Making by Means of Mathematical Tools Through the Application of Formulas that Contribute to Management Direction

To make informed decisions in management using mathematical tools, it's crucial to understand various cost concepts and how they are calculated. Here are key terms and their formulas:

Unit Cost: The total cost incurred to produce, store, and sell one unit of a product or service.

Total Cost: The sum of all costs associated with the production of a good or service.

Unit Fixed Cost: The fixed cost per unit produced.

Total Fixed Cost: Costs that do not change with the level of production.

Unit Variable Cost: The variable cost per unit produced.

Total Variable Cost: Costs that change in proportion to the level of production.

Economic Profit: The difference between total revenue and total costs, including both explicit and implicit costs.

Margin Percentage: The percentage of revenue that exceeds the cost of goods sold, showing the profitability of the product.

Profit Margin: The amount by which revenue from sales exceeds costs in a business.

Break-even point where revenues equal costs and expenss

The break-even point, in financial and accounting terms, is the point at which a company's revenues are equal to its costs and expenses, meaning there is neither loss nor gain at that level of activity. In other words, it is the midpoint where an entity is neither generating profits nor incurring losses, however, it remains economically active.

Case 1: to calculate the break-even point where my revenues equal

ACADEMIC S.A., its economic activity is providing higher education services, with a monthly fee per career of $300; the Economics career with 51 students; Law with 302 students; Accounting has 100 students, Logistics and Transport 94 students, and Foreign Trade 57 students.

Under an employment relationship, there are 50 full-time teachers with an average salary of $1,600.00 each and 15 part-time teachers with a salary of $800.00 each; its administrative staff in the financial department, library, cleaning, and concierge are 17 with an average salary of $600; Social Benefits expenses $24,220.90; employer contribution expenses amount to $12,417.30; classroom rental expenses for teaching are

$17,200 monthly; electricity consumption is $19,000.00; office supplies for the printing of partial evaluations are $400 monthly; cleaning and sanitation supplies in classrooms amount to $300.00; water cooler expenses $200.00; additionally, there is maintenance and repair payment of $400.00; Payment for security guard services $1,400.00; for advertising $120; financial interest expenses $310.65; for straight-line depreciation $1350; amortization $1,111.11; taxes and contributions $330.04; municipal properties $200; and drinking water consumption $40.00. The SP (Selling Price) is $380.00 for each service.

Development:

- Revenues=Sales price*Q
- Expenses=Costs+total expenses
- Pto of EQ=revenues-costs-expenses
- Pto of EQ=181,200-181,200
- Pto of EQ=0

According to the application of the break-even point in the equality of its revenues, costs, and expenses, it could also be asserted that the revenues and its expenses generate a profit of zero.

Case 1A: break-even point by equation

Crespo Company dedicated to the production of Nike shoes for men with a selling price of $199 USD, whose direct material costs represent 75.025126% in relation to the SP. Its direct labor is 20.603015% of the

SP; and the indirect manufacturing costs (IMC) amount to $8.70; of which $5 USD correspond to fixed and $3.7 USD correspond to variable IMC. The quantities produced covered their production capacity reaching a level of 3000 units. It is requested to determine the break-even point equation.

Table 5

Breakeven point by equation

DESCRIPTION	CU	Q	CT
MD	149,300001	3000	447.900,00
MOD	40,9999999	3000	123.000,00
CIF. Fijo	5	3000	15.000,00
CIF variable	3,7	3000	11.100,00
Pv	199	3000	597.000,00

Note: own elaboration

- Revenues=Sales price*Q
- Expenses=Costs+total expenses

- *Equation Pto* $\frac{Revenues}{Costs + expenses}$ 597.000,00/597.000,00

Analysis

According to the application of the break-even point in the equality of its revenues, costs, and expenses, it could also be asserted that revenues have the capacity to cover its costs and expenses just once.

Break-even point in terms of quantity produced

The break-even point in terms of quantity produced refers to the level of production at which a company equals its total costs (fixed and variable costs) with its total revenues. At this point, the company does not make a profit nor incurs losses, as the revenues generated from the sale of the products or services are exactly equal to the costs associated with the production and sale of those products or services.

Case 2: to calculate the break-even point in terms of quantity produced

After an exhaustive analysis regarding its revenues, costs, and expenses, ACADEMIC S.A. applies continuous improvement for the elimination of wastes and the identification of Throughput or bottleneck, as well as the identification of service constraints, avoiding slack in execution in attention.

Likewise, it is established as an internal policy to hire personnel of a certain age, attributing that they are dynamic personnel, after a few months of testing it was proven that age does not affect their functions, on the contrary, it generates skill and abilities complementing by having highly competitive personnel due to their experience.

To this end, policies were established in relation to changing suppliers generating a decrease in costs and complying with the same characteristics of inputs or raw materials, likewise, amounts in adjustable expenses were reduced, achieving profitability margins.

The mentioned company reduced up to 25% expenses on office supplies, classroom cleaning supplies, maintenance and repair, purchase of water coolers; advertising expenses. In addition, the advertising staff and the advertising broadcaster were changed, as a result, enrolled students increased, this attributes to the company establishing percentage profitability margins of 18.20669431%

The following formula can be used:

Equilibrium Point Q = Fixed Costs / (PV- CVu)

- $PEQ = Total\ Fixed$
- $PEQ = 376{,}347359 \quad \dfrac{1. \qquad Costs}{Monthly\ Income - Unit\ Variable\ Costs}$

Where:

Fixed Costs are expenses that an organization must pay regardless of its level of production or sales, such as rent, fixed employee salaries, and asset depreciation costs.

Unit Selling Price is the price at which a product or service is sold

Unit Variable Cost is the cost directly associated with the production or sale of the product or service. It includes materials, labor and other costs

that depend on the volume of production and this generates a behavior within its classification as variable costs.

Once the break-even point is calculated in units, the necessary units of a product or service that must be produced and sold to cover all costs and expenses are known. In other words, it is the starting point where the microentrepreneur needs to know from which units produced he will start to earn or lose.

It is important to note that the company exceeds the break-even point in terms of quantity, generating profits, since the income obtained from the units produced exceeds the total costs. On the other hand, producing and selling fewer units than needed for the break-even point originates losses. Therefore, the break-even point is a fundamental concept for financial management and business decision making.

Case 3: break-even point in terms of monetary value per revenue

Breakeven point $ = Fixed Costs /1- (CVu/PV)

Break-even point in monetary terms = $112,904.21

Contribution Margin.

The Contribution Margin ratio is the portion of each monetary unit obtained in sales that is left over after deducting variable costs. That is, the amount available from each monetary unit sold to cover fixed costs and then generate profits.

MCUB(PV-CVu)

Case

Crespo Company whose activity is to provide higher education services, acquires office supplies on offer whose reams on offer are at 3.70 so it has to decide whether to buy the 1000 boxes that are in that condition $3700. The delivery of the supply is at the institution.

For this you need to occupy a classroom because you do not have space for storage. However, it is necessary to consider that the value that is paid for monthly lease of 57 offices including classrooms is $ 7000 monthly. How much does it correspond to him for that occupied classroom.

What would your cost be?

Is it convenient for you to buy at normal price according to your needs at a value of $4.00.

Pdta. The average monthly consumption of reams in the institution is 20 reams.

Determine the time over which the reams will accrue. The savings generated by having amortized money.

Development of the case

1,000 Ream units
3.7 cu
3,700.00 Total cost
7,000 Amount paid for office lease
57 # of offices
$122.81 cu. in relation to # of offices

$122,81
1,000 Ream units
0.1228070 cu in relation to ream units.

Resolution:
3.70 cost per ream
0.12 lease unit cost
3.82 actual unit cost
4.00 is the unit cost per ream without discount
=0,177193
*1,000 reams
$177,19298245614
1,000 ream units
20 Q average consumption
50 # of months in which the 1,000 reams will be consumed 50 months means 4 years and 2 months

Free Costs

It refers to the capability of the “seller” to deliver their product to the “buyer” without charging any money. There can be various reasons for this occurrence.

Zero pricing is healthy when the cost is also zero, and this can exist when labor is minimized via technology, when demand equals necessity, and when labor compensation is the right to acquire what is needed, not money.

Consumer

The optimal scenario for the consumer is to choose the best option among

alternatives. This curve is reflected between the budget constraint line and the indifference curve where the chosen option lies. To understand what lies behind the reaction to zero cost or the free effect, it is necessary to outline the theoretical model of zero cost and its operation in consumer purchase preferences.

Reactions to price, or the act of purchase, are based on another type of behavior related to a greater attraction to products at zero cost.

According to (Ariely, Gneezy, Haruvi, etc.), empirical results can be found demonstrating the existence of special zero-cost models for explaining consumer reactions to a zero price within the offered products or services.

The Free Effect

It implies that in the face of a product offered for free, consumers tend to overreact to this price, beyond preferences and even the intrinsic need to acquire and consume said product.

It is produced by the existence of a zero price that provides an added appeal to the product, even greater than the appeal presented by a product with a significantly low but positive price different from zero.

This added appeal of zero cost causes consumer preferences to change irrationally, and they do not react according to what standard economic theory proposes.

Unexpected References

The zero-cost model refers to unexpected reactions from consumers, who are willing to select and acquire a product at zero cost or for free,

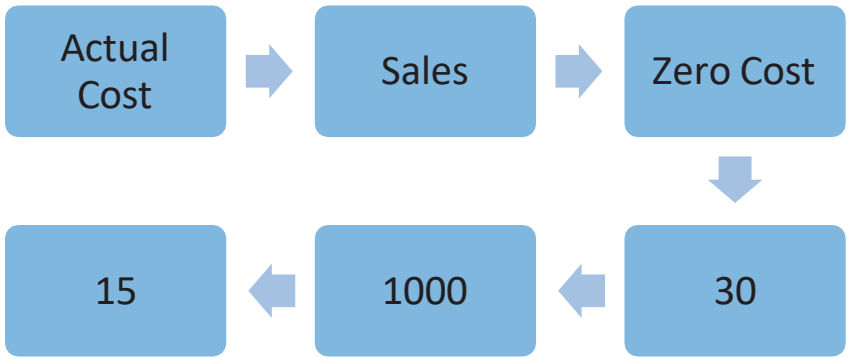
even if it means not acquiring a product for which they had a marked preference, but at a positive price different from zero.

Decision-Making Model

Throughout history, those tasked with analyzing consumer behavior have been concerned with discovering the factors that influence the making of a purchase or activity. Such behavior includes not only the decision-making moment but also all the characteristics associated with the experience that involves the use or consumption of the product or service. The outcome generated by this decision is absolutely associated with changes that occur in people's attitudes or feelings, such as: satisfying a need, increasing belonging in a group, entertainment, freedom of expression, etc.

Figure 1

Diagram of zero cost behavior

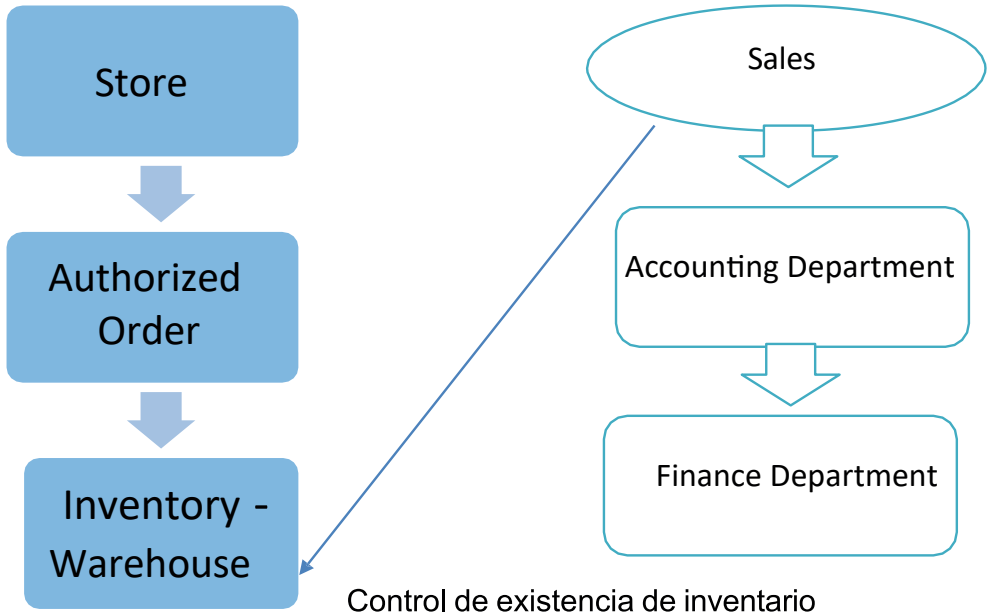


Analysis.

The actual cost is 15, but the zero cost represents 100% of the cost.

Figure 2

Zero cost business control



According to is a proposal for strengthening management skills is the current market and organizations have multiple interdependent factors that determine success. Companies are currently experiencing difficulties in the projections and measurement process. In remote times financial indicators were reliable tools for companies that wished to project into the future, (Sanchez, 2014). A successful or unsuccessful company depends on a group of people working in them as managers and having responsibility as a primary point. Every human team must innovate, interrelate, be committed to the company and have a global vision, which is essential when it is necessary to adopt a new management

methodology. Now another way for a company to succeed or fail refers to the competences, the acquired knowledge and application in the practical managerial exercises, this motivates the human team with a horizontal communication promoting in them the integration of the business objectives, with this the managers manage to promote inside the company the behavior and managerial abilities and managing to promote the human talent, the individual and group competences.

CHAPTER VI

Contribution to the Measurement of Profits Through the Direct or Variable Cost Valuation Methods and Absorption Costing

The continuous struggle of ecuadorian companies to be profitable, competitive, and sustainable is a constant concern, where they establish and implement accounting, administrative, and financial strategies. From this arises the need for reliable information, which allows appropriate action at both an internal and external level. In this context, valuation methods such as direct or variable and absorption are presented.

A lack of knowledge generates a series of difficulties in their application and understanding that limits action or leads to misguided or untimely decision-making. Therefore, we will review the theoretical part and practical cases presented, being able to determine when they are applied, how they are applied, according to their activity, without forgetting their relationship with accounting and tax regulations.

The allocation of indirect manufacturing costs to products is carried out through the use of costing methods, such as absorption costing or activity-based costing. These methods allow the equitable distribution of indirect costs among products based on some criteria, such as machinery usage time or energy consumption.

Standard Cost

Calculation, analysis, and variations

One of the purposes of using standard cost is to assist management in controlling production costs.

Absorption or Total Costing

Includes in the cost of a product the total manufacturing costs regardless of whether they are variable or fixed. The basis of this method is that these types of costs are needed to manufacture a product, while administrative and sales expenses (variable and fixed) are taken to results in the corresponding period.

Absorption costing means that fixed manufacturing overheads are inventoried, while direct or variable costing means that fixed manufacturing overheads, also expressed on a per-unit basis and absorbed as a product cost at the same time as the variable manufacturing overheads. In direct costing, inventories are not considered, for better understanding the different costing methods are detailed below.

Normal Absorption Costing. Includes actual manufacturing costs such as direct materials, direct labor, plus fixed and variable manufacturing overheads applied, using predetermined rates related to actual input hours.

Standard Absorption Costing. Includes predetermined manufacturing costs plus predetermined fixed and variable overheads.

Normal Direct Costing. Includes actual manufacturing costs, plus applied variable manufacturing overheads, using predetermined rates multiplied by actual input hours, excluding fixed manufacturing overheads.

Standard Direct Costing. Includes predetermined manufacturing costs, plus predetermined variable factory overheads, excluding fixed manufacturing overheads.

Generally, absorption costing is much more used than direct costing, although the focus on distribution in performance measurement and internal cost analysis has led to the application of direct or variable costing.

Opponents of direct costing argue that inventories should carry a fixed cost component, because both fixed and variable costs are necessary to produce finished goods, both costs should be inventorable, regardless of the differences in their behavior patterns, however, today there is approval of the inventory valuation system such as the method

Direct costing known as variable (marginal) costing, because it essentially applies to the product, only the variable production costs, such as direct raw materials, direct labor, plus variable manufacturing overheads. Manufacturing indirect costs and operating expenses (administrative and sales, fixed and variable), must be taken to the period facing the revenues generated in it.

Generally, there are different criteria regarding the need to differentiate between the behavior patterns of fixed and variable costs for planning and administrative control.

Proponents of direct costing argue that fixed manufacturing costs correspond to the installed plant capacity, within a relevant range, but being fixed, they do not depend on the volume of production, therefore do not vary as do other costs.

Direct costing has an impact on net profit, different from absorption costing, because fixed manufacturing overheads are considered as a period cost, which is charged directly against revenues and not as a product cost, assigned to the produced units, which are equal to the sold units.

Difference Between Direct-Variable and Absorptive Costing Methods

The difference between the costing methods lies in that variable costing does not assign fixed production costs to product inventories, while absorption costing does, therefore, these costs are inventoriable within the product cost and in determining the unit manufacturing cost. On the other hand, the way of presenting the information in the income statement is different in both methods. In variable costing, income is derived from variable costs and expenses of sales, obtaining the contribution margin, from which total fixed costs and expenses are deducted, resulting in operating profit and subsequently net profit deriving worker participation and income tax. While absorption costing deducts from the revenues the production costing whether fixed or variable, of the sold products, determining the gross profit and for this there are derived the administration and sales expenses whether fixed or variable and the result of them will be the operating profit, therefore, variable costing uses a marginal contribution format and the absorptive one a gross margin.

Another contrast to reveal from the methods is that profits can be changed with increases or reductions in inventories and according to the method used. For example, the profit will be higher in variable costing if the units sold are greater than the units produced, this is because it will have more income to cover a constant amount of fixed costs; on the other hand, in absorption costing the profit will be lower because

by selling the quantity that has been produced or facing the inventoried fixed costs from past periods, coming from the inventory units that are being sold, against present income, for the opposite to happen, fewer units than those produced must be sold, to thus store in inventories fixed costs and not deplete present incomes, in variable costing there will be less income, to cover the same amount of fixed costs. If the sales of the production are equal and no final inventories are determined, both methods will reflect the same profit, that is, there will be no variation.

Adjustments for capacity under the absorption method

When the company has an established plant, it can produce at its maximum capacity, where its fixed costs are identified, achieving or not its production at its top level. Where there are missing produced units that support their fixed costs, their corrective is carried out through adjustment, that has the difference of the units of plant capacity and of the actual production achieved, multiplied by the unit fixed cost or the (total fixed costs/maximum production capacity in units), to accrue and reveal it in the Income Statement when it did not reach its maximum capacity, and in the case of exceeding its maximum capacity it should be added.

This context allows clarifying that. Under the variable method, this adjustment is not made, because all fixed costs are faced to the period, regardless of whether the maximum production capacity is covered or not, and of course, there will always be the mentioned costs.

Generally, the small and medium entrepreneur does not reach the maximum production capacity, however, they focus on determining the cost of sales by difference of formulas and in them is immersed the total fixed cost, then it is adjusted indirectly, but to a negligible unit fixed cost.

Another relevant aspect is that it does not allow the analysis period by period of how much the percentage of the installations in the plant are actually being used in manufacturing and thus determine if there are fewer possibilities of units to produce or establish the capacity fluctuates inevitably, but immersed in the production process, as well as the defaults by default in an x number of produced quantities.

Application of IFRS and Impact on the Tax Scope

IFRS 2 leads us to the correct way to cost inventories under the absorptive or total method. In this standard by not mentioning variable costing, it is understood that such costing does not necessarily contemplate the accounting standards for its realization and that its information is internal and that due to its variability of cost behavior, it is fundamental for planning control and adjustable correctives to Analysis

According to the application of the break-even point in the equality of its revenues, costs, and expenses, it could also be affirmed that the revenues have the capacity to cover their costs and expenses just once.

Break-even Point in Terms of Quantity Produced

The break-even point in terms of quantity produced refers to the level of production at which a company equates its total costs (fixed and variable costs) with its total revenues. At this point, the company neither makes a profit nor incurs a loss, as the revenues generated by the sale of products or services are exactly equal to the costs associated with the production and sale of those products or services.

Case 2. To calculate the break-even point in terms of quantity produced

After an exhaustive analysis regarding its revenues, costs, and expenses, ACADEMIC S.A. applies continuous improvement for the elimination of waste and the identification of Throughput or bottleneck, as well as the identification of service constraints, avoiding slack in execution in attention.

Likewise, it is established as an internal policy to hire staff of a certain age, attributing that it is dynamic staff, after a few months of testing it was proven that age does not affect their functions, on the contrary, it generates skill and abilities complemented by having highly competitive staff due to their experience.

For this, policies were started to be established in relation to changing suppliers generating a decrease in costs and complying with the same characteristics of inputs or raw materials, likewise, amounts were reduced in adjustable expenses, achieving profitability margins.

The mentioned company reduced up to 25% office supplies expenses, classroom cleaning supplies, maintenance and repair, purchase of water coolers; advertising expenses. In addition, the advertising staff was changed, and the advertising broadcaster, as a result, increased enrolled students, this attributes to the company establishing percentage profitability margins of 18.20669431%.

The following formula can be used:

Free Costs

It involves the capacity of the “seller” to deliver their product to the “buyer”

without charging any money. There can be various reasons for this to happen.

Zero pricing is beneficial when the cost is also zero and this can exist when labor is minimized via technology, when demand equals need, and when the compensation for labor is the right to acquire what is needed and not money.

Consumer

Optimally, the consumer should choose the best option among alternatives. This curve is reflected between the budget constraint line and the indifference curve where the chosen one lies. To understand what lies behind the reaction to zero cost or the free effect, it's necessary to outline the theoretical model of zero cost and its operation in consumer purchase preferences.

Reactions to the price, or the decision not to purchase, are based on another type of behavior related to a greater attraction to products at zero cost.

According to (Ariely, Gneezy, Haruvi, etc.), empirical results demonstrate the existence of special zero-cost models to explain consumer reactions to a zero price within the offered products or services.

The Free Effect

It implies that in the face of a product offered for free, consumers tend to overreact to this price, beyond preferences and even the intrinsic need to acquire and consume the mentioned product.

This is caused by the existence of a zero price that adds an additional appeal to the product, even greater than the appeal of a product with a significantly low but positive price different from zero.

This additional appeal of zero cost causes consumer preferences to change irrationally, and they do not react according to what standard economic theory proposes.

Unexpected References

The zero-cost model refers to unexpected reactions from consumers, who are willing to select and acquire a product at zero cost or for free, even if it means not acquiring a product for which they had a marked preference, but at a positive price different from zero.

Decision-Making Model

Throughout history, those analyzing consumer behavior have sought to discover the factors influencing making a purchase or activity. Such behavior includes not only the decision-making moment but also all the characteristics associated with the experience of using or consuming the product or service. The outcome generated by this decision is absolutely associated with changes in people's attitudes or feelings, such as satisfying a need, increasing belonging to a group, entertainment, freedom of expression, etc.

Tabla 6

Absorptive Costing

Valuation method under the Absorbing Costing Method ACTO S.A. Company Income Statement Cut off as of December 31, 202			
Sales			300.000,00
Cost of Goods Sold			180.000,00
Initial Merchandise Inv.	0,00		
Production	216.000,00		
Available for sale	216.000,00		
Final Inv. (200 pcs*180)	36.000,00		
Cost of Goods Sold		180.000,00	
Gross Profit			120.000,00
Operating Expenses			50.000,00
Variable selling expenses per unit	20.000,00		
Fixed administrative expenses	30.000,00		
Total operating expenses		50.000,00	
Operating Profit			70.000,00
Employees' Statutory Profit Sharing			10.500,00
Income before taxes			59.500,00
Current income tax			14.875,00
Income for the year			44.625,00

Note: own elaboration

If your units produced are greater than the units sold, i.e. you would have a variation in your profit, under the absorption method your profit will be greater.

Tabla 7

Direct or Variable Costing

Valuation method under direct or variable costing

Crespo S.A. Company
Income Statement
Cut-off as of December 31, 2023

Sales			$300.000,00
Cost of Sales			$80.000,00
Initial Inv. of Merc.80)	$-		
Production (1200*80)	$96.000,00		
Available for sale	$96.000,00		
Final Inv. of Goods (200 pcs*80)	$16.000,00		
Cost of Goods Sold		$80.000,00	
Gross Profit			$220.000,00
Variable selling expenses x units $20 x cu cu sold			$20.000,00
Gross contribution margin			$200.000,00
Cost for the period			$150.000,00
Total fixed costs for the period	$120.000,00		
Administrative Expenses	$30.000,00		
Total fixed costs and expenses for the period		$150.000,00	
Operating profit			$50.000,00
Employees' profit sharing			$7.500,00
Income before taxes			$42.500,00
Income tax			$10.625,00
Income for the year			$31.875,00

Note: own elaboration

If its units produced are larger than the units sold, it would have variation in its under the variable or direct method its utility will be lower.

Table 8

Variation between the Absorbent method and the Variable method.

Absorption Method	Final Inventory Q	*	Unit cost	Final inventory in monetary terms
	200		180,00	36.000,00
Variable or Direct Method	Final Inventory Q	*	Cvu	Final inventory in monetary terms
	200		80,00	16,000,00
Variation in unit costs	Final Inventory Q		Cvu	Final inventory in monetary terms
	200	*	100,00	**20.000,00**

Note: own elaboration

Analysis

If there are initial or final inventories then there is variation in their utility, as shown in the variation table.

Case 2. When their produced units are equal to their sold units.

Company ACTO S.A. dedicated to the manufacture of lenses, needs the financial chief officer to provide information in which it is demonstrated the cost of sale, the final inventory and the utility, applying the methods of direct or variable cost and absorbent cost. Its total production capacity is 1,200 units, its units sold were 1,200; its unit cost is $100; unit cost variable is $80.00; sales commissions are $20 per unit sold, fixed administration costs are $30,000.00; It has no initial and final inventory of merchandise.

Table 9

Absorbent coastline

Assessment method under Costeo Absorbente Empresa ACTO S.A. Statement of Results Cut as at 31 December 2023		
Sales		300.000,00
Sales Costs Inventory of Commodities *180) Production (1200*180)		216.000,00
Available for sale	-	
End of Commodity 200 units*180)	216.000,00	
Cost of sale	216.000,00	
Gross utility	-	
Operating expenses	216.000,00	
Variable sales costs per unit 20 per unit sold		84.000,00
Fixed administrative expenses		50.000,00
Total operating costs	20.000,00	
Operational Utility	30.000,00	
Workers' participation	50.000,00	
Utility before taxes		34.000,00
Income tax		5.100,00
Usefulness of the exercise		28.900,00
Sales		7.225,00
Sales Costs Inventory of Commodities *180) Production (1200*180)		21.675,00

Note: own elaboration

According to table 9, under the absorption valuation method its utility is $21.675,00. It is indicated that there is neither final inventory nor the initial inventory of merchandise.

Table **10**
Direct *Coast*

Assessment method under Costeo Absorbente Empresa ACTO S.A. Statement of Results Cut as at 31 December 2023			
Sales Sales Costs Inventory of Merchandise *80)			300.000,00
Production (1200*80)			96.000,00
Available for sale	-		
End of sale. 200 units*80)	96.000,00		
Cost of sale	96.000,00		
Gross utility	-		
Variable sales costs in units 20 per c/u sold		96.000,00	
Gross contribution margin			204.000,00
Period Cost			20.000,00
Cost Fixed Total Period			184.000,00
Administrative expenses			150.000,00
Total Costs and Fixed Expenditures of the Period	120.000,00		
Operational Utility	30.000,00		
Workers' participation Utility before taxes		150.000,00	
Income tax			34.000,00
Usefulness of exercise.			5.100,00
Sales			28.900,00
Sales Costs Initial Inventory of Merchandise *80)			7.225,00
Sales Sales Costs Inventory of Merchandise *80)			21.675,00

Note: own elaboration

According to table 10, under the Direct valuation method its utility is $21,675,00, it is indicated that there is no final or initial inventory of merchandise. If the produced units are equal to the units sold then their usefulness would not be affected, therefore, it would be the same.

CHAPTER VII

Variability of Estimated Costs and Actual Costs

In the seventh chapter, the variability between estimated and actual costs is established, where the cash balance revealed through the master budget serves as a basis for cost control. This budget demonstrates future cash flows from operational activities, which help determine the feasibility of a project relative to its investment. A budget is a financial statement that displays anticipated revenues and expenses under specific forecasted operating conditions. Its purpose is to guide management in the control and direction of an entity's operations. It can be integrated into the accounting system, although it is generally used as a statistical document prepared for comparing actual costs against estimated costs.

A budget is considered an estimation of future operations, encompassing all business activities. It is prone to errors and must always be subject to revisions in response to the needs of the business, taking into account external factors that generally affect the organization's liquidity. From this arises the need for adjustments to reverse situations or reduce costs.

The implementation of a budget provides direction and controlled action by the management of the entity, as it sets goals to be achieved and avoids random outcomes. When a budget is structured, it involves all the departments within the company and is established with achievable outcomes. For instance, when a budget projects an increase in sales, all staff are involved in meeting these targets. Similarly, with an expense budget, all employees must adhere to their spending limits.

This is considered in relation to the resources available and planned in accordance with their working conditions.

Budgets are useful in cost accounting as they allow for more accurate setting of standards for operational expenses based on management directives and anticipated estimates. Budgets are also beneficial when implementing a new cost system due to the acquisition of information regarding expenses that would otherwise go unnoticed.

Similarly, an established cost system is valuable in preparing a budget because of the detailed expenditure reports it provides. This detailed accounting helps in the precise control and strategic planning essential for effective financial management within an organization.

Table 11

Coefficient Cost

Variation of actual finished production of materials	6.837,50	**1,22921 CC**
Estimated coefficient of finished production of materials	5.562,50	
Variation of MOD's actual finished output	1.230,00	- **0,19743 CC**
Estimated MOD finished production coefficient	6.230,00	
Real CIF finished output variation	2.365,00	**0,88577 CC**
Estimated coefficient of finished production in CIF	2.670,00	

Note: own elaboration

Table 12

Default or estimated, projected Variation Determiner of Produced Costs

Details	Units	Unit Cost	CT	Coefficient Cost	Corrected coefficient	Adjusted Cost	Adjusted Total Cost	Variation
MPD	2000	2,5	5000	1,2292135	3,07303371	5,5730337	11.146,07	6.146,07
MOD	2000	2,8	5600	- 0,197432	- 0,55280899	2,247191	4.494,38	- 1.105,62
CIF	2000	1,2	2400	0,8857678	1,06292135	2,262921	4.525,84	2.125,84
Total	**2000**	**6,5**	**13000**			10,083146	20.166,29	**7.166,29**

Note: own elaboration

Table 13

Diary book

Details	Must	Having
Sales Cost	7.166,29	
Cost variation of finished products		7.166,29
Vr.variation of units sold		

Note: own elaboration

Table 14

Default or estimated, projected Sales Cost Variation Determiner

Detalle	Quantity	Unit cost	Total cost projected	Coefficient Cost	Coefciente rectificador	CU Adjusted	Real Adjusted Total Cost	Variation
MPD	1800	$2,50	$4.500,00	$1,23	$3,07	$5,57	$10.031,46	$5.531,46
MOD	1800	$2,80	$5.040,00	-$0,20	-$0,55	$2,25	$4.044,94	-$995,06
CIF	1800	$1,20	$2.160,00	$0,89	$1,06	$2,26	$4.073,26	$1.913,26
CT	**1800**	**$6,50**	**$11.700,00**			$10,08	**$18.149,66**	**$6.449,66**

Note: own elaboration

Table 15

Diary book

Details	Must	Having
Sales cost of sold units	6.449,66	
Sales		6.449,66
Vr. the variation of the units produced		

Note: own elaboration

Table 16

Determiner of Cost Variation in a Default or Estimated, Projected Process

Detalle	Quantity	Unit cost	Total cost projected	Coefficient Cost	Rectifier Coefficientr	CU adjusted	Real Adjusted Total Cost	Variation
MPD	225	2,5	562,5	1,229213483	3,073033708	5,573033708	1.253,93	691,43
MOD	225	2,8	630	-0,197431782	-0,552808989	2,247191011	505,62	- 124,38
CIF	225	1,2	270	0,88576779	1,062921348	2,262921348	509,16	239,16
CT	**225**	**6,5**	**1.462,5**			10,08314607	**2.268,71**	**806,21**

Note: own elaboration

1,468,00 Total cost

806.21 Variation

2.268.71 Process Costs

Table 17

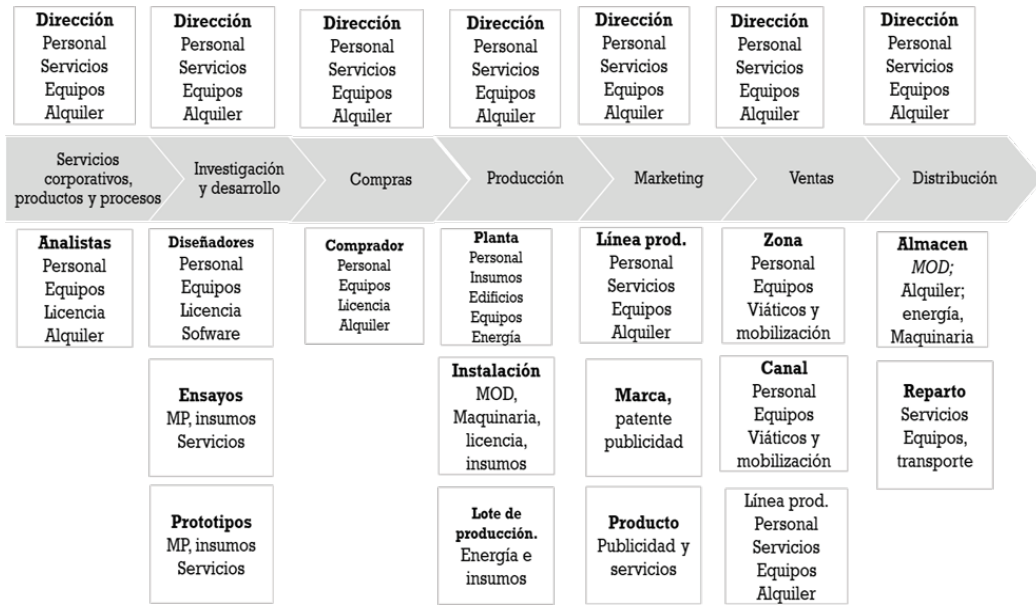
Diary book

Detail	Must	Having
Process Costs	806,21	
Variation of settings		806,21
Vr.variation of production materials		

Note: own elaboration

Segmenting costs by activities through the supply, value and production chain. Supply Chain of a banana activity.

Value chain



Note: own elaboration

Table 18
Relationship between the supply chain-production-value chain

Aspects	Supply Chain	Productiv e chain	Value Chain	Value Chain	
				Factors affecting	Positive Factors
Organizational structure	Interdependent players	Interdependent players	Dependent actors	Disorganization	Your improvement process will be gradual in the organization; however, teamwork generates trust;
Orientation	Supply driven	Supply-Driven	Demand-driven	Individualism,	Associativity
Market identificatio n	Market potential	Market potential	Specific niches and businesses	Difficulty due to competition	Generate trust;
Main Item	Transportation logistics	Cost/price	Value/ quality	Bureaucratic processes	Improve commercialization, negotiation alternatives
Strategy	Commodities	Commodities	Differentiated products.	Difficulty in obtaining suppliers	Generate trust

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Actor Relationship	Informal	Informal	Formal	Demands on self	Differences in the characteristics of the good or service, such as punctuality, quality, lower cost, cordiality, improvement in your processes.
Relationship View	short term	Short-term	Medium term (eliminated in the long term)	Short time results, few in being achieved	Better results
Confidence Level	medium/ high	Low/medium	High	Costs for continuous improvement, workers' dissatisfaction	Number of goals achieved
Information Flow	low none	low none	Broad	Lack of employee commitment	Significant results

Note: own elaboration

Predetermined costs are those calculated before the product is made and sometimes during its manufacture. This calculation must show us in detail the amount of each cost element. The difference with historical costs lies in that these are obtained after the article is manufactured.

Numerous circumstances necessitate the use of estimates or pre-determinations of manufacturing costs; among the advantages, we can cite the following:

They provide manufacturing reports that allow the Sales Department to establish sales volumes and selling prices that result in the highest possible net benefit.

They are of great help in budget preparation

They indicate, approximately, variations in costs when changes are made to product specifications.

They reveal the existence of inefficiency conditions that can be avoided or unnecessary profit leaks from the factory.

It is evident that working with predetermined costs requires prior knowledge of the probable costs of the product, and its success lies in planning and efficiently

controlling the manufacturing process. The predetermined cost system we use must be the most appropriate for the type of company, as otherwise, the results could be contrary to those desired with its implementation.

For the effective use of predetermined costs, knowledge of the following is necessary:

The structuring of cost pre-determinations Methods to verify their correct application

The use of accounts in the estimated cost systems in relation to the needs to perform tests and establish the necessary corrections.

Usually, they are prepared by people versed in the technical procedures of the activity, such as: calculators, engineers, workshop experts, etc. When the estimate is about a usual job, one of these people is in charge of preparing it after obtaining the corresponding information from the rest of the departments. When it comes to a new product or changes, this task is developed by a committee and the advice of experts, especially for the most important estimates.

The cost accountant provides figures regarding estimates, such as the rate of indirect manufacturing costs, comparable production records, and other similar reports.

The sales department supplies data related to the probable demand estimate, required production quantities, and the determination of selling prices. The financial department and management determine the type or amount of profit required in a profitable operation, as well as the provisions of economic resources.

It is advisable to prepare the cost pre-determinations in printed skeletons that show all the materials and operations needed in relation to the projected article and in each of the steps to be followed, to avoid errors. These skeletons must be arranged systematically so that all activities and materials are noted in the order they are incurred in production. The use and number of skeletons will be subject to the production itself or its complexity. When using several skeletons, they will be

summarized in a single sheet called the master sheet; the estimate sheets should be attached to the master sheet as support for it.

An estimate represents the judgment of one or more people about what a certain job or product should cost, so it is necessary to have some method that lets us know the reasonableness of the estimates. When a verification method is used, errors can be located and corrected, improving the results of operations based on estimates. The verification of cost estimates can be done using one of the following methods:

Compare the cost records actually incurred with the estimated costs

Make statistical comparisons with accounting data

Record predetermined costs along with actual costs and determine the variation between them.

A system of predetermined costs is a mean to verify the reasonableness of cost estimates or to determine the extent to which an error is present in them. Predetermined costs are not systems in themselves but simply methods used to reconcile two groups or sets of figures, estimated costs, and actual or historical costs, and to show in which part they agree and where they do not. When there are few variations, predetermined costs can be used advantageously; but in many industrial establishments, their results will probably be quite distant, or their operation is too cumbersome, costly, and difficult to justify the value of the results obtained.

When using predetermined costs, the estimate can be compared with the actuals:

In terms of their total cost, without paying attention to discrepancies in material costs, labor costs, or indirect manufacturing costs.

In terms of each of the cost elements without regard to departmental differences.

In terms of each of the elements, divided according to the departments in which they were used.

Any of these objectives can be achieved in factories that produce a single product or several. The number of accounts needed and the cost of maintaining the accounting system increases as the number of products or the number of ways in which the test is required increases.

The techniques of predetermined cost accounting can be advantageously used to prepare provisional or monthly statements when a historical cost accounting is carried out, provided that management does not lose sight that the results of operations in the reports offered are only estimates. This method can be applied advantageously in plants that work on several long-term orders, each of which takes several months to complete, but for which partial deliveries are made. In this case, direct material would be charged to each job upon receipt, direct labor would be applied to each job as incurred, and indirect costs would be applied periodically. In this way, all costs incurred would be recorded at actual value for each job. However, considering that the different jobs are not fully completed, there are no costs available to apply to the sales of the month to determine the result of the operations of the period. A reasonable figure for the cost of sales can be obtained by setting the cost of each finished unit at its estimated cost. It will then be possible to charge to cost of sales and to inventory of finished products crediting to work in process the cost of the production finished for the respective

period. Since actual costs have been charged to work in process and credited to predetermined costs, any resulting difference remains in this account until:

A physical inventory is taken, applying to the partially processed part the equivalent of production.

The actual production in units is computed, and the actual unit costs are determined

Upon reaching these results, journal entries will be made to adjust the recorded figures to predetermined costs, to historical costs, distributing the existing variations according to the system being implemented in the factory, either:

Affecting the total cost of sales account.Distributing the value of the variations (favorable and/or unfavorable) among the finished units.

Applying proportionally to the cost of sales, inventory of finished products, and products in process.

Predetermined production costs are divided into:

Estimated costs Standard costs

Estimated costs were the first step towards the pre-determination of the production cost and aimed to forecast the material, labor, and indirect expenses to be invested in a specific article.

The initial objective pursued in the cost estimate was to have a basis for quoting selling prices, later it was possible to use that estimated cost for

accounting purposes, giving rise to the system of estimated costs. These are widely used by a number of companies where the method is applicable, such as shoemakers, clothing industries, bakeries, furniture stores, and especially in the construction industry and in various engineering works where, despite advances in cost accounting, estimates are still applied for their simplicity and for the good results they offer, without many administrative expenses.

It is the cost system in which figures obtained based on experience or knowledge of the industry are used to:

Record costs in accounting books. Compare these costs with the actual ones.

Determine the variations with respect to the estimates

The special characteristic of an estimated cost system is that when comparing it with the actual costs, those must be adjusted to reality, making it possible to achieve over time a pre-determination that is closer to the actual cost.

Due to the way estimated costs are calculated, which only indicate what a produced article may cost, when compared with the actual ones we will obtain differences that will indicate what was surplus or lacking to the pre-calculated cost, being necessary to make corrections to adjust it to the actual cost; but eliminating those factors that are not of permanent occurrence such as: strike, temporary lack of raw materials, machinery unusable for longer than normal, temporary change in product specifications, etc.

When the nature of manufacturing and sales operations requires

the determination of selling prices some time in advance of actual manufacturing.

To reduce office work expenses when keeping cost accounts, as it is not necessary to maintain a complete cost accounting system.

Estimated costs can be used to great advantage under any of the following conditions:

When manufacturing operations are simple.

When the products are few in number in size and shape. When there is little variation in cost from one period to another.

The preparation of estimated costs prior to production leads to the establishment of a more or less correct selling price.

It provides almost all the information necessary for management.

It can be used as a preliminary stage to reach the establishment of a more complete cost system, for example: of the standard cost type.

They are not completely correct, that is, they do not strictly adhere to reality. Different conditions from one period to another make the estimates very secure.

The more variable the production and the more complex the manufacturing operation, the less possible it is that the estimates are correct.

The material account is handled in the usual way, that is, based on actual costs.

Products in process are charged with material, labor, and manufacturing overhead at actual costs, and they are credited with finished production at estimated costs.

Those involved in these calculations are those who are most directly related to production, assisted by the cost accountant who generally provides information about manufacturing overhead.

They are established based on:

Statistics from past experiences, which must of course, be modified to take into account changes in costs and also the changing trends of the same.

When it comes to a new product, a considerable amount of study is required. In such cases, production requirements are determined by establishing the quantities and types of labor required, and the types of processes or operations required. The cost of materials and labor can be estimated by referring to current rates and prices.

Market studies, by analyzing the cost of labor and materials. Studies of competition.

Generally, they are established by cost elements and it is convenient to establish them by departments, for control purposes.

Comparisons between estimated costs and actual costs can be made in any of the following three ways:

Comparing the estimated costs of a certain period, with the total costs incurred in the same period.

Comparing the estimated costs by elements: raw materials, direct labor, and indirect costs, of a certain period, with the corresponding incurred costs.

Comparing the actual departmental costs with the actual departmental costs located in a certain period. This comparison can be made by the totals or by the cost elements.

Comparisons by any of the forms described above aim to determine the differences between what was estimated and what was real, which in accounting technique are called variations, in order to establish the causes that produced them, apply the resulting sums to the cost of sales or to this and the inventories, make the respective adjustments and corrections to the accounting bases and prepare the new sheet of estimated unit costs in case the variations warrant it.

Estimated costs can be included in a company's accounts. This is generally done in order to increase cost control or to facilitate the accounting of the flow of costs applicable to finished jobs. They are particularly useful when the contracts of the jobs require the completion of a certain number of units of a product and deliveries over a relatively long period.

Calculation of the estimated cost sheet per unit Calculation of finished production at estimated costs Calculation of sold production at estimated costs.

Calculation of production in process at estimated costs Determination of variations

Elimination of the variation account and its distribution Correction of the cost sheet per unit

Based on experience, it is feasible to determine approximately the quantity and value of the materials needed to produce a certain amount of units in a given time. Similarly, the value of labor and manufacturing overhead for the total units we have previously determined is established. Once these calculations are made, the estimated unit cost can be found with a simple division.

In Excel

Once the estimated unit cost is established, it suffices to multiply this by the number of finished units to calculate the estimated cost that must be charged to the account of finished products with credit to production in process, always indicating the accounting record that this makes at estimated costs.

The operation can be done by:

Costing the total billing issued in the period Recording on each invoice the corresponding cost

Complementing the sales register with columns where the costs of the units sold in each case are included

In the accounting entry, it must be expressed that the values recorded correspond to estimated costs.

In the case of production in processes, it is necessary to convert unfinished articles to finished equivalent units and apply the corresponding estimated cost.

When production is based on orders, the estimated cost will be applied

to the phase of work in which the order in question is located, for this purpose it is necessary that the cost sheet per unit be prepared following the productive steps of an order. According to the above, the equivalent production must be calculated or the estimated cost per unit applied proportionally depending on whether the cost system is by processes or by orders.

Variations are easy to determine by opening a production in process account for each cost element.

These accounts are charged at actual costs and credited at estimated costs, therefore, the balance represents the variation. When in these accounts the balance is of a debit nature, it is said that the variation is unfavorable, and in the opposite case, the variation is favorable.

The production in process accounts are settled by a variation account for each cost element. The variations presented between estimated and actual costs can be canceled:

Against cost of sales.

Against losses and gains.

Applying the variations to the finished units, in which case the accounts of finished products and cost of sales are affected.

Distributing proportionally to the accounts: cost of sales, products in process, and finished products, according to the number of net units with which each of these accounts has been affected in the respective period.

When the variations are significant, it is advisable to use any of the last

two methods and especially the last one, when the inventory of products in process at the end of the period is representative with respect to the total units processed in the same.

When the variation in one or more cost elements is of a certain magnitude and is not due to common situations, the sheet of estimated unit costs must be modified for the following periods taking into account the results of the one being compared.

If temporary aspects that possibly will not occur in later stages have influenced the variation, these must be valued and eliminated from the variation, to thus obtain a data closer to reality and establish in this way the new estimated cost per unit.

In many companies, the month, quarter, or current year is compared with the corresponding previous period. However, this assumes that the previous period has been typical, which is not always the case. A much more suitable system, especially for setting product costs, is the standard cost.

Through predetermined costs, management can find out how much a product should cost and how much it actually costs.

Against sales costs. Against profits and losses.

By applying variations to finished units, in which case the accounts for finished goods and cost of sales are affected.

By distributing proportionally to the accounts: cost of sales, work in process, and finished goods, according to the number of net units that have affected each of these accounts in the respective period.

When variations are significant, it is advised to use either of the last two methods, especially the latter, when the inventory of work in process at the end of the period is representative with respect to the total units processed in the same.

When the variation in one or more cost elements is of a certain magnitude and not due to common situations, the sheet of estimated unit costs must be modified for the following periods taking into account the results of the one being compared.

If temporal aspects that possibly will not occur in later stages have influenced the variation, these should be valued and eliminated from the variation, to thus obtain data closer to reality and establish the new estimated cost per unit in this way.

In many companies, the month, quarter, or current year is compared with the corresponding previous period. However, this assumes that the previous period has been typical, which is not always the case. A much more suitable system, especially for setting product costs, is the standard cost.

Through predetermined costs, management can find out how much a product should cost and how much it actually costs.

Based on data seriously calculated using scientific procedures, it is indicated before production takes place, what the expected costs are. Subsequently, as the elaboration of the products progresses, the predetermined data are confronted with the real ones, and the costs as they should be are taken into account. Such seriousness, both the studies, and so many people involved in the predetermination of costs by standard, that, if differences with the historical or real data subsequently arise, these last ones are considered “wrong.”

The standard cost system originated at the end of the first decade of the current century as a result of the development of mechanization, or the replacement of human effort by machinery, studies made by, among others, the engineer Frederick Taylor.

At that time, it was possible to standardize operations and units, considering within these latter, quantities of material and hours of labor. Subsequently, these quantities were quantified in values, leading to what we now call standard costs and which, because of the bases of the calculations used are considered as instruments for measuring efficiency, with which we want to say that the standard cost indicates what an article can cost. For the above reason, standard costs must be the basis for adjusting historical costs and against estimated costs must be adjusted to historical costs.

Standard costs for a product are established after studying manufacturing operations and the anticipated costs for materials, labor, and manufacturing overhead. If any of these factors vary, the standard must be changed accordingly.

Standard costs are used with either of the two cost-setting systems: by job orders or by process. When many manufacturing operations are performed in the same department, the standards are set by specific cost centers.

Current or actual standards

Fixed, basic, or measurement standards.

Current standards are those that represent what the cost should be under prevailing circumstances, generally considered as

an actual cost that must be carried to the books and financial statements. These standards should be reviewed as frequently as needs warrant, to reflect changes in production methods and price, otherwise, they would cease to be representative costs under present circumstances.

Fixed or basic standard is one that serves only as a point of reference or measure, with which actual results can be compared and although it has some characteristics of current standards, it resembles more the basis that serves to calculate a price index, since the procedure to be used with this type of standards consists of reducing actual costs to relative percentages of the standard cost taken as a base. An important feature is that they facilitate the exposition of cost trends in relation to the basic standard cost.

These calculations demand that the basis used for comparison remains fixed and, therefore, basic standard costs will only be changed when manufacturing methods are radically altered.

When fixed standards are applied, current ones must also be used, although the latter can be used without the former.

The reason for the above is that the basic standard itself does not represent what should be the outcome of a given period, but only serves as a base for measuring changes or variations.

Therefore, when the system of fixed standard costs is used, the following rules must be observed:

Current standards are determined and expressed as percentages of the corresponding basic figures. For example: the basic standard is

100% and the percentage corresponding to the current standard is 140% indicates that the latter is higher than the basic by 40%.

Then, actual costs (Historical) expressed as percentages of the basic standard are compared with their current standards to find out to what extent the actual result has deviated from what should have been, and with the basic standard to know the trends from one period to another; this last comparison would not be possible by measuring deviations with respect to a variable basic standard.

Cost standards can be an important instrument for performance evaluation. When standards are realistic, feasible, and properly managed, they can motivate individuals to work more effectively. It is perhaps easier for people to act efficiently when they know what is expected of them.

The control of production is one of the most important advantages that the application of the standard cost system can offer within a company, as it provides management with the necessary tools to confront actual data with predetermined ones.

The predetermination of costs in most cases makes it possible for a company to set, before production takes place, sales pricing policies. If such predetermination is made based on the most serious studies possible, such policies will be more accurate.

It helps in the preparation of budgets since these aim to present the future plans of a company, and as long as they are based on the most precise data, they will be better and offer better results.

- They allow timely information and tend to facilitate accounting work in addition to reducing its operational cost.

- Due to their degree of specialization, they are not adaptable to any type of company.
- Economically, their implementation in small factories is not justified.
- They are only applicable in rationally organized factories.
- They are only valid for the purpose for which they have been established or the control of operational efficiency.
- They require periodic inventorying of work-in-process inventories.
- Departmentalization of the company.
- Creation of an analytical plan of accounts.

Determination of physical standards or specifications

Choice of the system to be used, which may represent: the figure expected to be achieved in the period; the prediction of what costs should be when operating under normal conditions; the optimal production costs or any figure that allows exercising some control over future disbursements.

Given that standard costs represent the most efficient tool of administrative control and are considered as objective costs since the figures expressed by them indicate what the product may cost and based on them accounting records are made, the management when selecting the type of standard to use, has to consider these two basic questions. What type of standard cost will be more effective for the company for control purposes? And should the information from the standard cost accounting be incorporated into the company's accounting records or be treated as statistical data?

The most widely used method by companies that have a standard cost system is that of anticipated real costs. Whether standard costs are recorded in the books or treated as statistical data is a matter that requires a decision for each company.

The determination of the standard cost requires knowledge of a series of data formulated by various professionals such as: industrial engineers, time and motion experts, economists, public accountants, etc., that allow setting the standard in all its aspects; among it:

- Standardization of products
- Standardization of production routines.
- Standardization of operation routines, in aspects:
- Handling of materials.
- Handling of equipment and tools.
- Handling of manufactured products.
- Formulation of work instructions.

Therefore, the implementation of standard costs in the strict sense of the term requires a series of preliminary works that few companies can afford, opting then for studies based on the factory's own experience, to arrive at determining data that can be tested to be modified, corrected, in order that they meet the conditions of "benchmark cost" applicable.

For its determination, two factors must be considered: the quantity of materials per unit of product and the cost of that material.

To establish the quantity of material needed, the Cost Department must have the technical specifications of the product, which are a compilation of measures and physical and chemical conditions that serve to establish the norms to which the elaboration of each article must adjust.

It must contain, among others, the following data: diameter, thickness, area, volume, length, weight, raw materials to be used, quantity of each of them per unit of the product.

The specifications must be clear, concise, and as stable as possible, admitting only the tolerance considered normal and without forgetting important elements such as the percentage of waste.

Once the needs of each of the raw materials have been established, this information is provided to the purchasing department. This department corresponds to study in a meticulous manner all the possibilities in price changes, taking into account past experiences and the current behavior of the market.

The predetermination of the direct materials processes is an indicator of efficiency or inefficiency of a purchasing department, as there are numerous factors to consider when using the standard cost system, and its impact on the company's profits is quite noticeable.

Buying large volumes of direct materials in time when prices are low is generally beneficial for the company as long as there are storage facilities available, because otherwise, it could be harmful in the case of materials

that require special storage conditions, such as temperature, humidity, etc., and there were no such facilities.

When establishing price standards, it must not be lost sight of that the best standards have to take into consideration the advantages of prices to be obtained by determining the quantity to buy that is more economical, the best methods of delivery and storage at the lowest cost, and credit conditions that will result in costs or price.

Three primary factors must be taken into account: monthly working time, daily working hours, and hourly productive capacity.

For this, the working days must be established according to the national calendar, taking into account those days when work is not done due to union agreements. Considering working from Monday to Saturday, we would have that the total number of workable days in Colombia will be:

Excel< Sheet 2

There are various theories about which can be the base level to consider and they are related to the different types of standard costs; based on the maximum theoretical capacity; based on the maximum possible capacity, taking into account normal yields as consequences of logical and justified stops; determine it in relation to sales.

The maximum practical capacity is the one that enjoys the preferences since the normal level that should be considered in standard costs is the one that can be achieved by operating machinery at maximum efficiency, but considering justified stops to meet maintenance needs. The least practical is that of sales demands, since it forces production to follow the ups and downs of the same and these are subject to

market demand, which requires repeatedly modifying the standard level.

To fix it, the first step is to choose the best method susceptible to being used as a basis for the standards. This includes standardization of all physical conditions or the environment that may influence in some way the efficiency with which the worker will perform his task. These conditions can be: layout of the machinery, the conditions of the same, the workplace, and the means of transporting materials, the establishment of control can have the correct quantity and quality of the same and in the right place; provide the worker with all the necessary instructions either in the form of previous training or written instructions for each particular job.

It requires the investigation of the time necessary to perform each operation when working under normal conditions. This can be achieved by any of the following methods: averaging the notations of past realizations as they appear in the cost sheets of previous periods, making experimental test batches of manufacturing operations under the real conditions foreseen, making time and motion studies of the various labor operations under the real conditions foreseen, making a reasonable estimate based on the experience and knowledge of the manufacturing operations and the product.

The following steps should be followed: establishment of a classification for labor categories. Among the characteristics that serve as a basis, we have: degree of complexity, intellectual knowledge required, and knowledge of the product.

Determine the standard rates for paying each class of labor. For this, the most important thing is the establishment of rates that represent as accurately as possible the qualification of the quality or category of

the work in question, comparing it with another relative work of the own factory. Three fundamental types can be distinguished for the payment of wages, namely:

Fixed salary per piece. By this system, the standard cost in a unit of producers is the price per piece, regardless of how many have actually been produced.

Multiple rates per piece and the systems of bonuses and awards set by scales of performance.

The indirect manufacturing costs or manufacturing overhead are the element of the production cost that practically cannot be applied or appreciated precisely in a worked unit, making its absorption in the costs of elaboration through rates or percentages established under different bases depending on the case.

Under the concept of indirect manufacturing costs are grouped all the factors necessary to transform the raw materials such as: place, equipment, tools, electric power, and all other elements that contribute to the production.

It is quite a complex problem to determine the volume of production that corresponds to a certain volume of indirect costs, and when studying it, a situation of normal work should be considered to find the normal efficiency of the factory, discounting the so-called theoretical efficiency or that which only exists in catalogs, but without ceasing to recognize that this measure can be useful to locate the normal efficiency.

On the other hand, it should not be lost sight of that indirect costs, in general terms, gather certain characteristics in relation to production volumes,

dividing therefore into fixed and variable costs. The former remain more or less at the same value or whatever the volume of production and the latter increase or decrease in relation to said volumes.

According to the above, the establishment of standards for indirect production costs requires.

Determination of the production capacity under normal working conditions. This study may be entrusted to technicians in the field, but in any case, the factory's own experience should be taken advantage of in order to obtain the volume of production in units or hours of work that covers the manufacturing budget which in turn is closely related to the sales budget.

Budget for indirect manufacturing costs, separating fixed from variable, taking for this purpose the statistical data of the own company, related to the volumes of production worked. It is advisable to take the greatest number of previous months to analyze concept by concept in order to eliminate those items spent in abnormal situations, originated by causes that surely do not repeat, it will also be necessary to update or modify other concepts in such a way that we are in a position to obtain the indirect cost that corresponds to the proposed productive capacity.

Known the budgets of costs and volumes of production, the actor or application rate is obtained either by: man-hour, machine-hour, produced unit, etc.

Every time the structure of a product is modified, which may be due to: quality improvement, cost reduction, lack of raw material, etc., it must be produced by the product specifications department. These changes can be permanent, temporary, or provisional.

They are the specifications that are set definitively for certain products as new standards.

They are issued to authorize a temporary alteration, generally caused by a transitory lack of the original raw material

They are the specifications that are established for a period of experimentation.

The new specifications serve as a basis for the cost department to modify the standard cost in order to make it comparable with the actual cost and be able in this way to correctly establish the variations in the affected period. Quantity standards are generally produced by the product engineering department with the help of production and accounting.

When there is no product-engineering department, the material standard can be established based on experience taking care of determining normal quantities, that is, excluding from the costs taken as a base those that are affected by variations or abnormal conditions. If it is a new product, enough tests must be done until establishing the quantity considered more or less normal.

The difference between a standard cost and an actual cost is called variation and this can be favorable or unfavorable depending on its nature credit or debit, just like in estimated costs.

The importance of the analysis of variations lies primarily in the use that management makes of them in order to determine the causes of facts or situations away from the standard norms, and to be able to take the necessary corrective measures. For these measures to have favorable

effects, they must be taken in a timely manner, for which management must know in time the following aspects:

Amount of variation, causes that originated it, and department, section, or area in which it was produced.

The difference between the actual cost and the standard cost of the materials used is reflected in two variations: the variation in the price of the materials and the variation in the quantity used.

The variation in the price of materials represents the difference between the standard cost of the actual quantities used and the actual cost of these materials.

The variation in the use or quantity of materials results from using more or less quantity than contemplated in the standard and the standard cost assigned to the actual production.

In labor, variations in price and quantity are represented being its analysis similar to the variations in materials.

The variation of indirect manufacturing costs can be divided into: budget variation, capacity variation, and efficiency variation.

The capacity variation represents the cost of under or overutilization of facilities and is given by the difference between the budgeted hours and the real ones at the standard rate of indirect manufacturing costs.

The budget variation is the difference between the budgeted sum and the actually spent sum.

The sum of the two previous ones is equal to the under or over-application of manufacturing overhead.

The efficiency variation is the difference between the cost of the actual hours and the standard hours at the standard rate.

Establish the standard production costs for 1984, of a basic article in three different models.

Determine the unit selling price for each of the models, to obtain a profit after taxes equivalent to 12% of sales.

Obtain the selling prices for additional orders to the budget, without varying the percentage of profit.

- Establish and analyze the variations presented during the first quarter of 1984.

- Metal cabinets for appliances are manufactured. in the references L-12, L-30, and L-60.

They are established taking into account the practical installed capacity, the availability of labor, and the demand for the product in the domestic and foreign market.

For 1984 production has been set at 420,000 good units, leaving a margin of defective units equivalent to 0.5% for each of the references, as follows:

Reference L-12	60.000	Good units
Reference L-30	120.000	Good units
Reference L-60	240.000	Good units

It works from Monday to Saturday, excluding holidays, Holy Saturday and between December 20 and January 10 for collective vacations, leaving a total of 282 working days in 1984.

Work is performed 24 hours a day, distributed in three shifts, as follows: first from 6 a.m. to 2 p.m.; second from 2 p.m. to 10 p.m.; third from 10 p.m. to 6 a.m.

Manufacturing workers are hired daily

As far as possible, workers are not dismissed without just cause, thus avoiding severance pay.

There are no factory personnel with 10 or more years of service with the company.

The following percentages have been established for some presentations, based on the seniority of the personnel, personnel turnover and the company's salary policies:

Cessantia	12.00% of the base to be settled
Service premium	8.00% of the base to settle
Interest on cessation	16.67% of cessations

A detailed report of the total cost of the product is presented

The direct raw material is made up of cold rolled steel sheet.

To determine the cost of direct labor, the following are considered: the standard time provided by industrial engineering, the basic salary of the operators, and the social presentations corresponding to the manufacturing operations.

Indirect manufacturing costs are made up of indirect materials (paints, welding acids, acetylene, degreasers, etc.), which are applied proportionally to the square meters of sheet used in each wage shift; fixed amounts assigned to the departments for salaries, social presentations, employee contributions, stationery, utilities, maintenance, repairs and personnel services, depreciation of the factory's fixed assets; taxes assignable to production; insurance inherent to the factory.

Except for indirect materials, factory overhead costs are distributed on the basis of direct labor costs.

Name: "L" type metal cabinet for household appliances. Basic material: 22-, 20- and 18-gauge C.R. steel sheet.

Reference	Width	Length	Weight per m²
L-12	0.80 m	1.65 m	0.950 kg
L-30	0.80 m	2.15 m	1.000 kg
L-60	0.80 m	2.40 m	1.050 kg

The cut sheet will be placed, by size, in pallets in groups of 100 units and isolated from chemical elements.

The die-cutting, stamping and folding operations will be carried out independently for each model, in order to eliminate the continuous change of dies and the loss of material by carrying out one of these operations on the wrong size.

Degreasing and banderizing will be carried out in two continuous tanks of 4.15 m wide by 3.30 m long by 0.90 m deep, in cycles of 6 minutes each.

Painting can only be carried out after three hours of completion. The flagging

Model	Height	Width	Length	Tolerance
L-12	0.78 m	0.40 m	0.40 m	1% ±
L-30	0.78 m	0.50 m	0.65 m	1% ±
L-60	0.78 m	0.40 m	0.77 m	1% ±

In accordance with the established needs of C.R. steel sheet, and taking into account the maximum and minimum inventory levels, as well as the possible fluctuations of prices in the market and the availability of the same from suppliers, the standard price to be used in the valuation of direct material has been established in order to determine the standard production costs for the year 1984 (Table 3). The prices have been calculated for the merchandise placed in our warehouses. The sheet is available in 0.80 m width.

Table 19

Analysis of waste from leftovers

Model Detail	L-12	L-30	L-60	Total
Total sheet to be cut	60.300	120.600	241.200	422.100
Weight per roll in kg	200	200	200	
Weight per sheet in kg	1.254	1.720	2.016	
Complete sheets per roll	159	116	99	
Rolls required	379.24	1,039.66	2,436.36	3,855.26
Kilograms required	75.848	207.932	487.272	771.05
Weight of sheets	75.616	207.432	486.259	769.307
Weight of leftover material	232	500	1.013	1.745

Based on the data in tables 3 and 4, the direct material cost amounts to $112,614.578 distributed as follows:

Production of 420,000 good units	$11,802.540
Production of 2,100 defective units	$559.013
Loss of foil due to leftover cuttings	$253.025

This total corresponds to the three models, applied as follows: L-12 $10,997.960, L-30 $30,150.140 and L-60 $70,654.440.

To establish the labor standards, the following time and movement reports are used, based on the factory's experience, the existing facilities and the established production process:

Table 20

Time and motion report

Labor	Time required	Personnel required
Prepare sheet	15 Min. per roll	2 operators II
Cut	15 sec. per unit	1 operator IV
Punching	15 sec. Per Unit	1 operator IV
Stamping	2 Min. Per Unit	1 operator III
Folding	1 Min. Per Unit	1 operator IV
Degreasing and bonding	12 min. per cycle	1 operator IV and 1 operator II
Welding	4 min. per unit	1 operator VI and 1 operator IV
Polishing	4 min. per unit	1 operator II
Painting	3 min. per sq. m.	1 operator V and 1 operator III
Overhaul	2 Min. Per Unit	1 operator III

Table **21**
Time required for *production*

Minutes required per model				
Work to be performed	**L-12**	**L-30**	**L-60**	**Total Min.**
Prepare rolls	12.060	31.356	72.360	115.776
Cut sheets	15.075	30.150	60.300	105.525
Punching	15.075	30.150	60.300	105.525
Stamping	120.600	241.200	482.400	844.200
Folding	60.300	120.600	241.200	422.100
Degreasing and bonding	18.090	57.888	144.720	220.698
Welding	482.400	964.800	1,926.600	3,376.800
polishing	241.200	482.400	964.800	1,688.400
Painting	458.280	1,206.000	2,653.200	4,317.480
Overhaul	120.600	241.200	482.400	844.200
totals	1,543.680	2,405.744	7,091.280	12,040.704

Unqualified operators (category II)

Knowledge Assessment Questionnaire obtained through this compendium:

1. What was the reason for the appearance of managerial accounting?

   To eliminate financial accounting
   To eliminate cost accounting
   To reduce complexity in the analysis of fixed and variable costs.

2. Select the correct answer. What is the role of managerial accounting in decision- making?

   It is the discipline that provides the necessary information to formulate, implement, and carry out strategies that allow achieving a competitive advantage, meeting proposed objectives.

   It is the set of standards adapted to the needs of the company that allows compliance with what is stipulated.

3. Select the correct answer. According to the role of managerial accounting in planning, select two plans:

   a. Tactical Planning:
   b. Structural Planning
   c. Strategic Planning:
   d. Organizational Planning

4. Select one of the characteristics of Tactical Planning.

   a. Short range (1 to 3 years); more limited participation.
   b. Its objectives are long-term (5 to 10 years) and broader than a company or individual wishes to achieve.

5. Select one of the characteristics of Strategic Planning

   a. Short range (1 to 3 years); more limited participation.
   b. Its objectives are long-term (5 to 10 years) and broader than a company or individual wishes to achieve.

6. Select at least one of the alternatives as a decision-making model

   a) Budget
   b) Present the strategic plan
   c) Identify the costs and benefits associated with each feasible alternative.

7. Select the correct answer: The administrative process is:

   A set of administrative functions whose objective is to maximize the use of each of the company's resources efficiently.

   It is the purpose of achieving a competitive advantage that allows achieving cost leadership.

8. Select one of the external factors that affect the administrative process

   a. The company's organizational plan
   a. Political conditions, frequent changes in laws.
   b. Objectives, mission, vision, internal regulations, policies, manuals, and functions

9. Select one of the internal factors that affect the administrative process

a. The company's organizational plan
a. Political conditions, frequent changes in laws.
b. Objectives, mission, vision, internal regulations, policies, manuals, and functions.

10. Select the correct answer: Managerial accounting emerged in the year:

1960
1980
1950

11. Select the correct answer. Managerial accounting first appeared as:

a. Cost Accounting
b. Management Accounting
c. Financial Accounting

12. Select at least one of the similarities between managerial, financial, and cost accounting.

a. Analyze, interpret, process information.
b. Produces information for external actors, such as shareholders, suppliers, banks, and regulatory government offices.
c. Produces information for managers within the organization.

13. Select the revolution that is the starting point of managerial accounting.

a. The fiscal revolution
b. The social revolution

c. The industrial revolution

14. According to established formulas, mark T if it is true or F if it is false

a. The revenue formula is = Q*t ( ) leave both T and F options
b. The revenue formula is = Pv/Q ( )
c. The revenue formula is = Pv*Q ( )

15. According to established formulas, mark T if it is true or F if it is false

The unit cost is equal to =CT/Cu ( )
The unit cost is equal to =CT/Q ( )

16. According to established formulas, mark T if it is true or F if it is false

The total variable cost is = Cvu*Q ( )
The total variable cost is = CVT/Q ( )

17. According to established formulas, mark T if it is true or F if it is false

The unit variable cost is = Cvu*Q ( )
The unit variable cost is = CVT/Q ( )

18. According to established formulas, mark T if it is true or F if it is false

The total fixed cost is = Cfu*Q ( )
The total fixed cost is = CFT/Q ( )

19. According to established formulas, mark T if it is true or F if it is false

The unit fixed cost is = Cfu*Q ( )
The unit fixed cost is = CFT/Q ( )

20. Select the correct answer: If a company produces 2 units per hour, has 4 workers, what will be the annual production:

a. 8
b. 15,360
c. 1280
d. 320
e. 20,000
f. 64

21. Select the correct answer: If a company produces 2 units per hour, has 4 workers, what will be the weekly production:

a. 8
b. 15,360
c. 1280
d. 320
e. 20,000
f. 64

22. Select the correct answer: If a company produces 2 units per hour, has 4 workers, what will be the daily production:

a. 8
b. 15,360
c. 1280
d. 320

e. 20,000
f. 64

23. Select the correct answer: If a company produces 2 units per hour, has 4 workers, what will be the monthly production:

a. 8
b. 15,360
c. 1280
d. 320
e. 20,000
f. 64

24. Select the correct answer: If a company produces 2 units per hour, has 4 workers, what will be the hourly production:

a. 8
b. 15,360
c. 1280
d. 320
e. 20,000
f. 64

25. According to established formulas, mark T if it is true or F if it is false The cost-benefit is calculated as follows:

a. Total Revenue/Total Expenses and Costs.
b. Total revenue * Q
c. Total Revenue*Total Expenses and Costs.
d. Total Revenue*Q

CHAPTER VIII

Towards sustainable tire management to reduce vehicle pollution

Introduction to the Problem of Pollution from Discarded Tires

Each year, approximately one billion used tires reach the end of their useful life worldwide, leading to their accumulation and environmental pollution (Dierkes & Saiwari, 2021a). Discarded tires are a significant source of long-term environmental pollution, as they are not biodegradable and can disrupt sanitation and create difficulties in cleaning up territories (Petrov et al., n.d.). When tires are burned, they release a large number of toxic substances, contributing to environmental pollution and posing a danger to the environment (Petrov et al., n.d.).

Tires mainly pose environmental problems after their relatively short useful life, contributing to the chemical pollution of the environment (Wolfersdorff & Plaumann, 2023a). Tire waste has been classified as a material with hazardous properties affecting aquatic organisms and soil organisms, highlighting the ecotoxicity of discarded tires (Kobetičová et al., 2020). It is relevant to note that tire particles are a significant source of microplastic pollution, with potential impacts on the environment and human health, requiring stricter control measures and environmental regulations to mitigate their ecotoxic effects on all ecosystems and trophic levels (Jan Kole et al., 2017; L. Kim et al., 2023).

Among the long-term consequences in the ecosystem is the contribution of tire wear to the flow of microplastics in the environment, affecting air, water, and soil, with potential effects on human health and the global health burden of air pollution (Jan Kole et al., 2017). Moreover, tire wear particles and their associated chemicals pose environmental and toxicological challenges, with potential effects on aquatic and terrestrial biota, requiring further research to assess the risks to human health and mitigate environmental impacts (Jan Kole et al., 2017; Khan et al., 2024a). According to (Khan et al., 2024b), tire wear particles (TWP) are a significant source of plastic pollution, as they release chemicals that pose environmental and toxicological problems. Moreover, TWPs can cause biological responses in aquatic and terrestrial biota, leading to ecological risks and harm to organisms and human health (Chen et al., 2022; Gieré & Dietze, 2023).

Interest in tire wear particles (TWP) has increased, focusing on the quantification of particle emissions, the leaching of different compounds, and their ecological impact, underscoring the need for a collective approach to address this environmental concern (Trudsø et al., 2022). Current regulations focus on various aspects of tire production and use, but not enough attention is paid to the environmental contribution of TWPs, their mixture effects, and transformation products in the environment, highlighting the need to renew attention to the risk assessment of complex mixtures like TWPs (Trudsø et al., 2022). However, advanced recycling techniques can transform used tires into new useful materials, offering both economic and environmental benefits [5].

Likewise, (Trudsø et al., 2022) indicates that the tire industry is making significant efforts to achieve more eco-friendly and sustainable production, including reducing CO2 emissions, recycling, and sourcing materials (Trudsø et al., 2022). However, it is important to note that although

discarded tires pose environmental problems, efforts are being made to solve them through recycling and sustainable production practices (Dierkes & Saiwari, 2021a; Trudsø et al., 2022).

Factors Affecting the Lifespan of Tires

The factors affecting the lifespan of a tire include peripheral speed, ground surface, contact pressure and patch area, acceleration and deceleration, camber angle, turning and sliding contact, type of rubber compounds, rubber compound recipe, amount of traction force, type of motion, wheel installation angles, tire design, driving mode, and vehicle fuel consumption (Chathura & Punchihewa, 2016; Karelina et al., 2020; Pohrt, 2019; Sun et al., 2016a, 2017a). Consumer behavior, such as variability in lifespan, rolling resistance, tire size and inflation pressure, and car engine mass and efficiency, can significantly influence the environmental footprint of tires (Hennequin et al., 2023a). Factors such as fuel consumption during the use phase, raw material acquisition, production processes, and the end-of-life phase influence the environmental impact of tires, with vehicle fuel consumption being one of the main factors contributing to the environmental impact during the lifespan of tires (Sun et al., 2016a, 2017a). Encouraging the use of smaller cars and low-consumption tires with a longer lifespan can result in environmental savings and mitigate the impacts of the tire life cycle (Hennequin et al., 2023a). The scientific literature proposes the following factors affecting tire lifespan:

Environmental Factors: Tires pose environmental problems mainly due to their relatively short lifespan, contributing to waste and pollution (Wolfersdorff & Plaumann, 2023b). The lifecycle of tires, including their disposal and processing methods, impacts the environment and human health (Kubaymurat & Karimova, 2019). The environmental impact of tire production and disposal can be quantified through life cycle assessment

(LCA) (Dong et al., 2021; Piotrowska et al., 2020; Sun et al., 2016b).

Driving Habits: Consumer behavior, including the variability of tire lifespan, rolling resistance, and vehicle mass, can significantly influence the environmental impact of tires (Hennequin et al., 2023b). Vehicle factors such as tire pressure, tread depth, and driving experience can affect tire wear and the likelihood of issues before an accident (Choi, 2013).

Tire Maintenance: Tire wear and tread degradation are influenced by vehicle and tire maintenance, and the interaction between the tire, vehicle, and road (De Martino et al., 2020). Using worn tires towards the end of a race in motorsport competitions highlights the importance of tire management and maintenance (Chindamo et al., 2021).

Technological Advances: It has been demonstrated that adding silica to replace part of the carbon black as filler in tire production reduces the environmental impact over the tire's life cycle (Sun et al., 2017b). Developing a tire wear prediction tool can help in their management and maintenance, benefiting both manufacturers and customers (De Martino et al., 2020).

In summary, the factors affecting the lifespan of tires are multiple and cover environmental aspects, driving habits, vehicle maintenance, and technological advances in manufacturing. Environmental factors such as tire disposal and production methods, driving habits, including consumer behavior and vehicle maintenance, and technological advances, such as the use of alternative materials, play a crucial role in determining tire longevity. Although some abstracts provided information on the environmental impact of tires and the influence of driving habits, direct information on the role of tire maintenance and specific technological

advances was limited. Therefore, the response was deduced from the available information in the abstracts.

Models for Predicting and Controlling Tire Wear

With the aim of efficient tire management that contributes to extending their lifespan, mathematical models have been developed in order to predict and control their wear based on various variables. Currently, several models and methods are used to predict and control tire wear:

Tire Model by Finite Elements: A study developed a finite element tire model and conducted parametric rolling simulations to obtain internal tire accelerations. Subsequently, machine learning-based algorithms were developed for predicting tire wear, using various detection options. The study compared the performance of these algorithms and found that an algorithm using information from both the vehicle and the tire showed the best performance with a prediction error of 0.21 mm (K. Kim et al., 2023).

Combination of Physical and Statistical Analysis: Another approach proposed a tire wear model that combines physical and statistical analysis based on telemetry from high-performance vehicles, tire prints, road data, and viscoelastic properties of tires (Napolitano Dell'Annunziata et al., 2023).

Grey Box Model Approach: A proposed approach uses physical models for vehicle and tire dynamics in combination with machine learning techniques to predict rolling resistance and tread wear of tires under realistic conditions (Burger & Steidel, 2020).

Onboard Sensor Signals: A method was proposed to make diagnostic/prognostic judgments about tire wear using existing onboard sensor

signals, focusing on estimating the effective rolling radius for individual tires and determining tire wear and the remaining safe driving time (Poloni & Lu, 2017).

Accelerometer-based System: A system was proposed to estimate tire wear using a 3-axis accelerometer attached to the tread inside the tire, using axial acceleration and machine learning for feature classification to estimate tread depth with reasonable accuracy (Han et al., 2023).

Implemented Sustainable Tire Management Strategies

Several strategies exist to improve the sustainable management of used tires, which are shown below:

Circular Economy Approach: The 7R concept (Reduce, Reuse, Recycle, Redesign, Renew, Repair, and Recover) aims to extend the lifespan of resources through rational and efficient use, reducing costs and waste (Araujo-Morera et al., 2021). Likewise, the circular economy model focuses on improving the circular flow of rubber materials from tires, with the goal of achieving sustainable mobility (Araujo- Morera et al., 2021).

Advanced Recycling Techniques: Advanced recycling techniques can transform used tires into new useful materials, offering both economic and environmental benefits (Dierkes & Saiwari, 2021b).

Material Recycling vs. Energy Recovery: Life cycle assessment studies indicate that material recycling provides greater impact reductions than energy recovery in terms of environmental impact potentials such as energy demand, global warming potential, and acidification (Feraldi et al., 2013).

Retreading and Reusing Tires: Retreading tires for reuse has been identified as a beneficial strategy, providing economic and environmental advantages (Chang & Gronwald, 2016).

Regulatory and Organizational Efforts: Transparent and organized efforts are needed to properly dispose automobile tires, including designing an international system to control the use and disposal of tires (Torosian & Chernyaev, 2020).

Proposals to Improve Sustainable Tire Management to Reduce Pollution in Ecuador

Ecuador faces various challenges in managing end-of-life tires (ELT) due to a high percentage of imported tires and poor outcomes in the early years of adopting an Extended Producer Responsibility (EPR) model (Padilla & Díaz-Márquez, 2023). However, when making a global comparison, Brazil has implemented a system where manufacturers and importers collect and dispose the same number of tires sold, collecting millions of tons of used tires (Lagarinhos et al., 2023). A study conducted in Ecuador demonstrated the potential for carbon emission reduction by using recommended tire brands and solving common tire defects (Ruiz, 2019). On the other hand, a case study conducted in Ecuador showed the success of using discarded tires in civil engineering, in line with the principles of the circular economy (Davis et al., 2023). Therefore, challenges in managing used tires in developing countries, including Ecuador, face challenges such as lack of knowledge, tire storage, and limited application of technology for their processing and treatment (Mmereki et al., 2019). Likewise, the implementation of efficient approaches, including the circular economy, harmonization of policies and economic instruments, is essential to improve the efficiency of waste tire management in developing countries like Ecuador (Mmereki et al., 2019).

Conclusions

- Discarded tires represent a serious environmental problem because they are not biodegradable, and accumulate and release toxic substances when incinerated. The particles generated by tire wear are a significant source of microplastic pollution.

- There are multiple factors that influence the lifespan of tires, including environmental aspects, driving habits, vehicle maintenance, and technological advances in their manufacturing.

- Several mathematical models have been developed to predict and control tire wear, based on finite elements, physical-statistical analysis, grey box model, sensor signals, and accelerometer systems.

- Among the strategies implemented for sustainable tire management are: circular economy, advanced recycling techniques, comparison of material recycling vs. energy recovery, and retreading.

- To improve tire management in Ecuador, it is recommended to: implement an Extended Producer Responsibility model, use efficient tires and solve common defects, as well as apply the principles of the circular economy.

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