
INTEGRATING GREEN NETWORK EFFICIENCY INTO PRODUCTION COST ANALYSIS: A PATHWAY TO SUSTAINABLE TELECOM OPERATIONS IN KALIMANTAN

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ABSTRACT

This study aims to analyze the influence of production and production costs on company performance at PT Indosat Tbk Palangkaraya Branch. In the competitive telecommunications industry, production efficiency and cost control are important factors in improving performance. The method used is a quantitative approach with multiple linear regression analysis. The independent variables consist of production (X_1) and production costs (X_2), while the dependent variable is company performance (Y). The results of the study indicate that partially, production has a positive and significant effect on performance (t count = $2.84 > t$ table = 2.06), and production costs also have a significant effect (t count = $3.21 > t$ table = 2.06). Simultaneously, both variables have a significant effect on performance (F count = $9.87 > F$ table = 3.55) with an R^2 value of 0.61, which means that 61% of performance is explained by production and production costs, while 39% is influenced by other factors.

Keywords: Production, Production Cost, Efficiency, Company Performance, Indosat Tbk

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INTRODUCTION

The telecommunications industry is a strategic sector supporting the development of Indonesia's digital economy. The growth of internet and communication service users has created intense competition among companies, including PT Indosat Tbk, which operates in various regions, including Palangkaraya. To face this competition, companies must be able to improve production efficiency and control costs to maintain optimal profitability. Production in the telecommunications services sector is not measured by the quantity of physical goods produced, but rather by the number of customers, network capacity, and service quality. Higher production levels are expected to improve performance. However, increased production is often accompanied by increased costs, which, if not managed properly, can reduce company efficiency (Etika, 2024).

According to (Revaldo et al., 2025), production theory explains the relationship between input and output, where efficiency is achieved when a company is able to produce maximum output with minimal input. Meanwhile, (Hidayat L & Salim S, 2013) emphasize that controlling production costs is the key to achieving operational efficiency.

The phenomenon at PT Indosat Tbk's Palangkaraya branch shows that despite continued increases in network capacity and customer base, financial performance has not shown significant growth. This indicates that production and cost efficiency still need to be improved. Therefore, this study was conducted to determine the extent to which production factors and production costs influence company performance.

LITERATURE REVIEW

Production Theory

According to (Azizah et al., 2025), production is the process of creating utility value to meet human needs. Samuel Revaldo (2025) explains that in the long run, production efficiency can be described through the relationship between isoquants and isocosts. Optimal production is achieved when the two lines intersect, indicating the most efficient combination of inputs. In economics, production is defined as the process of converting various inputs into outputs that have utility for consumers. Every production activity aims to meet the needs and desires of society through the utilization of available resources such as land, labor, capital, and entrepreneurship. The main focus of

production theory is the relationship between production factors as inputs and the goods or services produced as outputs. Inputs can be natural resources, labor, equipment, capital, and the managerial capabilities of entrepreneurs who manage the entire production process.

The ultimate goal of production activities is to create goods and services with economic value that can be used and traded by the public. In this regard, understanding the basic principles of production theory is crucial for more efficient use of production factors and the results obtained can meet market demand at minimal cost. One of the fundamental principles of production theory is the law of diminishing returns. This principle explains that if one factor of production is increased while others remain constant, the additional output (marginal output) obtained will decrease. For example, in agricultural activities, if the workforce is continuously increased without expanding land or adding more production equipment, the increased workforce will no longer produce comparable results. This principle applies widely to various sectors, including agriculture, manufacturing, and industry. Furthermore, there is the principle of economies of scale, which states that as the scale of production increases, the production costs per unit tend to decrease. This concept is relevant in sectors with high investment requirements, such as mining and large-scale manufacturing.

The factors of production themselves consist of land, labor, capital, and entrepreneurship, which play a vital role in producing goods and services. One important analytical tool in production theory is the isoquant curve, a curve that depicts various combinations of inputs that can produce the same level of output. This curve helps producers determine the most efficient combination of labor and capital in the production process. Applying the isoquant concept allows producers to maintain a balance between production costs and the resulting output. By selecting an efficient combination of inputs, companies can reduce costs, increase profits, and strengthen competitiveness in the global market. Furthermore, the isoquant curve also helps companies adapt their production strategies to changing market conditions. If there is an increase in labor wages or a shortage of skilled labor, companies can decide whether to increase the use of capital in the form of technology and machinery, or invest in improving workforce skills. This adaptability is crucial amidst increasingly fierce global competition.

Production Cost Theory

(Hidayat L & Salim S, 2013) state that production costs include all expenses incurred to produce goods or services. In the service sector, such as Indosat, these costs include labor costs, network maintenance, promotion, and digital service development. Production costs are all sacrifices of economic resources incurred by a company in order to produce goods or services that are useful to consumers. In the classical economic view, production costs include all expenses incurred to obtain production factors such as labor, capital, raw materials, and technology used in the production process. According to Sukirno (2011), production costs are all costs incurred by a company to produce a certain amount of output, whether in the form of goods or services, in a certain period. Thus, production costs reflect the value of all inputs used to produce output.

In the context of a service company like PT Indosat Tbk's Palangkaraya Branch, production costs take a different form than those in a manufacturing company. While in a manufacturing company, production costs are synonymous with raw materials and labor, in the telecommunications services sector, production costs are more related to operational activities that support customer service. These costs include network infrastructure maintenance (base transceiver stations/BTS), electricity and energy costs, and other costs.

Internet bandwidth costs, technician and network operator salaries, and service promotion costs. All of these components are categorized as production costs because they are directly used to produce and maintain the quality of service provided to customers.

(Rosdiana et al., 2020) explain that production costs can be grouped into three main components: direct material costs, direct labor costs, and production overhead costs. In the telecommunications services industry, direct materials can be defined as network resources or technological capacity used to distribute data and voice services. Meanwhile, direct labor is the employees involved in network operations and technical services to customers. Production overhead costs include indirect expenses such as electricity, network equipment maintenance, equipment depreciation, and operational administration costs.

Production cost analysis is important because it plays a strategic role in managerial decision-making. According to (Hidayat L & Salim S, 2013), production costs serve as the basis for planning,

controlling, and evaluating a company's production activities. Accurate information about production costs helps management set selling prices, determine process efficiency, and identify cost components that can be reduced without reducing output quality. In the context of PT Indosat Tbk's Palangkaraya Branch, understanding the production cost structure is an important basis for management in developing efficiency strategies, particularly in dealing with rising operational costs such as electricity, network maintenance, and investment in new equipment.

From an economic perspective, production costs also describe the relationship between output volume and total costs. When a company increases its production volume, total costs typically increase, but unit costs (average costs) can decrease if the company achieves economies of scale. Under these conditions, increasing production capacity can reduce average costs, which means increased operational efficiency. However, if increased output actually causes average costs to rise, production inefficiency occurs. Therefore, cost control is a crucial element in maintaining a balance between production growth and financial performance. Therefore, production cost theory addresses not only nominal expenditures but also the concept of efficiency in resource use. In the context of PT Indosat Tbk's Palangkaraya Branch, production costs are an important indicator for measuring a company's ability to manage inputs (such as labor, energy, and network equipment) to produce high-quality, stable, and financially efficient communication services.

Production and Cost Efficiency

(Lukita Permanasari, 2021) states that cost efficiency is achieved when costs can be reduced without reducing output quality. (Simamora et al. 2024) add that efficiency can be increased through innovation and digitalization of work processes. Production cost efficiency is a measure of the extent to which a company can utilize its resources to produce output at the lowest possible cost without reducing the quality of products or services. According to (Lukita Permanasari, 2021), cost efficiency means a company's ability to reduce expenses while maintaining or even increasing productivity. Cost efficiency does not mean drastically reducing all costs, but rather optimizing each cost component to provide maximum results for company performance. In economic theory, cost efficiency is achieved when

A company operates at a point of equilibrium between the isoquant and isocost curves. Isoquants describe the combination of inputs that can produce a given level of output, while isocosts show the combination of inputs that can be obtained at a given cost. When the two curves intersect, the company has achieved economic efficiency, which is the use of inputs at minimum cost to produce maximum output (Revaldo et al., 2025). In other words, cost efficiency occurs when a company is able to produce output with the most optimal use of resources.

In the operational context of PT Indosat Tbk's Palangkaraya Branch, production cost efficiency is reflected in the company's ability to manage network and operational costs proportionally to the volume of services produced. For example, when a company increases network capacity to increase signal coverage and the number of customers, the resulting cost increase must be commensurate with the increase in revenue. If the increase in costs is greater than the increase in output, efficiency decreases. Conversely, if output increases with a relatively small increase in costs, cost efficiency increases. This demonstrates the importance of budget planning and monitoring in every production activity.

Cost efficiency is also closely linked to workforce productivity and the effective use of technology. The use of automated network systems, process digitization, and preventative network maintenance can reduce long-term operational costs. According to (Lukita Permanasari, 2021), sustainable cost efficiency can only be achieved if a company has a sound cost management system, which encompasses planning, implementing, and monitoring expenditures periodically. This means that efficiency is not simply the result of savings, but rather a continuous managerial process to maintain a balance between expenditure and performance.

Production and cost efficiency are crucial for maintaining company competitiveness, particularly in the capital-intensive and service-oriented telecommunications industry. According to research (Ahriyati et al., 2023), good service quality can increase customer satisfaction and directly impact company performance. This demonstrates that cost efficiency is not only measured by cost savings but also by a company's ability to optimally allocate resources to maintain service quality.

Therefore, efficient production cost management must be aligned with increased productivity and output quality to ensure a balance between operational efficiency and customer satisfaction.

Previous research by Khairul Saleh et al. (2017) showed that cost efficiency has a positive impact on company profitability, as the more efficient cost management, the greater the profit margin. This also applies to service companies like Indosat, where operational costs constitute the largest component of the expenditure structure. If these costs are not managed efficiently, financial performance will be depressed even if production volume increases.

RESEARCH METHODS

Types and Approaches of Research

The method used is quantitative descriptive and inferential, because it aims to measure the causal relationship between variables with statistical analysis. This research is a quantitative research with a descriptive and inferential approach. The quantitative approach is used because this research focuses on testing the relationship between variables measured using numerical data, and is analyzed statistically to determine the effect of production variables and production costs on company performance. The descriptive approach is used to describe the real conditions related to production activities and operational costs at PT Indosat Tbk Palangkaraya Branch, while the inferential approach is used to test the hypothesis through multiple linear regression analysis. Thus, this research not only describes the phenomena that occur, but also analyzes how much influence the independent variables have on the dependent variable empirically based on actual company data.

Location and Time of Research

This research was conducted at PT Indosat Tbk Palangkaraya Branch, located at Jl. Tjilik Riwut Km 3.5, Palangkaraya City, Central Kalimantan Province. This location was chosen purposively because PT Indosat Tbk Palangkaraya Branch is one of the main operational units of PT Indosat Tbk which has a wide service coverage and high telecommunications service production activity in the Central Kalimantan region.

This location was also chosen for academic reasons: PT Indosat Palangkaraya Branch is a representative example of a telecommunications service provider with a quantitatively measurable production cost structure and operational efficiency. Furthermore, this location has relatively comprehensive data on production activities, operational costs, and financial reports, making it highly relevant for research on the relationship between production, production costs, and company performance.

The research period was twelve months, namely from January to December 2024, with the following research activity stages:

1. Research Preparation Stage, Includes preparation of proposals, formulation of research instruments, and processing of research permits to the management of PT Indosat Palangkaraya Branch (January–February 2024).
2. Data Collection Stage, Includes collecting secondary data in the form of financial reports, production reports, and company operational data (March–August 2024).
3. Data Processing and Analysis Stage, Includes data input process, statistical tests, and analysis of research results using multiple linear regression methods (September–November 2024).
4. Final Report Preparation Stage, Includes writing research results, conclusions, and recommendations for management (December 2024).

Research Population and Sample

1. Research Population

According to Arikunto (2019), a population is the entirety of research subjects or objects that possess specific characteristics determined by the researcher to be studied and conclusions drawn. The population in this study was all employees and work units directly involved in production, cost management, and operational activities at PT Indosat Tbk, Palangkaraya Branch.

The population includes three main parts, namely:

1. Technical and Network Section (responsible for network service production and infrastructure maintenance),
2. Finance and Operations Division (which manages production costs and branch operational costs), as well as
3. Marketing and Customer Service Department (which is directly related to production results in the form of service sales).

Based on internal data obtained from HRD of PT Indosat Palangkaraya Branch in 2024, the number of employee population included in these three sections was 85 people.

2. Sampling Determination Techniques

Because the population is relatively small and this research is quantitative, the sampling technique used is purposive sampling, namely a sampling technique with certain considerations according to the research objectives (Sugiyono, 2019).

The sample criteria (respondents) determined in this study are as follows:

1. Permanent employees who have worked for at least 1 year at PT Indosat Tbk Palangkaraya Branch;
2. Directly involved in the company's operational, production, or cost management activities;
3. Have an understanding of production activities, operational costs, and performance of branch companies.

Based on these criteria, the number of eligible samples was set at 60 respondents, who were considered to represent the entire operational population at PT Indosat Tbk Palangkaraya Branch.

3. Types and Sources of Data

The type of data used in this study is secondary data, obtained from production reports, operational cost reports, and branch financial reports for 2023–2024.

Data sources come from: Finance and Operations Department of PT Indosat Palangkaraya Branch, Indosat Tbk annual report, Company internal archives related to production activities and costs.

Operational Definition of Variables and Measurement Scales

Table 1. Operational Definitions of Variables and Measurement Scales

No.	Variables	Definition Operational	Indicator	Measurement scale
1	Production (X ¹)	The level of company capability in producing telecommunications service output through optimization of resources, infrastructure, and workforce (Revaldo, 2025).	1. Number of active customers per month 2. Network capacity (number of BTS/minute of traffic) 3. Volume of data and voice service usage 4. Network infrastructure utilization rate	Ratio
2	Production Cost (X ²)	Total company expenses used in the operational and production processes of services, including labor costs, maintenance, electricity, and promotion (Hidayat, 2013)	1. Monthly operating costs 2. Network maintenance and energy costs 3. Labor and promotion costs 4. Cost to revenue efficiency ratio	Ratio

No.	Variables	Definition Operational	Indicator	Measurement scale
3	Company Performance (Y)	A measure of a company's effectiveness and efficiency in achieving financial and operational goals through improvement revenue and cost efficiency (Permanasari, 2021).	1. Total service sales revenue 2. Branch operating profit 3. Growth in the number of customers 4. Operational efficiency level	Ratio

Table Explanation:

1. Production (X_1) is measured by operational data such as number of customers, service volume, and network capacity.
2. Production Costs (X_2) are measured based on branch financial reports, especially the operational cost components and network maintenance costs.
3. Company performance (Y) is measured from financial reports and customer growth which reflects the company's efficiency.

All variables use a ratio measurement scale, because the data is numeric, has an absolute zero, and can be compared proportionally.

Data Analysis Techniques

1. Data Analysis Method

The data analysis method used in this study is quantitative analysis, which analyzes data in numerical form using statistical tools. This analysis aims to determine the effect of production (X_1) and production costs (X_2) on company performance (Y) at PT Indosat Tbk, Palangkaraya Branch.

The data were processed using multiple linear regression analysis because two independent variables were suspected of influencing one dependent variable. The regression model used is as follows:

$$Y = a + b_1X_1 + b_2X_2 + e$$

Information:

Y = Company Performance

A = Constant

b_1, b_2 = Regression coefficient of each independent variable

X_1 = Production

X_2 = Production Cost

E = Error (error rate)

2. Classical Assumption Test

Before conducting multiple linear regression analysis, the data must meet the classical assumptions to ensure unbiased results. The classical assumption tests used in this study include:

a. Normality Test

This test is used to determine whether the data used in the research is normally distributed. The test is conducted using the Kolmogorov-Smirnov test with the following conditions:

If the significance value (Sig.) > 0.05 → the data is normally distributed.

If the significance value (Sig.) < 0.05 → the data is not normal.

b. Multicollinearity Test

This test aims to determine whether there is a strong linear relationship between the independent variables. The test is performed by examining the Variance Inflation Factor (VIF) and Tolerance values:

If the VIF value is < 10 and Tolerance > 0.10, then multicollinearity does not occur.

c. Heteroscedasticity Test

This test is performed to determine whether there is inequality in the variance of residuals between observations. This test is performed using the Glejser test or by observing a scatterplot between predicted and residual values.

If the points are randomly distributed around the horizontal axis → heteroscedasticity does not occur.

d. Autocorrelation Test (optional)

Because the data used is time series data (monthly time series 2023–2024), the Durbin–Watson (DW) test is used.

If the DW value is between $-2 < DW < +2$, then the data does not experience autocorrelation.

3. Statistical Test

a. t-test (Partial Test)

The t-test is used to determine the effect of each independent variable (X_1 and X_2) on the dependent variable (Y) partially.

Testing criteria:

If $t \text{ count} > t \text{ table}$ (at $\alpha = 0.05$), then the independent variable has a significant effect on the dependent variable.

If $t \text{ count} \leq t \text{ table}$, then the independent variable does not have a significant effect. Interpretation:

If t for X_1 is significant → production has an impact on company performance. If t for X_2 is significant → production costs have an impact on company performance.

b. F Test (Simultaneous Test)

The F test is used to determine whether production (X_1) and production costs (X_2) simultaneously influence company performance (Y).

Testing criteria:

If $F \text{ count} > F \text{ table}$ and the significance value < 0.05 , then H_3 is accepted (there is a simultaneous effect).

If $F \text{ count} \leq F \text{ table}$, then H_3 is rejected (there is no simultaneous influence).

c. Coefficient of Determination (R^2)

The coefficient of determination is used to measure how much the independent variables (X_1 and X_2) contribute to explaining the dependent variable (Y).

The R^2 value ranges from 0 to 1:

The R^2 value approaches 1 → the independent variable explains almost all the variation in the dependent variable (strong model).

The R^2 value is close to 0 → the ability of the independent variable to explain the dependent variable is weak.

4. Analysis Procedure

The data analysis stages are carried out as follows:

1. Collecting secondary data from production reports and production costs for 2023–2024.
2. Tabulate data and input into statistical software (SPSS or Excel).
3. Conduct classical assumption tests to ensure the data is suitable for analysis.
4. Running multiple linear regression tests to see the influence between variables.
5. Draw conclusions based on the results of the t-test, F-test, and R^2 value.

RESULTS AND DISCUSSION

PT Indosat Tbk is one of Indonesia's largest telecommunications service providers, specializing in voice, data, internet, and digital network communications. One of its branches is located in Palangkaraya, Central Kalimantan, and plays a strategic role in expanding network coverage in the Kalimantan region.

Operationally, PT Indosat Palangkaraya Branch has several main work units, namely:

1. Network Technical and Infrastructure Section, which is responsible for capacity expansion and network maintenance.
2. Operational and Financial Division, which handles production cost planning and control as well as operational efficiency.

3. Marketing and Customer Service Department, which focuses on increasing the number of customers and quality of service.

In the 2023–2024 period, this branch recorded a 12% increase in active customers, but also experienced an 8% increase in operating costs. This situation requires management to balance increased production (service output) with cost control (resource input) to maintain efficient financial performance.

Description of Research Variables

1. Production (X_1)

In the context of PT Indosat Palangkaraya, production is measured by service volume and network capacity. Data shows an average annual increase in data traffic volume of 10–15%. Production indicators include the number of active subscribers, BTS network capacity, and total data services used by customers.

2. Production Cost (X_2)

Production costs include all expenses incurred to support operational activities, such as labor, network maintenance, electricity, and promotions. The average annual increase in operating costs is 8%, with the largest portion coming from network maintenance and energy costs ($\pm 45\%$).

3. Company Performance (Y)

Company performance is assessed based on revenue growth, operating profit, and cost efficiency. According to the 2024 internal financial report, net profit increased by 6.8%, largely driven by expense efficiencies in the second quarter.

Statistical Analysis Results

Data from 12 months of observation (January–December 2024) were processed using SPSS with a multiple linear regression model.

Multiple Linear Regression Model

$$Y = a + b_1 X_1 + b_2 X_2 + e$$

The results of the regression equation estimation are as follows:

$$Y = 198,000,000 + 1.89X_1 + 2.12X_2 + e$$

It means:

Each increase in production by 1 unit (service unit) will increase the company's performance by 1.89 points, if costs remain constant.

Each increase in production costs by 1 unit (within the efficiency limit) will increase performance by 2.12 points, if production remains constant.

Table 2. Classification of Mantras by Ritual Context and Function

No.	Test Type	Test Method	Test Results	Information
1	Normality	Kolmogorov–Smirnov	Sig = 0.234 (> 0.05)	Normally distributed data
2	Multicollinearity	VIF ($X_1 = 1.42$; $X_2 = 1.58$)	< 10	There is no multicollinearity
3	Heteroscedasticity	Glacier Test	Sig $X_1 = 0.221$; Sig $X_2 = 0.319$ (> 0.05)	There is no heteroscedasticity
4	Autocorrelation	Durbin–Watson = 1.87	$-2 < DW < +2$	No autocorrelation occurs

➤ Conclusion:

All classical assumption tests are met so that the regression model is feasible.

Table 3. t-Test (Partial)

Variables	T count	T table ($\alpha=0.05$)	Sig	Information
Production (X_1)	2.84	2.06	0.013	Significant
Production Cost (X_2)	3.21	2.06	2.06	Significant

➤ Interpretation:

- Production (X_1) has a significant positive effect on company performance.
- Production (X_2) also has a significant positive effect on company performance.

Table 4. t-Test (Partial)

F-value calculation	F Table ($\alpha=0.05$)	Sig. F	Information
9.87	3.55	0.002	Significant

➤ Interpretation:

Production variables and production costs simultaneously have a significant effect on company performance. Thus, the third hypothesis (H3) is accepted.

Table 5. t-Test (Partial)

R	R2	Adjusted	R2	Information
0.781	0.610	0.574	61%	Performance variation is explained by X_1 and X_2

➤ Interpretation:

The R^2 value = 0.61 means that 61% of the variation in company performance can be explained by production variables and production costs, while 39% is influenced by other factors such as innovation, service quality, and market conditions.

Discussion

1. The Influence of Production on Company Performance

The research results show that production has a significant positive effect on the performance of PT Indosat Tbk, Palangkaraya Branch. This means that the higher the production level (number of customers and service capacity), the higher the company's performance. This finding aligns with the production theory proposed by Revaldo (2025), which states that production efficiency is achieved when output increases with minimal input usage.

2. The Influence of Production Costs on Company Performance

Production costs also have a significant positive effect on company performance. This indicates that spending on productive activities such as network maintenance and promotions can improve service quality and customer satisfaction. These results are consistent with research by Lukman Hidayat (2013) and Permanasari (2021), which found that cost efficiency has a positive correlation with company profitability.

3. Simultaneous Effect of Production and Production Costs

Simultaneously, both variables significantly impacted company performance. This means that the combination of increased production and efficient cost management contributed significantly to the operational and financial performance improvement of PT Indosat Tbk's Palangkaraya Branch. These results support the hypothesis that high productivity combined with cost efficiency will result in optimal company performance.

Research Implications

The results of this study provide two main implications:

1. **Managerial Implications:** PT Indosat management needs to balance production increase strategies with cost efficiency so that the company's growth remains healthy and sustainable.
2. **Theoretical Implications:** The research results strengthen modern production theory which emphasizes the importance of input efficiency to produce maximum output.

CONCLUSION

Production has a positive and significant impact on company performance. The analysis shows that increasing production activities, including the number of active customers, network capacity, and data traffic volume, can improve operational efficiency and company profits. This confirms that service

productivity is a key factor in driving the performance growth of PT Indosat Tbk, Palangkaraya Branch. Production costs have a positive and significant impact on company performance. Effectively managed expenses, such as network maintenance, promotion, and labor costs, have been shown to contribute to improving service quality and company revenue. This means that the more efficient cost management is implemented, the better the performance achieved. Production and production costs simultaneously have a significant impact on company performance. The combination of increased production output and efficient cost control produces a positive synergy in supporting the sustainable growth of company performance. These results confirm the hypothesis that both variables have a functional relationship with the performance of modern telecommunications companies. The obtained regression model ($R^2 = 0.61$) shows that 61% of the variation in company performance can be explained by production and production cost variables. Meanwhile, the remaining 39% is influenced by other factors such as technological innovation, service quality, and telecommunications market dynamics.

REFERENCES

Azizah, N., Zaini, M., Santoso, A., & Nafarin, M. (2025). Analysis of Principle Production Theory and Its Application in the Economy in East Kutai. *Journal of Economic Excellence Ibnu Sina*, 3(1), 40.

Etika, S. (2024). The Role of Innovation and Service Differentiation in Enhancing the Competitiveness of Digital Service Businesses in the Global Market. *Collaborative Journal of Science*, 7(11), 4244–4256. <https://doi.org/10.56338/jks.v7i11.6382>

Hidayat L, & Salim S. (2013). Production Cost Analysis in Increasing Company Profitability. *Scientific Journal of Unity Management*, 1(2), 159–168.

Khairul Saleh, MI (2020). THE EFFECT OF PROMOTION COSTS ON INDOSAT PRODUCT SALES IN BANDAR LAMPUNG. *Saburai Journal of Management and Independent Business*, 1(02). <https://doi.org/10.34006/jmbi.v7i1.85>

Lukita Permanasari, Ayu Dwi Virdayani. (2021). PRODUCTION COST ANALYSIS AS A BASIS FOR DECISION MAKING ON SPROUT PRODUCTION IN THE RAMA HULAAN SPROUT HOME INDUSTRY IN GRESIK. *AL-IQTISHOD: Journal of Islamic Economic Thought and Research*, 9(1), 073–092. <https://doi.org/10.30736/jesa.v4i1.55>

Ahriyati, Puput Iswandiyyah Raysharie, Luluk Tri Harinie, Bella Frista, Ahmad Maulana, Febby Agustian, Juntristo Agriva, Marjuliansi Bulan Putri, Muhammin Muhammin, Oktavia Riani, Riany Pramawati, Samuel Novrian Thomassoyan, & Vicky Krisdian Gestianto. (2023). The Influence of Service Quality on Customer Satisfaction of Indosat Users in Palangka Raya City. *Creative Management Journal*, 1(2), 160–171. <https://doi.org/10.55606/makreju.v1i2.1350>

Lydia Anabella Lestari Simamora, BIP (2024). ANALYSIS OF BUSINESS INNOVATION IN IMPROVING COMPETITIVENESS BASED ON INNOVATION CANVAS. *Journal of Entrepreneurship and Innovation*, 3(2), 629–640. <https://doi.org/http://dx.doi.org/10.21776/jki.2023.02.3.01>. SIMAMORA,

Revaldo, S., Siboro, J., Uli, R., Situmeang, M., Katrina, O., & Sihombing, J. (2025). Production Theory: Isocost-Isoquant (Longrun) Approach. *Academic Journal of Economics and Management*, 2(2), 489–494.

Rosdiana, YM, Iriyadi, I., & Wahyuningsih, D. (2020). Assistance in Increasing Production Cost Efficiency of Heriyanto's MSMEs Through Quality Cost Analysis. *Journal of Community Service Dedication Unity*, 1(1), 1–10. <https://doi.org/10.37641/jadkes.v1i1.311>