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The Influence of Project Scheduling Effectiveness and Administrative Efficiency on the Performance of Telecommunication Tower Construction Management at PT Dayamitra Telekomunikasi, Tbk Regional *Office* Central Sumatra

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Abstract

The performance of infrastructure development management is one of the important aspects in the successful implementation of projects, especially in the telecommunications sector which requires punctuality, administrative efficiency, and good work coordination. This study aims to analyze the influence of project scheduling effectiveness and administrative efficiency on the performance of telecommunication tower construction management at PT Dayamitra Telekomunikasi Tbk, Regional Office Sumbagteng. The study uses a quantitative approach with a sampling technique in the form of saturated sampling of the entire population totaling 31 respondents. Data collection was carried out through observation, literature study, and the distribution of questionnaires that have gone through validity and reliability tests. The data analysis methods used included classical assumption tests, multiple linear regression analysis, hypothesis tests, and determination coefficients with the help of SPSS version 25 application. The results of the study show that the effectiveness of project scheduling and administrative efficiency have a positive and significant influence on the management performance of telecommunication tower construction. Based on the results of multiple linear regression analysis, the equation $Y = -0.445 + 0.568X_1 + 0.439X_2$ was obtained, which shows that any improvement in project scheduling effectiveness and administrative efficiency will improve the performance of development management. The value of the determination coefficient (R^2) of 0.622 indicates that the two independent variables contribute 62.2% to the performance of development management, while the remaining 37.8% is influenced by other factors outside the study. Thus, companies need to improve the accuracy of project scheduling and optimal administrative management to support the success of telecommunication infrastructure development.

Keywords: *Project Scheduling Effectiveness, Administrative Efficiency, Development Management Performance.*

1. Background

The construction of telecommunication towers has a very strategic role in supporting the acceleration of digital transformation in Indonesia. In the era of increasingly rapid development of information and communication technology, people's needs for internet access and stable communication networks continue to increase. Telecommunication infrastructure is one of the main foundations in supporting social, economic, educational, government, and creative industry activities. The availability of a wide and quality telecommunication network is not only a need for urban communities, but also an important means of expanding connectivity in rural areas and remote areas. Therefore, the construction of telecommunication towers needs to be carried out optimally so that equal access to communication and information can be achieved evenly throughout Indonesia.

The digital transformation that is currently underway encourages various sectors to utilize internet-based technology to increase efficiency and productivity. In the education sector, an adequate telecommunication network supports the implementation of online learning, access to academic information, and the development of a digital-based education system. In the economic field, telecommunication infrastructure plays a role in supporting the development of e-commerce, digital transactions, online marketing, and micro, small, and medium enterprises (MSMEs) activities. In addition, the government sector is also increasingly relying on digital technology in the implementation of public services through the concept of e-government. Thus, the existence of

telecommunication towers is an important part of supporting national development oriented towards technological advancement and digitalization.

The increasing public need for telecommunication services causes telecommunication infrastructure providers to be required to be able to build networks quickly, precisely, and efficiently. One of the companies that has an important role in the development of telecommunication infrastructure in Indonesia is PT Dayamitra Telekomunikasi Tbk. This company is engaged in the provision and management of telecommunication tower infrastructure that supports the operations of various cellular operators in Indonesia. In carrying out telecommunication tower construction activities, the company must be able to ensure that each project can be completed according to the target time, budget, and quality standards that have been determined.

However, in practice, the implementation of telecommunication tower construction projects often faces various obstacles that can affect the success of the project. Based on internal data from PT Dayamitra Telekomunikasi Tbk RO Sumbagteng, it is known that a number of tower construction projects are delayed between 9 to 22 days from the planned completion time target. These delays are an important problem to pay attention to because they can have various negative impacts on companies and telecommunication service users. Intimeliness of project completion not only hinders the development of telecommunication networks, but also has the potential to increase operational costs and reduce the overall effectiveness of project implementation.

Delays in telecommunication tower construction projects can have considerable consequences for companies. From a financial perspective, delays can lead to increased project costs due to increased duration of use of labor, tools, and other resources. In addition, companies can also suffer losses due to delays in tower operations which have an impact on delays in providing network services to the community. These conditions can affect customer satisfaction levels and reduce the company's competitiveness in the increasingly competitive telecommunications industry. Therefore, companies need to evaluate the factors that affect project delays so that the development process can run more effectively and efficiently.

Project delays can generally be caused by various factors, both internal and external to the company. Internal factors include immature project planning, weak coordination between sections, limited manpower, suboptimal resource management, and inaccuracies in the preparation of project implementation schedules. Planning that is not carried out in detail and systematically can cause a mismatch between the target time and the implementation conditions in the field. In addition, the lack of coordination between the parties involved in the project can also hinder the work process, causing delays in the completion of telecommunication tower construction.

Meanwhile, external factors that can affect project delays include obstacles in the licensing process, weather conditions, late distribution of materials, and technical obstacles in the field. In telecommunication tower construction projects, the administrative and licensing process is one of the most important stages because it relates to the legality of development and land use. If the administrative process runs slowly, the implementation of the project will also experience obstacles. In addition, delays in the delivery of materials from suppliers can cause the construction process to not be carried out according to the set schedule. This condition shows that the success of the telecommunication tower construction project is greatly influenced by the company's ability to manage various aspects of the project comprehensively.

One of the most important aspects of project success is the effectiveness of project scheduling. Project scheduling is the process of determining the order of activities, time allocation, and use of resources needed in project implementation. Effective scheduling can help companies in controlling the execution of work to match predetermined targets. In addition, good scheduling can also minimize the occurrence of waste of time and resources so that projects can be completed more efficiently. In telecommunication tower construction projects, scheduling effectiveness is very important because each stage of work is interrelated with each other. Delays in one stage of work can have an impact on delaying the next stage of work.

Effective project scheduling also allows companies to anticipate various risks that may occur during project execution. With a clear time plan, companies can supervise the progress of work and immediately take action if deviations from the schedule are found. In addition, proper scheduling can help in the management of labor, the use of tools, and the distribution of materials so that they can be used optimally. Therefore, the effectiveness of project scheduling is one of the factors that greatly determines the success of telecommunication tower construction management.

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In addition to the effectiveness of project scheduling, administrative efficiency is also an important factor in supporting the smooth construction of telecommunication towers. Administrative efficiency is related to the company's ability to manage administrative processes quickly, precisely, and organized. In the telecommunication tower construction project, the administrative process includes document management, licensing coordination, project data management, and communication between related parties. If the administrative process is carried out efficiently, the project implementation can run more smoothly and the risk of delays can be minimized.

The licensing process is one of the administrative aspects that has a great influence on the implementation of telecommunication tower construction projects. The processing of development permits often takes a long time because it has to go through various stages and involve related agencies. If the licensing process experiences obstacles, then the project cannot proceed according to the planned schedule. Therefore, companies need to have an effective administrative system so that the process of managing permits and project documents can be carried out more quickly and accurately. Administrative efficiency can also improve coordination between parties involved in the project so that the decision-making process can be carried out better.

The management performance of telecommunication tower construction is greatly influenced by the company's ability to optimally manage the scheduling and administration aspects of the project. Good project management will help companies achieve target time, cost, and quality of work according to the predetermined planning. On the other hand, if project management is carried out less effectively, the risk of delays and cost overruns will be greater. Therefore, efforts are needed to improve the effectiveness of project scheduling and administrative efficiency to support the success of telecommunication infrastructure development.

Research on the influence of project scheduling effectiveness and administrative efficiency on the management performance of telecommunication tower construction is important because it can provide an overview of the factors that affect the success of the project. The results of the research are expected to be evaluation material for companies in improving the project management system, especially in the scheduling and administrative aspects. In addition, this research can also contribute to the development of project management science, especially in the field of telecommunication infrastructure development.

Based on this description, this study aims to analyze the influence of project scheduling effectiveness and administrative efficiency on the management performance of telecommunication tower construction at PT Dayamitra Telekomunikasi Tbk, RO Sumbagteng. This research is expected to provide practical benefits for companies in improving the effectiveness of project implementation and become a reference for future research related to project management and telecommunication infrastructure development.

2. Research Methods

This study uses a quantitative approach with a survey method. The research population is all project employees and administrative staff involved in the construction of telecommunication towers at PT Dayamitra Telekomunikasi, Tbk Regional Office Central Sumatra, totaling 31 people. Because the number is relatively small, the sampling technique is carried out with total sampling.

The data used were in the form of primary data (questionnaires with a Likert scale of 1–4) and secondary data (company documents, literature, and related journals). Independent variables include project scheduling effectiveness (X_1) and administrative efficiency (X_2), while dependent variables are tower construction management performance (Y).

Indicators of scheduling effectiveness include planning, organizing, control, coordination, and punctuality. Indicators of administrative efficiency include licensing, procurement of goods/services, documentation, communication, and reporting. Management performance is measured through timeliness of completion, administrative constraints, and project deviations.

The data analysis technique in this study uses the help of the Statistical Package for the Social Sciences (SPSS) version 25 application. The use of SPSS aims to facilitate the process of processing data in a systematic, accurate, and measurable manner so that research results can be analyzed scientifically. Data analysis was carried out through several stages which included instrument validity and reliability tests, classical assumption tests, multiple linear regression analysis, and hypothesis tests consisting of t-test, F test, and determination coefficient (R^2). These stages are carried out to ensure that the data used meets statistical requirements and is able to answer research objectives appropriately.

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a. Test the validity and reliability of the instrument.

The first stage in data analysis is the test of the validity and reliability of the research instrument. The validity test was carried out to find out the extent to which the question items in the questionnaire were able to measure the variables being studied. A valid instrument shows that each statement in the questionnaire can actually represent the concept to be measured in the study. Validity testing is performed by comparing the correlation value between the item score and the total score using a certain level of significance. If the correlation value is greater than the r-value of the table and the significance level is less than 0.05, then the statement item is declared valid and suitable for use in the study.

Furthermore, a reliability test was carried out to determine the level of consistency of the research instrument. Reliability indicates the instrument's ability to provide stable and consistent results when used repeatedly under the same conditions. The reliability test was carried out using Cronbach's Alpha method. An instrument is declared reliable if it has a Cronbach's Alpha value greater than 0.60. Thus, valid and reliable research instruments can produce accurate data so that they can support the quality of research results.

b. Classical assumption test (normality, multicollinearity, heteroscedasticity).

The next stage is the classical assumption test. This test is performed before multiple linear regression analysis to ensure that the data meets the statistical requirements required in the regression model. The classical assumption test consists of a normality test, a multicollinearity test, and a heteroscedasticity test.

The normality test aims to find out whether the research data is distributed normally or not. Normal data distribution is one of the important requirements in regression analysis because it can affect the accuracy of statistical test results. Normality testing is carried out using graph methods or statistical tests, such as Kolmogorov-Smirnov or Shapiro-Wilk. The data is said to be normally distributed if the significance value is greater than 0.05. If the data is normally distributed, then the regression model can be used for further analysis.

The multicollinearity test aims to find out if there is a strong relationship between independent variables in the regression model. A good regression model should not have a high correlation between independent variables because it can lead to inaccuracies in the measurement of the influence of each variable. The multicollinearity test was carried out by looking at the value of the Variance Inflation Factor (VIF) and the tolerance value. If the VIF value is less than 10 and the tolerance value is greater than 0.10, then the regression model is declared free of multicollinearity.

Furthermore, a heteroscedasticity test was performed to find out whether there was a residual variance disparity in the regression model. A good regression model must have a constant residual variance at each level of independent variable prediction. Heteroscedasticity testing can be done through scatterplot graphs or certain statistical tests. If no specific pattern is found on the graph or the significance value is greater than 0.05, then the regression model is declared free of heteroscedasticity.

c. Multiple linear regression analysis to test the influence of X_1 and X_2 on Y.

Once all the classical assumptions are met, the next stage is multiple linear regression analysis. This analysis was used to determine the influence of independent variables, namely project scheduling effectiveness (X_1) and administrative efficiency (X_2), on dependent variables, namely tower construction management performance (Y). Multiple linear regression is used because the study involves more than one independent variable that is thought to affect the bound variable. Through this analysis, the researcher can find out the direction of the relationship and the magnitude of the influence of each independent variable on the dependent variable.

d. Hypothesis tests through t-test (partial), F-test (simultaneous), and determination coefficient (R^2).

The last stage is the testing of the research hypothesis. Hypothesis testing was carried out through a t-test, an F test, and a coefficient of determination (R^2). The t-test is used to determine the influence of each partially independent variable on the dependent variable. If the significance value is less than 0.05, then the independent variable is declared to have a significant influence on the dependent variable.

The F test is used to determine the influence of independent variables simultaneously or together on dependent variables. If the significance value of the F test is less than 0.05, then all independent variables together have a significant effect on the dependent variables.

Meanwhile, the coefficient of determination (R^2) is used to measure how much of an independent variable is capable of explaining the variation of the dependent variable. The larger R^2 value indicates that the model's ability to explain the influence of independent variables on dependent variables is getting better. Thus, all stages of data

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analysis are carried out to obtain research results that are valid, reliable, and able to explain the relationship between variables scientifically and systematically.

The regression equations used are:

$$Y=a+b1X1+b2X2+eY = a + b\_1X_1 + b\_2X_2 + eY=a+b1X1+b2X2+e$$

3. Results and Discussion

This study involved 31 respondents from PT Dayamitra Telekomunikasi Tbk, Central Sumatra Regional Office, using a total sampling technique. The use of the total sampling technique was carried out because the population was relatively limited so that all members of the population were used as research respondents. This approach allows researchers to get a more comprehensive picture of the actual conditions that occur in the process of building telecommunication towers in the company. Based on the results of the descriptive analysis, it is known that the effectiveness of project scheduling, administrative efficiency, and tower construction management performance are in the high category. These findings show that in general the company has implemented a fairly good project management system in supporting the implementation of telecommunication tower construction. However, there are still some projects that have experienced delays in completion, indicating that there are certain aspects that still need to be improved so that the implementation of the project can run more optimally.

The high effectiveness of project scheduling indicates that the company has a sufficiently structured time planning system in the implementation of tower construction projects. Project scheduling is one of the important elements in project management because it is directly related to timing, resource allocation, and coordination of work execution. Effective scheduling helps companies in realistically setting work completion targets and controlling the stages of work to run as planned. In telecommunication tower construction projects, punctuality is a very important factor because delays at one stage of work can affect the entire construction process. Therefore, the company's ability to compile and manage project schedules is one of the indicators of the success of development management.

In addition to the effectiveness of project scheduling, the results of the study also show that administrative efficiency is in the high category. This indicates that the administrative process in the implementation of the project has gone quite well, starting from document management, coordination between sections, to project licensing management. Administrative efficiency is very important in supporting the smooth implementation of the project because every development activity requires a structured and timely administrative process. In the construction of telecommunication towers, the administrative process is not only related to the management of the company's internal documents, but also involves external parties such as local governments, material providers, and other parties related to the legality of the project. Therefore, efficient administration can help speed up project execution and minimize obstacles that could potentially lead to delays.

The performance of tower construction management which is in the high category shows that the company is able to carry out the project management function quite effectively. Project management performance can be seen from the company's ability to achieve time targets, work quality, and resource use efficiency. In the context of telecommunication tower construction, the success of development management is greatly influenced by inter-section coordination, project supervision, resource management, and the ability to resolve various obstacles that arise during project implementation. The results of this study show that PT Dayamitra Telekomunikasi Tbk RO Central Sumatra already has a good enough project management system so that it is able to support the success of telecommunication infrastructure development.

Before further analysis was carried out, this study first tested the research instrument through validity and reliability tests. The test results showed that all statement items in the questionnaire were declared valid and reliable. This means that the research instrument is able to measure the variables being studied appropriately and consistently. The validity of the instrument indicates that each question item has the ability to measure concepts that fit the research objectives, while reliability indicates the level of consistency of respondents' answers to a given question item. Thus, the data obtained in this study can be trusted and suitable for further analysis processes.

Furthermore, classical assumption testing is performed to ensure that the multiple linear regression model used meets statistical requirements. The test results showed that the research model had met the assumptions of normality, multicollinearity, and heteroscedasticity. The normality test shows that the research data is distributed normally so that regression analysis can be carried out properly. The multicollinearity test shows that there is no too strong relationship between independent variables, so each variable can explain its effect on the dependent variable separately. In addition, the heteroscedasticity test showed that there was no residual variance inequality

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in the research model. With the fulfillment of all these classical assumptions, the regression model used in this study is considered feasible and able to provide accurate analysis results.

Based on the results of multiple linear regression analysis, the following regression equations are obtained:

$$Y = -0.445 + 0.568X_1 + 0.439X_2$$

The regression equation shows that the effectiveness of project scheduling and administrative efficiency have a positive influence on the performance of tower construction management. The regression coefficient of 0.568 on the project scheduling effectiveness variable shows that any increase in project scheduling effectiveness will improve the performance of tower construction management by 0.568 units assuming other variables are fixed. Meanwhile, the regression coefficient of 0.439 in the administrative efficiency variable shows that the increase in administrative efficiency will also improve the performance of tower construction management by 0.439 units. The positive coefficient value in both variables shows that the better the implementation of project scheduling and company administration, the higher the performance of the tower construction management produced.

The results of the t-test showed that the effectiveness of project scheduling (X_1) had a positive and significant effect on the performance of tower construction management with a t-value of 3.822 and significance of 0.001. Significance values smaller than 0.05 indicate that the research hypothesis is accepted. These results prove that the effectiveness of project scheduling has a real contribution to improving the performance of telecommunication tower construction. Effective project scheduling helps companies control work execution time, manage resource distribution, and reduce the risk of project delays. With a clear and structured work schedule, each part involved in the project can carry out its tasks in a more coordinated manner so that the project completion target can be achieved as planned.

The results of this study are in line with various previous studies that stated that time management is an important factor in the success of construction and telecommunications projects. Previous research has shown that projects that have a good scheduling system tend to have lower delays than projects that are not managed in a structured manner. The genesis of the idea in this study lies in the focus of a study that specifically researches the construction of telecommunication towers in certain operational areas, namely PT Dayamitra Telekomunikasi Tbk RO Central Sumatra. This research makes a new contribution in strengthening the understanding that scheduling effectiveness has an effect not only on the timeliness of projects, but also on the overall performance of telecommunications infrastructure development management.

In addition to the effectiveness of project scheduling, the results of the t-test also showed that administrative efficiency (X_2) had a positive and significant effect on the performance of tower construction management with a t-value of 3.264 and significance of 0.003. These findings show that efficient administration has an important role in supporting the smooth operation of projects. Administrative efficiency is related to the company's ability to manage documents, internal coordination, permit management, and communication processes between parties involved in the project. In telecommunication tower construction projects, slow administrative processes can lead to delays in the execution of work and hinder the overall completion of the project.

The results of this study reinforce previous research that stated that the success of a project is not only influenced by the technical aspect, but also by the organization's ability to manage project administration effectively. The feasibility of this research can be seen from the combination of administrative efficiency variables with the effectiveness of project scheduling in analyzing the management performance of telecommunication tower construction. This study shows that administrative aspects that are often considered as supporting factors actually have a significant influence on the success of the project. The significance of this research lies in its ability to provide an empirical picture of the importance of fast, precise, and coordinated administration in supporting the development of efficient telecommunications infrastructure.

Furthermore, the results of the F test showed that the effectiveness of project scheduling and administrative efficiency simultaneously had a significant effect on the performance of tower construction management with an F value of 23.037 and a significance of 0.000. These results show that the two independent variables are together able to explain changes in the dependent variables. In other words, the success of telecommunication tower construction management is not only influenced by one factor, but is the result of a combination of good project time management and efficient administration.

The determination coefficient value (R^2) of 0.622 indicates that 62.2% variation in tower construction management performance can be explained by project scheduling effectiveness and administrative efficiency. Meanwhile, the remaining 37.8% was influenced by other factors outside the research, such as the quality of human resources, the condition of the work environment, the technology used, organizational communication, and other external factors.

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The value of the determination coefficient shows that the two variables studied have a considerable contribution to improving the management performance of telecommunication tower construction.

Overall, this study proves that the effectiveness of project scheduling and administrative efficiency are two important factors that affect the success of telecommunication tower construction. Effective project scheduling helps ensure projects can be completed on time, while efficient administration supports smooth operational processes and decision-making. This research also makes theoretical and practical contributions to the development of project management science, especially in the telecommunication infrastructure sector. From a practical perspective, the results of the research can be an evaluation material for companies to improve the project scheduling system and administrative management so that the implementation of tower construction can run more optimally. Thus, the improvement of the performance of tower construction management relies heavily on the combination of good project planning and efficient administration.

4. Conclusion

The effectiveness of project scheduling has a positive effect on the management performance of telecommunication tower construction. However, its implementation is not fully optimal because it is still constrained by weak supervision, coordination, and planning. Administrative efficiency has a positive effect on management performance, even though its implementation has not been fully integrated with the technical needs of the project. Simultaneously, the effectiveness of project scheduling and administrative efficiency have a significant effect on the performance of tower construction management. This research model was able to explain 62.2% of the variation in management performance, while 37.8% was influenced by other factors outside the study such as geographical conditions, weather, logistics, and local government regulations.

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