
Production Cost Control using Activity-Based Costing Methods in Information Systems

Suparto Darudianto¹, Yunus Widjaja²

Abstract

Abstract—Companies engaged in furniture manufacturing with marketing targets mostly abroad are faced with very tight price and quality competition that requires a more accurate production costing system than traditional methods, which are still widely used in Indonesia. In general, companies use cost calculation methods that pay attention to only one cost driver, resulting in deviations in the calculation of actual production costs. A production cost calculation method is proposed using activity-based costing to overcome this problem. Many companies have used this method in developed countries, showing improvements in calculating production costs. The activity-based calculation method takes into account the activities that are cost drivers and is taken into account in obtaining actual production costs. So that the cost planning for the management is better, in this study, calculations using traditional methods are shown, and the results are compared with the results of the activity-based costing (ABC) method. Then an analysis of the *system* needed for applying the information system-based ABC method and the proposed implementation is also carried out. The information system will help calculate costs faster and more accurately.

Keywords

Control, Cost, Production, Activity-Based Costing, ABC

1. Introduction

The development of technology and information in recent times has experienced extraordinary outcomes rapidly. Information technology has been used to assist companies in improving performance and other aspects. Therefore, the decision-makers in the company are very aware of this and try to apply this information technology as a supporting tool and even become the spearhead of their company.

Along with the improvement in the world economy, especially in Indonesia, many new companies have emerged, and their development seems very fast. The story of technology and information causes the competition between companies to be more stringent. Not to mention the existence of globalization which also forces a country to abolish regulations that hinder free market competition. Competition faced by companies is not only from within the country but also from small-scale and multinational foreign companies. Like it or not, companies must make continuous improvements to survive. The old business strategies and tactics are no longer suitable for today's era, where the flow of information moves very quickly and in large quantities [1]. It is a significant added value if so much information is utilized for the company's benefit; it is a significant added value [2]. So we need a system that can process data and use it for the company's benefit [3].

Corresponding Author: Suparto Darudianto (suparto.darudianto@upj.ac.id)

1 Suparto Darudianto, Program Studi Sistem Informasi, Universitas Pembangunan Jaya, Institution, suparto.darudianto@upj.ac.id

2 Yunus Widjaja, Program Studi Sistem Informasi, Universitas Pembangunan Jaya, Institution, yunus.widjaja@upj.ac.id

In the previous era, it was still possible for companies to be product or business oriented because there were still relatively few similar companies. But now, with so many new companies being established in the same field, consumers are inevitably divided. Demand and consumer needs must be considered and even be the key to competition [4], [5]. If the company succeeds in meeting consumer expectations, consumers are satisfied and will return to using the company's products [2]. The company's competitiveness is getting higher [6], but if it is the other way around, consumers will switch to similar companies that can meet their needs.

Three things are the main points of competition [7], [8], namely: 1) Price - which states that a product or service must be cheap, if possible, the most affordable in its field without reducing quality and service. 2) Quality - related to the fulfilment of consumer expectations. If a product or service can meet consumer expectations, then the product or service can be of high quality. 3) Service - a service that can be in the form of speed in getting products, ease of obtaining products, and so on.

The inconsistency in determining the cost of a product can lead to disruption in the information needed by management for decision-making, such as setting product selling prices, measuring performance, cost control, and buying or making decisions [9]. Proper and accurate calculation of production costs can reduce company errors in determining company profits and losses. Besides that, it can also help determine the desired price and profit level so that companies can use pricing strategies to compete. Due to the reasons above, we need control over production costs within the company.

One of the efforts to control costs within the company is to use an accounting information system, especially a cost information system. This system will help companies see the costs incurred in the production process and allow managers to find prices irrelevant to the product. So managers can take action to reduce these costs or even eliminate non-value-added costs to the product.

The conventional cost accounting system is no longer appropriate because it can represent the costs incurred on products. The production cost of a product consists of 3 components, namely direct material costs, direct labour costs and factory overhead costs [10]. The conventional cost accounting system allocates overhead costs based on measuring production volume so that the overhead costs are the same for different products.

One concept in determining a product's cost and cost management is Activity-Based Costing (ABC). The ABC concept is an accounting system that tracks product costs according to the activities carried out on the product during the production process and is not affected by the size or size of production [11]. This production cost control system will be better if supported by information systems. Using an information system will reduce errors, increase accuracy and ease tracing production costs so that companies can determine the correct production costs [12].

In general, a company determines costs by estimating the cost of the product that has been designed by looking at the specifications. Based on these specifications, it is estimated the need for materials, labour, and other indirect costs or overhead costs. However, now, the company still needs help to determine the actual production cost of a product. The planning and calculations that are usually carried out are a traditional method approach in determining the actual overhead price of a product.

On this occasion, we will discuss companies that produce furniture, most of which are sold abroad. In this case, the product's price is a critical factor in marketing the product. The company is engaged in the furniture sector, which produces many types of products with various specifications by following consumer demand. With multiple products in terms

of volume, size, and complexity, companies need a cost system that is accurate in allocating the actual costs of a product.

From some of the descriptions above, the existing problems become interesting to be raised as a thesis topic. In the end, it is hoped to assist companies in determining production costs precisely, quickly, and accurately.

2. Proposed Method

In calculating product costs, conventional costing systems allocate costs based on the units produced or the other cost-allocation base that causes prices to be too high for high-volume products and charges too low for low-volume products. So that inequality often occurs because the allocated costs are not the actual costs of the product.

The ABC method costing system allocates product costs based on cause-and-effect relationships [13]. This method is an approach to determining product costs based on the resources they consume, usually caused by activity. The rationale for this costing approach is that activities produce a company's products or services and use resources that cause costs [2], [13]. The rationale for this costing approach is that activities produce a company's products or services and use resources that cause costs [2], [13].

The research method used in this study begins with formulating the problems that occur and determining the research steps described in Fig. 1: The following Research Framework:

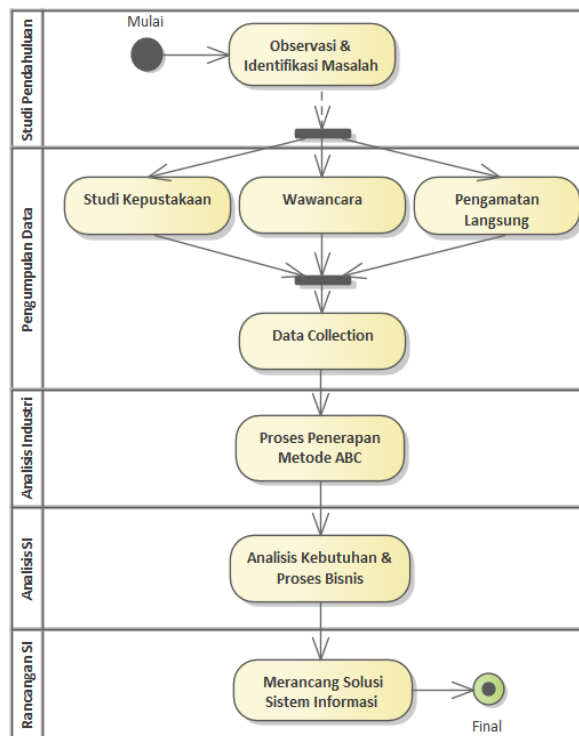


Fig. 1: The following Research Framework

3. Result & Analysis

a. Production Data Analysis

Based on the sources contacted, production data for 2021 was obtained, as shown in Table I below.

Table I. Production Data of 2021

Types of products	Production Amount
Round Table	2.927 unit
Side Table	2.154 unit
Deck Chair	2.029 unit
Dining Table	1.977 unit
Bench	4.978 unit
Lounge Chair	2.559 unit
Arm Chair	24.930 unit
Total	34.627 unit

Pay attention to Table I, where the total production of the seven products produced by the company is presented in 2021. As for the order of the total output of the seven products, we can see that the Arm Chair is the product that is produced the most, followed by the Bench, Round Table, Lounge Chair, Side Table, Deck Chair, and finally, the Dining Table. A comparison of the seven products can be seen in Fig. 1.

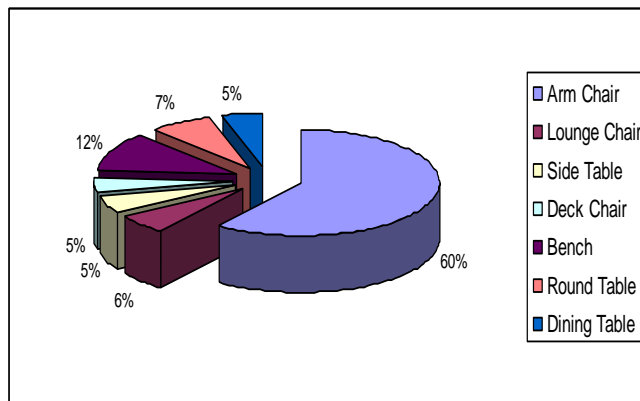


Fig. 1: Production Comparison Ratio of 2021

By producing the seven products mentioned above, the total production volume per year is around 1500 m³, with a remaining production of 25 m³. The rest of the output is used as a buffer inventory for preparation if the number of products produced is insufficient to meet market demand. The reason for the existence of a buffer inventory is that the production preparation costs are too significant to produce products in small quantities. Therefore, this inventory will cover ad hoc needs.

In conducting an analysis using this data, we should look at the sample products used to represent the products produced by the company. When selecting a product as a sample company, it is better to see its costing system. Companies charge costs based on the amount of production as a determinant of the expenses, so products with the highest production volume bear the highest prices. Concerning loading based on quantity, the products taken as examples are armchairs, dining tables, and benches. The Arm Chair represents the product with the highest requests, the Dining Table represents the product with the least demand, and the Bench represents the product in between. These three products can provide a clear picture of the differences between the ABC and traditional systems.

In general, Nyatoh wood is used for Arm Chairs but can adjust this to consumer demand, and for the production of Bench and Dining Tables, Teak wood is used. The indirect materials used to produce the three products above can be seen in Table II below.

Based on direct and indirect materials, direct and indirect costs (Table II) are obtained as shown in

Table III. this is done by estimating labour costs per hour per m³ and the average labour to the output produced per share. Indirect costs (Overhead) are calculated by calculating the production volume per product unit. Overhead costs for one year are reduced to overhead costs per m³ by dividing it into 12 months, the number of containers per month, and the total volume of product per container. Based on historical data from the PPIC, every month, an estimate of the importance of production is carried out, namely seven containers, and an average container contains 15 m³ of product, so the results of the cost per product using the traditional method are shown in

Table IV.

Table II. Table of Indirect Materials and Packing

Bahan	Amount		
	Arm Chair	Bench	Dining Table
Poyoshica Glue	0,16 m ²	0,32 m ²	0,43 m ²
Polyartica Glue	0	0,06 m ²	0
Dowel Stakes (40 x ø6)	10 pcs.	38 pcs.	8 pcs.
Grooved dowels	0	0	8 pcs.
Cross Dowel (30 x ø6)	0	2 pcs.	0
Screw (+) 1¼", ø 8 mm	0	37 pcs.	74 pcs.
Screw (+) 5/8", ø 8 mm	0	0	24 pcs.
Screw (+) 1", ø 8 mm	0	0	16 pcs.
Leg corner Bracket	0	0	4 pcs.
Bolt	0	0	8 pcs.
Rubber Feet	0	0	4 pcs.
Pin (20 x ø5)	0	4 pcs.	0
Pin (20 x ø6)	0	2 pcs.	0
Pin Galv. 37 x ø6	0	2 pcs.	0
Wooden peg	2 pcs.	7 pcs.	0
Pin (30 x ø6)	8 pcs.	0	0
Cross Dowel (30 x ø6)	2 pcs.	0	0
Logo "X"	1 pc.	1 pc.	1 pc.
Brass Nail 1,2"	2 pcs.	2 pcs.	2 pcs.
Carton DW	3,25 m ²	3,81 m ²	4,08 m ²
Strapping band	6,50 m	7,17 m	10,15 m
Band tape	5,82 m	6,12 m	8,9 m
Sticker	1 pc.	1 pc.	1 pc.
Brosur + Ass. instruction	2 set	2 set	2 set

Table III. Production cost

Jenis	Unit	Total (Rp.)
Indirect Labour Costs	Month	107.235.000
PBB Fees	Year	19.827.450
Teak Wood	m ³	17.640.000
Nyatoh Wood	m ³	4.464.000
Arm Chair Auxiliary Material Costs	Unit	11.725
Arm Chair Packing Material Costs	Unit	31.355
Cost of Bench Auxiliary Materials	Unit	46.151
Cost of Bench Packing Materials	Unit	81.249
Cost of Dining Table Auxiliary Materials	Unit	39.621
Dining Table Packing Material Costs	Unit	36.192
Arm Chair Direct Labour Cost	m ³	142.546
Bench Direct Labour Costs	m ³	243.859
Dining Table Direct Labour Cost	m ³	339.071
Arm Chair Overhead Cost	Unit	185.215
Bench Overhead Costs	Unit	316.856
Overhead Costs	Unit	440.570

Table IV. Cost of Production Per Unit Using Traditional Methods

Biaya	Arm Chair	Bench	Dining Table
1. Material Cost	777.533	434.103	1.883.695
2. Labour costs	139.380	238.445	331.545
3. Overhead Costs	174.056	297.768	414.030
4. Production cost	1.090.969	970.317	2.629.269
% Overhead Costs (3/4)	15,95%	30,69%	15,75%

Table IV above shows that after one production period is complete, the costs incurred during production are recalculated. Cost calculations include direct material costs, direct labour, and overhead using traditional methods, and these costs are added up to obtain the actual production costs. Meanwhile, the ABC method's production costs are shown in Table V.

Table V. Cost of Production Per Unit Using the ABC Method

Biaya	Arm Chair	Bench	Dining Table
1. Material Cost	777.533	434.103	1.883.695
2. Labour costs	139.380	238.445	331.545
3. Overhead Costs	229.146	292.363	378.853
4. Production cost	1.146.059	964.912	2.594.092
% Overhead Costs (3/4)	19,99%	30,309%	14,60%

After calculating overhead costs using the traditional and the ABC methods, a comparison of the results obtained from the calculation of the two methods will be carried out. The results of the comparison of the two methods can be seen in Table VI.

From Table VI, it appears that there are differences in overhead costs per unit for the three products where there are product costs allocated using the traditional method for Arm Chair products resulting in a price of IDR 174,056 while using the ABC method IDR 229,146. The difference in the expenses is -IDR 55,090 with 20,775 units produced, so the total difference in overhead costs charged to Arm Chair products is -IDR 1,144,500,000

(rounded up). The difference here means that from the total income earned by the Arm Chair product, there is an excess of IDR 1,144,500,000 in a recording. Will explain more details about this to the product's gross profit.

Table VI. Production Comparison Ratio of 2021

	Arm Chair	Bench	Dining Table
1. Production Units	20.775	4.148	1.647
2. Total Overhead Costs) (Rp)	3.616.020.000	1.235.140.000	681.910.000
3. Total Overhead Costs (ABC) (Rp)	4.533.480.000	1.133,96	586.910.000
4. Overhead Costs) /unit (Rp)	174.056	297.768	414.029
5. Overhead Costs) /unit (ABC)	229.146	292.363	378.853
6. Cost of Deviation /unit (4-5)	-55.090	5.405	35.176
7. Percentage (6/4)	-31,65%	1,82%	8,50%
8. Difference total (6x1)	-1.144.500.000	22.420.000	57.940.000

For bench and Dining table products, the overhead costs charged using the traditional method amounted to IDR 297,768 and IDR 414,029. Meanwhile, using the ABC method, the calculated overhead costs are IDR 292,363 for the Bench and IDR 378,853 for the Dining Table. The price difference is IDR 5,405 and IDR 35,176; multiplied by the number of production units of 4,148 and 1,647 will produce a difference of IDR 22,420,000 and IDR 57,940,000. From these figures, the company sets costs that are too high so that it becomes an additional profit for the company. Setting the selling price of the product will undoubtedly be higher, making it difficult for the company to compete with other similar products.

b. Information System Analysis and Design

In this section, the analysis and design of the proposed information system are carried out. The information system that will create is a production cost calculation and reporting system that aims to help the automation process so that existing processes become faster, more precise, and more accurate.

On this occasion, the design of this production cost calculation system will present a process model using a Data Flow Diagram (see Fig. 2 and Fig. 3) and a data model using an Entity Relationship (Fig. 4).

Fig. 2 is a process model of cost calculation and production reporting, modelled using Data Flow Diagrams. In the proposed Production Costing and Reporting System, the system will:

- 1) Perform cost prediction calculations (direct and indirect material costs, direct labour, and overhead costs) from detailed orders provided by the marketing department.
- 2) Exercise control over the use of materials by providing a plan for the benefit of materials filled out by the production department and sent to the warehouse. The warehouse will receive the material request file for processing, after which it records the material transactions.
- 3) Carry out the accumulation of material costs. For each use of direct and indirect materials, the transaction value will be recorded and stored in the materials usage database, which will be charged to the Order Production Cost.

- 4) Accumulate costs for using direct labour hours, which will be charged to Order Production Costs.
- 5) Receive proof of charging factory overhead costs from the finance department, then accumulate the value to actual FOH costs.
- 6) Record the activities consumed by the product during the production process, such as machining activities, receiving raw materials, etc., to calculate OHP costs using the ABC method.
- 7) Making a report recording and calculating the cost of production is done for the manager's needs. The reports generally consist of Cost Prediction Reports, Material Transaction Reports, TKL Transaction Reports, FOH Transaction Reports, Production Cost Reports, and Actual Cost Reports.

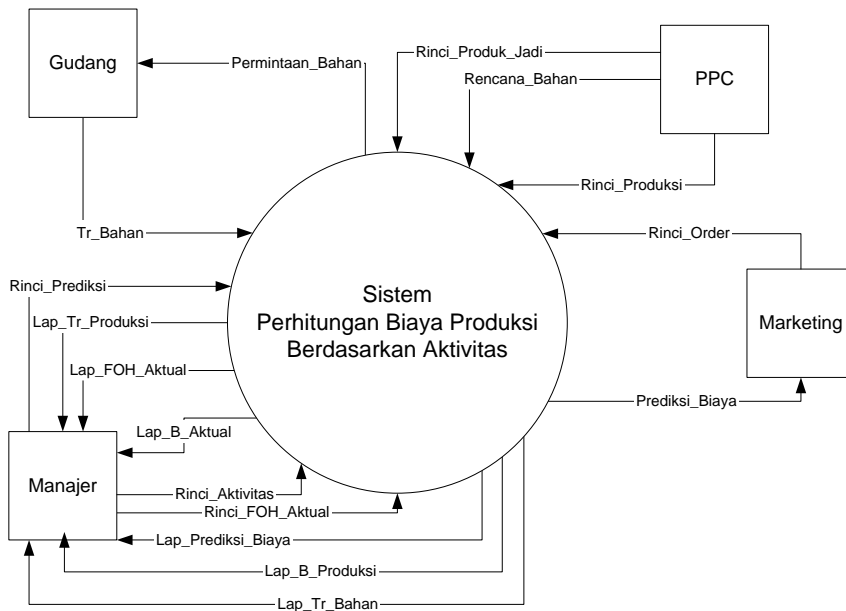


Fig. 2: Context Diagram (Level 0) Production Cost Calculation and Reporting Process

Based on the process described in Fig. 3 above can be described in more detail into six process groups, namely; 1) Order Cost Prediction, 2) Material Transaction, 3) Production Transaction, 4) Actual FOH Transaction, 5) Order Production Cost, and 6) Actual Cost. The six processes are described in Fig. 3 in the following.

In the processes described in Fig. 3, you can see the datastore used in each process. However, not all data stores are described in the Level 1 Data Flow Diagram. For details, the data store used in calculating and reporting Production costs can be seen in the data model, which the Entity Relationship Diagram illustrates in Fig. 4.

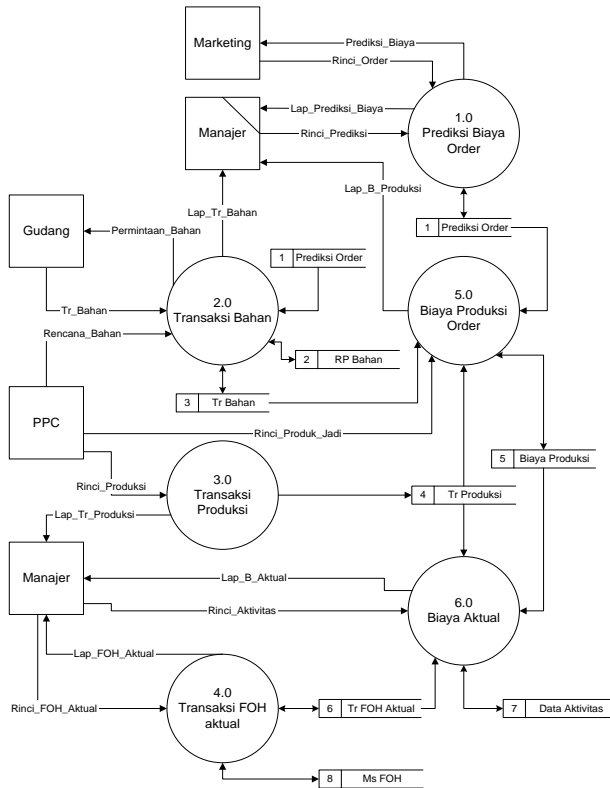


Fig. 3: Level 1 Diagram of Production Cost Calculation and Reporting Process

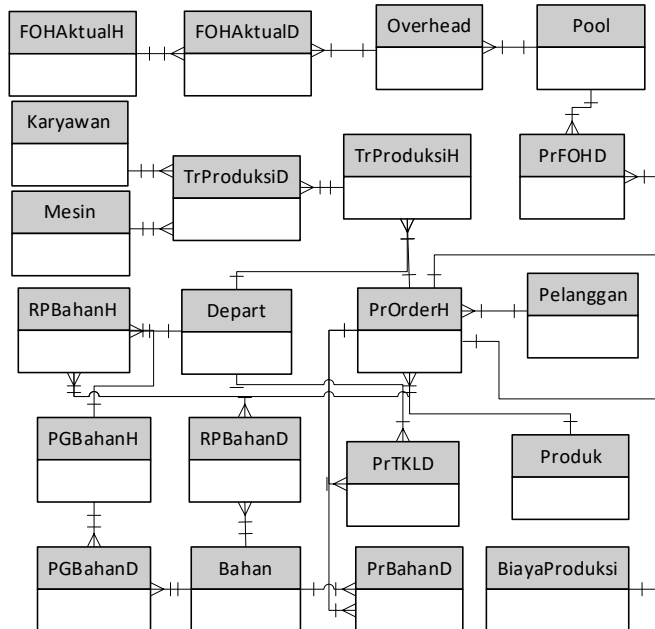


Fig. 4: Production Cost Calculation and Reporting Process Data Model

4. Conclusion

From the use of the ABC method, six types of cost-triggering activities are obtained, which are grouped into six types of pools that are triggered by: machine hours, number of batches, number of deliveries, standard capacity, number of building maintenance, and number of machine maintenance.

The discussion using the activity-based costing method shows differences (distortions) in allocating costs to the sample products where there are products whose fees are charged more than they should (overprice) and vice versa. The highest deviation occurred in the Arm Chair product by 25.37% and for the Bench and Dining Table product deviation by 8.19% and 13.93%.

The proposed costing information system helps record labour and product overhead costs more clearly so that cost calculations are more accurate and can know the profit margin obtained from these products with certainty.

The information system is a support system for the company's strategy. The implementation plan is arranged in stages to minimize disruption due to adding new methods.

Acknowledgement

Thank you to LP2M Pembangunan Jaya University (UPJ) for supporting and facilitating the research to realize this paper.

References

- [1] P. C. Verhoef *et al.*, "Digital transformation: A multidisciplinary reflection and research agenda," *J. Bus. Res.*, vol. 122, no. September 2019, pp. 889–901, 2021.
- [2] H. M, T. Militina, and G. N. Achmad, "Effect of Customer Value and Customer Experience on Customer Satisfaction and Loyalty Pt Meratus Samarinda," *Int. J. Econ. Bus. Account. Res.*, vol. 4, no. 01, pp. 84–94, 2020.
- [3] S. P. Barus and E. Surijati, "Chatbot with Dialogflow for FAQ Services in Matana University Library," *Int. J. Informatics Comput.*, vol. 3, no. 2, p. 62, 2022.
- [4] B. Musumali, "An Analysis why customers are so important and how marketers go about in understanding their decisions.," *Bus. Mark. Res. J.*, vol. 23, no. 23, pp. 230–246, 2019.
- [5] M. A. Camilleri, "Understanding Customer Needs and Wants," in *Travel Marketing, Tourism Economics and the Airline Product*, Cham, Switzerland: Springer Nature, 2018, pp. 29–50.
- [6] Albari & Kartikasari, "The Influence of Product Quality, Service Quality and Price on Customer Satisfaction and Loyalty," *AJEFB - Asian J. Entrep. Fam. Bus.*, vol. 3, no. 1, pp. 49–64, 2019.
- [7] X. Guo and M. Wen, "Research on Competitive Strategy of Coca-Cola Company," *Proc. 2021 3rd Int. Conf. Econ. Manag. Cult. Ind. (ICEMCI 2021)*, vol. 203, no. Icemci, pp. 2879–2885, 2022.
- [8] W. Kuncoro and W. O. Suriani, "Achieving sustainable competitive advantage through product innovation and market driving," *Asia Pacific Manag. Rev.*, vol. 23, no. 3, pp. 186–192, 2018.
- [9] J. V. Gray, S. Helper, and B. Osborn, "Value first, cost later: Total value contribution as a new approach to sourcing decisions," *J. Oper. Manag.*, vol. 66, no. 6, pp. 735–750, 2020.
- [10] I. Nurhayati, "The Determination of the Main Production Cost of Jipang Cake Using the Full Costing Method," *J. Manaj.*, vol. 11, no. 1, p. 26, 2020.
- [11] D. Al-Eidan, M. Al-Ahmad, M. Al-Ajmi, N. Al-Sayed, R. Al-Ajmi, and W. Smew, "Activity-based costing (ABC) for manufacturing costs reduction and continuous improvement: A case study," in *Proceedings of the International Conference on Industrial Engineering and Operations Management*, 2019, no. July, pp. 1963–1975.

- [12] U. Tu Tran and H. Thi Tran, "Factors of application of activity-based costing method: Evidence from a transitional country," *Asia Pacific Manag. Rev.*, vol. 27, no. 4, pp. 303–311, 2022.
- [13] S. Aeffiong and A. Eakpan, "Effect of Activity Based Costing (Abc) on the Productivity of Manufacturing Company.," *Int. J. Adv. Res.*, vol. 7, no. 1, pp. 753–765, 2019.