

Analysis of Productivity Level at PT Telkom Indonesia (Persero) Tbk. using Malmquist Productivity Index (MPI)

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Abstract

The telecommunications sector in Indonesia continues to grow very rapidly. This was followed by the launch of 4G in Indonesia which officially operated in 2011. The entire community continues to support and demand the development of telecommunications in Indonesia. Therefore, there has been an increase in the operational activities of each telecommunications company, especially at PT Telkom Indonesia (Persero) Tbk. This study aims to analyze the productivity level of the telecommunications company PT Telkom Indonesia (Persero) Tbk. (Persero) Tbk. in the period 2011-2020. This study uses the Malmquist Productivity Index (MPI) method to calculate the level of productivity using DEAP 2.1 software. There are two variables, namely the input and output variables. The input variables consist of labor, capital, and materials, while total income and earnings per share are used as output variables. The results showed that PT Telkom Indonesia (Persero) Tbk. unproductive judging by the value of TFPCH and supported by TECHCH. This means that PT Telkom Indonesia (Persero) Tbk. unproductive, PT Telkom Indonesia (Persero) Tbk. not optimal in using and utilizing technology in its operational activities. Although not yet productive, PT Telkom Indonesia (Persero) Tbk. already efficient in managing its inputs and outputs.

Keywords: malmquist productivity index, productivity, telecommunication

Abstrak

Sektor telekomunikasi di Indonesia terus berkembang sangat pesat. Hal ini diikuti dengan peluncuran 4G di Indonesia yang resmi beroperasi pada tahun 2011. Seluruh masyarakat terus mendukung dan menuntut perkembangan telekomunikasi di Indonesia. Oleh karena itu, telah terjadi peningkatan dalam kegiatan operasional setiap perusahaan telekomunikasi khususnya di PT Telkom Indonesia (Persero) Tbk. Penelitian ini bertujuan untuk menganalisis tingkat produktivitas perusahaan telekomunikasi PT Telkom Indonesia (Persero) Tbk. (Persero) Tbk. pada periode 2011-2020. Penelitian ini menggunakan metode Malmquist Productivity Index (MPI) untuk menghitung tingkat produktivitas menggunakan software DEAP 2.1. Ada dua variabel yaitu variabel input dan variabel output. Variabel input terdiri dari tenaga kerja, modal, dan bahan, sedangkan total pendapatan dan laba per saham digunakan sebagai variabel output. Hasil penelitian menunjukkan bahwa PT Telkom Indonesia (Persero) Tbk. tidak produktif dilihat dari nilai TFPCH dan didukung oleh TECHCH. Artinya PT Telkom Indonesia (Persero) Tbk. tidak produktif, PT Telkom Indonesia (Persero) Tbk. belum optimalnya penggunaan dan pemanfaatan teknologi dalam kegiatan operasionalnya. Meski belum produktif, PT Telkom Indonesia (Persero) Tbk. sudah efisien dalam mengelola input dan outputnya.

Kata Kunci: malmquist productivity index, produktivitas, telekomunikasi

1. Introduction

The telecommunications sector in Indonesia continues to grow very rapidly. This was followed by the launch of 4G in Indonesia which officially started operating in 2011. And also the emergence of the Covid-19 pandemic which required people to interact via online. Therefore, there has been an increase in the operational activities of each telecommunication company, especially in PT Telkom Indonesia (Persero) Tbk. PT Telkom Indonesia (Persero) Tbk. Is a State-Owned Enterprise (BUMN) in the field of Information and Communication Technology (ICT) services and telecommunications networks in Indonesia. As a state-owned company whose shares are traded on the stock exchange, the company's majority shareholder is the Government of the Republic of Indonesia. At the same time, the rest is controlled by the public. The largest state-owned T.I.M.E.S (Telecommunication, Information, Media, Edutainment and Services) business provider company in Indonesia, is a complete business portfolio following the changing trends of global business.

Quoted from the Katadata page, PT Telkom Indonesia (Persero) Tbk's financial performance continued to rise despite the Covid-19 pandemic. It can be proven from the increase in Telkom's profit to double digits in the first half of 2021 compared to the same period in the previous year. Earnings per share also rose from Rp 110.93 to Rp 123.69. The increase in Telkom's net profit was driven by an increase in the company's revenue by 3.92% in the first half of this year (Katadata, 2021). PT Telkom Indonesia has penetrated throughout Indonesia with its network service

provider so that urban and rural communities already know about this Telkom network. Unexpectedly, PT Telkom Indonesia (Persero) Tbk. has become one industry that contributes to national economic growth (CNBC Indonesia, 2020). In 2020 PT Telkom Indonesia achieved revenues of around 136 billion rupiah. PT Telkom Indonesia also received several awards in 2020, one of which was "Innovative Company for Digital Edutainment Service category Telecommunication" and "The best SOE in National Building" (CNBC, 2020). So from the achievements that have been achieved, PT Telkom Indonesia claims to be the largest telecommunications company in Indonesia, with 15 million fixed telephone subscribers and 104 million cellular telephone subscribers.

From the explanation above, it can be seen that a company can be said to be good if we look at its financial performance. A well-developed telecommunications system is key to a country's economic growth and development. (Dutta, 2015). If the company's performance is good, investors will be interested in investing. When looking at a company's financial performance through its financial statements, which will be analyzed using financial ratios, it may be said that the company's financial performance is good. When viewed from the development of technology at this time, the telecommunications sector can indeed be said to be in good condition. However, despite these conditions, the company's performance must be appropriately maintained. According to Octrina (2020), company performance is related to how the level of profitability of the company, how the company can work productively, and how efficient the company is in managing its inputs and outputs. One measurement of financial performance is seen from profitability and how they manage their inputs and outputs productively and efficiently, where companies are expected to minimize inputs with optimal output.

Productivity is one of the key factors in promoting optimal economic growth. To produce good company productivity requires employees who have a good work ethic, caring attitude, and discipline. Companies need to pay attention to knowledge, skills, abilities, behavior, and workforce satisfaction to ensure high employee productivity. The definition of productivity itself is the relationship between labor, materials, and money to produce a good form or value (Supriyanto & Brodoastuti, 2012). Based on the financial reports and events described above, it shows a probability of an increase in productivity at PT Telkom Indonesia. The Malmquist Productivity Index (MPI) method is used in this study to determine a company's productivity level. To compare the input and output to be calculated, the Malmquist Index is utilized. The Malmquist Index, which is part of the Data Envelopment Analysis (DEA) approach, can be used to see each business unit's productivity level so that improvements in efficiency and technology are based on specified inputs and outputs. MPI is also used to analyze performance change (Octrina et al., 2020).

Performance measurement is very important for any company in any sector, and determining its efficiency and achievement and comparing the company with other companies in the same industry, from previous research using one of the telecommunications companies in the world, namely Emirates Integrated Telecom. It has been compared from various sectors in the world using the Malmquist Productivity Index that the telecommunications sector is the first sector whose TFP is above the average TFP of other sectors. So this research purpose to find out the level of productivity at PT Telkom Indonesia (Persero) Tbk using Malmquist Productivity Index.

2. Literature and Research Framework

2.1 Productivity

According to Irwandy, (2019) explains the basis of productivity, namely the relationship between output and input in a production process. Productivity measurement can be done partially or totally. Partial productivity is the relationship between output and one input. According to Octrina et al. (2020) Total Factor Productivity (TFP) is used to measure the relationship between output and several inputs together. The connection is expressed in the ratio of the output index to the aggregate input index. When the ratio increases, it means that more output can be produced using a certain amount of input, or a certain amount of output can be produced using less input.

According to Octrina & Setiawati (2019), The ratio between the output generated and the input consumed is known as productivity. Total Factor Productivity (TFPCH), on the other hand, is a measure of productivity that takes into account all elements of production and is based on changes in the total output of all inputs. Productivity measurement is an important management tool at all levels of the economy. There are various methods that can be used to determine the productivity of a particular company, the most common of which is to use the Malmquist Productivity Index (MPI), which is a subset of the Data Envelopment Analysis (DEA) method and can be used to determine the productivity of each bank, allowing for changes in both productivity and technology.

Pambuko et al. (2019) explained that two approaches can be used to measure productivity, namely the input and output approaches. To determine the model approach, it can be adapted to the production characteristics of the company or its business unit, namely minimizing the use of inputs to produce a certain level of output or

maximizing a certain level of output from the input. To measure the productivity of financial institutions can use the output approach, because it is considered more appropriate to use. Financial service institutions have an orientation to maximize output, by using available inputs. So, for this study, the output approach is used with the assumption of Variable Return to Scale (VRS). Because of PT Telkom Indonesia (Persero) Tbk. as a telecommunications service company, it is not certain that when its input is increased by one unit, it will also result in an additional output unit. When the company's input is increased by one unit, it is possible for the bank to produce an output that is smaller or larger than one.

In the first generation model developed by Caves (1982) there are 2 (two) Malmquist productivity index models, namely 'Malmquist input quantity index' and 'Malmquist output quantity index.' Malmquist input quantity index for a unit of production, at the time of observation t and $t+1$, for reference technology in period k , $k = t$, and $t+1$. The Malmquist input quantity index only measures the observed change in the input quantity between time t and $t+1$, where:

$$MI_k(y_k, x_t, x_{t+1}) = \frac{E(y_k, x_t)}{E(y_k, x_{t+1})}, k = t, t+1 \quad (2.1)$$

Meanwhile, the Malmquist output quantity index used for a production unit, at the time of observation t and $t + 1$, for the reference technology in the period k , $k = t$, and $t + 1$ is expressed by the following formula (2.2). This Malmquist output quantity index measures only the observed change in the quantity of output between time t and $t + 1$, where:

$$MO_k(y_t, y_{t+1}, x_k) = \frac{E_k^0(y_{t+1}, x_k)}{E_k^0(y_t, x_k)}, k = t, t+1 \quad (2.2)$$

The new definition of the Malmquist productivity index for units of production between t and $t + 1$ based on the level of technology at times k , $k = t$, and $k = t + 1$ follows the tradition of most productivity indices. In keeping with Tornqvist's productivity index, the index is constructed using the ratio between the output and input indices:

$$MTFP_k = \frac{MO_k(y_t, y_{t+1}, x_k)}{MI_k(y_k, x_t, x_{t+1})} = \frac{E_k^0(y_{t+1}, x_k) / E_k^0(y_t, x_k)}{E_k^1(y_k, x_t) / E_k^1(y_k, x_{t+1})}, k = t, t+1 \quad (2.3)$$

The equation above describes the ratio between Malmquist's output and input indices. If the value of the productivity index (TFPCH) is greater than 1, it indicates an increase in productivity. On the other hand, if the productivity index value (TFPCH) is less than 1, it means that the productivity level is decreasing (Octrina & Setiawati, 2019). Based on the explanation above, it can be concluded that productivity is the correlation between input and output in production activities. Productivity measurement can be done partially and totally. In this study, the total productivity measurement is called Total Factor Productivity (TFP) using the MPI method, to measure TFP from time to time.

2.2 Input and Output Variable

The following is an explanation of the output and input variables that will be used to determine productivity:

1. Input Variable

a) Labour

In this study, labor is measured in terms of worker wages and salaries. According to Shields et al. (2020) Wage is something tangible or intangible that the organization gives to employees either intentionally or not as a reward for employees' potential or good contributions and for employees to be used as a positive value to satisfy certain needs.

b) Capital

Fixed capital is used for a long period of time and can provide income (Butkova, 2020). In this study, the net book value of the property, plant, and equipment in the non-current assets section of the Balance Sheet is used to calculate capital.

c) Material

According to (Dewi & Kristanto, 2013) Material costs are the expenses of procuring all materials that will eventually become part of the cost object (goods in process, then finished goods) and can be traced to a cost object in a cost-effective manner. The material metrics in terms of the cost of products sold in the income statement were used in this research.

2. Output Variable

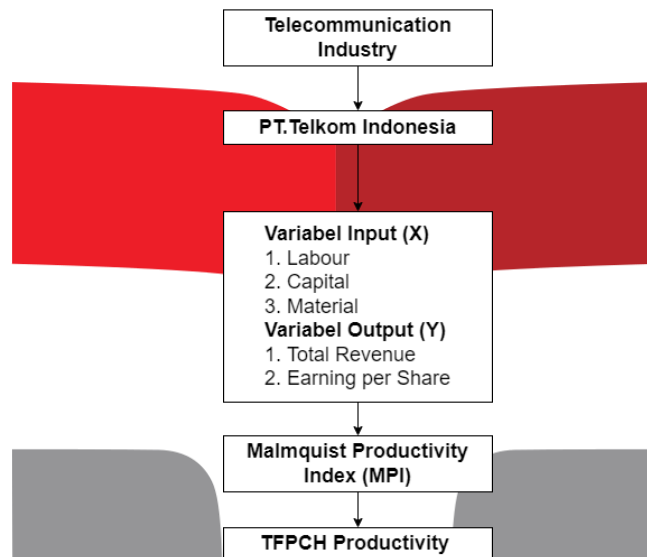
a) Total Revenue

Revenue is the gross inflow of economic benefits during the current period that arise in an entity's ordinary course of activities when inflows result in additional capital other than those relating to equity holder contributions (Lau & Lam, 2014).

b) Earning per Share

Earnings Per Share (EPS) is a way of providing advantages to shareholders based on the number of shares they possess. (Fahmi, 2015)

2.3 Research Framework



Source: Processed (2022)

3. Research Methodology

3.1 Research Characteristic

No.	Research Characteristic	Type
1.	Research Method	Quantitative
2.	Research Purposes	Descriptive
3.	Approach to theory development	Positivism
4.	Research Strategy	Case Study
5.	Unit of Analysis	Organization
6.	Research Background	Non-contrived
7.	Execution Time	Time-series

Source: Processed (2022)

3.2 Research Stages

The methodology of research is a discussion of the theoretical concepts of various approaches, their upsides and downsides, which is continued in scientific work with the selection of the method to be used (Pandoyo & Sofyan, 2018). In this study, quantitative research methodologies were applied. This is a descriptive and verification type of a research. The stages of research are a series of systematic processes based on the scientific method, the are several stage that need to be carried out in this research including:

1. Obeservation and data collection

The phenomenon that occurs in this study is the fairly rapid growth of the Telecommunications Industry in Indonesia, especially at PT Telkom Indonesia (Persero) Tbk. is the development in the telecommunications industry at PT Telkom Indonesia (Persero) Tbk. in line with the productivity of the company.

2. Defining the problem statement

After determining the phenomena and data that form the basis of the research, the next step is to formulate a problem formulation that will be discussed in this study. The formulation of the problem made by the author is that there is 1 problem formulation.

3. Conduct a literature study

This research was conducted to find references through journals, books, and relevant articles related to this research regarding productivity in the telecommunications sector, research variables, and previous studies that discussed similar problems.

4. Create Framework

The framework of thinking is carried out as the main basis of this entire research to describe the relationship between input variables: Labor, capital, and materials, and output variables: Total revenue and earnings per share on the productivity level of PT Telkom Indonesia (Persero) Tbk.

5. Collecting Data

The researcher's data collection technique uses secondary data retrieval from the annual report taken from the PT Telkom Indonesia (Persero) Tbk. website and the Indonesia Stock Exchange website. The criteria for secondary data collected are data published periodically from 2011 to 2020.

6. Analyze Data

This stage is done by managing the data that has been done using descriptive statistical analysis, and the researchers explain the results of data processing input variables (Labour, Capital, Material) and output (Total Revenue and earnings per share) using excel to find out the mean, standard deviation, maximum value. And the minimum value. And after that, the researcher explained the meaning of the results of the four values. Then, the productivity input and output variables are reprocessed using DEAP 2.1 software to determine the level of productivity on an annual basis in the 2011-2020 period. And to know productive or not, seen from the Total Productivity Factor (TFPCH) >1.

7. Interpreting Data

After analyzing the data, the researcher explains and concludes the results obtained from processing the data so that it can be seen how the influence of input and output variables on the productivity of PT Telkom Indonesia (Persero) Tbk.

3.3 Population and Sample

The population used in this study is PT Telkom Indonesia (Persero) Tbk. (Indrawati, 2015). In this study, the authors conducted a case study with the object of the research, namely PT Telkom Indonesia (Persero) Tbk. So the sampling technique used in this study is total sampling.

3.4 Data Collection and Data Sources

The data sources of this research are from the company website PT Telkom Indonesia (Persero) Tbk, the Indonesia Stock Exchange Website, the annual report of PT Telkom Indonesia (Persero) Tbk. The data collection techniques used in this study are documentation, namely by collecting existing documents. This study uses secondary data from the annual financial statements of PT Telkom Indonesia (Persero) Tbk. for the period 2011-2020 obtained from the PT Telkom Indonesia (Persero) Tbk. website and the Indonesia Stock Exchange Website.

3.5 Data Analysis Technique

The analysis will give a brief overview or description of the data using the mean, standard deviation, variance, maximum, minimum, sum, range, kurtosis, and skewness (Ghozali, 2019). This study uses Data Envelope Analysis (DEA) with the Malmquist Productivity Index (MPI) approach. In using descriptive analysis, the data used include input variables, namely Labor, Capital, and Materials, and the output variables, namely total revenue and earnings per share by using excel to determine the mean, standard deviation, maximum, and minimum values. After obtaining the results, the researcher will explain the meaning of the four values. Furthermore, the input and output variables were reprocessed using DEAP 2.1 software to determine the productivity level of PT Telkom Indonesia (Persero) Tbk. The results of data processing using the Malmquist Productivity Index (MPI) approach will display the results of TFP and other components directly in the 2011-

2020 period. PT Telkom Indonesia (Persero) Tbk. will be said to be productive if the Total Factor Productivity (TFPCH) > 1. On the other hand, if the productivity index's value (TFPCH) is < 1, it is declared unproductive (Octrina & Setiawati, 2019)

4. Result and Discussion

4.1 Descriptive Analysis

The descriptive statistical analysis in this section is carried out using Capital, Labor, and Materials as input variables. While the output variables used are total revenue and earnings per share. These variables will be used to measure the company's productivity. So it will be seen what the lowest, highest, average, and standard deviation values of the variables used are. This descriptive statistical analysis uses SPSS 26 software.

	Mean	Std. Dev	Maximum	Minimum
Labour	11.7456	2.08794	14.39	8.56
Capital	131.1548	41.22400	200.44	81.80
Material	17.8012	4.55579	23.73	10.98
Total Revenue	107.0934	25.50659	136.46	71.25
Earning per Share	169.9180	35.68724	223.55	111.90

Source: Processed (2022)

The highest value of Labor, Capital, and Total Revenue from PT Telkom Indonesia (Persero) Tbk. occurred in 2020 with a labor value of 14,390, Capital with a value of 200,440, and total revenue with a value of 136,462. Meanwhile, the highest material value is PT Telkom Indonesia (Persero) Tbk. achieved in 2019 at 23,731. And the highest value of Earning per Share of PT Telkom Indonesia (Persero) Tbk. was achieved in 2017. It can be summarized that PT Telkom Indonesia (Persero) Tbk. continues to grow from year to year, even reaching the highest peak of income in 2020.

4.2 Result

This section describes and determines the results of productivity research from PT Telkom Indonesia (Persero) Tbk. using the Malmquist Productivity Index (MPI) approach, where company productivity can be seen from the TFPCH value. This MPI is processed using DEAP 2.1 software, producing five index components.

No	Period	EFFCH	TECHCH	PECH	SECH	TFPCH	Description
1	2011	1.000	0.940	1.000	1.000	0.940	Not Productive
2	2012	1.000	1.042	1.000	1.000	1.042	Productive
3	2013	1.000	1.025	1.000	1.000	1.025	Productive
4	2014	1.000	0.974	1.000	1.000	0.974	Not Productive
5	2015	1.000	0.956	1.000	1.000	0.956	Not Productive
6	2016	1.000	1.041	1.000	1.000	1.041	Productive
7	2017	1.000	1.050	1.000	1.000	1.050	Productive
8	2018	1.000	0.896	1.000	1.000	0.896	Not Productive
9	2019	1.000	0.975	1.000	1.000	0.975	Not Productive
10	2020	1.000	1.026	1.000	1.000	1.026	Productive
Mean		1.000	0.993	1.000	1.000	0.993	Not Productive

Source: Processed (2022)

Based on Table 4.2 above, it can be seen that some were productive and unproductive during the ten research periods. From these data, it can be seen that there are the lowest and highest productivity values. For example, in 2018, the lowest productivity value was 0.896. This shows that the productivity of PT Telkom Indonesia (Persero) Tbk. is less stable, and there are some gaps in managing its inputs and outputs. So there are specific years when PT Telkom Indonesia (Persero) Tbk. Very productive in managing inputs and outputs. Therefore, PT Telkom Indonesia (Persero) Tbk. must be able to manage input and output properly so that there is no productivity gap between years. This is done so that it has a good impact on the level of income or output that will be produced.

Based on the results of productivity measurements at PT Telkom Indonesia (Persero) Tbk. Using MPI shows that from 2011 to 2020, PT Telkom Indonesia (Persero) Tbk. has an average TFPCH <1 , which is 0.993. This means that PT Telkom Indonesia (Persero) Tbk. has not been productive in managing its inputs and outputs. The productivity value of PT Telkom Indonesia (Persero) Tbk. is driven by the efficiency change factor (EFFCH) of 1,000. In terms of efficiency achieved by PT Telkom Indonesia (Persero) Tbk. is also driven by the pure efficiency factor (PECH) and scale efficiency (SECH) with a value of 1,000 each and supported by the value of technological change (TECHCH) which is <1 which is 0.993 which is also one of the factors for the unproductivity of PT Telkom Indonesia (Persero) Tbk. It can be concluded even though PT Telkom Indonesia (Persero) Tbk. is not productive in managing its inputs and outputs, PT Telkom Indonesia (Persero) Tbk. has been efficient in managing its inputs and outputs during the research period. In addition, PT Telkom Indonesia (Persero) Tbk. has not been optimal in using and utilizing technology for its operational activities during the research period.

The analysis of the TFPCH value at PT Telkom Indonesia (Persero) Tbk. shows that total revenue is very influential in determining a company's productivity. So the results of this study are in line with research that has been carried out Majumdar & Asgari, (2017) in several other sectors in research from 2007 to 2014, Wulan Sari & Sulistyaningsih, (2021) on the telecommunications industry in ASEAN-5, Nigam et al., (2012) on analysis of Indian telecom operators, and Hisali & Yawe, (2011) on growth analysis of Uganda's telecommunications industry.

The study results indicate that the driving factor for the average TFPCH value of PT Telkom Indonesia (Persero) Tbk. is the TECHCH value. While the driving factor for the average TFPCH value is EFFCH. So the results of this study are in line with the research conducted (Majumdar & Asgari, 2017). Where Majumdar & Asgari, (2017) conducted research in measuring productivity in several non-financial sectors in the period 2007-2014, the results showed that the break-up of the TFP indicated that technological improvements drove the efficiency indices in the top-performing industries.

Based on the analysis of PT Telkom Indonesia (Persero) Tbk. for ten years, it can be concluded that the telecommunications sector in Indonesia, especially PT Telkom Indonesia (Persero) Tbk, has not been so stable as seen from the results of productivity results that are still up and down every year. Supported by PT. Telkom Indonesia (Persero) Tbk. which is still adapting in following all technological advances and optimizing the technology. Therefore, in order for PT. Telkom Indonesia (Persero) Tbk. to reach a stable productive stage every year, PT. Telkom Indonesia (Persero) Tbk. must be able to manage its inputs and outputs optimally. And PT. Telkom Indonesia (Persero) Tbk. must be efficient in managing its inputs and outputs. In addition, PT. Telkom Indonesia (Persero) Tbk. must also be able to use and utilize technology in its operational activities. So the company can obtain a stable level of productivity and increased company performance. As well as being able to provide products and services to customers more optimally, PT Telkom Indonesia (Persero) Tbk. must also continue to adapt to all existing technological advances. When the company's performance increases, the other output variables, namely total revenue and earnings per share, get an optimal value.

4. Conclusion and Recommendation

4.1 Conclusion

Based on the analysis and discussion of the results of research regarding the level of productivity at PT Telkom Indonesia (Persero) Tbk. the research period from 2011 to 2020, the MPI results show that the average TFPCH of PT Telkom Indonesia (Persero) Tbk. not too high, meaning that PT Telkom Indonesia (Persero) Tbk. Unproductive in managing its inputs and outputs. But even so, PT Telkom Indonesia (Persero) Tbk. has been efficient in managing its inputs and outputs. PT Telkom Indonesia is not productive because of the lack of maximum use of technology for its operational activities, indicated by the average TECHCH value which is still below 1. Therefore, PT Telkom Indonesia (Persero) Tbk. must increase the use of technology in terms of products, services, and operational activities in order to achieve optimal levels of productivity. However, PT Telkom Indonesia (Persero) still needs to improve efficiency in managing its inputs and outputs, so that productivity can continue to be maintained and even develop.

4.2 Recommendation

For companies, it can increase digital technology by promoting efficient and effective digital methods in bureaucratic matters from the lowest to the highest level to improve time efficiency and reduce costs, such as initiating internal applications in the company's operational activities among employees and optimizing company activities that can be carried out online or digitally. Because the research results obtained, there are still several periods when PT Telkom Indonesia (Persero) Tbk. is not optimal in utilizing technology. In addition, the company must be able to carry out cost efficiency so that the resulting output is optimal. Therefore, companies must be able to utilize technology and perform cost efficiency to achieve high productivity with optimal output. From the output results, the company must also be able to allocate its funds as well as possible so that the company's fund turnover runs smoothly and produces optimal output as well. So that the company can achieve high productivity when the company allocates its funds appropriately and optimizes technology in its operational activities. When the company is productive, it can increase investor confidence to deposit their funds in the company, namely PT Telkom Indonesia (Persero) Tbk.

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