# Financial Performance Analysis Using the Du Pont System Method: A Case Study

# Andrian Listyo Kawuri

Master Program of Industrial Engineering
Faculty of Engineering
Universitas Sebelas Maret
Surakarta, Indonesia
andrianlk27@student.uns.ac.id

# Wahyudi Sutopo

University Centre of Excellence for Electrical Energy Storage Technology
Research Group Industrial Engineering and Techno-Economic
Industrial Engineering Department, Faculty of Engineering
Universitas Sebelas Maret
Surakarta, Indonesia
wahyudisutopo@staff.uns.ac.id

# Renny Rochani

Industrial Engineering Department, Faculty of Engineering
Universitas Sebelas Maret
Surakarta, Indonesia
rennyrochani@staff.uns.ac.id

#### Abstract

In 2019 the world was experiencing a crisis due to the coronavirus pandemic which had an impact on company operations. Several companies experienced termination and restrictions on the operations of the company and its subsidiaries. PT Mayora Indah Tbk. is one of the companies engaged in the Fast-Moving Consumer Goods Companies also experienced the impact of the company's operational restrictions due to the pandemic that hit Indonesia. Operational restrictions affect product sales, it affects the financial performance of PT Mayora Indah Tbk. For this reason, it is important to analyze the company's financial performance because it can assist in making a company decision, for the company's strategy in the future. In this study, the objectives to be achieved are to examine and determine the benefits of financial analysis and to assess the financial condition and performance of the company at PT Mayora. This study uses our du Pont financial analysis method to determine: the level of efficiency of the company by knowing the size of the operating profit in relation to the level of sales (net profit margin), the rate of turnover of business assets in a period (total asset turnover), and the level of efficiency. Use of capital in the company, return on investmen.

# **Keywords**

Performance Measurement, Du Pont System, SWOT, Business Strategy and ROI

#### 1. Introduction

The world economy in 2019 experienced the test of the coronavirus pandemic, this had an impact on company operations. Several companies experienced termination and restrictions on the operations of the company and its subsidiaries.

PT Mayora Indah Tbk. is one of the companies engaged in the Fast-Moving Consumer Goods Companies also experienced the impact of the company's operational restrictions due to the pandemic that hit Indonesia. The types of activities that have been discontinued include cessation of operations in the packaging section. There were also other difficulties, such as the difficulty of coordinating with advertising vendors, machine vendors, and raw material vendors, resulting in delays, difficulties in coordinating between employees due to working from home, difficulties in distributing product sales, and reduced shipping frequency which hampered exports.

PT Mayora Indah Tbk produces various kinds of processed food and beverage products. Operational restrictions affect product sales, it affects the financial performance of PT Mayora Indah Tbk. For this reason, it is important to analyze the company's financial performance because it can assist in making a company decision, for the company's strategy in the future. One way to see the state of a healthy company can be seen from the company's financial performance, a company must have a healthy and efficient financial performance to earn profits and increase company performance (Dewa, A. P., et al. 2015). Analyzing the company's financial condition, there are several ways, but analysis using ratios is the most common thing, the results of measurements made can provide a relative measurement of the company's operations.

Financial Statement Analysis is a measuring tool for identifying the financial characteristics of a company obtained from accounting data and other financial reports (Kasmir 2010). The purpose of financial statement analysis is to assess the company's financial condition in the past, present, and possibly in the future. In addition, financial statements can also provide financial information as a source to support strengthening decision-making, especially from the financial side of the company. Du Pont analysis is used to analyze firm value. Saraswati, et al. (2015) said the du Pont system is a tool used to measure company performance that combines financial ratios, namely profitability ratios and activity ratios. The profitability ratio used in du Pont is net profit margin (NPM) and the activity ratio used is total assets turnover (TATO). The two ratios used are taken from the net profit contained in the company's resources. This analysis is used to show how the ratios influence each other in determining the company's profitability.

In this study, the objectives to be achieved are to examine and determine the benefits of financial analysis and to assess the financial condition and performance of the company at PT Mayora. The benefits of using the Du Pont financial analysis method are: the level of efficiency of the company by knowing the size of the operating profit in relation to the level of sales (net profit margin), the speed of turnover of business assets in a period (total asset turnover), and the level of efficiency in the use of capital in the company (return on investment).

Several previous studies discuss the performance measurement model. Ikasari et al. (2020) in their research discuss performance measurement using the SCOR model in battery companies. Istiqomah et al. (2021) in their research discuss the use of the logistic scorecard method for performance measurement. Khofiyah et al. (2021) also discusses the measurement of performance efficiency in the technology transfer office process in accelerating the commercialization of technology in companies. Hanif et al. (2020) also discussed supply chain performance using data envelopment analysis on fuel oil companies.

## 2. Literature Review

#### 2.1 Financial Statements Analysis

According to Prastowo (2010) financial statement analysis aims to reduce the dependence of decision makers on pure guesswork, guesswork, and intuition as well as reduce and narrow the scope of uncertainty that cannot be avoided in every decision-making process. Financial statement analysis allows reporting of trends and the ability to compare key performance metrics across time periods and types. Several financial cues have been observed and are associated with excess and can also be used as an aid in decision-making in the investment process. A financial statement may not directly reflect all the information about the potential of a company, but financial statements make an important contribution to an investment puzzle (Griffin and Mahajan 2019).

## 2.2 Financial Ratio Analysis

The research conducted by Bambang Riyanto (2001) said that the measure that is often used in financial analysis is the ratio and a ratio is just a measuring tool stated in arithmetic terms that can be used to explain the relationship between two kinds of financial data. Financial ratios are used to compare the relationship between different parts of financial information. Financial ratio is one form of accounting information in measuring the performance appraisal

process of the company, so that the company's financial condition can be disclosed through financial ratios in the period specified (Islami and Rio 2019).

# 2.3 Du Pont System

Du pont analysis is a tool to measure financial performance, as well as directly describe two reports, namely the balance sheet and income statement, in this model analysis includes elements of sales, assets used, and profits that can be generated by the company. The du Pont analysis is the result of the company's ROI derived from multiplying the profit from the sales component and the efficient use of total assets in generating this profit (Syamsudin 2004). Munawir (2010) stated that the benefits of Du Pont System analysis are as follows:

- Comprehensive or comprehensive, can measure the efficiency of the use of capital, production efficiency, and sales efficiency.
- 2. Efficiency, this system can compare the efficiency of the company with the efficiency of industry standards, so that the company's ranking can be known, then the company's performance can be known.
- 3. Can measure the efficiency of the action.
- 4. Can measure profitability.
- 5. Can make plans.

The approach with the Dupont System Financial Analysis is one of the most relevant financial performance measurement tools used to see the extent to which the company's effectiveness in returning on investment is carried out by the company or Return On Investment (Sunardi 2018).

## 2.4 SWOT Analysis

According to Richard L. Daft (2010), SWOT analysis includes efforts to identify strengths, weaknesses, opportunities, and threats that determine performance. External information about opportunities and risks is available from many sources, including customers, government documents, suppliers, the banking industry, and partners from other companies. SWOT analysis is a method used to evaluate factors that are strengths, weaknesses, opportunities, and threats that can occur in a company to achieve its goals. Many companies use the services of scanning agencies for newspaper clippings, internet research, and analysis of relevant domestic and global trends. To position the company in the market and at large, SWOT analyzes the internal and organizational environment during times of doubt. Strengths, weaknesses, opportunities, and threats (SWOT) analysis has become a fundamental tool for solving these problems (Rozmi et al. 2018).

# 3. Methods

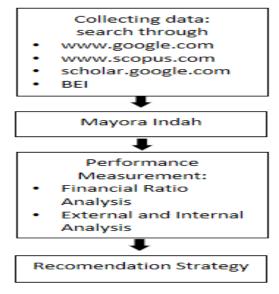


Figure 1. Methodology and Framework

This research uses quantitative research using descriptive studies. The type of data used in this study is secondary data obtained from researchers indirectly. Secondary data is evidence of a company's financial statements published by the company. In this study, the secondary data used is the financial statements of PT Mayora sourced from the Indonesia Stock Exchange (IDX) for 2019-2021. Sources of data used by researchers are documentary data in the form of journals, invoices, minutes, or the form of reports. The data needed is history, organizational structure, and financial reports which include PT Mayora's balance sheet and income statement from 2019 to 2021. (Figure 1)

## Data analysis technique

The analytical technique used in this research is descriptive analysis with a qualitative approach. The following descriptive analysis techniques with a qualitative approach will be carried out are:

- 1. Calculating PT Mayora's financial ratios, during the 2019-2021 period which includes liquidity ratios, leverage ratios, activity ratios, and profitability ratios.
- 2. Analyzing the results of the calculation of PT Mayora's financial ratios from 2019-2021.
- 3. Concluding the results of the calculation of the financial ratios of PT Mayora, Tbk.

Analyzing using SWOT analysis by looking at the company's strengths and weaknesses seen from the internal side of the company, then based on the SWOT analysis it will be known the company's position and what strategies should be used by the company, especially in terms of increasing product sales volume.

## 4. Results and Discussion

## 4.1 Financial Ratio Analysis

## I. Liquidity Ratio

Table 1. Liquidity Ratio PT. Mayora Indah, Tbk during the period 2019 to 2021

Year	NWC	Current Ratio (%)	Quick Ratio (%)	GPM
2019	9.049.743.242.312	342,9%	268,0%	31,64%
2020	9.363.405.450.151	369,4%	288,7%	29,82%
2021	7.399.010.405.873	232,8%	178,4%	24,81%

#### a) Net Working Capital

Based on Table 1, the results of the calculation of the financial ratios of PT. Mayora Indah, Tbk during the period 2019 to 2021, Net Working Capital decreased in 2021 by 7.399.010.405.873 after previously experiencing an increase in 2020. The lower the company's liquidity ability, the lower the company's ability to pay current liabilities/ current debt.

# b) Current Ratio

Based on Table 1, the results of the calculation of the financial ratios of PT. Mayora Indah, Tbk during the period 2019 to 2021, the company's Current Ratio in 2020 had increased, but in the following year 2021, it decreased from 369.4% to 232.8%. A decrease in the value of the current ratio or a decrease in the company's ability to pay current debt indicates that the company's liquidity is decreasing.

#### c) Ouick Ratio

Based on Table 1, the results of the calculation of the financial ratios of PT. Mayora Indah, Tbk during the period 2019 to 2021, the company's Quick Ratio in 2020 increased by 288.7%, but in 2021 it decreased to only 178.4%. the quick ratio percentage results in the three-year period studied exceeded 100%, which means good (Tanor et al. 2015). This ratio shows the company's ability to cover its debts. Therefore, the greater this ratio to debt, the better. It is said that the most optimal is 1:1 (Ottay and Alexander 2015).

# **II Activity Ratio**

Table 2. Activity Ratio PT. Mayora Indah, Tbk during the period 2019 to 2021

Year	ITO	AAI	FATO	TATO
2019	6,13	58,73	4,00	1,31
2020	6,12	58,82	3,53	1,24
2021	6,91	52,10	4,02	1,40

## a) Inventory Turnover Ratio

Based on Table 2, the results of the calculation of the financial ratios of PT. Mayora Indah, Tbk during the period 2019 to 2021, the company's ITO in 2019 and 2020 did not experience significant changes ranging from 6.13 to 6.12 times. In 2021 the ITO has increased to 6.91 times. An increased ITO indicates that the funds embedded in inventory are rotating and the more efficient the company is in carrying out operations.

## b) Average Age of Inventory

Based on table 2, the results of the calculation of the financial ratios of PT. Mayora Indah, Tbk during the period 2019 to 2021, AAI in 2019 and 2020 for 58 days, in 2021 it decreased to 52 days. If the average age of inventory (AAI) in the company is getting shorter, the more active the inventory is.

#### c) Fixed Assets Turnover

Based on Table 2, the results of the calculation of the financial ratios of PT. Mayora Indah, Tbk during the period 2019 to 2021, the company's FATO in 2020 decreased to 3.53 times. In 2021 it will increase to 4.02 times. This shows that the higher the fixed asset turnover rate, the more efficient the company is in managing its fixed assets in generating sales.

#### d) Total Assets Turnover

Based on Table 2, the results of the calculation of the financial ratios of PT. Mayora Indah, Tbk during the period 2019 to 2021, in 2020 it decreased from the previous year to 1.24 times, then in 2021, it increased by 1.40 times. This shows the more efficient the company is in managing its total assets in generating sales.

# III. Solvability Ratio

Table 3. Solvability Ratio PT. Mayora Indah, Tbk during the period 2019 to 2021

Year	Debt Ratio	The Debt Equity Ratio	DTCR
2019	48,00%	54,66%	35,34%
2020	43,01%	44,63%	30,86%
2021	42,97%	26,29%	20,82%

# a) Debt Ratio

Based on Table 3, the calculation results of financial ratios of PT. Mayora Indah, Tbk during the period 2019 to 2021, the company's debt ratio has decreased from the year 2019 to 2021. The decline in the value of the debt ratio indicates that the company's long-term debt is decreasing.

# b) The Debt Equity Ratio

Based on Table 3, the calculation results of financial ratios of PT. Mayora Indah, Tbk during the period 2019 to 2021, the company's DER decreased from 2019 to 2021 to 26.9%. The lower the DER, the smaller the financial risk borne by the company. The decrease in DER was due to a decrease in the company's long-term debt. The smaller the DER, the smaller the company's debt.

# c) The Debt to Total Capitalization Ratio

Based on Table 3, the calculation results of financial ratios of PT. Mayora Indah, Tbk during the period 2019 to 2021, the company's DTCR decreased from 35.34% in 2019, and 20.82% in 2021. This shows that 20.82% of the total long-term capital comes from the company's long-term loans.

# IV. Profitability Ratio

Table 4. Profitability Ratio PT. Mayora Indah, Tbk during the period 2019 to 2021

Year	GPM	OPM	NPM
2019	31,64%	12,68%	8,15%
2020	29,82%	11,57%	8,57%
2021	24,81%	6,35%	4,34%

## a) Gross Profit Margin

Based on Table 4, the calculation results of financial ratios of PT. Mayora Indah, Tbk during the period 2019 to 2021, the company's GPM has decreased from year to year. The lower the GPM value indicates that the company's operating conditions have decreased. The increased cost of goods sold affects the value of GPM.

# b) Operating Profit Margin

Based on Table 4, the calculation results of financial ratios of PT. Mayora Indah, Tbk during the period 2019 to 2021, Operating Profit Margin decreased in 2019 by 12.68%, in 2021 by 11.57%, then in 2021 by 6.35%. The decrease in Operating Profit Margin was due to a drastic increase in operating expenses. The lower the Operating Profit Margin, the less good a company's operating activities are.

## c) Net Profit Margin

Based on Table 4, the calculation results of financial ratios of PT. Mayora Indah, Tbk during the period 2019 to 2021, the company's NPM in 2020 has increased by 8.57%, in 2021 it has decreased by 4.34%. The lower NPM value indicates the company's operating activities are not doing well.

# 4.2 Du Pont Analysis

#### a) Return On Investment

Table 5. Return On Investment PT. Mayora Indah, Tbk during the period 2019 to 2021

Year	NPM	TATO	ROI
2019	8,15%	1,31	10,68%
2020	8,57%	1,24	10,63%
2021	4,34%	1,40	6,08%
Industry Standard	20%	2 Times	30%
Source: Kasmir (2008)			

Based on the results Table 5 of the calculation of ROI PT. Mayora Indah, Tbk during the period 2019 to 2021 experienced a decline, in 2019 by 10.68%, then in 2020 by 10.63%, and in 2021 it decreased to 6.08%. The decline in ROI is inseparable from the impact of the declining value of the company's NPM in 2021. A declining ROI indicates the company's ability to decline in managing its assets to generate an operating profit.

#### b) Return On Equity

Table 6. Return On Equity PT. Mayora Indah, Tbk during the period 2019 to 2021

Year	ROE
2019	20,5%
2020	18,7%
2021	10,7%

Industry Standard	40%
Source: Kasmir (2008)	

Based on the results Table 6 of the calculation of ROE PT. Mayora Indah, Tbk during the period 2019 to 2021 experienced a decline, in 2019 by 20.5%, then in 2020 by 18.7%, and in 2021 it decreased to 10.7%. The ROE value in industry standards is explained by Kasmir (2008), namely the industry average ROE of 40%. A declining ROE indicates that the level of net income earned by the company on the capital invested in the company decreases.

# 4.3 SWOT Analysis

In this study, a SWOT analysis was conducted to analyze the company's strengths and weaknesses and to formulate a company strategy. The following are the results of the SWOT analysis:

Table 7. SWOT Analysis

Strength	Weakness
PT Mayora is the market leader in creating new product	High cost of promotion.
innovations.	The company has not been able to maximize
PT Mayora is a large food and beverage industry	the existing debt, as can be seen from the low
company that has been selling products in Indonesia	ROE value, which is 10.7%.
and abroad.	• Net sales in 2021 decreased by 6.35%.
Have a lot of substitute products so that they can	Low consumer loyalty in the food and
compete and make it easy to determine the selling price	beverage industry (Investor.id 2022).
of the product.	
Attractive product advertisement.	
Sophisticated production facilities and large capacity.	
Opportunities	Threats
The food and beverage market in Indonesia is still very	• Many competitors such as INDOFOOD,
open.	TPS, etc
<ul><li>open.</li><li>Development of new products from existing products.</li></ul>	TPS, etc  The fast-paced home-based food and
	·
Development of new products from existing products.	• The fast-paced home-based food and
<ul> <li>Development of new products from existing products.</li> <li>The development of opportunities for PT Mayora's</li> </ul>	The fast-paced home-based food and beverage industry keep up with market
<ul> <li>Development of new products from existing products.</li> <li>The development of opportunities for PT Mayora's product market in the increasing e-commerce sector.</li> </ul>	The fast-paced home-based food and beverage industry keep up with market developments.
<ul> <li>Development of new products from existing products.</li> <li>The development of opportunities for PT Mayora's product market in the increasing e-commerce sector. (Marketeers 2022)</li> </ul>	<ul> <li>The fast-paced home-based food and beverage industry keep up with market developments.</li> <li>The increase in raw material prices reached</li> </ul>
<ul> <li>Development of new products from existing products.</li> <li>The development of opportunities for PT Mayora's product market in the increasing e-commerce sector. (Marketeers 2022)</li> <li>Expectations of economic recovery and significant</li> </ul>	<ul> <li>The fast-paced home-based food and beverage industry keep up with market developments.</li> <li>The increase in raw material prices reached</li> </ul>

Based on the SWOT analysis described Table 7 above, it can be formulated a strategy that can be used by PT. Mayora Indah, Tbk in developing its business to be more advanced. Conduct more massive e-Commerce marketing, and always be adaptive to market changes. Below is a more complete explanation:

# Formulation of Improvement Strategy through SWOT analysis

SWOT analysis resulted in 4 strategic recommendations, then the formulation of improvement strategies was carried out, through SWOT analysis obtained strategies for further company development, including:

#### 1. S-O Strategy

- a) PT mayora does not miss e-Commerce in the company's efforts to ensure products are present at every touchpoint (Marketeers 2022).
- b) Changes in habits due to the Pandemic, concerns about traveling too long or often being answered by presenting large, packaged products, Family Packs or Share Packs (Marketeers 2022).
- c) In the online channel, Mayora strengthens the official store in e-commerce and builds a home delivery service that utilizes Mayora's infrastructure in every area (Marketeers 2022).

#### 2. W-O Strategy

- a) After the pandemic, people's activities and mobility have returned to encourage economic recovery and restore people's purchasing power, as a result of increasing production demand, PT Mayora presents new product innovations, and it is estimated that five new products will be launched (Investor.id 2022).
- b) Capacity expansion was carried out to support the increase in export demand (Investor.id 2022).
- c) To expedite the use of capital expenditure, PT Mayora has prepared a strategy to continue innovation in 2022 and continue to carry out marketing activities to increase brand awareness and loyalty for Mayora products (Kontan.co.id 2022).
- d) PT Mayora boosts performance by ensuring the availability of each product in all distribution channels and the company's target market. This is so that Mayora's products can be easily reached by the public (Kontan.co.id 2022).

#### 3. S-T Strategy

- a) The increase in selling prices is a challenge for the company to maintain the company's financial and sales performance so that it continues to run well, the company internally innovates the way it works (Investor.id 2022).
- b) In the FMCG sector, the promotion has an important role, so the company carries out promotions intensively to make reminders to consumers through promotions because in this industry loyalty for snack products is very low (Investor.id 2022).

# 4. W-T Strategy

- a) With the high price of raw materials and high inflation rate, the company considers the increase in product selling prices by 10% (Investor.id 2022).
- b) PT Mayora takes servicing steps in facing challenges by understanding consumer behavior and adjusting it from the marketing mix side so that Mayora products can always be relevant to consumer needs (Marketeers 2022).
- c) From the product side, Mayora creates communication materials that are relevant to consumers. If all this time, Mayora's communication materials tend to touch the emotional side, now the communication materials are directed more functionally (Marketeers 2022).

## 4.4 Suggestion

# 4.4.1 Relationship Marketing

In the marketing department, companies must begin to realize that conventional marketing through one-way communication aimed at everyone is no longer adequate, this happens because consumer expectations are getting higher from time to time. Therefore, the concept of relationship marketing or one-to-one marketing can be used as an alternative strategy for meeting customer expectations by providing personalized service. Companies that apply this concept are very customer-oriented because the company is aware that the company's survival depends on its customers, so companies need to pamper their customers to stay loyal. The thing that is important for a company when running relationship marketing is to build long-term relationships with customers. Relationship marketing is a dynamic concept, so customer behavior is a major component in determining the direction of relationship marketing policies. Long-term relationships with customers, by identifying what customer needs and expectations are the main sources for companies to achieve the expected profitability. Chan (2003) said that 7 stages need to be considered when implementing the concept of relationship marketing, namely: Recognizing and building a database, selecting priority customers by segmenting customers, making it easy for customers to interact, facilitating the handling of interactions

through internet technology, providing an enjoyable experience, attractive, provide personalized service and maintain customer loyalty. If this is implemented, then consumers are expected to be loyal to the company's products.

# 4.4.3 Cost Leadership Strategy

The use of this strategy emphasizes the manufacture of products at low costs for price-sensitive consumers, because of the broad mass market focus the company seeks to reduce overhead costs. Efforts to utilize company resources effectively to avoid waste. Since we are engaged in food and beverage manufacturers, the trends of which are rapidly changing according to consumer demands, it is necessary to invest in renewable technologies to achieve good and dynamic intelligent working of the Rend department.

#### **4.4.2** First Mover Benefits

With the company taking early competitive action steps, both strategic and tactical. By implementing this first mover strategy, it is hoped that PT Mayora will get above-average returns until competitors respond effectively, and also gain customer loyalty, thus creating a barrier for competitors to enter the competition and gaining market share that may be difficult for competitors to take in the future.

## 5. Conclusion

Based on the performance measurement results obtained on the ROI at PT. Mayora Indah, Tbk during the period 2019 to 2021 experienced a decline, in 2019 by 10.68%, then in 2020 by 10.63%, and in 2021 it decreased to 6.08%. The decline in ROI is inseparable from the impact of the declining value of the company's NPM in 2021. A declining ROI indicates the company's ability to decline in managing its assets to generate an operating profit. ROE PT. Mayora Indah, Tbk during the period 2019 to 2021 experienced a decline, in 2019 by 20.5%, then in 2020 by 18.7%, and in 2021 it decreased to 10.7%. A declining ROE indicates that the level of net income earned by the company on the capital invested in the company decreases.

By using the company's internal and external analysis, the company's business strategy formulation is obtained. The marketing strategy that will be implemented is by regularly studying consumer trends and continuing to innovate to meet consumer needs by creating new products that are by the intended target market. To increase sales, promotional activities are carried out in the field according to each target market.

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# **Biography**

**Andrian Listyo Kawuri** is a student at Master Program of Industrial Engineering Department, Universitas Sebelas Maret, Surakarta, Indonesia. His research interests are logistics and supply chain management, e-business design, and business strategic management.

Wahvudi Sutopo is a professor in industrial engineering and Head of Industrial Engineering and Techno-Economics Research Group, Department of Industrial Engineering, Universitas Sebelas Maret (UNS), Surakarta, Indonesia. He is also as researcher for center of excellence for electrical energy storage technology (CoE-EEST), the president of the industrial engineering and operations management (IEOM) society for Indonesia's professional chapter, and Director, IEOM Asia Pacific Operation. His educational background is the profession of engineer from UNS (2018); Doctor and bachelor's in industrial engineering from Institut Teknologi Bandung (2011 & 1999); and Master of Management Science from Universitas Indonesia (2004). His research interests include supply chain engineering, engineering economy & cost analysis, and technology innovation & commercialization. Dr Sutopo has completed research projects with more than 45 grants and carried out research projects funded by Institution of Research and Community Services - UNS, Ministry of Research and Technology, National Agency for Research and Technology, Indonesia Endowment Fund for Educational (LPDP), PT Pertamina (Persero), PT Toyota Motor Manufacturing Indonesia, and various other companies. He has written 4 textbooks and 7-chapter books and made 5 intellectual property rights (IPR) in the form of copyrights, and 3 patents. He has initiated to commercialize research outputs of UCE-EEST UNS related to energy storage technology and electric vehicle conversion through start-ups where he is one of the founders, namely PT Batex Energi Mandiri and PT. Ekolektrik Konversi Mandiri. Dr Sutopo has published articles over 185 documents indexed by scopus with H-index 12. His email address is wahyudisutopo@staff.uns.ac.id.

**Renny Rochani** is a lecture in Industrial Engineering Faculty at Universitas Sebelas Maret-Surakarta, Indonesia. Sheis also in the Research Group Industrial Engineering and Techno-Economic Industrial Engineering Department, Faculty of Engineering Universitas Sebelas Maret Surakarta, Indonesia. Her recent research is to develop a mobile battery swap charging station for electric motorcycles in Indonesia.