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# Proposed Implementation of Activity-Based Costing to Determine Cost Allocation in Manufacturing Company PT. S

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**ABSTRACT**

This research discusses the proposal for implementing Activity-Based Costing (ABC) in the cardboard box manufacturing company, PT. S, focusing on Plant 4 located in West Java. The products produced include standard A1 cardboard boxes, A1 printing, plain die-cut boxes, printed die-cut boxes, and top-bottom boxes. The application of the ABC approach is carried out with the intention of presenting more detailed cost information through the identification and allocation of costs to the various activities involved in the production process. The traditional method appears to be inappropriate as overhead allocation only burdens direct raw material costs, direct labor costs, shipping costs, and sales commission to products using percentages from historical data as a reference for the selling price of the product. The research type is problem-solving with a descriptive qualitative research method. The results indicate that the ABC method provides more accurate calculations by allocating costs per activity that are then assigned to products. Among the five studied products, it is found that the plain A1 product is the least profitable. On average, the allocation of product costs experiences undercosting, except for plain die-cut products that experience overcosting. PT. S needs to consider the use of the ABC method in product cost and product selling prices to be able to reduce costs and increase the profitability.

## INTRODUCTION

The increasing business competition in today's manufacturing companies poses a challenge for firms to enhance their competitiveness through various means. The application of cost accounting concepts is a crucial part and a determinant of a company's success. Detailed and accurate determination of production costs can be a competitive advantage for a company. Based

on the literature review, several variables can be used as corporate strategies, such as competitive advantage and cost-saving. Competitive advantage can take the form of cost leadership or differentiation (Porter, 1985). Cost leadership, as a competitive advantage, offers opportunities for manufacturing companies to compete with competitors by minimizing production costs. The effectiveness of production costs can serve as a cost-saving strategy for companies because reduced production costs influence product prices.

The development of cost calculation methods, in addition to the widely used traditional method, includes Activity-Based Costing (ABC). The main difference between traditional cost calculation and ABC lies in the grouping of costs based on activities. The traditional method uses only one level of activity, while ABC employs multiple levels, such as unit-level, batch-level, product-level, and customer-level activities. Another difference lies in the allocation of factory overhead costs. This method is particularly suitable for companies producing products with many variations (Alami & ElMaraghy, 2020). ABC can help identify costs more effectively in a company. ABC is a more detailed method compared to traditional methods, resulting in more accurate calculations (Kaplan & Cooper, 1998). Through ABC, companies can identify non-value-added activities and focus on value-added activities (Hansen & Mowen, 2016). Operational efficiency improvements can include reduced production costs, resource efficiency, production time savings (cycle time), supply chain optimization, service cost reductions, minimizing product failures, and more.

This research is motivated by the need for companies to optimize production costs and find a faster and more accurate formula for determining production costs, which can then be used to set product prices. The study will be conducted at PT. S, a manufacturing company engaged in the cardboard box industry in West Java. PT. S is classified as a medium-level company based on its sales value which is less than 50 billion rupiah. The legal basis used is according to the Government Regulation of the Republic of Indonesia Number 7 of 2021 concerning Ease, Protection, and Empowerment of Cooperatives and Micro, Small, and Medium Enterprises (MSMEs), the criteria for MSMEs are listed in Chapter III, Article 35, especially paragraph (5) regarding the criteria for annual sales points (c), which states that Medium Enterprises have annual sales of more than IDR 15,000,000,000.00 (fifteen billion rupiah) up to a maximum of IDR 50,000,000,000.00 (fifty billion rupiah).

In its business practices, companies often face issues regarding the effectiveness of their production costs, mainly due to the use of traditional methods in determining selling prices and other determining components, including detailed overhead costs. Currently, overhead calculations to determine selling prices at PT. S have not separated manufacturing and non-manufacturing costs. The use of traditional methods takes a considerable amount of time to estimate the selling price of products, especially for those with higher difficulty levels and various components that need to be calculated. Management requires 30 minutes to 2 hours to calculate the selling price of a product made on special request from a customer (customization). Production time and resources needed to produce a product are not measured. The production cost estimates are based on a single cost driver variable with overhead estimated only through approximations, i.e., a percentage of overhead multiplied by the raw material price and the quantity to be produced. Currently, there is no differentiation in estimating overhead percentages for different products and variations. The current pricing calculations do not consider the Cost of Goods Sold (COGS) associated with work in progress (WIP) and finished goods inventory, leading to potential waste that affects the company's profitability.

The analysis in this study aims to provide benefits to all company management, especially in production cost efficiency. According to ABC theory, this method can help manage costs, decision-making, profitability improvement (Kaplan & Cooper, 1998). The ABC method helps companies with varied product types and high production complexity. PT. S, in its production process, requires various types of resources, production processes, activities, and different cost calculation methods for each product it produces.

Several previous studies related to ABC have been conducted. Kristarini (2015) applied Activity-Based Costing to PT. X, a plastic manufacturing industry. The research aimed to analyze production cost calculations for two main customers of PT. X through observation, interviews, and processing internal company data. The conclusion of the study showed relatively higher production cost calculations for both customers of PT. X due to inaccuracies in cost allocation using traditional methods.

Other previous studies that share the concept of comparing ABC and traditional methods include Mahal et al. (2015) and Winardi (2019), which researched ABC as an effective tool for better management in manufacturing companies and avoiding cost distortions. Cost allocation analysis was also conducted by Prastyarianti (2016), examining the overhead cost allocation analysis of manufacturing company X. The study evaluated the traditional cost accounting system applied by Company X by providing ABC calculations using the company's data. Furthermore, Almeida et al. (2017) conducted research on the implementation of ABC in a coffee manufacturing company in Portugal, and Al-Halabi (2018) explored the impact of ABC costs on performance efficiency in a manufacturing company in Jordan. The level of ABC's influence on manufacturing productivity compared to traditional methods was also studied by Effiong et al. (2019). The conclusion showed that, rather than allocating overhead based on one variable, ABC effectively uses various cost drivers to provide a more accurate basis for overhead cost allocation.

This study is a development with a different research object from previous studies to examine how the comparison of traditional calculation methods in the cardboard box industry compares to the ABC method. This is an interesting reason to be investigated as a proposal to the management to create a more detailed and detailed production cost calculation, so it will be known whether the existing overhead allocation is undercost or overcost.

The purpose of the study is in accordance with the description of the background and problem formulation to evaluate the comparison between the application of traditional calculations and ABC calculations on the production costs of PT. S. The limitation of the study is that the research was conducted to analyze the production costs of five products (A1 plain, A1 printing, die-cut plain, die-cut printing, top-bottom) produced by PT. S in plant 4 West Java to recommend the application of ABC in allocating more accurate overhead costs.

## LITERATURE REVIEW

### Traditional Cost Calculation Method

Cost management information systems can be divided into two types: unit-based and activity-based. Traditional costing models are widely used for product pricing. Unit-based costing systems use traditional product cost definitions and only employ unit-based activity drivers to allocate overhead costs to products. Traditional cost calculation methods do not address non-production costs, such as marketing and distribution expenses, as these are not considered part of the product, according to generally accepted accounting principles. The traditional costing system simply calculates product costs by incorporating direct labor, direct raw materials, and overhead costs. The traditional cost method does not accurately allocate overhead costs to different product types based on average overhead allocation. The main differentiating feature of traditional costing systems from other developed methods, such as ABC, lies in the allocation of overhead costs. Costs are classified based on their traceability to cost objects, divided into direct costs and indirect costs. Direct costs can be accurately traced to a cost object, while indirect costs cannot be precisely traced, necessitating cost allocation methods to assign these indirect costs (Hansen & Mowen, 2016).

According to Blocher (2019), traditional costing, also known as volume-based or conventional costing, uses a single cost driver for its calculations, usually based on production volume. This traditional approach is simple and less detailed compared to the application of ABC. Despite its limitations, some companies still use traditional calculations.

**Activity-Based Costing (ABC) Cost Calculation Method**

Activity-Based Costing (ABC) was first researched by accounting professors Robert S. Kaplan and Robin Cooper in the 1980s. In 1988, Kaplan and Cooper published the book "Cost and Effect: Using Integrated Cost Systems to Drive Profitability and Performance," which is now widely applied across various industries globally. ABC establishes reliable managerial data at all organizational levels, prepared for decision-making and performance evaluation. ABC reveals the cost complexity arising from different products and variations in the structure and composition of operating costs. In many organizations, indirect costs constitute a significant part of operating costs, and ABC is designed to achieve better allocation of cost drivers based on activities (cost drivers) (Eden & Ronen, 2002).

ABC operates differently from traditional costing systems. The primary benefit of ABC costing is the allocation of unit costs for a product based on the capacity used for that product. ABC calculates costs for each activity and then allocates each activity to the corresponding products. This type of system is suitable for companies with numerous product variations (Alami & ElMaraghy, 2020). According to Blocher (2019), ABC operates on the concept that activities requiring resources influence the costs of services or products produced. By applying ABC, organizations can gain a deeper understanding of their cost structure and make more informed strategic decisions. ABC helps identify the actual cost drivers, enabling better decision-making regarding pricing, product combinations, and process improvements. The implementation of ABC requires more detailed analysis and data collection compared to traditional costing. However, ABC provides a more accurate picture of the costs associated with product production or service provision, allowing organizations to make more precise and effective decisions. Compared to traditional methods, which involve adding a percentage markup (profit margin) to the cost of raw materials, labor, and overhead for a product, the ABC method is more efficient in cost reduction. There are 4 main steps of the ABC method according to Blocher, the first step is to identify activities, the second step is to determine activity costs, then the third step is to allocate costs to products or services, and the last step is to calculate the cost of products or services.

**Cost Measurement**

According to Hansen and Mowen (2016), there are two commonly used ways to measure production-related costs: actual costing and normal costing. Standard costing is also used in manufacturing. Actual costing requires companies to use the actual costs of all resources used in production to determine the cost per unit. In practice, strict actual cost systems are rarely used because they cannot provide accurate and timely information on per-unit costs. Calculations for actual direct material and labor costs can be traced to the produced unit. The main issue with using actual costs to calculate per-unit costs is production overhead.

Normal costing addresses the issues associated with actual costing. A cost system that measures overhead costs on a predetermined basis and uses actual costs for direct materials and direct labor is called a normal costing system. The difference between actual overhead and applied overhead is referred to as overhead variance. Normal costing is generally preferred as it provides more timely information. In the normal costing approach, actual overhead costs are never charged to jobs. Overhead is applied to each job using predetermined overhead rates. However, the company still needs to account for the actual overhead costs incurred.

Standard costing also simplifies product cost setting for companies in process industries. If a standard costing system is used to set product costs, there is no need to calculate per-unit costs for each equivalent cost category. Standard cost units will exist for direct materials, transferred materials, and conversion costs. Usually, a standard process costing system will follow the equivalent unit calculation using the First In First Out (FIFO) approach. Actual production costs can be compared to standard costs (allowable costs for current production) for control purposes. Standards are often classified as ideal or currently achievable.

## METHODS

The research employs a descriptive qualitative method for its analysis. Qualitative research is an approach focused on interpretation based on data collection and interviews. The results of qualitative research cannot be generalized because each research subject has unique characteristics, even in similar conditions, as this type of research is bound by context and time (idiographic statement). According to Creswell (2018), qualitative research is an approach to explore and understand the meaning given by individuals or groups to a social or human problem. The research process involves the emergence of questions and procedures, data collection is usually done in a participant environment, data analysis is done inductively building from specific details to general themes, and researchers interpret the meaning of the data. The final written report has a flexible structure. Those involved in this type of investigation support viewing research that respects inductive styles, focuses on individual meaning, and emphasizes the importance of reporting the complexity of the situation. Although the qualitative research process is similar to quantitative research, qualitative methods are more descriptive, relying on text and visual data, having unique steps in data analysis, and using various designs.

The qualitative approach in this research is used to obtain information about the production process flow to detect activities that require resources. Activities will be grouped, and their cost drivers will be analyzed to determine the costs arising from each activity. In line with the research's qualitative method objectives, it is expected to provide in-depth and detailed understanding of the researched issues, benefiting various parties, especially the company's stakeholders. The writing procedure for this research is largely inspired by the thesis written by Rachmatika (2022) because the methods and literature used are similar to this research.

Primary data collection was carried out through field observations and semi-structured interviews with relevant sections at PT. S, and secondary data collection from internal company data. Interviews were conducted directly face-to-face and through whatsapp media. After obtaining primary and secondary data, analysis is carried out by grouping cost drivers to be implemented in ABC calculations to be compared with traditional methods. There will also analyze the selling price of the product against the allocation of production costs to determine the current allocation for the five products (A1 plain, A1 printing, die-cut plain, die-cut printing, top-bottom) in plant 4 whether it is appropriate or not.Identify activities and cost objects to determine the costs required at each stages of production for all products studied and to determine the studied and to determine the effects resulting from the proposed ABC method to be used.

The interviewees include the CEO, Operational Manager, Production Head, Production Planning and Inventory Control (PPIC), and sales admin. The CEO is interviewed because, as the founder and owner of the company, he holds the top management position. Most of the information is known by the CEO, who has experience in the industry from the company's inception. The CEO also often serves as the marketing representative seeking markets for expansion. The CEO is also the pioneer of the traditional cost calculation method currently used to predict production costs. Most questions will be directed to the CEO because the respondent is familiar with almost all activities and costs required in the production process. Questions directed to the Operational Manager and Production Head aim to understand the production process flow from raw materials to the final product delivered to customers. The Operational Manager is chosen as a respondent because, similar to a plant manager, they know the entire production process from raw materials to finished goods delivered to customers. The Operational Manager is responsible for controlling and supervising the production process. Formerly, the Operational Manager was the Production Head who has been promoted. Questions are asked to trace existing activities, group cost drivers, and determine the costs required for each activity. The current Production Head is chosen as a respondent because they serve as a leader for responsible parties in each production category to produce products, thus being familiar with the entire production process.

## RESULTS

### First Step: Identifying Activities

The initial step in the ABC process is to identify activities occurring at each production stage to be grouped into cost activity centers (cost pool). Once the cost pool is established, the activity drivers (cost driver) can be classified. These activity drivers are the causes of overhead costs. Understanding the business process and various information required for analysis is obtained from interviews based on the questions outlined to the targeted informants. The identification of three main activities at PT. S in Plant 4 is as follows:

1) Purchasing Activity
   The purchasing activity is carried out based on requests from the PPIC department regarding the need for goods for production or from the General Affairs department for consumable goods requests. Purchases may include direct raw material purchases, consumables, assembly and folding services for die-cut cardboard, and contract manufacturing services, with the process involving the creation of Purchase Orders to suppliers. Direct raw material purchases are made after receiving orders (Sales Orders) from customers. Sales orders are provided by the sales marketing, sales engineering, and inner sales departments to PPIC for production process planning and estimating raw material needs. This activity includes the purchase of materials such as cardboard sheets, machine knives, machine rubber, film for printing, stretch film, glue, and staples for the stitching machine.
2) Production Activity
   Production activity consists of 7 types of activities, mostly involving machines. Activities include: 1) Die-cutting machine, 2) Slitter machine, 3) Slotter machine, 4) Manual process, 5) Flexo machine, 6) Finishing on stitching or gluing machines, 7) Packing process. The use of machines depends on the type of product to be made, as each has different production stages. The manual production process includes folding and shaping cardboard for the top-bottom box product. The Die-cutting machine is used to cut cardboard sheets with specific knives according to the desired size. The machine setting for knife use is based on the basic design of the cardboard shape (drawing). Standard-shaped and sized cardboard does not require this machine as it doesn't need special knives. The Slitter machine is used to fold the cardboard (creasing). The Slotter machine is used to shape notches or folded cardboard ears. The Flexo machine is a printing machine for cardboard production that can provide prints in 3 to 4 colors as requested and designed. The use of the Flexo machine involves adjusting the machine rubber and film to produce the desired print image. If the order is for plain cardboard without printing, the Flexo machine is not needed. The finishing production stage involves activities on the stitching machine or gluing machine (staples). The use of glue or staples through the stitching machine is made based on customer requests. The final stage of production activities is packing using a strapping machine.
3) Delivery and Administration Activity
   Activities performed after the completion of the production process include product delivery. The delivered goods are the finished products that have been sorted by the quality control department. Sorted and high-quality products are packed using plastic wrapping and strapped for delivery preparation to customers. Unusable cardboard is separated and categorized as rejected/defective/not good (NG) items. Excess production, such as leftover raw materials, work in process, and finished goods, is stored and regularly recorded through stocktaking. Administrative activities in this department include creating supporting documents such as delivery notes, receipts, invoices, and other required documents.

The mentioned activities are related to the production process. These three main activities are then reclassified based on the level hierarchy according to Blocher's theory (2019). The cost pool classification is depicted in Table 1 as follows.

**Table 1 Cost Pool and Cost Driver Classification**

| No | Cost Pool | Cost Driver | Level |
|---|---|---|---|
| 1 | Purchasing Activity | Sales Order | Batch-Level Activity |
| 2 | Production Activity | Production Time | Unit-Level Activity |
| 3 | Delivery and Administration Activity | Sales Order | Batch-Level Activity |

Source: The interview results have been reprocessed.

The process of production have the differences in production stages for the five types of products produced in Plant 4. The die-cutting machine is only used for die-cut cardboard products, and the flexo machine is only used for products with printing. The choice of using glue or stitching machine on products is based on customer needs and requests. In fact, for die-cut products, some use glue and some do not, depending on the type of die-cut being produced. Examples of die-cut boxes that require glue are gable boxes, souvenir boxes, and die-cut shapes with standard small sizes. Whereas die-cut boxes that do not require glue, such as pizza boxes, partitions, and snap-lock boxes (pieces that can automatically interlock). In this research, die-cut products are considered not to use glue/stitching at all because most die-cuts produced by PT. S are partitions for spare parts ordered by the same customer with the highest monthly sales. Based on information from the interview with the CEO that the number one customer with the highest monthly sales is a manufacturing company engaged in automotive spare parts. The most ordered product is the die-cut partition that does not require glue. Sales data for die-cut partitions throughout 2022 amounted to 11,984,601 pieces (98%), and other die-cuts that cannot trace their glue usage amounted to 232,298 pieces (2%). The number of labor required for each activity per product is shown in Table 2.

**Table 2 Labor Required for Each Activity and Product**

| Description | A1 Plain | A1 Printing | Die-cut Plain | Die-cut Printing | Top Bottom |
|---|---|---|---|---|---|
| **Purchasing Activity** | **1** | **1** | **1** | **1** | **1** |
| **Production Activity** | | | | | |
| Punching Machine | | | **1** | **1** | |
| Slitter Machine | **1** | **1** | | | **1** |
| Slotter Machine | **1** | **1** | | | **1** |
| Manual Process | | | | | **2** |
| Flexo Machine | | **1** | | **1** | |
| Gluing/Stitching Machine | **1** | **1** | | | **1** |
| Packing | **2** | **2** | **2** | **2** | **2** |
| **Delivery and Administration Activity** | **2** | **2** | **2** | **2** | **2** |
| **Total (Person)** | **8** | **9** | **6** | **7** | **10** |

Source: The interview results have been reprocessed

Table 2 shown the number of workers needed for each activity with different products. Labor is required for purchasing raw materials, setting up machines, delivering goods to customers, and administrative tasks such as creating invoices. The data were obtained from interviews with the operational manager, assuming 1,000 pieces per product. It can be observed that the product requiring the most labor is the top-bottom product. Top-bottom is also the only product in Plant 4 that requires a manual process for folding and shaping its cardboard. Further, for each process in the production activity, the production time can be measured using the production capacity per minute in Table 3.

**Table 3 Capacity of Machines and Manual Production Process**

| Machine Name | Capacity per Minute (Pcs) | Time per 1.000 pcs (Minute) |
|---|---|---|
| Pond Machine | 35 | 28,57 |
| Slitter Machine | 30 | 33,33 |
| Slotter Machine | 30 | 33,33 |
| Manual Process | 5 | 200,00 |
| Flexo Machine | 40 | 25,00 |
| Glue/Stitching | 35 | 28,57 |
| Packing | 2 | 500,00 |

Source: The interview results have been reprocessed.

Table 3 above shows the capacity and time required for production activities using machines or manual processes, assuming an output of 1,000 pieces per product. The process that takes the longest time is the manual process, where only 5 pieces are produced in 1 minute, requiring 2 direct laborers (as per information in Table 2), and it takes up to 200 minutes to produce 1,000 pieces. Some production-related information from the respondents includes:

> *"The product with the highest production level is die-cut products. Daily production capacity can produce 20,000-50,000 cardboard pieces. For die-cut alone, one machine can produce up to 7,000 pieces per day. This capacity is influenced by the size of the desired box. The larger it is, the fewer the output."* - CEO
>
> *"The longest process is waiting for the layer sheet material from the supplier and machine setup. Waiting for material can take 7-10 days, and the fastest is 5 days. We estimate to customers that all products require 10-14 days of production for quantities per 1,000-3,000 pieces."* - PPIC
>
> *"For setting up the flexo machine, the estimate for setting 1 and 2 colors is 1 hour, for setting 2 colors it takes 3 hours, and for setting 4 colors it can take a full day because of the high level of difficulty, and it needs to be trialed many times until the sample results are perfect so that the printing is not tilted/shifted."* - PPIC

Based on information from the PPIC interview, the number of color machine settings (flexo) is based on the desired colors. The more printing colors needed, the more settings and time are required on the machine. The number of machine settings for all other machines cannot be accurately measured because multiple settings are needed until the results are accurate.

**Second Step: Determine Activity Costs**

The second step in the ABC process is to determine costs and cost drivers. Information is obtained from financial reports and respondent interviews. Some costs in plant 4 can be traced directly based on records from PT S management, but some of them cannot be traced directly. The method used to trace the amount of costs in plant 4 is to use resource costs in each plant based on the percentage of the number of activities and production results.

The largest cost component is the purchase of layer sheet raw materials as the main raw material, which is worth 13,897 million rupiah or 62.43%. The second largest direct cost is direct labor costs, which amounted to 1,862 million rupiah, or 8.36%. The direct labor category includes all employees in production activities at plant 4. Based on information from interviews, plant 4 as the main production site has 2 work shifts with 8 working hours each. Furthermore, the percentage of indirect costs from the overall cost is 23.55%, which is still smaller than the total direct costs totaling 76.45%. Direct costs are entirely allocated to the product cost allocation currently running at PT. S, while indirect costs that are not related to production are allocated only shipping costs and sales commissions. Consideration of shipping costs refers to shipping distances based on historical data in the past as a cost reference. According to the operational manager and PPIC, there are some constraints:

*"Most deliveries are still in the West Java areas. If there are deliveries outside that area, we still find it difficult to determine how much shipping costs are needed*." - PPIC

After detailed information about the costs in Plant 4 is known, resource drivers for each cost are classified so that they can be charged to activities. Factory overhead costs during 2022 are costs that cannot be traced accurately. These costs are indirect costs that cannot be traced. After classifying resource costs, these costs are then allocated to each activity. The cost allocation to each activity is carried out in the next step.

**Third Step: Allocate Costs to Products or Service**

The third step in the ABC process is allocating cost objects to activities. The tracing of cost objects must be done in detail and gradually to accurately determine the costs that can be assigned to activities. According to Blocher (2019), determining the cost driver must be based on a cause-and-effect relationship for each activity performed on a specific batch of production. The production layout will affect production cycle time, maintenance costs, and factory cleaning costs. The analysis will focus on manufacturing costs as a reference for overhead calculations.

The resource costs allocated to activities based on resource drivers are based on the relationship with the activities in the business process at plant 4. Due to data limitations, the drivers used are mostly still using averages. Table 4 below shows a summary of resource costs that have been calculated rate and cost based on the resource drivers, and Table 5 shows a summary of cost per product.

**Table 4 Summary Results of Resources Cost Allocation to Activities (Indirect Cost)**

| Activity | Cost (Million Rupiah) |
|---|---|
| Purchasing Activity | 548 |
| Production Activity | 1.538 |
| Delivery and Administration Activity | 3.156 |
| **Grand Total** | **5.242** |

Source: Internal data of PT. S have been reprocessed.

**Table 5 Summary of Cost per Product (In Million Rupiah)**

| Name of Producs | Purchasing Activity | Production Activity | Delivery & Administration Activity | Total Cost Per Product |
|---|---|---|---|---|
| A1 Plain | 91 | 7.706 | 522 | 8.319 |
| A1 Printing | 158 | 458 | 910 | 1.526 |
| Die-cut Plain | 208 | 9.736 | 1.195 | 11.139 |
| Die-cut Printing | 6 | 32 | 36 | 74 |
| Top Bottom | 85 | 625 | 492 | 1.202 |
| **Grand Total** | **548** | **18.557** | **3.156** | **22.261** |

Source: Internal data of PT. S have been reprocessed.

**Fourth Step: Allocating Costs to Products**

The final step in the ABC process is to allocate direct costs and indirect costs to products. Indirect costs per activity that have been identified in Table 4 can then be directly charged to the product. However, before charging the two costs to production activities, an activity rate calculation is first carried out to determine the cost per product, because the stages of the production process for each product are different.

Direct costs are fully charged to production activities. Activity rate is calculated using machine capacity data and the amount of direct labor required for the production of each product.

While charging indirect costs to purchasing activities and shipping and administrative activities does not require an activity rate because there are no differences in processes such as those in production activities so that both use cost drivers in the form of the number of sales orders. The following Table 6 shows the results of the unit cost calculation using the ABC method.

**Table 6 Summary of Unit Cost Allocation Per Product to Activity with ABC Method (Rupiah)**

| Name of Producs | Purchasing Activity | | Production Activity | | Delivery & Administration Activity | | Total Unit Cost |
|---|---|---|---|---|---|---|---|
| | Direct Cost | Indirect Cost | Direct Cost | Indirect Cost | Direct Cost | Indirect Cost | |
| A1 Plain | - | 18 | 1.375 | 124 | - | 102 | 1.619 |
| A1 Printing | - | 647 | 1.719 | 155 | - | 3.726 | 6.247 |
| Die-cut Plain | - | 17 | 732 | 66 | - | 98 | 913 |
| Die-cut Printing | - | 232 | 1.076 | 97 | - | 1.337 | 2.742 |
| Top Bottom | - | 396 | 2.652 | 240 | - | 2.279 | 5.567 |
| **Grand Total** | **-** | **1.310** | **7.554** | **683** | **-** | **7.542** | **17.088** |

Source: Internal data of PT. S have been reprocessed.

The calculation of unit cost in production activities is done by dividing the cost per product by the quantity of each product. Meanwhile, unit costs in purchasing activities and shipping and administration activities use cost drivers from the sales order rate because they are both based on the number of incoming sales orders. The reason for using this cost driver is due to the limitation of the absence of master data on the number of invoices with product details, and the absence of delivery order data with details of delivery dates, products sent, and quantities. It can be seen that the unit cost for A1 plain products is Rp 1,619, A1 printing is Rp 6,247, die-cut plain is Rp 913, die-cut printing is Rp 2,742, and top bottom is Rp 5,567.

## DISCUSSION

### Unit Cost Comparison with ABC Method and Traditional Method

The cost calculation to trace factory overhead costs to products using the ABC method has been completed. Direct and indirect costs have been allocated to each product group based on their activities. Before comparing with costs using the traditional method, it is essential to know the unit cost using the traditional method. Table 7 show summary of the unit cost calculations using the traditional method for direct costs, shipping costs, and sales commissions included in the current product selling price at PT. S.

**Table 7 Summary Total Unit Cost with Traditional**

| Product Name | Unit Cost (Rp) | | | Total Unit Cost (Rp) |
|---|---|---|---|---|
| | Direct Cost | Shipping Cost | Commisions Fee | |
| A1 Plain | 955 | 12 | 90 | 1.057 |
| A1 Printing | 955 | 12 | 90 | 1.057 |
| Die-cut Polos | 955 | 12 | 90 | 1.057 |
| Die-cut Printing | 955 | 12 | 90 | 1.057 |
| Top Bottom | 955 | 12 | 90 | 1.057 |
| **Grand Total** | **4.775** | **60** | **450** | **5.285** |

Source: Internal data from PT. S processed accordingly

Table 7 shows the calculation of unit cost using the traditional method based on the rate of the quantity of products produced. Total direct costs, shipping costs, and sales commissions as factors to multiply costs according to the rate were obtained from internal cost data at plant 4. Table 8 below shows a comparison of unit costs using the traditional method and the ABC method.

**Table 8 Comparison of Unit Costs between Traditional Method and ABC Method (Rupiah)**

| Product Name | Unit Cost Calculation Method | | Difference | % Difference |
|---|---|---|---|---|
| | ABC | Traditional | | |
| A1 Plain | 1.619 | 1.057 | 562 | -53% |
| A1 Printing | 6.247 | 1.057 | 5.190 | -491% |
| Die-cut Plain | 913 | 1.057 | -144 | 14% |
| Die-cut Printing | 2.742 | 1.057 | 1.685 | -159% |
| Top Bottom | 5.567 | 1.057 | 4.510 | -427% |
| **Grand Total** | **17.088** | **5.285** | **11.804** | **-1117%** |

Source: Internal data from PT. S processed accordingly

Table 8 shown the four products, A1 plain, A1 printing, die-cut plain, and top bottom box, the undercost is quite large. This means that the costs allocated to the four products are currently less than the actual costs required. While the plain die cut product with the highest sales quantity experiences an overcost of 14%, which means that this product is allocated more than the actual production cost.

**Profitability Analysis using Cost Per Product between ABC Method and Traditional Method**

The main calculation of the selling price of products at PT. S is currently using the product quantity reference. The cost components included in the current selling price calculation are all direct costs, shipping costs, and sales commissions. All of them are measured using estimates in the form of percentages based on historical data, except for direct raw materials which can be directly traced using price data from suppliers. The amount of sales commission for each product and production batch varies depending on management policy, so there is no definite standard that PT. S has to calculate this component in the selling price of the product.

In PT. S's cost calculation, the selling price of the product is first determined by the desired profit, then the overhead uses historical rates with an average of 20-40%. There is no difference in the calculation of product selling prices for various variations. The price can be calculated by knowing information about the product type, quantity, and delivery area. The selling price is determined based on the overhead value and the desired profit first. Next, the material price is summed up with overhead costs and profit, then the product selling price is obtained to make an offer to the customer. The overhead percentage determined is considered sufficient to meet production costs in the form of direct labor, shipping costs, and sales commissions.

Comparison of traditional methods used today can be compared with the ABC method by detailing the activities and costs required in each activity. The traditional calculation method currently used at PT. S charges overhead costs in the form of direct labor, shipping costs and electricity costs. Based on information from the sales admin interview, shipping costs are sometimes separated from the product selling price, but most of them are combined in the calculation of overhead rates on the product selling price. Shipping costs that are separated can be measured into direct costs that can be directly traced. However, since most of the shipping costs are not separated in the product selling price, this analysis will assume direct costs in the production batch with the assumption of quantity, product type and assumption of certain shipping distance.

The cost per product with the ABC method that has been calculated in Table 5 is then used to compare with the traditional method for profitability analysis. Table 9 shows profitability analysis using cost per product between ABC Method and Traditional Method.

**Table 9 Comparison of Profitability Analysis with Traditional Method and ABC Method (Million Rupiah)**

| Description | Product Name | | | | | Total |
|---|---|---|---|---|---|---|
| | A1 Plain | A1 Printing | Die-cut Plain | Die-cut Printing | Top Bottom | |
| **Revenue** | 1.066 | 2.364 | 21.768 | 297 | 4.997 | 30.492 |
| **Traditional Method** | | | | | | |
| Direct Cost | 4.910 | 233 | 11.643 | 26 | 206 | 17.018 |
| Shipping Cost | 60 | 3 | 143 | 0 | 3 | 210 |
| Commissions Fee | 461 | 22 | 1.094 | 2 | 19 | 1.599 |
| **Total Cost** | **5.432** | **258** | **12.880** | **29** | **228** | **18.827** |
| **ABC Method** | | | | | | |
| Direct Cost | 7.067 | 420 | 8.929 | 29 | 573 | 17.018 |
| Indirect Cost | 1.252 | 1.106 | 2.210 | 45 | 629 | 5.243 |
| **Total Cost** | **8.319** | **1.526** | **11.139** | **74** | **1.202** | **22.261** |
| **Difference** | **3.343** | **251** | **610** | **9** | **441** | **3.434** |
| % Difference | 62% | 97% | -5% | 31% | 193% | |
| % Average Current Profit (Traditional) | -88% | 365% | 77% | 694% | 646% | |
| % Average Current Profit (ABC) | -80% | 816% | 69% | 938% | 2.090% | |

Source: Internal data from PT. S has been reprocessed.

The comparison of product costs using ABC and Traditional methods in Table 9 indicates a significant difference. The total difference of 3,434 million rupiahs represents costs that have not been allocated to products. These costs should be allocated to product costs, revealing that PT. S has been undercosting overall. The largest percentage difference is found in the Top Bottom Box product, reaching 2090%. Although only the A1 Plain product is experiencing a loss among the five products, this still needs attention as it will affect the overall profit percentage. The percentage difference between the two product costs using ABC and traditional methods is then compared with the average profit percentage to determine the product's selling price.

The average profit percentage determined for plain A1 products is smaller than the percentage difference in product costs. However, the currently set profit percentage can still cover direct costs and overhead costs, but does not match the desired profit expectation of 20-30%. The calculation results with the ABC method provide more accurate production cost information compared to the traditional method that PT S is still using today. The ABC method clearly shows which products provide the greatest profit and which ones provide losses for the company. The application of the ABC method helps cost savings for the company by allocating product costs more precisely and in accordance with the standard unit cost obtained from the ABC calculation results. Cost savings will increase profits, where in the last 4 years the average company profit was only 3.75%. In accordance with the theory put forward by Blocher (2019) that ABC helps identify true cost drivers and enables better decision making regarding pricing, product combinations, and process improvements.

## CONCLUSION

The conclusion of this research, in line with the background and problem formulation, is as follows:

1. The application of traditional costing methods and Activity-Based Costing (ABC) methods shows differences in product cost allocation. The current traditional costing method used by PT. S allocates direct costs such as direct raw materials, direct labor, shipping costs, and sales commission based on certain percentages derived from historical data. The only exception is direct raw materials, which can be traced through supplier price data. On the other hand, ABC is performed in four steps: first, identifying the main activities in Plant 4 of PT. S; second, determining indirect costs and cost drivers (resources drivers); third, assigning cost objects to activities using resources driver rates to trace indirect costs; and fourth, allocating costs to products. The difference between traditional and ABC calculations in PT. S production shows a significant disparity, specifically an unallocated indirect cost of IDR 3,434 million. This indicates that the company's budget allocation has been undercosted for all products, affecting the received profit not aligning with expectations in the product pricing calculations.
2. ABC allocates all direct and indirect costs to products by classifying activities first, obtaining accurate costs using rates from resources drivers. In contrast, the traditional method allocates overhead costs to the selling price based only on direct raw material costs plus estimated direct labor, shipping, and sales commission costs. Determining overhead with the traditional method using historical data and inaccurate assumptions results in undercosting. ABC helps the company to determine product cost allocation more accurately.

### Recommendations

Based on the research findings, the following recommendations are suggested:

1. PT. S should improve its financial report details for easier traceability of operational costs. If these costs can be accurately traced, the use of the ABC method can provide better benefits, especially in product cost allocation.
2. The use of the ABC method is suitable for this company's industry, considering its ease of use and the company's medium-sized scale in terms of revenue. ABC can be applied to all plants and products in PT. S, enabling the attainment of desired profits.
3. The use of the ABC method helps the company identify profitable and less profitable products, facilitating evaluation for the company to re-formulate product pricing calculations.

### Research Limitations

The limitations of this research include the completeness of data owned by PT. S and the manual, Microsoft Excel-based database system. PT. S's data lacks master data, which summarizes all information about sales, purchases, and business costs. The data is divided into several files, requiring more time to analyze and organize. Additionally, there is a lack of machine specifications data for each production stage, preventing the measurement in kilowatt-hours (kWh). ABC calculations for purchasing activities and shipping and administration activities using sales order cost drivers may be less precise due to research limitations, namely the absence of master data regarding the number of invoices with details of products on each invoice number, and delivery order data with details of dates and road letter numbers for each delivery activity at PT. S. If this data were available, ABC calculations might be more accurate.

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