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# Network Infrastructure Expansion Projects: A Case Study of Ethio Telecom

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**ABSTRACTS**

This study explores the key factors influencing the success of telecom network infrastructure expansion projects, focusing on a case study of Ethio Telecom. Utilizing an explanatory research design, the study combines both quantitative and qualitative approaches to offer a comprehensive analysis. Quantitative data were analyzed using multiple linear regression models, ANOVA, and correlation coefficients, while qualitative data were examined through a five-step process that included compiling, disassembling, reassembling, interpreting, and concluding. The data collection process was thorough, drawing from a variety of sources such as questionnaires, interviews with key informants, and secondary data, to gain a detailed understanding of the factors affecting the success of Ethio Telecom's infrastructure projects. The primary goal of the research was to identify the elements that significantly impact the successful execution of telecom network infrastructure expansion projects at Ethio Telecom. The findings underscore the importance of effectively managing key project knowledge areas—namely, project schedule, cost, scope, communication, procurement, and stakeholder management—in achieving project success. The study revealed that deficiencies in these areas can create substantial obstacles to successful project completion. Based on these findings, the research recommends enhancing the project management process, particularly by improving the implementation of project management knowledge areas. This study provides valuable insights into telecom infrastructure project management, offering practical recommendations to address challenges and improve project success rates at Ethio Telecom and potentially in similar settings within the telecommunications sector.

Keywords: Project Management, Project Schedule, Project Cost, Project Scope, Project Communication, Project Procurement, Project Stakeholders, Telecom Network Infrastructure Expansion, Project Success.

## 1. Introduction

The telecommunications industry has seen substantial technological growth and expansion over the past two decades, becoming a vital sector that significantly enhances a country's economic development and productivity. This rapid proliferation of telecommunications technology has led to significant improvements in people's lives, particularly with the advent of mobile wireless technologies, which have garnered attention across various sectors, including health and agriculture. Additionally, modern information systems have enabled the electronic delivery of government services, facilitating transactions through digital channels like the Internet.

Despite this growth, the telecom industry in developing countries continues to face challenges. As reported by the ITU (2022), global internet usage reached 66% in 2022, with approximately 5.07 billion people online, marking a 3.5% increase from the previous year. However, there is a stark contrast in connectivity across regions, with Europe boasting an 89% internet usage rate, while Africa lags at 40%. In Ethiopia, Ethiotelecom's half-year performance report for

2022/2023 indicates that the company's total subscribers have reached 70 million, covering 99.1% of the population and 85.4% of the geographic area, with mobile voice subscribers numbering 67.7 million and data and internet users at 31.3 million.

Ethiotelecom has been central to Ethiopia's Growth and Transformation Plan (GTP) through its Telecom Expansion Project (TEP), aimed at expanding mobile and wireless networks and enhancing infrastructure capacity. Although the company faced challenges, such as foreign currency shortages, it managed to incrementally improve its infrastructure, notably through a $1.2 billion expansion project designed to support an additional 5.2 million customers (TEP-Charter, 2013). Moreover, Ethiotelecom introduced a cutting-edge LTE advanced mobile internet service, expanding 4G LTE coverage in Addis Ababa, and launched a 5G mobile service in selected areas, positioning itself competitively in a market previously closed to international players (Berhane, 2020; CEO's report, 2022).

However, these expansion projects often encounter challenges, leading to variations from the initial plans. These issues can stem from various internal and external factors, including operational and technical challenges and the project management framework. Critical factors for project success include effective management of project scope, schedule, cost, procurement, risk, communication, resources, quality, and stakeholders.

Despite these efforts, Ethiotelecom's network expansion projects have been plagued by delays, cost overruns, and quality issues. Previous studies have identified several factors contributing to these challenges, such as insufficient information, inadequate management support, and delays in procurement (Meaza, 2018). The significance of these issues is amplified by the rapid pace of technological change in the telecom industry, necessitating a thorough understanding of the factors influencing project success to mitigate unnecessary delays and enhance project outcomes.

While some researchers have examined specific aspects of Ethiotelecom's project implementation, this study seeks to provide a comprehensive analysis of the factors affecting the successful implementation of telecom network infrastructure expansion projects at Ethiotelecom. The research aims to fill the gap in existing literature by focusing on key project management areas, including project schedule, cost, scope, procurement, and stakeholder management, to identify the most critical factors leading to delays, cost overruns, and quality failures in these projects (Mideksa, 2017; Tsehaye, 2017).

The main objective of this study is to investigate the factors affecting the successful implementation of telecom network infrastructure expansion projects at Ethiotelecom. Specific objectives include examining how project schedule, cost, scope, communication, procurement, and stakeholder management impact project success, providing insights that could improve future project outcomes in the telecom sector.

## 2. Theoretical Review

### 2.1. The Theory of Project Performance

The theory of project performance is built on six fundamental concepts that together form a framework for understanding project execution and performance improvement. These concepts are: context, knowledge level, skill level, identity level, personal factors, and fixed factors. Performance is defined as the execution of valued results, measured by the achievement of organizational or departmental goals, rather than individual accomplishments. These six components holistically determine the effectiveness or quality of performance, influencing the current performance level. The theory suggests that performance can be enhanced through three main avenues: the performer's attitude, engagement in an inspiring environment, and a commitment to reflective practice (Elger, 2010).

Performance in projects advances through different levels, termed as "Level 1," "Level 2," and so on, each indicating an increased effectiveness in performance. Reaching higher levels of performance brings multiple benefits: improved quality, resulting in better products or outcomes that meet or exceed stakeholder expectations with reduced waste; enhanced capability, allowing for the management of more complex projects; increased capacity, enabling a higher throughput; expanded knowledge, both in depth and breadth; improved skills, such as goal-setting and maintaining a positive outlook; and strengthened identity and motivation, as individuals develop a stronger sense of their professional roles and organizations solidify their core essence (Elger, 2010).

2.2. Measurement of Project Performance

Performance measurement involves the ongoing monitoring and reporting of program achievements, particularly focusing on progress toward pre-established goals. This process is inherently complex, requiring insights from economics, management, and accounting. Recently, performance measurement has garnered significant interest from both academics and practitioners. Navon (2005) emphasized that performance measurement compares desired performance with actual outcomes, making it crucial not only for managing current projects but also for updating historical databases. These updates help improve the planning of future projects, particularly in terms of costs, schedules, and resource allocation.

Various metrics are used to assess time and cost performance, including project characteristics, procurement systems, team performance, and external conditions. Key performance indicators (KPIs) must identify the causes of problems, address all potential performance drivers, and highlight opportunities for improvement. Neely (1995) identified seven main KPIs: time, cost, quality, client satisfaction, client changes, business performance, and safety and health.

Pheng and Chuan (2006) noted that project performance can be assessed using two primary sets of indicators. The first set relates to owners, users, stakeholders, and the public, who evaluate project performance from a macro perspective. The second set includes developers, non-operators, and contractors, who view performance from a micro perspective. Ugwu and Haupt (2007) developed and validated KPIs for sustainability appraisal, focusing on the economy, environment, society, resource utilization, health and safety, and project management and administration.

2.3. Project Management in Telecommunications

The telecommunications industry is diverse, encompassing various companies with different products, objectives, and operational modes. According to Desmond (2004), people in these companies work in many functional areas, within organizational structures that range from stable to highly precarious environments. Project Portfolio Scheduling is a common characteristic in the telecommunications service sector, where companies often manage multiple projects simultaneously (Ipsilandis & Tselios, 2017). Successful project management in this industry requires flexibility, a forward-thinking attitude, and a strong understanding of advanced project management methodologies (Ludovico & Petrarca, 2010).

3. Empirical Literature

Medhin (2019) explored the project management practices and challenges of the Telecom Expansion Project (TEP) at Ethiotelecom. The study concluded that while the five project phases were generally well-practiced, areas requiring improvement included setting high-level project schedule milestones during the initiation phase, identifying possible risks, preparing detailed scope statements in the planning phase, addressing team problem escalation, and regularly updating project schedules in the execution phase. Additionally, risk response control during the controlling phase and lessons learned documentation in the closing phase were identified as areas needing enhancement. The study also highlighted major challenges such as inadequate coordination with stakeholders, poor fund management, government policy challenges, and issues with project communication and integration management, all of which hindered the successful implementation of the telecom expansion project.

Saba (2019) investigated the critical success factors (CSFs) in leading information system projects. The study found that clear and realistic goals, scope management, management support, user involvement, and change management processes were crucial for project implementation. However, the study noted that factors such as project leadership, proper planning, and monitoring were not given adequate attention. Although there was a master plan, milestones, and feedback channels that were well-prepared and agreed upon by stakeholders, the lack of effective progress tracking methods and the failure to address project deviations led to significant delays.

Digis (2018) analyzed the factors impacting knowledge transfer success in Ethiotelecom's information systems projects. The study identified several critical factors affecting knowledge transfer, including client factors (such as learning capability and commitment), vendor factors (such as capability and credibility), knowledge factors (such as tacitness and complexity), and relationship factors (such as cultural and geographical differences). These factors were found to have significant impacts on the success of knowledge transfer within Ethiotelecom's projects.

Mideksa (2017) examined the performance and challenges of Ethiotelecom's Infrastructure Expansion Project, focusing on implementation, monitoring, and evaluation. The findings indicated that project teams often lacked sufficient information about project progress and performance. The lack of access to information, along with inadequate management support and external factors, meant that project performance frequently did not meet targets. Although the study found no significant issues with monitoring information and reporting processes between different projects, both internal and external challenges during implementation, monitoring, and evaluation were shown to impact the budget, schedule, and quality standards set at the project's baseline. Despite fixed-price contractual agreements between Ethiotelecom and vendors, these challenges still posed significant hurdles to project success.

4. Literature gap

Table 1: Summary of literature gap

| Authors | Finding | Literature Gap |
|---|---|---|
| Medhin (2019) | Project management practices properly practiced but need improvement on project management phases and challenges of Ethiotelecom expansion project implementation Lack of proper coordination with stakeholders, Lack of proper fund management in the project, Government Policy challenges, Project communication and integration management. | The research focused on project management phases practice on telecom project implementation and its challenge rather than factors affecting the successful implementation projects. |
| Saba (2019) | Critical success factors of leading information system projects are not good relationship project leadership, Proper planning and monitoring and there are not has effective progress tracking method to monitor project progress. In addition, project deviation off plan were not well addressed this led to project delay. | The studies addressed only on information technology/system project implementation critical success factors rather than factors affecting successful implementation of telecom network infrastructure projects. |
| Digis (2018) | Vendor's language, culture, and motivation and commitment are having negative impact on knowledge transfer success in Ethiotelecom information system projects. | The studies focused mainly on knowledge transfer impact rather than factors affecting the successful implementation projects. |
| Mideksa (2017) | Found the lack of Information; management support; internal and external project support; monitoring and evaluation project of contractual agreement between Ethiotelecom and vendors based on fixed price have no significant impact on successful implementation of telecom Infrastructure Expansion Project. | Focused on lack of information, management support; internal and external; monitoring and evaluation practice rather than factors affecting successful implementation of telecom network infrastructure projects. |

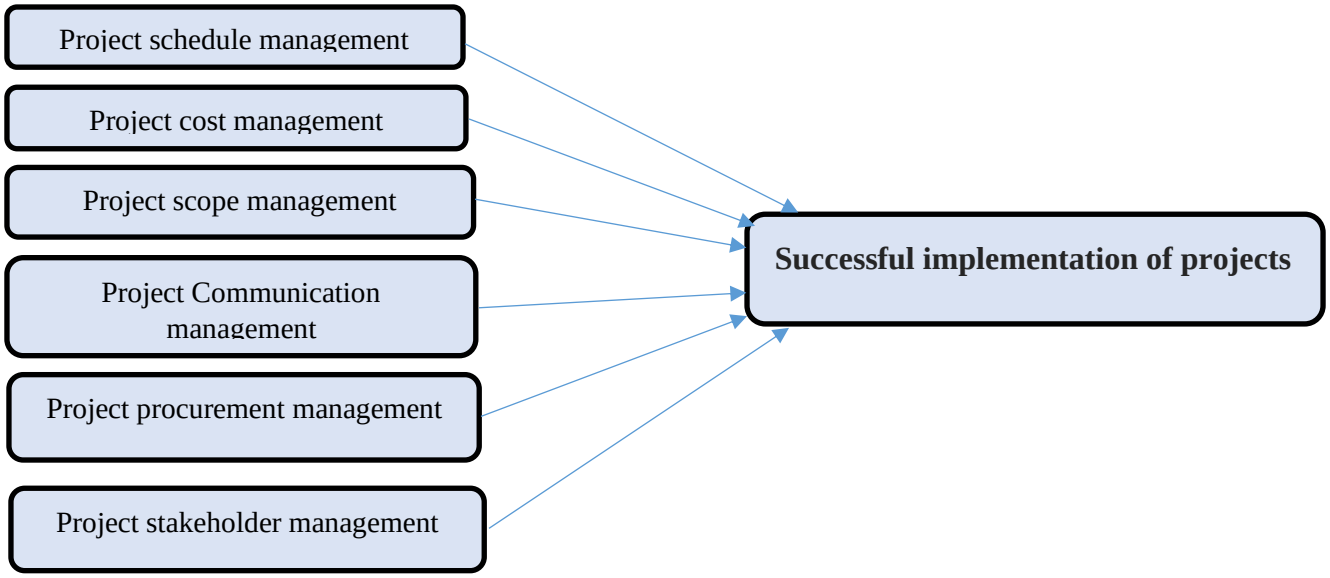
## 5. Conceptual Framework

According to Sekaran (2003), a theoretical framework serves as a conceptual model that explains or logically organizes the relationships among various factors identified as significant to the research problem. This framework is derived from a thorough review of prior research related to the problem area. When selecting a research topic, constructing a conceptual framework is crucial for studying the topic effectively, as it provides a foundation for understanding the relationships between different variables. Theory plays a vital role in interpreting data, as it allows researchers to make sense of their findings; without it, data interpretation would be nearly impossible.

In research, the dependent variable is the main focus of interest, as it represents the outcome that the study seeks to explain or predict. The independent variable, on the other hand, is the factor that influences the dependent variable, either positively or negatively. In essence, the independent variable accounts for the variation observed in the dependent variable. Therefore, the conceptual framework in this study examines how different factors (independent variables) affect the successful implementation of telecom network infrastructure expansion projects (the dependent variable).

The conceptual framework of this study includes six independent variables and one dependent variable, which are represented diagrammatically.

**Figure 1: Conceptual framework**




## 6. Research Methodology

### 6.1 Research Design

This study utilizes an explanatory research design to investigate the factors affecting the successful implementation of telecom network infrastructure expansion projects. Explanatory research, as defined by Cooper and Schindler (2014), aims to determine whether one or more variables explain or cause effects in one or more dependent variables. Specifically, this study adopts a causal-explanatory approach to assess the relationships between the independent variables—such as project schedule management, project scope management, project cost management, project communication management, project procurement management, and project stakeholder management—and the dependent variables influencing the successful execution of telecom infrastructure projects. The rationale behind choosing an explanatory research design is its ability to provide clear insights into problems that have not been thoroughly studied before. This design allows for new definitions, explanations, and improved final results, enhancing understanding, flexibility, and the reliability of conclusions. Consequently, the explanatory survey design method was selected for its effectiveness in clarifying the causal relationships between the variables in question, particularly within the context of Ethiotelecom's telecom network infrastructure expansion project.

### 6.2 Research Approach

The study adopts a mixed-methods approach, integrating both qualitative and quantitative data analysis techniques. The quantitative method involves descriptive and inferential statistical analyses using tools like SPSS and Excel to calculate means, standard deviations, and frequencies. Additionally, inferential statistics, including regression and correlation analyses, are employed to explore the relationships between dependent and independent variables. The qualitative method, on the other hand, involves surveys and interviews to gather in-depth data on various aspects of project execution. This combination of methods allows for a comprehensive analysis of the factors influencing the successful implementation of network infrastructure expansion projects.

### 6.3 Data Sources and Data Collection Methods

Both primary and secondary data sources were utilized in this study to collect qualitative and quantitative data. Primary data collection involved administering questionnaires with targeted project staff in various departments responsible for project implementation. The study included both closed-ended and open-ended questionnaires, allowing respondents to

either select from predetermined options or provide unrestricted answers. These questionnaires were designed to capture perceptions and opinions regarding the factors influencing the successful implementation of Ethiotelecom's network infrastructure expansion project. Secondary data was obtained through an extensive review of existing literature, including previous research, books, journals, reports, and other relevant documents. This review provided essential background information and context, helping to inform the study's findings and conclusions.

### 6.4 Population and Sample Size and Sampling Techniques

The target population for this study comprised 282 staff members from Ethiotelecom's head office network infrastructure department, all of whom are actively involved in telecom network infrastructure expansion projects. This population was drawn from various departments, including network infrastructure strategy and OPMO, network infrastructure planning and engineering, network infrastructure rollout, and data center and core site rollout.

The sample size was determined using Cochran's formula for finite populations (1977), resulting in a required sample size of 163 respondents. This sample size was calculated based on a 95% confidence level, a 5% margin of error, and an estimated population proportion of 0.5.

The study employed stratified random sampling to ensure adequate representation of all subgroups within the population. This involved dividing the population into homogeneous groups, or strata, and selecting samples proportionately from each stratum. This method was chosen to accommodate the diverse academic and professional backgrounds of the employees involved in the project, ensuring that all relevant perspectives were included.

### 6.5 Method of Data Analysis

The study used both quantitative and qualitative methods to analyze the collected data. Descriptive statistics, such as means, standard deviations, and frequencies, were computed using SPSS and Excel. Inferential statistics, including regression and correlation analyses, were employed to examine the relationships between dependent and independent variables. Regression analysis, in particular, was used to explore the factors influencing the successful implementation of network infrastructure expansion projects at Ethiotelecom. This approach aligns with the perspective of Sreevidya and Sunitha (2011), who describe regression analysis as a technique used to estimate relationships among variables.

Stepwise multiple regression was adopted to identify the factors most significantly influencing the performance of wireless telecom projects, based on the entry order of independent variables. The regression model used in this study is as follows:

$$Y = b0 + b1X1 + b2X2 + b3X3 + b4X4 + b5X5 + b6X6 + €$$

Where:

- Y = Project implementation (PI)
- b0 = Constant Term
- b1, b2, b3, b4, b5, b6 = Beta coefficients
- X1 = Project Schedule Management (PSM)
- X2 = Project Cost Management (PCM)
- X3 = Project Scope Management (PSCM)
- X4 = Project Communication Management (PCOMM)
- X5 = Project Procurement Management (PPM)
- X6 = Project Stakeholder Management (PSHM)
- € = Error Term

### 6.6 Reliability and Validity of Data Collection Instruments

The reliability and validity of the data collection instruments were thoroughly tested to ensure the accuracy and consistency of the results. Validity refers to the instrument's ability to measure what it is intended to measure, while reliability assesses the consistency of the measurements across different circumstances. The questionnaire's validity was confirmed through feedback from senior project directors, managers, and team members at Ethiotelecom, who provided input on the clarity and comprehensibility of the questions.

Reliability analysis was conducted using Cronbach's alpha, a measure of internal consistency. A Cronbach's alpha value of 0.880 was obtained for the overall questionnaire, indicating good internal consistency. The reliability of individual constructs, such as project schedule management, project cost management, project scope management, project communication management, project procurement management, and project stakeholder management, also showed acceptable to good reliability, with Cronbach's alpha values ranging from 0.769 to 0.933. These results indicate that the measures used in this study are reliable and can be trusted to provide accurate and consistent data.

## 7. Results and Discussions

### 7.1 Descriptive Statistics

The descriptive statistics of the variables show that project schedule management had a mean score of 3.4281 and a standard deviation of 0.67577, reflecting general agreement among respondents on its importance for successful project implementation (e.g., activity definition and schedule control). Project cost management received a mean score of 3.2432 and a standard deviation of 0.75541, indicating satisfaction with cost management processes. Project scope had a higher mean score of 3.8235 and a standard deviation of 0.57930, signaling positive perceptions. Project communication management earned a mean of 3.4361 with a standard deviation of 0.77959, while procurement management achieved a mean of 3.2589 and a standard deviation of 0.71945. Finally, stakeholder management recorded a mean score of 3.4880 with a standard deviation of 0.65872. Overall, project management processes scored a mean of 3.4467, with a standard deviation of 0.6566, showing a favorable view of project implementation success at Ethiotelecom. The relatively higher standard deviation for project scope indicates the effective application of project processes (Cooper & Schindler, 2014).

Table 2: Descriptive Statistics result of telecom network infrastructure

| | N | Mean | Std. Error |
|---|---|---|---|
| Project Schedule | 144 | 3.4281 | .67577 |
| Project Cost | 144 | 3.2432 | .75541 |
| Project Scope | 144 | 3.8235 | .57930 |
| Project Communication | 144 | 3.4361 | .77959 |
| Project Procurement | 144 | 3.2589 | .71945 |
| Project Stakeholder | 144 | 3.4880 | .65872 |
| Valid **N** | 144 | | |

Source: Survey result, 2024

### 7.2 Inferential Statistics

This section provides an in-depth analysis of the data collected through questionnaires, focusing on correlation and multiple linear regression models. Multiple linear regression (MLR) is a statistical method used to predict the outcome of a dependent variable by examining its relationship with multiple independent variables. The goal of MLR is to establish a linear relationship that best fits the data points, helping explain variations in the dependent variable based on changes in the independent variables (Leech & Morgan, 2014).

#### 7.2.1 Results of the Correlation Analysis

Correlation analysis assesses the relationship between two variables, but it does not quantify the extent of that relationship. Pearson correlation specifically examines the presence and strength of a linear relationship between independent and dependent variables, which serve as predictors and outcomes, respectively. The correlation coefficient (r) ranges from -1 to +1, with a p-value indicating whether the relationship is statistically significant. According to Leech and Morgan (2014), an absolute r-value of 0.1 is considered small, 0.3 medium, and 0.5 large, denoting the strength of the relationship.

Table 3: Correlation matrix

| Variables | PSM | PCM | PSCM | PCOMM | PPM | PSTM |
|---|---|---|---|---|---|---|
| Project Schedule Management (PSM) | 1 | | | | | |
| Project Cost Management (PCM) | .310* | 1 | | | | |
| Project Scope Management (PSCM) | 0.157 | -0.017 | 1 | | | |
| Project Communication Management (PCOMM) | 0.147 | .271** | -0.006 | 1 | | |
| Project Procurement Management (PPM) | .168* | .342** | 0.015 | .324** | 1 | |
| Project Stakeholder Management (PSTM) | 0.106 | .216** | -0.021 | .285** | .328** | 1 |

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
N = 144. This shows that dependent variables are explained at significant levels by independent variables with strong correlations.
Source: Survey Result, 2024

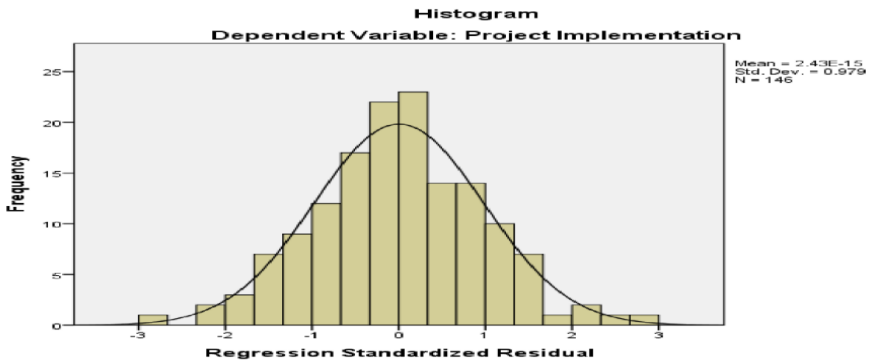
- **Multiple Linear Regression Analysis**

Multiple linear regression (MLR) estimates relationships among variables with a cause-and-effect relationship. Unlike univariate regression, which only includes one independent variable, MLR includes several independent variables to predict the outcome of a dependent variable. Before performing regression analysis, preliminary tests for key assumptions were conducted, including normality, linearity, homoscedasticity, and multicollinearity.

### 7.2.2 Normality Test

A normality test ensures that the independent variables are normally distributed, a critical assumption for regression analysis. The normality of variables was assessed using skewness and kurtosis, with all values falling between -1 and +1, fulfilling the assumption of normality (Zach, 2021).

**Figure 2: Normality plot**

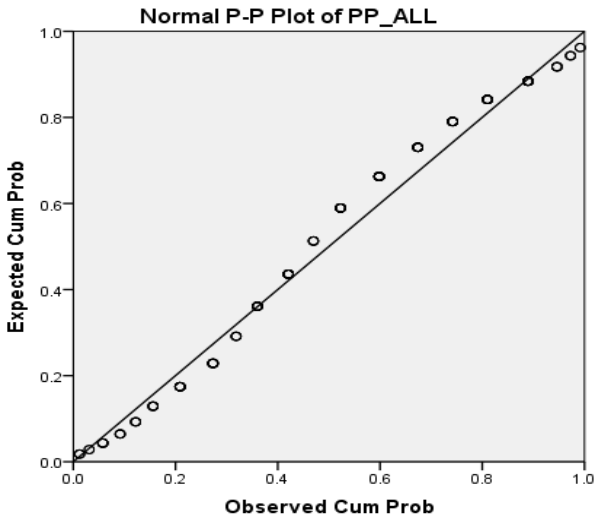



Source: Survey Result, 2024

### 7.2.3 Linearity

MLR assumes a linear relationship between the dependent and independent variables. This assumption is tested through visual inspection of scatter plots, where the data points should align symmetrically along a diagonal line. The scatter plots for the residuals showed a reasonably straight line, supporting the assumption of linearity. This confirms that the relationship between the variables is adequately represented by a linear model (Zach, 2021).

Figure 3: Linear regression P-P-Plot graph

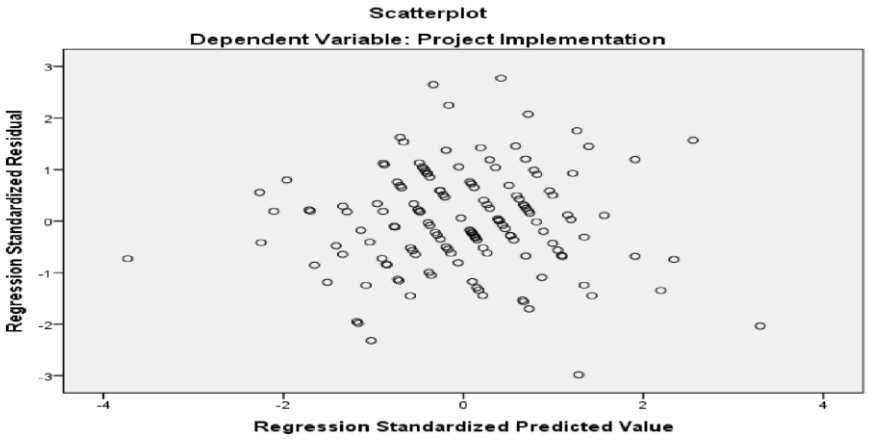



Source: Survey Result, 2024

### 7.2.4 Homoscedasticity

Homoscedasticity refers to the consistency of variance in the dependent variable across the range of values for the independent variables. In this study, a residual plot was used to check for homoscedasticity, where the points form a roughly rectangular shape with no outliers beyond negative 3 and positive 3 on the y-axis. This indicated that the data met the assumption of constant variance (Zach, 2021).

Figure 4: Homoscedasticity test scatterplot




Source: Survey Result, 2024

### 7.2.5 Multicollinearity

Multicollinearity occurs when two or more independent variables are highly correlated, which can obscure the individual effects of each variable. Tolerance values and the Variance Inflation Factor (VIF) were used to detect multicollinearity. In this study, all tolerance values were greater than 0.10, and VIF values were less than 2.5, indicating no significant multicollinearity issues.

Table 4: Multi collinearity Test

| Collinearity Statistics | |
|---|---|
| Tolerance | VIF |
| .871 | 1.149 |
| .788 | 1.269 |
| .969 | 1.032 |
| .835 | 1.197 |
| .780 | 1.282 |
| .850 | 1.176 |

Source: Survey Result, 2024

### 7.2.6 Model Summary

In terms of model fit, the $R^2$ and adjusted $R^2$ values help determine how well the independent variables explain the variance in the dependent variable. The model's R value was 0.921, indicating a high correlation between the independent and dependent variables. The adjusted $R^2$ was 0.842, meaning that 84.2% of the variance in the successful implementation of the telecom project was explained by the six independent variables.

This research assessed six key factors—project scheduling, cost management, scope management, communication, procurement, and stakeholder management—to evaluate their influence on the successful implementation of the telecom network infrastructure expansion project. With an adjusted $R^2$ of 84.2%, the model provides strong evidence that these variables significantly contribute to project success, validating the hypotheses. All assumptions of normality, linearity, homoscedasticity, and multicollinearity were met, ensuring the reliability of the regression analysis results (Leech & Morgan, 2014).

Table 5: Result of Multiple Regressions, Model Summary Model Summary^b

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Durbin-Watson |
|---|---|---|---|---|---|
| 1 | .921[a] | .849 | .842 | 1.06574 | 1.855 |
| A. Predictors: (Constant), Project Stakeholders, Project Scope, Project Schedule, Project Communication, Project Cost, Project Procurement | | | | | |
| B. Dependent Variable: Project successful implementation | | | | | |

Source: Survey Result, 2024

### 7.2.7 Overall Model Fit of the Regression Model

The overall fit of the regression model was assessed using the F-ratio in the ANOVA table. The model significantly predicted the dependent variable, with $F(6, 139) = 130.175$, $p < .001$, indicating a good fit.

Table 6: (ANOVA) Overall Model Fit of the Regression Model

| **ANOVA[a]** | | | | | |
|---|---|---|---|---|---|
| Model | Sum of Squares | DF | Mean Square | F | Sig. |
| 1 Regression | 887.117 | 6 | 147.853 | 130.175 | .000[b] |

| | | | | | |
|---|---|---|---|---|---|
| Residual | 157.876 | 139 | 1.136 | | |
| Total | 1044.993 | 145 | | | |
| a. Dependent Variable: Project Implementation<br>b. Predictors: (Constant), Project Stakeholders, Project Scope, Project Schedule, Project Communication, Project Cost, Project Procurement | | | | | |

Source: Survey Result, 2024

### 7.2.8 Regression Coefficient

Table 7:

| Model | Un-standardized Coefficients | | Standardized Coefficients | T | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| 1 (Constant) | -2.728 | .870 | | -3.136 | .002 |
| Project schedule | .165 | .023 | .250 | 7.087 | .000 |
| Project cost | .235 | .033 | .264 | 7.119 | .000 |
| Project Scope | .196 | .026 | .253 | 7.552 | .000 |
| Project communication | .345 | .041 | .301 | 8.331 | .000 |
| Project Procurement | .232 | .028 | .311 | 8.318 | .000 |
| Project Stakeholder | .257 | .036 | .252 | 7.053 | .000 |

Regression Coefficient of Independent Variables Coefficients

Source: Survey Result, 2024

The regression analysis showed that the project management processes—schedule, cost, scope, communication, procurement, and stakeholder management—had significant positive relationships with the successful implementation of the telecom network infrastructure expansion project. The beta coefficients revealed that project procurement ($\beta = 0.311$) and communication ($\beta = 0.301$) had the highest impact, followed by cost ($\beta = 0.264$), scope ($\beta = 0.253$), stakeholders ($\beta = 0.252$), and schedule ($\beta = 0.250$), all significant at $p < 0.01$ (Market Business News, 2024).

According to the regression equation:

$$PI = -2.728 + 0.250PSM + 0.264PCM + 0.253PSCM + 0.301PCMM + 0.311PPM + 0.252PSTM + \varepsilon_i$$

This equation shows that for each unit increase in schedule, cost, scope, communication, procurement, and stakeholder management, project implementation improves by 0.250, 0.264, 0.253, 0.301, 0.311, and 0.252, respectively.

Result of the Regression Analysis

The beta ($\beta$) coefficients indicate the strength of each predictor's influence on the dependent variable. Higher beta values signify a stronger relationship. For instance, procurement had the strongest influence ($\beta = 0.311$), while schedule had the lowest ($\beta = 0.250$), but all variables were significant predictors of project success.

## 8. Conclusions

The study aimed to investigate factors influencing the successful implementation of telecom network infrastructure expansion projects at Ethiotelecom. Six research objectives were explored. First, the study revealed that ineffective project schedule management, including poor forecasting and delayed tool deliveries, significantly impacted project timelines. Second, limitations in cost management, such as inadequate cost monitoring, led to budget deviations. Third,

poor project scope management, including weak planning and verification, hindered service quality. Fourth, communication deficiencies, such as a lack of clear organizational structures, contributed to delays. Fifth, procurement management issues, including material delays and inadequate quality control, slowed progress. Lastly, ineffective stakeholder management, including insufficient engagement, affected project outcomes. Correlation analysis confirmed strong relationships between the independent variables and project success, with project procurement emerging as the most influential factor. All research hypotheses were accepted, highlighting the critical role of project cost, procurement, and communication in the successful execution of telecom network infrastructure expansion projects.

## 9. Practical Implication

Based on the study's findings, several practical recommendations are proposed for Ethiotelecom to improve project management practices. First, to enhance project implementation, Ethiotelecom should involve all stakeholders in scheduling, costing, and scope management processes. This will ensure accurate estimations, thorough documentation, and greater stakeholder awareness. Additionally, project managers must effectively coordinate activities, allocate resources, and select appropriate delivery methods while proactively addressing challenges during execution. Effective communication management is also essential, with a structured communication plan, regular updates to stakeholders, and periodic reviews to maintain alignment and transparency. Furthermore, discrepancies in project procurement management highlight the need for Ethiotelecom to adopt analytical frameworks and provide procurement teams with comprehensive guidelines. Investing in training and conducting pre-proposal visits for significant decisions will enhance responsiveness and efficiency. These recommendations aim to align practical efforts with theoretical approaches, fostering better project outcomes through improved management, communication, and procurement practices at Ethiotelecom.

## 10. Limitation and Further Studies

This study focused primarily on telecom network infrastructure expansion projects at Ethiotelecom, which presents certain limitations. Future research should broaden its scope to include a wider range of telecommunications sectors. Each sector has unique variables that impact project success, so a more comprehensive investigation is needed to better understand these diverse factors. Expanding the research across various sectors will provide deeper insights into specific challenges and opportunities, improving the overall applicability of findings. By addressing these gaps, future studies can develop more effective project management strategies tailored to different telecommunications environments, fostering greater success in project implementation.

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