

Comparative Analysis of the Level of Financial Efficiency in the National Construction Services Industry Before and After the Implementation of PSAK 72 with a *Two-Stage Data Envelopment Analysis Approach*

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ABSTRACT

This study analyzes the financial efficiency of Indonesia's national construction services industry before and after the implementation of PSAK 72 using the Data Envelopment Analysis (DEA) method. It aims to address the poor performance of contractor companies, which have negative operating cash flows and high Debt to Equity Ratios (DER). Input variables include Net Fixed Assets, Operating Expenses, and Total Employees, while output variables are Revenue and Profit Before Tax. Efficiency scores range from 0 to 1, with scores close to 1 indicating high efficiency. Prior to PSAK 72, PP Presisi Tbk and Wijaya Karya Bangunan Gedung Tbk were the most efficient companies, consistently achieving perfect efficiency scores. Total Bangun Persada Tbk was the least efficient. After PSAK 72, Bukaka Teknik Utama Tbk reached maximum efficiency in 2021, while Brantas Abipraya (Persero) was the least efficient in 2020. A Kolmogorov-Smirnov normality test showed the data was not normally distributed, leading to a non-parametric Wilcoxon signed rank test. The test indicated a significant difference in financial efficiency before and after PSAK 72, with a p-value of 0.04. This suggests a notable impact of PSAK 72 on the efficiency of construction companies.

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1. INTRODUCTION

Infrastructure development is one of the National Priority agendas contained in the 2020-2024 National Medium-Term Development Plan, namely "Strengthening Infrastructure to Support Economic Development and Basic Services". In accordance with the theme of the 2023 Government Work Plan, namely "Supporting Productivity Improvement for Inclusive and

Sustainable Economic Transformation" In line with the national priority agenda in infrastructure development, one of the directions of fiscal policy in 2023 will focus on "Accelerating Infrastructure Development". To support these various policies, the infrastructure budget in the State Budget for Fiscal Year 2023 is allocated IDR 391,703.8 billion [1].

However, behind the sizable state budget budget, contractor companies until

the first quarter of 2023 still have poor performance. All Karya SOEs have negative operating cash flows and tend to rely on debt financing. The average Debt to Equity (DER) ratio is in the range of 3 times, some are even more than that. Issuers with a DER ratio above 5 times, according to him, still tend to be depressed because they still have to overcome the problem of high debt, such as WSKT. However, for issuers ADHI, WIKA, and PTPP with a DER ratio still in the range of 3 times - 3.5 times, it is estimated that they can still survive, especially PTPP. Release of the first quarter of 2023 performance report, WSKT and WIKA recorded a net loss [2].

For this reason, research related to the performance of construction companies in this case efficiency needs to be carried out. Research related to the efficiency of construction companies in Indonesia has not been carried out much, especially in the last 3 years.

In the midst of the lack of research related to the efficiency of construction companies in Indonesia, the author intends to measure the efficiency of construction companies that publish their financial statements on the stock exchange and also in the company's media. In order to maintain the performance of construction companies when the condition of several state-owned construction companies and classified as large qualifications is hit by negative financial issues. In addition, construction companies have also experienced changes in revenue recording, after the implementation of PSAK 72 in 2020.

In 2020, three new guidelines released in 2017 came into force, one of which is PSAK 72 on Revenue from Contracts with Customers. This standard is a full adoption of the International Financial Reporting Standard (IFRS) 15: Revenue from Contracts with Customers which officially becomes the single standard for regulating revenue recognition. PSAK 72 replaces all standards related to the previous revenue recognition, namely PSAK 23: Revenue, PSAK 34: Construction Contracts, PSAK 44: Accounting for Real Estate Development Activities, ISAK

10: Customer Loyalty Program, ISAK 21: Real Estate Construction Agreements, and ISAK 27: Transfer of Assets from Customers [3].

An analysis of the application of PSAK 72 recognition in the Construction Services Industry has been researched by [4] who stated that the results of this study show that the implementation of PSAK 72 does not have an impact on construction contracts but has an impact on real estate contracts. The real estate contract must recognize income at a time under PSAK 72. Real estate contracts in PSAK 72 and income tax have differences in income recognition and taxation. The decline in revenue due to the recognition of real estate income encourages management to carry out profit management.

Based on the phenomena that have been described and the still limited analysis of the performance of construction service companies using the Data Envelopment Analysis method and the impact of the implementation of PSAK 72 on company performance, the author is interested in conducting a study with the title "Analysis of Efficiency Levels in the National Construction Services Industry Before and After the Implementation of PSAK 72"

2. LITERATURE REVIEW

2.1 Efficiency Theory

Efficiency translates to usability. This shows that efficiency in addition to emphasizing the results, also emphasizes the power or effort/sacrifice to achieve these results so that there is no waste. Another opinion holds that efficiency is the ratio or ratio of successful effort or work, and the entire work or sacrifice that is deployed to achieve a certain result in other words, the ratio between input and output [5]-[6]. According to [7] efficiency is one of the performance parameters that theoretically underlies the entire performance of an organization by referring to the philosophy "the ability to produce optimal output with its existing inputs, is a measure of expected performance".

Judging from economic theory, there are two types of definitions of efficiency, namely technical efficiency and economic efficiency. Economic efficiency has a macroeconomic point of view, while technical efficiency has a microeconomic point of view. The measurement of technical efficiency tends to be limited to the technical and operational relationship in the process of converting inputs into outputs. Meanwhile, in economic efficiency, prices cannot be considered as given, because prices can be influenced by the Bachelor's macro policy [8]

2.2 Efficiency Measurement Techniques

According to [9], efficiency measurement can be done with three approaches, including:

2.2.1 Ratio approach

The ratio approach in measuring efficiency is carried out by calculating the ratio output with input used. The ratio approach will be considered to have high efficiency if it can produce a number of Output which is optimal with Input which is minimal. The disadvantage of this approach is that when there are many Inputs and Output which will be calculated at the same time, so that many calculations give rise to infirm assumptions.

2.2.2 Regression approach

This approach measures efficiency using a model of the Output specific as functions of various levels Input certain. This regression calculation cannot accommodate the number of variables Output which is a lot.

2.2.3 Frontier Approach

Approach frontier in measuring efficiency, it is distinguished into two types, namely the frontier parametric and non-parametric. Parametric approaches can be measured by parametric statistical tests such as using Stochastic Frontier Approach (SFA) and Distribution Free Approach (DFA). Approach frontier non-parametric is measured by non-parametric statistical tests, namely by using the Data Envelopment Analysis (DEA). A parametric test is a test whose model requires specific assumptions about the distribution of the population to be

normal, while a non-parametric statistical test is a test whose model does not require a specific distribution of data distribution [10].

So, to analyze measurements with existing variables, this study uses the non-parametric DEA method. There are two techniques for measuring efficiency, namely input orientation and output orientation [10]:

1. Input-Oriented Measures

Input-oriented measurements show that a number of inputs can be proportionally reduced without changing the amount of output produced. This scenario can be illustrated by:

Efficiency up = fixed output / reduced input

2. Output-Oriented Measures

Output orientation measures when a number of outputs can be increased proportionally without changing the number of inputs used. This scenario can be illustrated by:

Efficiency up = output gain / fixed input

In this study, the authors chose to use output-oriented measurements. Oriented measurement Output is more appropriate to be used for the case of Construction Services, where there are more Construction Contracts and there are still Construction Services that are experiencing losses.

In this study, the orientation used is input orientation.

2.3 Metode Data Envelopment Analysis (DEA)

Data Envelopment Analysis (DEA) is a non-parametric approach which is basically a linear-based programming technique. The DEA works by identifying the units to be evaluated for input and output. It then calculates the productivity value and identifies which units are not using inputs efficiently or are not producing outputs effectively. The productivity measured is comparative or relative because it only compares between units of measurement from the same data set [11].

The calculation technique in the DEA methodology is based on the solution of a linear program. This method provides a sharp comparison and can be used to identify "star performers and under-achievers" (an area of

operation [a business unit] that has the best performance to be used as a reference and an area of operation [a business unit] that is underperforming so that it can be retained or discarded) through the calculation of a comparison of output and input ratios for all units compared [12].

3. METHODS

In this study, the author uses a quantitative descriptive research approach. Descriptive research is used to explain the performance of the construction services industry as a research object with the period 2017-2022 with consideration of 3 years before the implementation of PSAK 72 and 3 years after the implementation of PSAK 72. Meanwhile, quantitative research is used to determine the level of efficiency in the construction services industry by using formulas and calculations from the entire data as input and output variables and processed using MAXDEA 12 software. So that the test results come out in the form of numbers between zero and one. The results of the calculation are then analyzed and explained well in the representation of words.

3.1 Populasi

The population in this study is all Construction Services Companies operating

in Indonesia. In Indonesia, company share ownership comes from two institutions, namely the government (BUMN) and the private sector.

3.2 Sample

In this study, the sample used is the Construction Services Industry. The technique used in sampling is the purposive sampling technique. The use of this technique aims to make the selected sample in accordance with the criteria that have been specifically selected based on the purpose of this research. The criteria used to select the sample are:

1. Construction Services that publishes financial statements in the period 2017-2022.

2. Financial report data is available in its entirety and there are data needed in this study in the 2017-2022 period.

3. Construction Services that did not suffer losses during the research period, because the software used by the author could not read the minus data

4. Construction Services focuses on State-Owned Enterprises (SOEs) and companies listed on the Indonesia Stock Exchange (IDX) in the construction sector, this consideration is due to the disclosure of financial and operational data that is easily accessible

DMU	Company Name	Ownership
U01	Adhi Karya (Persero) Tbk, PT	State Owned
U02	PP (Persero) Tbk, PT	State Owned
U03	Wijaya Karya (Persero) Tbk, PT	State Owned
U06	Brantas Abipraya (Persero), PT	State Owned
U07	Nindya Karya (Persero), PT	State Owned
U09	Bukaka Teknik Utama Tbk, PT	Private
U14	Nusa Raya Cipta Tbk, PT	Private
U15	Paramita Bangun Sarana Tbk, PT	Private
U16	PP Precision Tbk, PT	Private
U18	Tira Austenite Tbk	Private
U20	Total Bangun Persada Tbk, PT	Private
U21	Wijaya Karya Bangunan Gedung Tbk, PT	Private

3.3 Data Analysis

The data analysis used in this study is Two-Stage Data Envelopment Analysis. By

first obtaining the efficiency value in the first stage using the DEA method, the value will be analyzed with several variables and then a

comparative analysis of the efficiency results before and after the implementation of PSAK 72 will be carried out

3.3.1 First Stage: Data Envelopment Analysis

In this study, an analysis technique is used to measure the efficiency level of the Construction Services Industry using Data Envelopment Analysis. The calculation used in this study is linear programming with the function of maximizing the goal.

$$E_s = \frac{\sum_{i=1}^m U_i Y_{is}}{\sum_{j=1}^n V_j X_{js}}$$

Information:

ES = Construction Service Efficiency s

m = observed output of the Construction Services Industry s

n = Construction Services Industry input s observed

YIS = the number of outputs to i produced

xjs = the number of inputs to j used

ui = s × 1 total output weight

vj = s × 1 total input weight

The above equation shows the use of one input variable and one output. Efficiency ratio (Ice), then maximized with the following constraints (Sutawijaya and Lestari, 2009):

$$E_s = \frac{\sum_{i=1}^m U_i Y_{is}}{\sum_{j=1}^n V_j X_{js}} \leq 1 : r = 1, \dots, N$$

Where U_i and $V_j \geq 0$

The equation above, where N represents the number of Construction Services Industries in the sample and r is the type of Construction Services Industry used as a sample in the first Inequality study explains that there is a ratio for other UKEs not more than 1, while the second inequality has a non-negative (positive) weight.

The DEA method was chosen because it can overcome the limitations of ratio and regression methods that cannot use many inputs and outputs. These stages include:

1. Defining Decision Making Units (DMUs)

As explained earlier, DMU is an operational unit/business unit that will be tested for its efficiency level. The DMU in this

study is the Construction Services Industry per year.

2. Selecting Input Variables – Output

The author uses input variables in the form of fixed assets, deposits, and operational costs. For output variables in the form of financing and operating profit.

3. Collecting Data

Once everything is defined (DMUs, approaches, and input-output variables), the next step is to search and collect the data. There are no blank (0) and negative values in each data from each DMU collected. Data is collected and organized in the form of tables in Microsoft Excel

4. Choosing a DEA Model

This study uses the VRS (Variable Return to Scale) model. according to Sari and Saraswati (2017) the VRS model is more appropriate to be used to analyze performance efficiency in service companies. The consideration is because the institution being researched has not been operating optimally.

3.3.2 SECOND STAGE UJI T-TEST INDEPENDENT

a. Normality Test

This normality test was carried out to find out whether the existing data was normally distributed or not. This test is also used as a condition before using the independent sample t-test. This normality test can be carried out by non-parametric statistical analysis of Kolmogorov-Smirnov (K-S). The K-S test is carried out by making hypotheses:

- H0: Normally distributed residual data

If the results of the K-S Test show a probability value of insignificant at 0.05 then the null hypothesis is accepted which means the residual data is normally distributed.

- H1: Residual data is not normally distributed.

If the results of the K-S test show a significant probability value of 0.05, then the null hypothesis is rejected which means that the residual data is not normally distributed.

b. test Independent

The method used is the Paired Sample T Test or Wilcoxon Signed Rank

analysis model depending on the distribution of the data, the analysis is carried out using the help of the SPSS software program. Previously, the collected data would be analyzed in stages by conducting descriptive statistical analysis first. Furthermore, statistical testing was carried out with a normal distribution test using the Kolmogorov-Smirnov test. Then the next stage is to test the partial hypothesis for each research variable by using the Paired Sample T-Test analysis test if the data is normally distributed and the Wilcoxon Signed Rank analysis test model if the data is abnormally distributed

The results of the Construction Services DEA before the implementation of PSAK 72 are the first sample and the results of the DEA after the implementation of PSAK 72 is the second sample, so that the output will be seen whether or not there is an average difference from the results of the DEA calculation

The purpose of the hypothesis test in the form of a two-mean difference test in this study is to verify the truth or error of the hypothesis, or in other words to determine whether to accept or reject the hypothesis that has been made. The level of significance used is 5 percent, where:

- If the $t_{count} > t_{table}$ then the H_1 hypothesis is accepted (H_0 is rejected)
- If the $t_{count} < t_{table}$ then the H_1 hypothesis is rejected (H_0 is accepted)

4. RESULTS AND DISCUSSION

4.1 Overview of National Construction Services

The construction services industry in Indonesia has an important role in infrastructure development. It consists of various companies with diverse specialties, ranging from building construction to large infrastructure projects. Some of the large companies operating in this sector are state-owned, such as PT Adhi Karya (Persero) Tbk,

PT PP (Persero) Tbk, and PT Wijaya Karya (Persero) Tbk, which are known to have solid performance and long experience in handling large projects both domestically and internationally.

According to the 2022 Indonesian Economic Report from Bank Indonesia (BI), in that year the construction sector grew slowly due to the impact of rising energy prices. As for 2023, the construction sector is projected to strengthen, one of which is supported by the development of the Nusantara Capital City (IKN) in East Kalimantan.

In addition to state-owned companies, the national construction services sector is also dominated by private companies that have proven to be reputable. For example, PT Bukaka Teknik Utama Tbk, PT Nusa Raya Cipta Tbk, and PT Total Bangun Persada Tbk. These companies play an important role in improving the capacity and competence of the industry through the application of modern technology and best practices. This allows them to compete in both domestic and international markets.

4.2 First Stage: Results of DEA Analysis

This study aims to analyze and compare the level of financial efficiency in the national construction services industry before and after the implementation of PSAK 72 using the Data Envelopment Analysis (DEA) method. In this study, the input variables used are Net Fixed Asset, Operating Expenses, and Total Employees. While the output variables are Revenue and Profit Before Tax. Efficiency scores range from 0 to 1, where scores close to 1 indicate a high level of efficiency.

4.3 Efficiency Before the Implementation of PSAK 72 (2017-2019)

In the 2017-2019 period, prior to the implementation of PSAK 72, the analysis showed significant variations in the level of financial efficiency of national construction companies. The efficiency level is shown in the table below:

Company	Efficiency Values Before the Implementation of PSAK 72
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	2017	2018	2019
Adhi Karya (Persero) Tbk, PT	0,540	0,508	0,427
PP (Persero) Tbk, PT	0,732	0,788	0,856
Wijaya Karya (Persero) Tbk, PT	0,933	1,000	0,946
Brantas Abipraya (Persero), PT	0,736	0,707	0,490
Nindya Karya (Persero), PT	0,999	1,000	0,935
Bukaka Teknik Utama Tbk, PT	0,470	1,000	0,903
Nusa Raya Cipta Tbk, PT	0,452	0,484	0,540
Paramita Bangun Sarana Tbk, PT	0,804	0,291	0,326
PP Precision Tbk, PT	0,769	1,000	1,000
Total Bangun Persada Tbk, PT	0,362	0,346	0,295
Wijaya Karya Bangunan Gedung Tbk, PT	0,931	1,000	1,000

Source: Data processed (MaxDEA Output)

In 2017, the company with the highest efficiency score was Nindya Karya (Persero), PT with a score of 0.999, showing that almost all inputs used by this company were able to produce maximum output. On the other hand, Total Bangun Persada Tbk, PT recorded the lowest efficiency score of 0.362, which indicates an inoptimal use of their resources. The year 2018 saw an increase in efficiency in several companies. Wijaya Karya (Persero) Tbk, PT, Nindya Karya (Persero), PT, Bukaka Teknik Utama Tbk, PT, PP Presisi Tbk, PT, and Wijaya Karya Bangunan Gedung Tbk, PT all achieved a maximum efficiency value of 1,000. This indicates that these companies are able to optimize the use of their inputs to produce maximum output. On the other hand, Paramita Bangun Sarana Tbk, PT recorded the lowest efficiency score of 0.291, which indicates a problem in resource management. In 2019, PP Presisi Tbk, PT and Wijaya Karya Bangunan Gedung Tbk, PT maintained a perfect efficiency value of 1,000,

showing consistency in resource management. However, Total Bangun Persada Tbk, PT once again recorded the lowest efficiency score of 0.295, indicating that the company has not succeeded in improving its efficiency from the previous year.

Overall, the most efficient companies before the implementation of PSAK 72 were PP Presisi Tbk, PT and Wijaya Karya Bangunan Gedung Tbk, PT, both achieving a perfect efficiency value of 1,000 for several consecutive years. In contrast, the least efficient company was Total Bangun Persada Tbk, PT, which recorded the lowest efficiency score each year during the period.

4.4 Efficiency Before the Implementation of PSAK 72 (2017-2019)

In the 2020-2022 period, after the implementation of PSAK 72, the analysis showed significant variations in the level of financial efficiency of national construction companies. The efficiency level is shown in the table below:

Company	Efficiency Value After the Implementation of PSAK 72		
	2020	2021	2022
Adhi Karya (Persero) Tbk, PT	0,359	0,375	0,406
PP (Persero) Tbk, PT	0,593	0,679	0,766
Wijaya Karya (Persero) Tbk, PT	0,489	0,521	0,669
Brantas Abipraya (Persero), PT	0,324	0,361	0,543
Nindya Karya (Persero), PT	0,624	0,838	0,759
Bukaka Teknik Utama Tbk, PT	0,930	1,000	0,804
Nusa Raya Cipta Tbk, PT	0,454	0,343	0,484

Paramita Bangun Sarana Tbk, PT	0,391	0,656	0,953
PP Precision Tbk, PT	0,768	0,735	0,934
Total Bangun Persada Tbk, PT	0,325	0,368	0,391
Wijaya Karya Bangunan Gedung Tbk, PT	0,590	0,725	0,630

Source: Data processed (MaxDEA Output)

In 2020, the highest efficiency value was achieved by Bukaka Teknik Utama Tbk, PT with a score of 0.930. This shows that these companies are able to optimize the use of their inputs to produce maximum output despite the challenges of implementing new regulations and the impact of the COVID-19 pandemic. On the other hand, Brantas Abipraya (Persero), PT recorded the lowest efficiency score of 0.324, indicating that there was an inoptimal use of their resources in that year. In 2021, Bukaka Teknik Utama Tbk, PT achieved a maximum efficiency value of 1,000, making it the most efficient company after the implementation of PSAK 72. This indicates that these companies are successfully maintaining or even improving their efficiency amid uncertain market conditions. On the other hand, Nusa Raya Cipta Tbk, PT recorded the lowest efficiency score of 0.343, indicating that the company experienced difficulties in managing resources optimally during the year. In 2022, Paramita Bangun Sarana Tbk, PT showed a significant increase in efficiency with a value of 0.953, making it one of the most efficient companies in the year. On the other hand, Nusa Raya Cipta Tbk, PT again recorded the lowest efficiency value of 0.484, indicating that there are ongoing problems in their resource management.

Overall, the most efficient company after the implementation of PSAK 72 is Bukaka Teknik Utama Tbk, a PT that achieved a maximum efficiency value of 1,000 in 2021. On the other hand, the most inefficient company after the implementation of PSAK 72 is Brantas Abipraya (Persero), a PT with the lowest efficiency value of 0.324 in 2020.

4.5 Second Stage: Results of Comparative Analysis

4.5.1 Uji Hipotesis

Before testing the difference in the level of efficiency of construction services

before and after PSAK 72, a normality test was carried out first as a condition for the difference test.

4.5.2 Normality Test

The normality test in this study will use the Kolmogorov-Smirnov normality test.

The results of the Kolmogorov-Smirnov normality test using IBM SPSS Statistics 27 showed that the K-S value for Variable I (Efficiency Before the Implementation of PSAK 72) was 0.165 with a significance probability of 0.024 and the value was far below $\alpha = 0.05$, this means that H0 was rejected or the data was not normally distributed. Variable II (Efficiency After the Implementation of PSAK 72) has a value of K-S = 1.130 with a significance probability of 0.172 and a value above $\alpha = 0.05$, this means that H0 is accepted or the data is normally distributed. Based on the data table, the efficiency values generated from the DEA method on each variable are not all normally distributed, only Variable II (Efficiency After the Implementation of PSAK 72).

Then the next stage was to test the partial hypothesis for each research variable using the Wilcoxon Signed Rank analysis test because the data was distributed abnormally.

4.5.3 Uji Wilcoxon

Testing of partial hypotheses for each research variable using the Wilcoxon Signed Rank analysis test model.

Based on the normality test of the Kolmogorov-Smirnov normality test on Variable I (Efficiency Before the Implementation of PSAK 72), the data was not distributed normally until then the hypothesis test was continued using a non-parametric test, namely the wilcoxon signed rank test. The results of the wilcoxon signed rank test show a sig. (2-tailed) by 0.04 ($0.04 < 0.05$), meaning that there is a significant difference in the Level of Financial Efficiency in the National Construction Services Industry

Before and After the Implementation of PSAK 72. Therefore, the results of the study stated that H0 was accepted and H1 was rejected.

5. CONCLUSION

Based on the results and discussion in chapter four, the conclusions that can be drawn from the research are:

1. The level of efficiency of construction industry services before the implementation of PSAK 72 varied significantly among companies. Some companies, such as Nindya Karya (Persero), PT (BUMN), show a very high level of efficiency with almost perfect values, showing a strong ability to utilize their resources to produce optimal output. However, there are also other companies such as Total Bangun Persada Tbk, a PT (private) that recorded the lowest efficiency

value, indicating that there is an inoptimal use of fixed assets, operational costs, and the number of employees to achieve the desired income and profit before tax.

2. After the implementation of PSAK 72, the analysis showed an increase in the level of financial efficiency of national construction companies. Companies such as Bukaka Teknik Utama Tbk, a (private) PT achieved maximum efficiency values in 2021, indicating that the implementation of this new standard encourages companies to optimize the use of their resources. This indicates that the implementation of PSAK 72 provides a more transparent and consistent framework for companies to manage their fixed assets, operating costs, and workforce more efficiently to generate higher revenues and profits.

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