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Efficiency Analysis of PT Dayamitra Telekomunikasi Tbk in the Telecommunication Infrastructure Industry Using the Data Envelopment Analysis (DEA) Method

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ABSTRACT

The projected increase in the number of telecommunication towers in Indonesia by 100% by 2026 reflects the rapid growth in the telecommunications infrastructure sector, driven by increasing data demand and the adoption of 5G technology (WCA, 2021). In the Asia-Pacific region, similar demand indicates a huge opportunity for the expansion of this industry. PT Dayamitra Telekomunikasi Tbk (Mitratel) is one of the companies that excels in the Telecommunication infrastructure industry in Indonesia. This study uses the Data Envelopment Analysis (DEA) method, which is effective in measuring the efficiency of organizational units in various fields. The results show that in five years of observation, Mitratel managed to achieve full efficiency in almost all years of observation, with high-efficiency level results comparable to PT Sarana Menara Nusantara Tbk. Meanwhile, the annual efficiency level for Indus Towers and China Tower is quite volatile, although it remains at a high value. Trend analysis and Pearson Correlation coefficient between average efficiency and input/output variables show that the current assets, non-current liabilities, and CAPEX variables have a significant influence on Mitratel's efficiency with a negative correlation, while the current liabilities variable has a significant influence on a positive correlation.

Introduction

The number of towers in Indonesia is projected to increase by 100% from 100,000 to 200,000 by 2026 (WCA, 2021). This growth is driven by increasing data demand and the adoption of 5G technology. This is in line with the trend in the Asia-Pacific region, where there were approximately 5.4 million towers at the end of 2020, with an estimated compound annual growth rate (CAGR) of 3.74% from 2021 to 2031 (S&P Global, 2021). This projection shows that both in Indonesia and in the Asia-Pacific, there are still significant needs and opportunities for the development of the telecommunications infrastructure industry. PT Dayamitra Telekomunikasi Tbk (Mitratel), a subsidiary of PT

Telekomunikasi Indonesia (Persero) Tbk, is one of the leading companies in the telecommunications infrastructure sector in Indonesia (CNBC Indonesia, 2023). Through its vision of "Becoming InfraCo's #1 digital in the growing APAC (Asia-Pacific) market by offering sustainable best-in-class services," Mitratel demonstrates its excellence in profitability, corporate health, and connectivity performance (CNBC Indonesia, 2023). In December 2022, Mitatel was recorded to have 35,418 towers, this number is higher than its competitors, namely PT Sarana Nusantara Tbk which has 29,794 towers, and PT Tower Bersama Infrastructure Tbk with 21,758 towers. Followed by the following year, Mitratel still maintains its position advantage. Figure I. 1 below shows a comparison of the number of towers mentioned earlier.

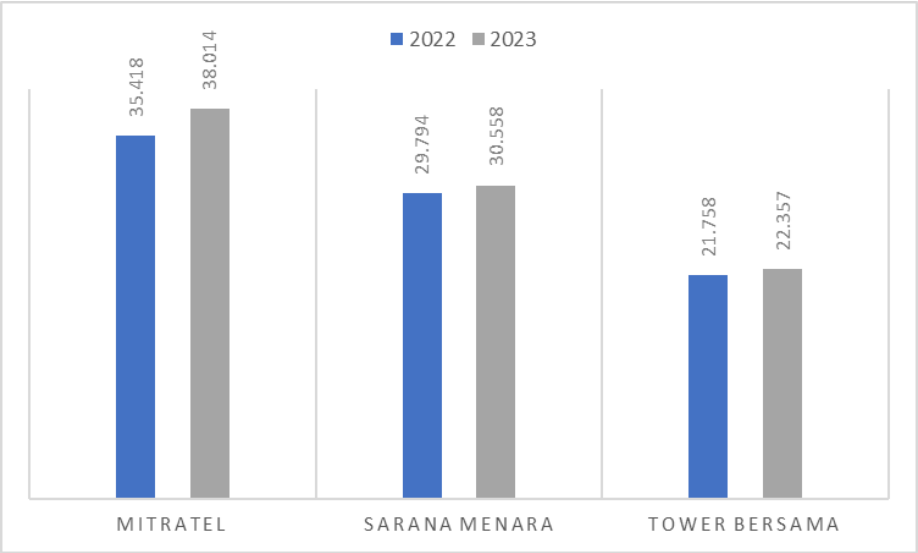


Figure 1 Comparison of the Number of Towers "The Big Three" of Indonesian Telecommunication Infrastructure Companies

However, according to a 5G Magazine report by TeckNexus (November 2023), Mitratel is not yet in the ranks of the best telecommunications infrastructure companies in Asia-Pacific (APAC), led by China Tower, Indus Towers, and GTL Infrastructure.

In realizing Mitratel's vision to become the number one digital InfraCo in the APAC market, efforts to maintain its main position in national competition are crucial. In addition, companies need to make improvements to compete with the best telecommunications infrastructure companies in the APAC region. (Setiajatnika & Hasyim, 2019). To achieve this, it can be done by benchmarking methods to compare with similar companies in the telecommunications infrastructure sector, especially focusing on tower infrastructure, both on a national scale and at the Asia-Pacific regional level. This method will assist Mitratel in identifying areas that need improvement and setting higher standards in this fierce industry competition. (Lee, Lee, Kho, & Kim, 2019).

According to Patterson (1996), benchmarking is the process of comparing the measurement of efficiency of a company with other companies to obtain the benefit of information that will be used for continuous improvement. Several previous studies have

conducted benchmarking, including research by (Abdel-Halim, Al Khars, & Alnasser, 2023), (Amin & Hendrawan, 2023), (Hendrawan & Nugroho, 2018), Iamratanakul (2018), (Masson, Jain, Ganesh, & George, 2016), etc. Based on a literature study from previous research, this shows that the benchmarking method can be used in efficiency comparative analysis to compare the efficiency level of companies in a predetermined period. Efficiency comparison is aimed at finding out how a company can maximize its resources but with limited data through the company's annual report data. So that parties from outside the company can analyze the comparison of the efficiency of a company compared to other companies (Nishiuchi, Todoroki, & Kishi, 2015).

The measurement of efficiency level can be carried out through three approaches, such as ratio, regression, and frontier approaches. Of the three, the frontier approach is considered more scientific and precise compared to other approaches. This is due to the limitations of the ratio approach which makes it difficult to manage many variables, as well as the regression approach which focuses only on many inputs and one output.

Comparing the level of efficiency with the frontier approach can be grouped into parametric and nonparametric categories. According to Berger (1997), methods that fall into the parametric category include the Stochastic Frontier Approach (SFA), the Distribution Free Approach (DFA), and the Think Frontier Approach (TFA). The methods included in the nonparametric category include Free Disposal Hull (FDH) and Data Envelopment Analysis (DEA).

Based on previous research, efficiency level analysis can and is widely carried out using the nonparametric frontier Data Envelopment Analysis method. The advantage of this method is that it does not require certain assumptions regarding the distribution of the analyzed population. In addition, this method is suitable for use in research data that has many input and output variables. According to Avkiran (1999), DEA is a technique for measuring the relative efficiency of various organizational units. This technique can reveal the exact relationship between diverse inputs and outputs that were previously difficult to accommodate through traditional ratio analysis. Data Envelopment Analysis (DEA) is one of the nonparametric statistical methods that is often applied in operations and economic research to measure the level of production efficiency. This method is used when the production process involves a variety of complex input and output factors.

Most of the comparative analysis studies of efficiency levels use the DEA method in measuring efficiency in various areas of management and engineering, such as CEO performance evaluation, transportation service performance, telecommunications, energy efficiency banking, manager and team effectiveness, operational efficiency in hotel management, and other industries. (Allen-Zhu & Hazan, 2016).

The update brought in this study is the analysis of efficiency in the telecommunications infrastructure industry, using the DEA method.

Based on the formulation of the problem, the objectives of this research are:

1. Conduct a comparative analysis of Mitratel's efficiency level with competitor companies in the domestic telecommunications infrastructure industry based on data from 2019 to 2023.

2. Conducting a comparative analysis of Mitratel's efficiency level with competitors in the telecommunications infrastructure industry in the Asia-Pacific (APAC) region based on data from 2019 to 2023.
3. Analyzing input and output variables that have a significant influence on Mitratel's efficiency level.
4. Determine what variables/factors need to be improved to improve Mitratel's efficiency.

Method

Problem-solving systematics is an explanation and description of the stages carried out in research to solve existing problems. The systematics in this study are compiled to achieve the final result in the form of strategy recommendations that can help companies improve their efficiency based on feedback that has been obtained previously from efficiency comparisons with its competitors. The systematic stages of this study consist of introduction, data collection, data processing, data analysis, as well as conclusions and suggestions.

Data Collection

The data collection stage is a stage to study literature materials related to the research formulation. The data collected in this study is secondary data sourced from the annual report (annual and financial report) for 2019-2023 through the official website of the related company. In addition, researchers also accessed the company's financial information from several sources such as Yahoo Finance, Ticker, and Finbox. Regarding the selection of competing companies, the information is taken from the ranking data of leading telecommunications infrastructure companies, both at the national and Asia-Pacific (APAC) levels. The companies selected as Mitratel's competitors for analysis include one company at the national level, namely PT Sarana Menara Nusantara, as well as two APAC regional companies, namely China Tower and Indus Towers.

Data Processing

In the data processing stage, the data that has been collected in the previous stage will be processed to produce answers to the formulation of problems that have been determined in the preliminary stage.

Specifying Input and Output Variables

Research variables are defined as all forms determined by the researcher to be investigated to obtain information and conclusions about them. (Yayuk & Sugiyono, 2019). In dividing variables, variable operationalization is carried out.

The operationalization of variables in research is a step to break down the variables in the problem statement into the smallest components so that they can be understood more deeply. This process consists of two stages, namely defining the variables to be measured and determining the measurement indicators. (Amin & Hendrawan, 2023). According to Sekaran & Bougie in Amin et al. (2023).

Data Processing Engineering

In processing research data, the collected data will be obtained according to the following stages:

1. Compile categories of input and output variables based on predetermined indicators
2. Create a graph visualization of the progression of predefined input and output variables
3. Conducting simulations using the nonparametric DEA method with data collected based on predetermined input and output variables. This process will compare the determinants among the existing Data Measurement Units (DMUs). DEA uses relative comparisons between DMUs rather than generating absolute numbers for efficiency. The equations used for the simulation in finding the DMU efficiency value are as follows:

$$\boldsymbol{Eb} = \frac{\sum_{r=1}^{R} \boldsymbol{u_{rb} y_{rb}}}{\sum_{i=1}^{I} \boldsymbol{v_{ib} x_{ib}}}$$

Constraint function:

$$\boldsymbol{Eb} = \frac{\sum_{r=1}^{R} \boldsymbol{u_{rb} y_{rj}}}{\sum_{i=1}^{I} \boldsymbol{v_{ib} x_{ij}}} \leq \mathbf{1}, \forall \boldsymbol{j}, \boldsymbol{j} = \mathbf{1}, \mathbf{2}, \mathbf{3}, \dots, \boldsymbol{N}$$

and

$\boldsymbol{u_{rb}}, \boldsymbol{v_{ib}} \geq$ for each (where and $\boldsymbol{r}, \boldsymbol{ir} = \mathbf{1}, \mathbf{2}, \mathbf{3}, \dots, \boldsymbol{Ri} = \mathbf{1}, \mathbf{2}, \mathbf{3}, \dots, \boldsymbol{I}$)

$\boldsymbol{Eb}$Is the efficiency in unit *B*

$\boldsymbol{y_{rj}}$is the quantity of *the output* produced by units *j=1, 2, 3..., N*

$\boldsymbol{x_{ij}}$Is the quantity of *the input* produced by the unit *j=1, 2, 3..., N*

$\boldsymbol{u_{rb}}$is the weight given to *the output* based on unit *b*

$\boldsymbol{v_{ib}}$is the weight given to *the input* based on the unit *b*

$\boldsymbol{e}$A a very small positive number

4. The simulation results with the DEA method will produce the efficiency value of each DMU. The efficiency values of each company are then compared for further analysis
5. The Pearson Correlation coefficient is then used to measure the strength of the relationship between input and output variables to the Mitratel efficiency value. The correlation coefficient value ranges from -1 to 1, indicating the degree of strength and direction of the relationship between two random variables. The results of the correlation coefficient are then interpreted using criteria that have been predetermined by (Astini, Sri Budhi, Suyana Utama, & Ramantha, 2024), as follows in Table III. 1.

Table 1
Interpretation of Pearson Correlation Coefficients

Coefficient Interval	Relationship Level
0	There is no correlation between the two variables.
0 – 0,199	Correlation is very weak.
0,20 – 0,399	Weak correlation
0,40 – 0,599	Medium correlation
0,60 – 0,799	Strong correlation

0,80 – 0,99	Correlation is very strong.
1	Perfect correlation

Results and Discussion

Determination of Competitor Companies

The determination of competitors in this study considers Mitratel's vision to become the number one company in the telecommunications infrastructure industry in Asia-Pacific (APAC) while maintaining its superiority at the national level. Based on this vision, the researcher looked at the ranking of companies in the telecommunications infrastructure sector on a national and regional scale in Asia-Pacific and then selected the top two companies from each scale.

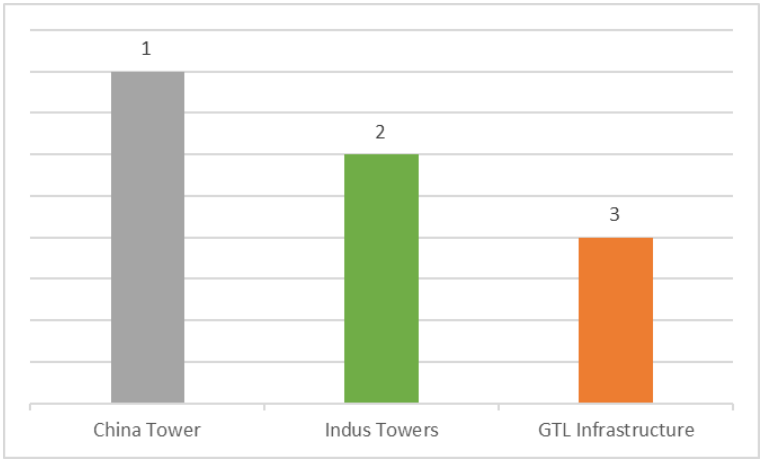


Figure 1 The Three Largest Telecommunications Infrastructure Companies at the APAC Regional Level (TeckNexus, 2023)

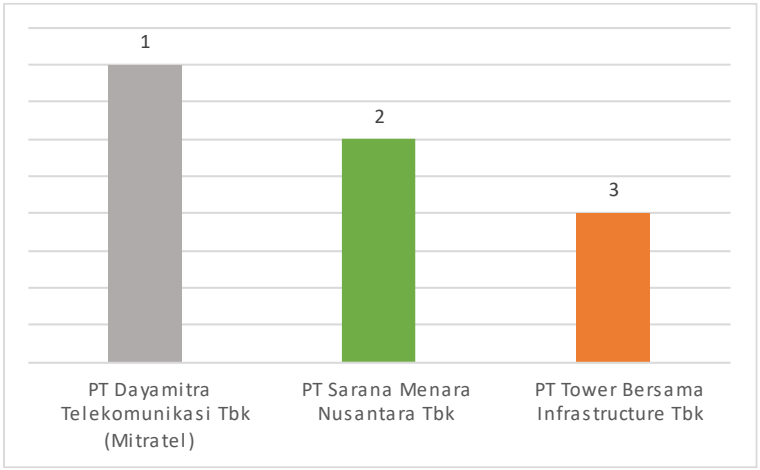


Figure 2 The Three Largest Telecommunications Infrastructure Companies at the National Level (CNBC Indonesia, 2023)

Based on information obtained from CNBC Indonesia and TeckNexus (2023), PT Sarana Menara Nusantara Tbk has been determined as Mitratel's competitors on a national scale, as well as China Tower and Indus Towers as the main competitors on the APAC regional scale. The determination of the number of competitors is also adjusted to the minimum number of Decision-Making Units (DMUs) needed for accurate data processing (Golany & Roll, in Masson et al., 2016).

Development of Input Variables

The input variables that have been selected from the previous process consist of current assets, non-current assets, current liabilities, non-current liabilities, CAPEX (capital expenditure), number of towers, and operating expenses. Table IV.2 provides more information regarding the mean, minimum, maximum, slope, N, and CAGR values of the input variables.

The mean shows the average value of each input variable and provides an overview of the magnitude of the values that often appear. The minimum and maximum indicate the highest and lowest values of the observation, as well as identify the value range of each input variable. Skewness indicates a picture of the data distribution, and a slope value close to 0 describes a symmetrical distribution of data and vice versa. N shows the number of DMUs used in this study. CAGR (Compound Annual Growth Rate) measures the compound annual average growth rate of each input variable over the observation period.

Development of Non-Current Assets Inputs

Based on data from the following non-current assets variables, the development of non-current assets of each company is depicted through the graph in Figure 2 below.

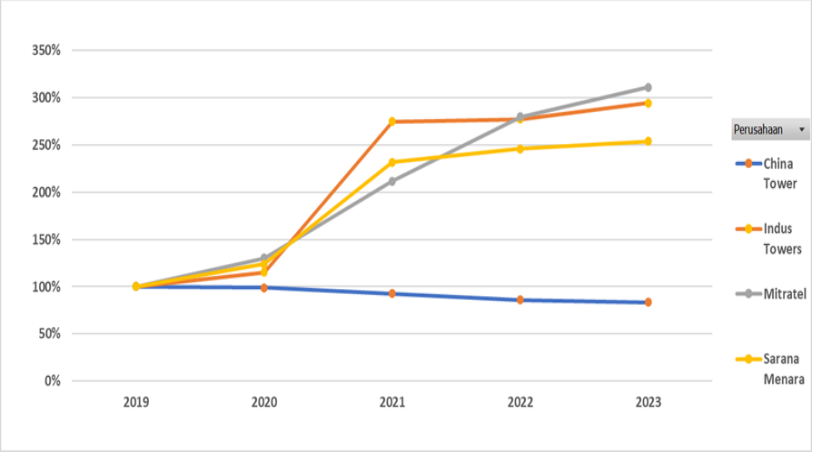


Figure 3 Average Growth Non-Current Assets per Company Chart

The following are the results of the CAGR of variable non-current assets of each company (Table 2)

Table 2
CAGR Non-current Assets

	China Tower	Indus Towers	Mitratel	Sarana Menara	Average
CAGR *Non-current Assets*	-4,42%	31,02%	32,83%	26,25%	21,42%

Based on the graph and table above, it can be seen that the average compound growth of variable assets of the four companies in the 2019-2023 range is 21.42%. However, the figure does not reflect positive growth (improvement) in all companies.

Growth above average was experienced by Mitratel with an increase of 32.83%. followed by Indus Towers at 31.02%, and Sarana Menara at 26.25%. On the other hand, China Tower experienced a negative growth (decline) of non-current assets of 4.42%.

Development of Input Non-Current Liabilities

Based on data from the non-current liabilities variable, the development of non-current liabilities of each company can be seen through the graph in the following Graph 3.

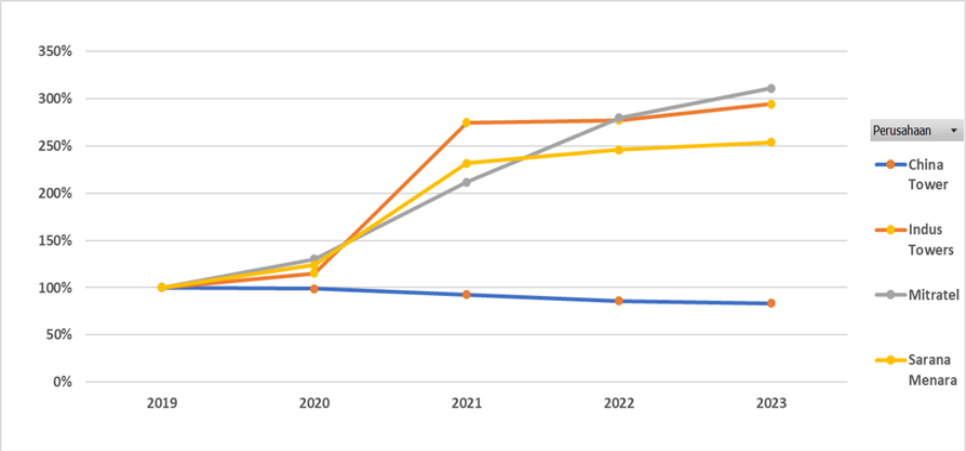


Figure 4 Average Growth Non-Current Assets per Company Chart

The following are the results of the CAGR of non-current assets variables of each company (Table 3).

Table 3
CAGR Non-current Assets

	China Tower	Indus Towers	Mitratel	Sarana Menara	Average
CAGR *Non-current Assets*	-4,42%	31,02%	32,83%	26,25%	21,42%

Based on the graph and table above, it can be seen that the average compound growth of variable assets of the four companies in the 2019-2023 range is 21.42%. However, the figure does not reflect positive growth (improvement) in all companies.

Growth above average was experienced by Mitratel with an increase of 32.83%. followed by Indus Towers at 31.02%, and Sarana Menara at 26.25%. On the other hand, China Tower experienced a negative growth (decline) of non-current assets of 4.42%. These figures show that the company's strategy for managing assets is not current. For example, according to an article written by HSB Investment, the strategy of increasing

non-current assets can be used to support the company's operational activities, long-term investments, company expansion, or credit financing. Thus, the improvement of non-current assets is not always through the purchase of new assets, but can also be achieved through the optimization of existing assets.

Development of Output Variables

The output variable data of China Tower, Indus Towers, Mitratel, and Sarana Menara was obtained from the company's official website source taken from the annual report (annual and financial report) from 2019 to 2023. It consists of total revenue, EBITDA (earnings before interest, taxes, depreciation, and amortization), and number of tenants. Table IV.10 provides more information regarding the mean, minimum, maximum, slope, N, and CAGR values of the output variables.

Correlation Calculation

In the correlation calculation stage, the DMU data set and the efficiency values that have been obtained from the previous stage are grouped based on each company. Furthermore, the value of Pearson's correlation coefficient between each input and output variable against the efficiency value of each company is calculated. This method is used to evaluate the linear relationship between these variables and the company's efficiency level.

Table 4 below, presents an example of the results of the calculation of Pearson's correlation coefficient for variables that affect efficiency in Mitratel. The table provides an overview of how strong and directional the relationship between each input and output variable is with the efficiency value, which can help in understanding the factors that contribute to the company's efficiency.

Table 4
Pearson Correlation Coefficient Between Mitratel Efficiency and Input/Output

DMU	Perusahaan	Tahun	*Output Efficiency*	*Current Assets* (Million USD)	*Non-Current Assets* (Million USD)	*Current Liabilities* (Million USD)	*Non-Current Liabilities* (Million USD)	CAPEX (Million USD)	*Number of Towers* (Unit)	*Operating Expenses* (Million USD)	*Total Revenue* (Million USD)	EBITDA (Million USD)	*Number of Tenants* (Unit)
			θ	x1	x2	x3	x4	x5	x6	x7	y1	y2	y3
Mitratel_2019	Mitratel	2019	1,0000	179,10	1.071,59	306,96	462,46	322,58	15892	22,22	331,55	162,79	22854
Mitratel_2020	Mitratel	2020	1,0000	180,15	1.393,86	457,42	608,44	322,58	18473	25,59	385,15	260,52	30570
Mitratel_2021	Mitratel	2021	0,9990	1.326,13	2.267,55	403,14	1.096,05	782,81	28206	29,76	427,66	322,77	42594
Mitratel_2022	Mitratel	2022	1,0000	490,91	2.999,56	635,02	751,00	661,04	35418	31,19	481,14	382,35	52006
Mitratel_2023	Mitratel	2023	1,0000	212,90	3.336,03	689,18	740,85	392,49	38014	35,92	535,05	430,90	57409
Mitratel	**Koefisien Pearson**		**0,9998**	**(0,96)**	**(0,03)**	**0,33**	**(0,87)**	**(0,75)**	**(0,06)**	**(0,09)**	**0,03**	**(0,06)**	**(0,06)**

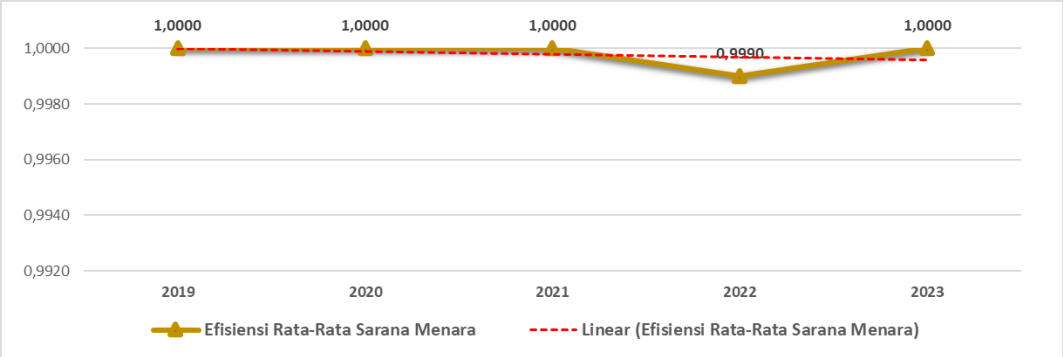
The results of the Pearson Correlation between input and output variables to the efficiency value, shown in Table 4, show that some variables have the opposite relationship with the Mitratel efficiency value. For example, the input variable current assets have a correlation level result of (0.96) or -0.96, indicating a significant negative relationship. On the other hand, some variables have a positive (unidirectional) relationship with Mitratel's efficiency, such as the input variable current liabilities which correlates with 0.33.

Efficiency Analysis of Mitratel and Its Competitors

Referring to the results of the calculation in the previous section, the efficiency value of each DMU has been grouped by company. Furthermore, the average efficiency value for each company for 5 years, starting from 2019 to 2023, is calculated.

Efficiency Analysis in Nusantara Tower Facilities

Sarana Menara is one of the companies with the highest average efficiency value during the observation year period (2019-2023) with an average efficiency of 0.9998 and the lowest value of 0.9990 (2022).



PERUSAHAAN	Current Assets (Million USD)	Non-Current Assets (Million USD)	Current Liabilities (Million USD)	Non-Current Liabilities (Million USD)	CAPEX (Million USD)	Number of Towers (Unit)	Operating Expenses (Million USD)	Total Revenue (Million USD)	EBITDA (Million USD)	Number of Tenants (Unit)
	x1	x2	x3	x4	x5	x6	x7	y1	y2	y3
Sarana Menara	0,16	(0,42)	0,00	(0,65)	(0,39)	(0,41)	(0,34)	(0,49)	(0,50)	(0,39)

Figure 5 Graph of Development and Correlation of Efficiency of Tower Facilities

Based on Figure 5, the input and output variables that affect the average value of the efficiency of the Tower Facilities according to the Pearson Correlation calculation are as follows:

a. There was a positive correlation (unidirectional) with a very weak correlation level ($0 \leq r \leq 0.199$) between the average efficiency value of Tower Facilities and the input variable current assets ($r = +0.16$)
b. There was a negative correlation (opposite) with a strong correlation level ($0.60 \leq r \leq 0.799$) between the average efficiency value of Tower Facilities and the input variable non-current liabilities ($r = -0.65$). There was also a moderate correlation level ($0.40 \leq r \leq 0.599$) with input variables of non-current assets ($r = -0.42$), number of towers ($r = -0.41$), total revenue output variables ($r = -0.49$), and EBITDA ($r = -0.50$). In addition, there was a weak correlation ($0.20 \leq r \leq 0.399$) to several input variables such as the number of towers, operating expenses, and output variables number of tenants
c. There is no correlation between the average efficiency of Tower Facilities and the input variable of current liabilities.

The results show that the increase in current asset variables does not have a significant effect on the increase in efficiency value in Tower Facilities.

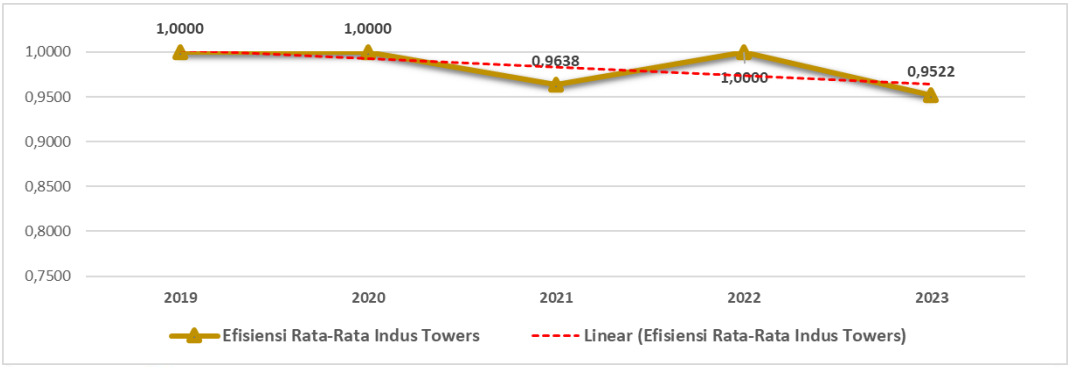
Based on the analysis of the trend and Pearson Correlation coefficient of input/output variables to the average efficiency value of Sarana Menara previously,

several conclusions and recommendations can be drawn for Mitratel to maintain efficiency and improve the management of its company:

1. Tower Facilities Efficiency Trend: Tower Facilities show a relatively stable efficiency trend with high values every year during the observation period (2019-2023). This reflects the excellent management of input variables in producing maximum output.
2. Pearson Correlation Analysis: Based on the results of Pearson Correlation, Sarana Menara shows that the control of variables non-current assets, non-current liabilities, CAPEX, number of towers, total revenue, EBITDA, and number of tenants contributes to increased efficiency.
3. Tower Facilities Situation: Based on the results of Pearson Correlation, there are indications that Tower Facilities have not fully optimized the management of the number of towers. The construction of telecommunication infrastructure towers does not seem to have optimally considered economic factors, the purchasing power of tenants, and market potential in the region (Siregar & Nurlaila, 2023).

Efficiency Analysis on Indus Towers

Indus Towers had a high average efficiency value during the observation year period (2019-2023) with an average efficiency of 0.9832 with the lowest efficiency value of 0.9522 (2023).



PERUSAHAAN	Current Assets (Million USD)	Non-Current Assets (Million USD)	Current Liabilities (Million USD)	Non-Current Liabilities (Million USD)	CAPEX (Million USD)	Number of Towers (Unit)	Operating Expenses (Million USD)	Total Revenue (Million USD)	EBITDA (Million USD)	Number of Tenants (Unit)
	x1	x2	x3	x4	x5	x6	x7	y1	y2	y3
Indus Towers	(0,29)	(0,69)	(0,63)	(0,64)	(0,96)	(0,68)	(0,46)	(0,44)	0,36	(0,60)

Figure 6 Development Graph and Efficiency Correlation of Indus Towers

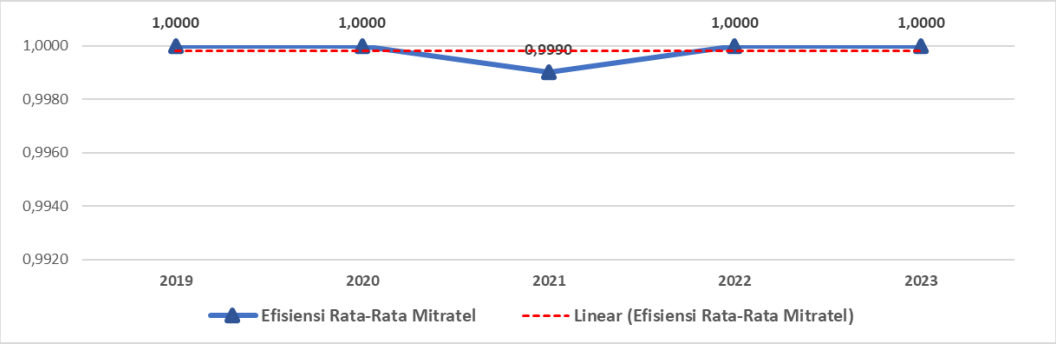
Based on Figure 6, the input and output variables that affect the average value of Indus Towers efficiency according to the Pearson Correlation calculation are as follows:

a. There was a positive correlation (unidirectional) with a weak correlation level ($0.20 \leq r \leq 0.399$) between the average efficiency value of Indus Towers and the EBITDA output variable ($r = +0.36$)
b. There was a negative correlation (opposite) with a very strong correlation level ($0.80 \leq r \leq 0.99$) between the average efficiency value of Indus Towers and the CAPEX input variable ($r = -0.96$). There was also a strong correlation level ($0.60 \leq r \leq 0.799$) with input variables of non-current assets ($r = -0.69$), current liabilities ($r = -0.63$), non-

current liabilities (r = -0.64), number of towers (r = -0.68), and number of tenants (r = -0.60). The correlation was moderate (0.40 ≤ r ≤ 0.599) with the input variable of operating expenses and the output variable of total revenue. In addition, there was a weak correlation (0.20 ≤ r ≤ 0.399) to the input variable of current assets.

Efficiency Analysis on Mitratel

Mitratel is one of the companies with the highest average efficiency value during the observation year period (2019-2023) with an average efficiency of 0.9998 and a low value of 0.9990 (2021).



PERUSAHAAN	Current Assets (Million USD)	Non-Current Assets (Million USD)	Current Liabilities (Million USD)	Non-Current Liabilities (Million USD)	CAPEX (Million USD)	Number of Towers (Unit)	Operating Expenses (Million USD)	Total Revenue (Million USD)	EBITDA (Million USD)	Number of Tenants (Unit)
	x1	x2	x3	x4	x5	x6	x7	y1	y2	y3
Mitratel	(0,96)	(0,03)	0,33	(0,87)	(0,75)	(0,06)	(0,09)	0,03	(0,06)	(0,06)

Picture 1 Graph of Mitratel's Development and Efficiency Correlation

Based on Figure 7, the input and output variables that affect the average value of Mitratel's efficiency according to the Pearson Correlation calculation are as follows:

a. There was a positive correlation (unidirectional) with a weak correlation (0.20 ≤ r ≤ 0.399) between the average efficiency value of Mitratel and the input variable current liabilities (r = +0.33). In addition, there was a very weak correlation (0 ≤ r ≤ 0.199) with the total revenue output variable (r = +0.03)
b. There was a negative correlation (opposite) with a very strong correlation level (0.80 ≤ r ≤ 0.99) between the average efficiency value of Mitratel and the input variables of current assets (r = -0.96) and non-current liabilities (r = -0.87). There was also a strong correlation level (0.60 ≤ r ≤ 0.79) with the CAPEX input variable (r = -0.75). In addition, there is a very weak correlation (0 ≤ r ≤ 0.199) to several input variables such as non-current assets, number of towers, operating expenses, and output variables EBITDA and number of tenants.

The results show that the increase in current liabilities variables, total revenue, or reduction of non-current asset variables, number of towers, operating costs, EBITDA, and number of tenants have no significant effect on increasing the efficiency value of Mitratel.

Based on the analysis of trends and Pearson Correlation coefficients of input/output variables to the average efficiency value of Mitratel previously, several conclusions can be drawn that can be recommendations for Mitratel to maintain efficiency and improve the management of its company:

1. Mitratel Efficiency Trends: Mitratel shows a relatively stable efficiency trend with high values every year during the observation period (2019-2023). This reflects the excellent management of input variables in producing maximum output
2. Pearson Correlation Analysis: Based on the results of Pearson Correlation, Mitratel shows that the control of current assets, non-current liabilities, and CAPEX variables contributes significantly to increasing efficiency. The increase in the variable of current liabilities can also be considered for increased efficiency.
3. Recommendation for Mitratel: Based on the results of the Pearson Correlation analysis in the previous point, current asset control can be carried out by focusing on increasing the tenancy ratio, liquidity management, short-term investment, inventory optimization, and receivables management. This can be achieved through an operational excellence strategy, where companies can focus on optimizing their assets and implementing consistent and efficient processes in asset management.

The control of non-current liabilities factors can be done by controlling the capital needed, long-term investments, capital structure, and risk management. For CAPEX control, Mitratel can manage technology and innovation, company growth and expansion, as well as changes in market demand. Cost leadership strategies can be used to ensure that costs are spent selectively so that Mitratel can offer products or services at lower prices without sacrificing quality. To consider increasing current liabilities, Mitratel can strengthen cash management and debt payments.

Based on benchmarks with Sarana Menara, Indus Tower, and China Towers, Mitratel can use these references to optimize the number of towers by considering economic factors, the purchasing power of tenants, and market potential in the region. With this, Mitratel can increase efficiency in tower management.

Conclusion

Based on data analysis for 2019-2023, PT Dayamitra Telekomunikasi Tbk (Mitratel) shows a good trend and efficiency level, with an average efficiency of 0.9998. This value is comparable to its competitor at the national level, PT Sarana Menara Nusantara Tbk, which also has an average efficiency of 0.9998. However, the results of Pearson Correlation indicate that Sarana Menara has weaknesses in managing the number of towers, so Mitratel needs to make more efforts to maintain its superiority. At the Asia-Pacific regional level, Mitratel's efficiency of 0.9998 is superior to Indus Towers (0.9832) and China Tower (0.9594). However, the average number of Mitratel towers during the period is still far below the Indus Towers (178,097) and China Tower (2,029,800). China has good market potential with a large population and a moderate Gini Index, while India has a large social inequality with a high Gini Index, which affects the efficiency and management of towers.

The correlation results show that the variables of current assets, non-current liabilities, and CAPEX have a significant negative influence on Mitratel's efficiency, while current liabilities have a significant positive influence. Therefore, to improve

efficiency, Mitratel needs to control current assets, non-current liabilities, and CAPEX, as well as consider increasing current liabilities. Current asset control can be carried out through an operational excellence strategy with a focus on increasing the tenancy ratio, liquidity management, short-term investment, inventory optimization, and receivables management. Non-current liabilities control is carried out by capital management, long-term investment, capital structure, and risk. For CAPEX, Mitratel can manage technology and innovation, growth, expansion, and changes in market demand with a cost leadership strategy.

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