Hindawi
Advances in Civil Engineering
Volume 2020, Article ID 5648394, 13 pages
https://doi.org/10.1155/2020/5648394

Research Article

The Moderating Influence of Project Scope on Leadership Skills, Stakeholder Management, and Execution of Fibre Optic Infrastructure

James Konya Akhwaba

University of Nairobi, School of Open and Distance Learning, P.O. Box 7652, Nairobi 00200, Kenya

Correspondence should be addressed to James Konya Akhwaba; saulokonya@yahoo.com

Received 26 September 2019; Revised 26 June 2020; Accepted 10 August 2020; Published 24 August 2020

Academic Editor: Michael Yam

Telecommunication and Internet service enterprise has drastically evolved in the last 10 years across the globe. With demand for huge amounts of data and increased voice traffic, optical fibre is globally preferred technology to transmit high-speed broadband. Nonetheless, fibre optic infrastructure involves construction challenges and continues to fail for several reasons including ineffective leadership, poor stakeholder management, and unclear scope definition. The main purpose of this study was to investigate the moderating influence of project scope on leadership skills, stakeholder management, and execution of fibre optic infrastructure. The study adopted the pragmatism paradigm approach, with a cross-sectional survey design. Questionnaire, interview guide, and document review guide were data collection instruments. Census was used to select 187 respondents from a target population of 187 functional members of staff in fibre optic infrastructure departments of two mobile telecommunication, four Internet service companies, and two policy-making and regularity authorities in Nairobi County in Kenya. Quantitative data was analyzed by descriptive and inferential statistics while qualitative data was analyzed by content analysis. It was demonstrated that project scope has a positive and significant moderating influence on the combined influence of leadership skills and stakeholder management on execution of fibre optic infrastructure. This study contributes to the literature in project management by not only providing empirical evidence on project scope, leadership skills, stakeholder management, and execution of fibre optic infrastructure but also by expanding research on project scope. The results may also help professionals in mobile telecommunication and construction industries by providing strategic guideline in effective, efficient, and sustainable execution of fibre optic infrastructure.

1. Introduction

Telecommunication and Internet service enterprise has drastically evolved in the last 10 years across the globe. Consequently, customers and business enterprises with smart devices consume huge amount of data and increased voice traffic [1]. One of the innovations to beat this new development in telecommunication industry is the emergence of fibre optic telecommunication network. Optical fibre is the globally preferred technology to supply high-speed broadband to end users [2], and therefore a major building block in telecommunication infrastructure [3]. Torlak [4] defines optic fibre as flexible, long, transparent, and thin strands of glass or plastic about a diameter slightly thinner than human hair. Light signal from fibre optic cables do not cause interference among other fibre cables in the same channel. Optical fibre is therefore, suited for transmission of digital information and useful in computer and telecommunication networks [5, 6].

Nevertheless, fibre optic network involves construction challenges far beyond those associated with traditional construction projects on a contained and easily controlled site [7]. Crocker [7] also noted that fibre optic construction involves huge risks from weather as well as in safety and land access. Similarly, Deloitte [8] noted that lack of uniformity in policy, logistics in procurement, staff mobilization, and equipment and materials transport to sites also present significant challenges in fibre optic network. Furthermore,

fibre construction happens in communities for short periods and therefore a complex program of proactive community engagement with operators, constructors, government agencies, environment groups, and property owners are essential part of meeting schedules and budget [9].

Project planning and management focuses on organization as well as management of complex arrays of activities that deliver a project such as fibre optic infrastructure [10]. In projects, things often do not go according to plans and this can cause conflict among stakeholders. Therefore, there is a real need of project leaders who can manage tasks as well as people [11]. Leadership skills help project managers empower teams and other stakeholders, list down all stakeholders, assess their interest in the project, use influence and communication skills to convey and sell project vision to stakeholders, shape expectations, and affirm successful execution of projects [11].

Leadership skills are, therefore, vital in defining project vision, scope, and managing stakeholders throughout the project life cycle. In fibre optic infrastructure, governments, operators, constructors, and equipment vendors are the main stakeholders that take major responsibilities [9]. Scope of a project is the wide parameter of coverage area of an undertaking, be it an ecoregion programme with the aim of conserving priority areas, initiative to combat emerging threat, or action to project species [12]. Weijde [12] also postulated that clearly defined project scope leads to successful completion of a given project within a stipulated period and budget, as well as quality standards. Karl [13] noted that, during the process of managing the project, definition of project scope is a preplanning stage that requires a substantial amount of resources as well as time for coming up with concrete decisions regarding investment requirements.

In the United States, Martinsuo and Lehtonen [14] showed, in their study, that project scope covers work breakdown structure, stakeholder definition, and understanding of the laid down government policies. De Andrade et al. [15], in their study in Brazilian public sector, concluded that project scope gives a clear direction of any project, and implementers found it easy to plan and execute projects according to the set deadlines. In India, Rajani and Shobha [16] revealed that work breakdown structure could determine project success since it provides the foundation for project planning, cost estimation, scheduling and resource allocation, and risk management. In Namibia, Kawana [17], in his study, indicated that project scope planning is critical in order to guarantee project success, and project leaders should ensure the involvement and management of relevant stakeholders throughout project life cycle. Kariungi [18], in his study in Kenya, established that strategic leadership skills offer a great influence in shaping and transforming stakeholders to participate in implementation of a project by undertaking roles as listed in the project scope. Moenga and Moronge [19] findings demonstrated that stakeholder participation through well-planned project scope under leadership of a competent project manager in fibre optic infrastructure enhances successful execution. Odoyo [20] findings showed that poor daily coordination of activities because of deficiency in project scope planning and lack of stakeholder participation significantly delay execution of projects.

Despite advanced project management methodologies, many projects including fibre optic infrastructure across the world are not delivered within project time, budget, and scope for several reasons including inadequate project scope definition. Though leadership skills, stakeholder management, and project success have been examined in the literature, the moderating role of project scope is less empirically documented. Even with previous studies focusing on ICT infrastructure and construction projects in general, none has focused on the moderating influence of project scope on the joint influence of leadership skills and stakeholder management on execution of fibre optic infrastructure and interaction among the variables. This study was, therefore, carried out to fill this knowledge gap with reference to the joint influence of leadership skills and stakeholder management on execution of fibre optic infrastructure.

The objective of the study was to examine how project scope moderates the joint influence of leadership skills and stakeholder management on execution of fibre optic infrastructure. Leadership skills and stakeholder management were independent variables and project scope was the moderating variable, while execution of fibre optic infrastructure was the dependent variable. The target population comprised of functional members of staff in fibre optic infrastructure departments of mobile telecommunication and Internet service companies that own and deploy fibre optic infrastructure with their headquarters in Nairobi County in Kenya. It is hoped that the study findings would form a guideline for project planning and implementation. It is also hoped that the findings of this study will be valuable to academicians, policy makers, and other researchers as they add onto the current literature in project management, telecommunication industry, and construction industry in general.

2. Literature Review

Execution of fibre optic infrastructure revolves around installation activities. Installation phase consists of preinstallation, actual installation, and postinstallation phases [21]. Effective project execution leads to project success. Project success includes consideration of the time it took to accomplish a project, budget for the project, specifications, whether the customers were satisfied, and maintaining the existing social structure and values within the organization [22]. Leadership is the capacity to influence others positively and give them moral support to contribute towards the organization objectives to enhance success and effective operations [23]. Studies showed that visionary capability, team building, communication, delegation, planning, decision-making, problem solving, coaching, and training are essential skills for successful leadership in construction industry [23–25].

In fibre optic construction context, stakeholders are parties that are influenced by the installation of fibre optic

project from beginning until its closure [26]. Stakeholder management, therefore, involves identifying, analyzing, planning, and execution designed to manage and engage with stakeholders through the life cycle of a project. Studies showed that project success is influenced by its ability to show reinforcement and supervision by its stakeholders, and when stakeholders are satisfied, they help in improving progress and importance of the project and eventually help in contributing to its success [27]. Project scope is the parameter of coverage of an undertaking; hence, clearly defined project scope leads to successful completion of a given project [12]. For stakeholders to act on information, there is need for a well-defined scope management plan where leaders respond to and make decisions based on the scope for better project outcomes [28]. Therefore, the process of project scope definition in terms of scope management plan, scope statement, work breakdown structure, acceptance criteria, change criteria, and management of actual changes is the most effective approach that increases the probability of success and significantly decreases the risks that may increase during the process of project execution [13].

The link existing between leadership skill, stakeholder management, and execution of projects has been studied and documented. For instance, in United States, Martinsuo and Lehtonen [14], using questionnaire survey with 279 firms, showed in their study that project scope covers work breakdown structure, stakeholder definition, and understanding of the laid down government policies. They concluded that, for any execution of a project to succeed, there is need for project leaders with relevant leadership skills to be able to define key stakeholders, manage them, and influence relevant policies [14]. Knapp [29] stated that the main contributing factor to project failure is poor project scope definition by project managers. It is therefore, prudent to ensure definition of project scope at the earliest stage of the project development cycle. Knapp also noted that project scope should be given much attention during the process of project development and management and that time could be compromised but project scope should be uncompromised since it is much concerned with the needs and wants of the customers.

Rajani and Shobha [16], in their study in India, revealed that work breakdown structure could determine project success since it provides the foundation for project planning, cost estimation, scheduling and resource allocation, and risk management. In Taiwan, Ker and Yang [30] targeted heads of departments and students in their study and showed that lack of full appreciation of project scope because of the poor management system of incentive that encourages the benefits from the project normally which leads to failure of projects. The study concluded that project scope gives clear direction of any project, and implementers find it easy to plan and execute projects according to the set timelines [30]. Similarly, De Andrade et al. [15], in their study in Brazilian public sector, concluded that project scope gives a clear direction of any project, and implementers found it easy to plan and execute projects according to the set deadlines.

Mayer et al. [31] study in Africa, covering twenty-four sub-Saharan countries, showed that a good scope planning should be clear, complete, and logical enough for it to be well understood. They further argued that scope should be clear and not ambiguous, precise to cover what is required, who is to cover it, the time required to finish, and how successful completion is to be measured [31]. The argument by Zuofa and Ochieng [32] in Nigeria indicated that there existed unambiguous relationship between development and successful implementation of projects as well as societal well-being requiring proper verification. The study also established that project failure was because of contingent factors, but the key factors were corruption and poor competency skills among the project managers [32]. In Namibia, Kawana [17], in his study, postulated that project scope planning is critical in order to guarantee project success, and project leaders should ensure the involvement and management of relevant stakeholders throughout the project life cycle.

Moenga and Moronge [19], in their study in Kenya, found out that stakeholder participation through well-planned project scope under leadership of a competent project manager in fibre optic infrastructure enhances successful execution. Odoyo [20] findings showed that poor daily coordination of activities because of deficiency in project scope planning and lack of stakeholder participation significantly delay execution of projects. Kariungi [18], in his study, established that strategic leadership skills offer a great influence in shaping and transforming stakeholders to participate in implementation of a project by undertaking roles as listed in the project scope. The argument by Charles and Mohamed [33] showed that strict adherence to acceptable procedures develop confidence among the stakeholders resulting in successful execution of projects.

Leadership skills, stakeholder management, project scope, and project success have been examined in the literature review. However, none of the reviewed studies above focused on the moderating influence of project scope on the joint influence of leadership skills and stakeholder management on execution of fibre optic infrastructure which is the focus of this study. This study was anchored on the conceptual framework that execution of fibre optic infrastructure may be influenced by joint influence of leadership skills and stakeholder management moderated by project scope. Leadership skills whose indicators are visionary capability, team building, communication, delegation, planning, decision-making, problem solving, coaching, and training are independent variables. Stakeholder management with indicators, namely, identification and list with areas of interest, analysis, dynamics in the project life cycle, reaction to project decisions, and engagement through the project life cycle was also an independent variable. Project scope with indicators, namely, scope management plan, scope statement, work breakdown structure, acceptance criteria, change criteria, and management of actual changes, was the moderating variable, while execution of fibre optic infrastructure with indicators, namely, within timeline, with cost savings, level of quality standards achieved, level of stakeholder satisfaction, adequacy and relevance of learnt lesson reports, level of satisfaction with project benefits,

adequacy and relevance of handover documents, and level of commitment by the project team, is the dependent variable. The study therefore proposed the hypothesis as follows:

> **$H_0$1**: there is no significant moderating influence of project scope on the combined influence of leadership skills and stakeholder management on execution of fibre optic infrastructure.

3. Methodology

This section presents methodology adopted to carry out the study. The section introduces research paradigm and design. It proceeds to present target population of the study, development of data collection instruments, data collection procedure, and data analysis techniques of the study.

3.1. Research Paradigm and Design. The study adopted the pragmatism research paradigm approach, with a cross-sectional survey design. Pragmatists believe that since the world is not an absolute unity, its complete understanding demands use of different ways of gathering and analyzing data [34]. Bryman [35] states that a cross-sectional survey design involves data collection on more than one case from people who are similar in some characteristics but different in a key factor of interest such as age, income levels, or geographic location. In this study, quantitative and qualitative data were collected across mobile telecommunication and Internet service providing companies at one point in time to determine the relationship between leadership skills, stakeholder management, project scope and execution of fibre optic infrastructure, and mixed methods of data analysis used to analyze the data collected.

3.2. Target Population. In this study, target population was 187 functional members of staff in fibre optic infrastructure departments of two mobile telecommunication organizations, four Internet service providers, and two policy making and regularity authorities in Nairobi County in Kenya. The functional members of staff comprised of construction professionals, namely, engineers, project managers, and supervisors, who are members of relevant professional bodies distributed as follows: Telkom Ltd: 25, Safaricom PLC: 45, Liquid Telecom: 30, Jamii Telecom: 25, Access Kenya: 30, Wananchi Group: 30, Information, Communication and Technology Authority (ICTA): 1, and Communication Authority of Kenya (CAK): 1. Since target population was small, census was used to select the entire target population of 187 respondents. Census is the procedure of systematically acquiring and recording information about the members of a given population [35].

3.3. Development of Data Collection Instruments. The study used qualitative and quantitative data with questionnaire, interview guide, and document review guide as data collection instruments. Structured questionnaire was used for collection of primary data from 179 functional members of staff in fibre optic infrastructure departments of the target organizations. The questionnaire used to collect primary data had five sections, namely, background information, leadership skills, stakeholder management, project scope, and execution of fibre optic infrastructure. Questionnaires provide a cheap, quick, and efficient way of obtaining large amounts of information from many respondents and therefore possible to collect quantitative and qualitative data. This was, therefore, beneficial to the study. An interview schedule was conducted by face to face conversation initiated by the researcher to collect data from key informants, namely, 6 heads of department of target organizations and 1 executive each at Information, communication and Technology (ICT) Authority and Communication Authority of Kenya (CAK) responsible for policy and industry regulation. This was carried out to obtain additional in-depth information about fibre optic infrastructure in the target organizations. The document review guide was used to obtain secondary data. Secondary data brought together information from desk research on fibre optic infrastructure. Reviewing of documents was important in collecting factual data regarding fibre optic infrastructure.

The questionnaire had the visual analogue scale with a range of 0 to 10- and 5-point Likert scale. Wewers and Lowe [36] postulated that the visual analogue scale measures data in subjective experiences and it enables expression of opinion-based information on an interval scale, which then enables analysis of such information by use of powerful statistical tools. Therefore, in this study, the visual analogue scale measured the opinion ratings on an interval scale [37] and thus, data from the visual analogue scale was used to carry out inferential statistical analysis. With a range of 0 to 10, the respondents were requested to rate the performance of their companies in execution of fibre optic infrastructure, rate the extent to which leadership skills had been applied in their companies in steering company projects towards their intended goals, rate the performance of their companies in stakeholder management, and rate the extent to which development of project scope influences execution of fibre optic infrastructure.

A five-point Likert scale ranging from "strongly agree" to "strongly disagree" was employed as it has been most recommended by the researchers that it would reduce the frustration level of patient respondents and increase the response rate and response quality. Therefore, respondents were asked to rate items on a level of agreement where 5 represented strongly agree, 4 represented agree, 3 represented neutral, and 2 represented disagree, while 1 represented strongly disagree. The interpretation of arithmetic mean in Likert questions shows that strongly disagree is between 1 and 1.5, disagree is between 1.5 and 2.5, neutral is between 2.5 and 3.5, agree is between 3.5 and 4.5, and strongly agree is between 4.5 and 5.0 [38]. The Likert scale assumes that the strength/intensity of an attitude is linear, and hence, Likert scale data was used for descriptive analysis. The key informants were subjected to interview guide and they were asked to indicate whether key stakeholders are involved in fibre optic infrastructure, importance of project scope development, challenges experienced in

execution fibre optic infrastructure, possible solutions to the challenges, and how they rate the process of project scope development in the companies.

3.4. Data Collection Procedure. Prior to data collection, pilot testing of research instruments was conducted through the content-related method and Cronbach's Alpha technique to verify validity and reliability, respectively. Pilot testing was carried out to assess practicability, time required to carry out the study, cost of the study, study risks, and statistical variability. It helped in planning appropriate study population and adjusting study design before the actual study. The pilot study was conducted on one organization, Huawei, which does not own fibre optic infrastructure but is contracted to deploy fibre optic infrastructure by service providers. The researcher administered 19 questionnaires to respondents involved in deployment of fibre optic infrastructure, in line with Mugenda [39] who postulated that 10% of the study sample is adequate to carry out a pilot research. Additionally, Huawei being a private establishment was easily accessible, and respondents were cooperative and readily available once prior arrangements were made and hence practicality of testing research instruments. The study applied two validity tests, namely, face validity and internal construct validity for the functional members of staff questionnaire.

A pilot study with 19 questionnaires administered to Huawei Project Managers tested the face validity of study instruments. The managers were requested to fill the questionnaire for the purpose of research and highlight unclear questions. The questionnaire was then adjusted and administered to two scholars in the University, and their feedback was used to adjust and correct vague questions to improve the instrument that was adopted for the study. Internal construct validity, also known as measurement validity, refers to whether a measure devised of a concept really does reflect the concept that it is supposed to denote [35]. Therefore, measurement validity relates to reliability, and for this study, key variables were subjected to a reliability test to assess measurement validity. Reliability is the degree to which an evaluation tool gives steady and consistent results [40]. Reliability of instruments and the average correlation was assessed using Cronbach's alpha coefficient in the range of 0 to 1. The results on reliability indicated that Cronbach reliability alpha for the variables was greater than 0.7, and hence there was no need to change measures and indicators in the questions. Use of situational and job-related questions in the study ensured predictive validity of interview and document review guides. The researcher executed interviews and document reviews using highly structured questions to ensure predictive validity.

Several procedures were followed to ensure smooth collection of data. The researcher obtained letter of introduction from the University of Nairobi. Thereafter, the researcher sought approval of study undertaking from National Council for Science and Technology, who issued authorization letter and research permit. In addition, the researcher sought permission and acceptance by top management and responsible departments that deal with fibre optic infrastructure deployment and operations in the target organizations. Collection of primary data was carried out through administration of questionnaire to the respondents, with the help of three research assistants. The researcher oversaw data collection exercise and made spot checks to ensure conformity to standards and guidelines.

The questionnaire was used to collect data from 179 respondents. It was forwarded to respondents who were given ample time to respond. However, during the period, follow-ups on phone and impromptu visits were conducted so that respondents could complete it in good time. Interview guides were used to collect data from eight respondents. The researcher collected qualitative data by face-to-face interview with executive staff at ICT Authority, CAK at the Agencies' offices, and heads of departments in target organizations. Out of 179 questionnaires which were distributed during the study, 172 were duly filled and returned to the researcher. In addition, six interviews were carried out. Therefore, the response rate was 95.18%. According to Bryman and Cramer [41], a 50% response rate is adequate for analysis, making conclusions and inferences about a population. This implied that the response rate (95.18%) was adequate for analysis, making conclusions and reporting.

3.5. Data Analysis Techniques. Data analysis proceeded in three steps, namely, data preparation, data analysis, and reporting. Mixed methods of data analysis were adopted in this study incorporating descriptive, inferential, and content analysis. The instruments were assembled, sorted, and prepared for analysis after completion of data collection exercise and quantitative data coded into SPSS version 22 and analyzed using descriptive and inferential statistics. The study used summary statistics to analyze descriptive data. Inferential statistical analysis was performed using multiple regression. Descriptive analysis was used to express study variable data in a meaningful way to allow simpler way of interpreting the data. Arithmetic mean was used as a measure of central tendency while standard deviation was used as a measure of dispersion. Frequency tables showed background information of respondents and description of visual analogue and Likert scale data.

Multiple regression model of the form, $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 M + \beta_4 X_1 M + \beta_5 X_2 M + \varepsilon_0$, was used to determine the hypothesis ($\mathbf{H_0 1}$) that there is no significant moderating influence of project scope on combined influence of leadership skills and stakeholder management on the execution of fibre optic infrastructure. Multiple regression is used to predict the value of a variable based on the value of two or more other variables. In this study, it was used to predict execution of fibre optic infrastructure based on leadership skills, stakeholder management, and project scope. It helped the researcher to understand how much the execution of fibre optic infrastructure change would be when leadership skills, stakeholder management, and project scope changes.

Prior to the main data analysis, statistical investigation involving tests for statistical assumptions of linearity,

normality, homoscedasticity, multicollinearity, and autocorrelation were performed. In case any of the statistical assumptions is violated, confidence intervals and other scientific understandings from a statistical investigation may be inefficient, biased, or even misleading. Linear relationship is the first statistical assumption. A linear relationship is considered to exist when the values of the independent variable and dependent variable resemble a straight line on a scatter plot [41]. The line can have a positive slope or negative slope. The results showed that leadership skills, stakeholder management, and project scope had a linear and positive relationship with execution of fibre optic infrastructure.

Normality is also one of the statistical assumptions. Regression analysis assumes that variable data is normally distributed or is from a normal population. Data that is not normally distributed can distort associations between different variables. Shapiro–Wilk test is considered a specific normality test and is used to test normality of the data in this study. David [42] postulates that, for variables to have normally distributed data, p value must be more than the significance level of $p = 0.05$. The results showed that p values of study variables were greater than $p = 0.05$; hence, the data analyzed was normally distributed.

The third statistical assumption is multicollinearity. It is a statistical concept showing the likelihood that two or more independent variables in a multiple regression model are significantly or highly correlated [43]. This is an undesirable event if correlations among the independent variables are strong because it increases standard errors of coefficients. The rule of the thumb is that a Variance Inflation Factor that is more than 10 warrants further investigates [44]. To measure the presence of multicollinearity, the study used Variance Inflation Factor (VIF). The findings showed that there was no multicollinearity among the independent variables since all the VIF values were below 3 indicating that multiple regression results were not misleading.

Homoscedasticity is the fourth statistical assumption. Homoscedasticity violations make it difficult to evaluate forecast errors' standard deviation, which usually result in confidence intervals that are too narrow or too wide [42]. In this study, heteroscedasticity was tested by conducting the Breusch–Pagan/Cook–Weisberg test. The null hypothesis for this test is that error variances are all equal versus the alternative that error variances are a multiplicative function of one or more variables. According to Bryman and Cramer [41], homoscedasticity is usually evident when test p value is greater than the significance level of $p = 0.05$. The findings revealed that Breusch–Pagan/Cook–Weisberg test $p = 0.098$ was greater than the significance level of $p = 0.05$, indicating that there was no heteroscedasticity in the data analyzed.

The fifth and final statistical assumption is autocorrelation. It refers to the degree of correlation between the values of the same variables across different observations in the data and can be viewed as regression illness. In this study, it was tested by use of Durbin–Watson statistic. Durbin–Watson statistic is a statistical test used in detecting autocorrelation in regression analysis residuals. Durbin–Watson statistic can assume values ranging from 0 to 4. The rule of the thumb in this test statistic is that values between 1.5 and 2.5 ($1.5 < d < 2.5$) show that there is no autocorrelation in the data [45]. The study findings showed that Durbin–Watson statistic was 1.850, which lies between 1.5 and 2.5. This indicated that there was no autocorrelation in the data analyzed.

Test of reliability was carried on the retrieved and analyzed data using Cronbach's alpha, and results showed 0.806 value. According to Kothari [40], Cronbach's Alpha coefficient of 0.6–0.7 is a commonly accepted rule of thumb that indicates acceptable reliability and 0.8 or higher indicates good reliability. The results on reliability indicated that Cronbach reliability alpha for the variables was greater than 0.7. This implied that the reliability level was acceptable. For validity of statistical findings, a researcher ensures control of Type I and Type II errors that may result from wrong interpretation of results. Type I errors happen when a researcher rejects null hypothesis that is true. A type II error occurs when one fails to reject a null hypothesis that is false [35]. To minimize Type I errors in this study, 95% confidence interval was used as demonstrated by Bryman [35], which means the standard variate was 1.96 and significance level was $p = 0.05$. In addition, Type II errors were dealt with by taking a census of 187 respondents. The use of many respondents to address type II errors was recommended by Bhattacherjee [46].

Qualitative data was analyzed using content analysis, which Bryman [35] defines as an approach to document analysis and writings whose purpose is to quantify content in terms of prearranged categories, in a logical and repeatable manner. The main faces of qualitative data analysis include data reduction, data display, and drawing of conclusions. Field notes were therefore, summarized into briefs and summary sheets. Interim case summary sheets were drawn, and sequential analysis undertaken to provide deeper insight on leadership skills, stakeholder management, project scope, and their influence on execution of fibre optic infrastructure and emerging themes put together on aggregate basis for systematic analysis of the data. In mixed research studies, results from quantitative and qualitative analysis may be explained individually. The current research combined qualitative and quantitative data and jointly interpreted them at that stage as supported by Bryman [35].

4. Research Data

This section summarizes quantitative research data.

4.1. Demographic Information. Table 1 presents demographic characteristics of respondents in the study, namely, their gender, length of service in respective organizations, the organizations they were working for, level of education, and the service category of their organizations.

4.2. Performance of the Companies in Execution of Fibre Optic Infrastructure. Table 2 summarizes the number of respondents who gave different ratings to performance of companies in execution of fibre optic infrastructure.

Table 1: Demographic information.

Demography	Frequency	Percent
Gender		
Male	124	72.1
Female	48	27.9
Total	172	100.0
Length of service in the organization		
1 year	30	17.4
2 years	20	11.6
3 years	34	19.8
4 years and above	88	51.2
Current place of work		
Safaricom	44	25.6
Wananchi telecom	29	16.7
Access Kenya	28	16.4
Jamii telecom	25	14.5
Telkom	24	14.0
Liquid telecom	22	12.8
Total	172	100.0
Highest level of education		
Diploma	28	16.3
Bachelors	116	67.4
Masters	24	14.0
Other	4	2.3
Total	172	100.0
Service category		
Mobile telecommunication	68	39.5
Internet service provider	104	60.5
Total	172	100.0

Table 2: Performance of companies in execution of fibre optic infrastructure.

Score	Frequency	Percent
2.00	2	1.2
3.00	4	2.3
4.00	6	3.5
5.00	10	5.8
6.00	24	14.0
7.00	30	17.4
8.00	38	22.1
9.00	38	22.1
10.00	20	11.6
Total	172	100.0

4.3. Extent to which Leadership Skills Are Applied in Steering Fibre Optic Infrastructure. Table 3 summarizes the number of respondents who gave different ratings on the visual analogue scale on the extent to which leadership skills are applied in steering execution of fibre optic infrastructure towards their intended goals.

4.4. Performance of the Companies in Stakeholder Management. Table 4 summarizes the number of respondents who gave different ratings on the visual analogue scale on performance of the companies in stakeholder management.

4.5. Project Scope and Execution of Fibre Optic Infrastructure. Table 5 summarizes the responses on project scope on a Likert scale.

4.6. Extent to which Project Scope Influences Execution of Fibre Optic Infrastructure. Table 6 summarizes the number of respondents who gave different ratings on the visual analogue scale on the extent to which project scope influences execution of fibre optic infrastructure.

5. Findings

This section presents findings of the study in thematic areas, namely, demographic information, descriptive analysis of project scope from Likert scale data, descriptive analysis of project scope from visual analogue data and qualitative data analysis, and inferential analysis of leadership skills, stakeholder management, project scope, and execution of fibre optic infrastructure.

5.1. Descriptive Analysis of Demographic Information. From the findings in Table 1, 72.1% of the respondents were male while 27.9% were female. This implies that execution of fibre optic infrastructure is male dominated. The companies should therefore work towards bridging the gender gap in execution of fibre optic infrastructure in order to comply with the constitutional requirement of gender balance in all employment sectors. The findings in Table 1 also show that 51.2% of functional staff had stayed in their respective institutions for more than four years, 19.8% had stayed for a period of three years, 17.4% had stayed for a period of one year, and 11.6% had stayed for a period of two years. These findings suggest that most of the functional staff in mobile telecommunication and Internet service providing companies have stayed in their respective companies for more than four years. Therefore, most of the respondents in this study had worked in their organizations long enough and hence had the required information on leadership skills, stakeholder management, project scope, and execution of fibre optic infrastructure in their organizations. Similarly, the findings in Table 1 show that 25.6% of the respondents were working in Safaricom PLC, 16.7% were working in Wananchi Telecom, 16.4% were working in Access Kenya, 14.5% were working in Jamii Telecom, 14% were working in Telkom Ltd, and 12.8% were working in Liquid Telecom. This implies that Safaricom PLC had the highest proportion of functional staff in fibre optic infrastructure department, among mobile telecommunication and Internet service companies in Nairobi County.

Likewise, the findings in Table 1 show that 67.4% of the functional staff had bachelor's degrees, 16.4% had diplomas, and 14.0% had master's degrees. In addition, 2.3% of the participants indicated that they had PhD degrees. Since most of the respondents had bachelor's degrees as their highest education level, it can be assumed that they had basic knowledge on leadership skills, stakeholder management, project scope, and execution of fibre optic infrastructure in their organizations and provided accurate information as respondents in the study. Furthermore, the findings in Table 1 also show that 60.5% of the firms deal with provision of Internet services while 39.5% indicated that their companies deal with provision of mobile telecommunication

Table 3: Extent to which leaderships skills are applied in steering fibre optic infrastructure.

Score	Frequency	Percent
2.00	4	2.3
3.00	8	4.7
4.00	4	2.3
5.00	14	8.1
6.00	18	10.5
7.00	34	19.8
8.00	48	27.9
9.00	22	12.8
10.00	20	11.6
Total	172	100.0

Table 4: Performance of companies in stakeholder management.

Score	Frequency	Percent
2.00	6	3.5
3.00	4	2.3
4.00	4	2.3
5.00	28	16.3
6.00	30	17.4
7.00	12	7.0
8.00	38	22.1
9.00	30	17.4
10.00	20	11.6
Total	172	100.0

Table 5: Project scope Likert scale data.

Statements	1	2	3	4	5	Mean	Std. deviation
In my company, we prepare scope management plan before fibre project execution	0.0	4.7	5.8	38.3	51.2	3.907	0.997
We conduct planning workshops and prepare detailed scope statement	4.7	8.1	16.3	40.7	30.2	3.825	1.066
We research previous project experiences when developing scope in my company	2.3	7.0	18.6	37.2	34.9	4.011	1.005
In my company, we define scope in initial stages of fibre projects	1.2	8.1	9.3	41.9	39.5	4.232	0.793
We document project milestones and deliverables	3.5	3.5	11.6	43.0	38.4	4.058	1.090
We estimate resource requirements before project execution	0.0	4.7	9.3	44.2	41.8	4.360	1.013
My company has defined scope verification process	4.7	1.2	15.1	41.9	37.1	3.837	0.955
In my company, we detail project work acceptance criteria and get support from key stakeholders before embarking on the project	4.7	3.5	23.3	33.7	34.9	3.953	0.997
We have scope change control procedure in my company	2.3	7.0	25.6	36.0	29.	4.104	1.066
We identify factors that cause scope change, and when change has occurred, we ensure changes are beneficial to project objectives and manage actual change when and if they occur	2.3	7.0	14.0	40.7	36.0	4.093	1.005
Composite mean and standard deviation	—	—	—	—	—	4.038	0.9987

Table 6: Project scope visual analogue scale data.

Score	Frequency	Percent
1.00	4	2.3
3.00	4	2.3
4.00	10	5.8
5.00	10	5.8
6.00	8	4.7
7.00	16	9.3
8.00	48	27.9
9.00	54	31.4
10.00	18	10.5
Total	172	100.0

services. This implied that most of the companies provide Internet service. This might be because four of the firms studied, namely, Liquid Telecom, Jamii Telecom, Access Kenya, and Wananchi Group deal with Internet service provision while only two, Telkom Ltd and Safaricom PLC deal with mobile telecommunication.

5.2. Descriptive Analysis of Project Scope from Likert Scale Data. The functional staff in fibre optic infrastructure departments in mobile telecommunication and Internet service companies were asked to indicate their level of agreement with the various statements on project scope in their organizations. The results are shown in Table 5.

From the findings in Table 5, the functional staff in fibre optic infrastructure departments in mobile telecommunication and Internet service firms agreed that their companies estimated resource requirement before project execution ($M = 4.360$, SD = 1.013). The functional staff also agreed that, in their companies, they defined scope at initial stages of fibre optic infrastructure ($M = 4.232$, SD = 0.793). In addition, they agreed that, in their companies, they had scope-change control procedure ($M = 4.104$, SD = 1.066). The functional staff also agreed that the companies identified factors that caused scope change, and when change had occurred, they ensured changes were beneficial to the project objectives and managed actual changes when and if they occurred ($M = 4.093$, SD = 1.005).

Furthermore, the functional staff agreed that they documented project milestones and deliverables ($M = 4.058$, SD = 1.090). The functional staff agreed that, in their companies, they detailed project-work acceptance criteria and got support from key stakeholders before embarking on a project ($M = 3.953$, SD = 0.997). Moreover, they had defined scope verification process ($M = 3.837$, SD = 0.955). The functional staff also agreed that they conducted planning workshops and prepared detailed scope statement before embarking on project execution ($M = 3.825$, SD = 1.066).

Overall, the study findings showed that companies surveyed agreed that project scope definition in execution of fibre optic infrastructure is important ($M = 4.038$, SD = 0.9987). The results imply that project scope definition in terms of scope management plan, scope statement, work breakdown structure, acceptance criteria, scope change criteria, and management of actual changes, involving key stakeholders at every stage can significantly contribute to successful execution of fibre optic infrastructure.

5.3. Descriptive Analysis of Project Scope from Visual Analogue Scale Data. The respondents were asked to rate the performance of their companies in developing project scope using a scale of 0 to 10, where 0 represented least performance and 10 represented best performance. Table 6 shows the results.

From the findings in Table 6, most respondents (31.4%) rated the performance of their companies in developing project scope as 9.00, followed by 8.00 (27.9%), 10.00 (10.5%), 7.00 (9.3%), 4.00 (5.8%), 5.00 (5.8%), 6.00 (4.7%), 1.00 (2.3%), and 3.00 (2.3%). These findings showed that the performance of mobile telecommunication and Internet service providers in developing project scope were rated as 8 and above by 69.8% of respondents. The surveyed companies rated development of project scope as good, implying that project scope development is important and contributes to effective, efficient, and sustainable execution of fibre optic infrastructure.

The key informants also reported that project scope contributes to effective implementation of fibre optic infrastructure. This theme was captured by one quotation from a respondent stated in K04.

> *Understanding project scope enables project managers to have a comprehensive understanding of a project and come up with a comprehensive plan as well as allocate appropriate resources. However, changes in the project scope can occur in the process of developing a project (K04).*

In addition, key informants indicated that their companies had scope statement, risk register, and scope management plan. They also indicated that project scope encompassed budgeting, designs, and execution plans. This theme was captured by a quotation from a respondent stated in K06.

> *Project scope involves breaking down of major project deliverables in scope statement into smaller and workable components, breakdown of the work structure, and identification of required resources and milestones that gives a whole project perspective including acceptance criteria, change control criteria, and management of actual changes in the scope* (K06).

5.4. Inferential Analysis of Leadership Skills, Stakeholder Management, Project Scope, and Execution of Fibre Optic Infrastructure. Multiple regression analysis was used to determine how project scope moderates the joint influence of leadership skills and stakeholder management on execution of fibre optic infrastructure among mobile telecommunication and Internet service providers in Nairobi County. The hypothesis stated that:

Table 7 shows the model summary for the moderating influence of project scope on the combined influence of leadership skills and stakeholder management on execution of fibre optic infrastructure.

The first model included leadership skills, stakeholder management, and project scope and showed that the three variables could explain 59.8% of the variance in execution of fibre optic infrastructure. However, in the second model that included leadership skills, stakeholder management, project scope, leadership skills multiplied by project scope, and stakeholder's management multiplied by project scope showed that these variables explain 63.7% of the variance in execution of fibre optic infrastructure. An introduction of the interaction term in the model led to an increase in the coefficient of determination (R^2) by 3.9%.

Table 8 shows analysis of variance for the moderating influence of project scope on the combined influence of leadership skills and stakeholder management on execution of fibre optic infrastructure.

Table 7: Model summary for leadership skills, stakeholder management, project scope, and execution of fibre optic infrastructure.

Model	R	R square	Adjusted R square	Std. error of the estimate
1	0.773^a	0.598	0.591	1.15614
2	0.798^b	0.637	0.626	1.10620

From the findings in Table 8, the F-calculated for the first model was 83.401 and for the second model it was 58.164. Since the F-calculated for both models were greater than the F-critical (2.31), it was concluded that both models were good fits for the data analyzed and hence may be used in predicting the moderating influence of project scope on the combined influence of leadership skills and stakeholder management on execution of fibre optic infrastructure.

Table 9 shows regression coefficients for the moderating influence of project scope on the combined influence of leadership skills and stakeholder management on execution of fibre optic infrastructure.

In Table 9, the first model, by substituting the beta values as well as the constant term, emanating from the first step regression modeling, is as follows:

$$Y = 1.576 + 0.326X_1 + 0.306X_2 + 0.182M, \quad (1)$$

where Y is execution of fibre optic infrastructure, X_1 is leadership skills, X_2 is stakeholder management, and M is project scope.

The findings showed that leadership skills have a significant influence on execution of fibre optic infrastructure as the regression coefficient was $\beta = 0.326$ ($t = 5.476$, $p < 0.001 < 0.05$). In addition, stakeholder management has a significant influence on the execution of fibre optic infrastructure as the regression coefficient was $\beta = 0.306$ ($t = 5.187$, $p < 0.001 < 0.05$). Moreover, project scope has a significant influence on the execution of fibre optic infrastructure as the regression coefficient was $\beta = 0.182$ ($t = 3.164$, $p < 0.001 < 0.05$).

In Table 9, the second regression model, by substituting the beta values as well as the constant term, emanating from the second step regression modeling, is as follows:

$$\begin{aligned} Y = {} & -1.808 + 0.883X_1 + 0.644X_2 + 0.360M \\ & - 0.033X_1 * M - 0.047X_2 * M, \end{aligned} \quad (2)$$

where X_1 is leadership skills, X_2 is stakeholder management, M is project scope, $X_1 * M$ is interaction term between leadership skills and project scope, and $X_2 * M$ is interaction term between stakeholder management and project scope.

The results in the second model showed that leadership skills have a significant influence on the execution of fibre optic infrastructure as shown by a regression coefficient of $\beta = 0.883$ ($t = 6.087$, $p < 0.001 < 0.05$). The results also revealed that stakeholder management has a significant influence on the execution of fibre optic infrastructure as the regression coefficient was $\beta = 0.644$ ($t = 2.894$, $p = 0.004 < 0.05$). In addition, project scope has no significant influence on the execution of fibre optic infrastructure as the regression coefficient was $\beta = 0.360$ ($t = 1.760$, $p = 0.080 > 0.05$).

The interaction between leadership skills and project scope has no significant influence on the execution of fibre optic infrastructure as indicated by a regression coefficient of $\beta = -0.033$ ($t = -1.320$, $p = 0.188 > 0.05$). Also, the interaction between stakeholder's management and project scope has no significant influence on the execution of fibre optic infrastructure as indicated by a regression coefficient of $\beta = -0.047$ ($t = -1.704$, $p = 0.090 > 0.05$). From these results, the null hypothesis was rejected and the alternative accepted that there is a positive and significant moderating influence of project scope on the combined influence of leadership skills and stakeholder management on execution of fibre optic infrastructure.

6. Discussion

The study established that project scope has a significant moderating influence on the combined influence of leadership skills and stakeholder management on execution of fibre optic infrastructure. These findings concur with the argument by Martinsuo and Lehtonen [14] who, in their study, revealed that project scope covers work breakdown structure, stakeholder definition, and understanding of the laid down government policies. However, for any execution of a project including fibre optic infrastructure to succeed, there is need for project leaders with relevant leadership skills to be able to define key stakeholders, manage them, and influence relevant policies. Additionally, Kawana [17] findings showed that project scope planning is critical in order to guarantee project success and project leaders should ensure the involvement and management of relevant stakeholders throughout the project life cycle. Planning is a vital skill that organizations must practice on a regular basis because it forms the basis of most decisions that organizations make. Stakeholder management is also important because it is the heartbeat of effective project relationships. This means not only knowing project stakeholders but also understanding their unique communication needs at various stages in a project. Telecommunication and construction industry players should, therefore, regularly organize planning workshops and involve key stakeholders when defining project scope.

The study findings also agree with those of Moenga and Moronge [19] who, in their study, showed that stakeholder participation through well-planned project scope under leadership of a competent project manager in fibre optic infrastructure enhances successful execution. Furthermore, the findings by Odoyo [20] that poor daily coordination of activities because of deficiency in project scope planning and lack of stakeholder participation significantly delay execution of projects validates the results of this study. Developing leadership skills is, therefore, important for project management because the overall success of a project including fibre optic infrastructure is determined by its leaders. Project leaders oversee projects and make critical decisions that can lead to their success or failure. Additionally, coordination in projects helps to bring together the human and material

Table 8: ANOVA for leadership skills, stakeholder management, project scope, and execution of fibre optic infrastructure.

Model		Sums of squares	df	Mean square	F	Sig.
1	Regression	334.440	3	111.480	83.401	0.000[b]
	Residual	224.560	168	1.337		
	Total	559.000	171			
2	Regression	355.870	5	71.174	58.164	0.000[c]
	Residual	203.130	166	1.224		
	Total	559.000	171			

Table 9: Coefficients for leadership skills, stakeholder management, project scope, and execution of fibre optic infrastructure.

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. error	Beta (β)		
1	(Constant)	1.576	0.393		4.015	0.000
	Leadership skills	0.326	0.060	0.350	5.476	0.000
	Stakeholder management	0.306	0.059	0.350	5.187	0.000
	Project scope	0.182	0.058	0.203	3.164	0.002
2	(Constant)	−1.808	0.892		−2.028	0.044
	Leadership skills	0.883	0.145	0.948	6.087	0.000
	Stakeholder management	0.644	0.223	0.736	2.894	0.004
	Project scope	0.360	0.205	0.403	1.760	0.080
	Leadership skills ∗ project scope	−0.033	0.025	−0.442	−1.321	0.188
	Stakeholders management ∗ project scope	−0.047	0.028	−0.649	−1.704	0.090

resources of a project. It helps to make optimum utilization of resources. These resources are used to achieve the objectives of a project. Coordination also minimizes the wastage of resources in a project. Accordingly, players in mobile telecommunication and construction industry in general should ensure that project schedules, resources, equipment, and information are well coordinated, liaising with clients to identify and define project requirements, scope, and objectives and ensuring that clients' needs are met as the project evolves.

Furthermore, results of the study agree with the findings by Kariungi [18] who, in his study, demonstrated that strategic leadership skills offer a great influence in shaping and transforming stakeholders to participate in implementation of a project by undertaking roles as listed in the project scope. For stakeholders to act on information, there is need for a well-defined scope management plan where leaders respond to and make decisions based on the scope for better project outcomes [28]. Knapp [29] stated that the main contributing factor to project failure is poor scope definition by project managers. It is therefore, prudent to ensure definition of project scope at the earliest stage of a project. Scope management ensures a project's scope is accurately defined and mapped and enables project managers to allocate resources to complete the project. It establishes control factors that can be used to address elements that result in changes during the lifecycle of a project. Project scope is critical because without it project managers would have no clue what time, cost, or labor was involved in a project. These findings should enable project manager, project team, and other key stakeholders with right leadership skills to determine project scope issues in mobile telecommunication and construction industry and define strategies to enhance project scope definition for effective, efficient, and sustainable execution of construction projects including fibre optic infrastructure.

7. Conclusion

The objective of the study was to examine how project scope moderates the joint influence of leadership skills and stakeholder management on execution of fibre optic infrastructure. The study adopted the pragmatism paradigm approach, with a cross-sectional design. Findings of the study suggest that project scope has a positive and significant moderating influence on the combined influence of leadership skills and stakeholder management on execution of fibre optic infrastructure. Similarly, descriptive analysis and key informants indicated that project scope definition in terms of scope management plan, scope statement, work breakdown structure, acceptance criteria, scope change criteria, and management of actual changes, involving key stakeholders at every stage can significantly contribute to successful execution of fibre optic infrastructure.

This research makes a theoretical contribution by offering a new and integrative relationship between project scope, leadership skills, stakeholder management, and execution of fibre optic infrastructure. It contributes to the literature in project management by not only providing empirical evidence on leadership skills, stakeholder management, and execution of fibre optic infrastructure but also by expanding research on project scope. Findings of this study will also be valuable to academicians, policy makers, and other researchers in project planning and management field. This research also makes significant contribution to

telecommunication and construction industries. Findings of this study would also benefit professionals in the industries as they could help to complete fibre optic infrastructure on time, within budget and specifications. Furthermore, the study findings possibly would form a guideline for project planning and implementation that helps organizations in mobile telecommunication and construction industries to get on track and deliver more successful projects including fibre optic infrastructure.

It is therefore recommended that project scope should be clearly defined at the inception of a project and that key stakeholders should be involved throughout the project scope definition stage. It is also recommended that project leaders with right leadership skills should hold planning workshops when developing project scope and gather ideas from varied multiskilled stakeholders to enhance completeness and acceptability of fibre optic project results. The results of the study also demonstrated that changes in scope will happen during execution of fibre optic infrastructure. Project leaders in construction industry should therefore ensure that scope changes are dealt with in a positive and proactive manner. They should also make use of conflict management skills as well as communication skills to ensure appropriate management of changes in project scope.

This study was delimited to consider the extent to which project scope moderates the joint influence of leadership skills and stakeholder management on execution of fibre optic infrastructure in Nairobi County, Kenya. It is therefore suggested that more studies should be conducted on other factors that may influence execution of fibre optic infrastructure across the world. It is also recommended that a similar study be conducted across the world but consider all contractors and vendors that supply equipment and build fibre optic infrastructure as target population. This study is an extended version of the paper on leadership skills, stakeholder management, and execution of fibre optic infrastructure published in Journal of Engineering, Project, and Production Management [47].

Data Availability

The processed empirical data used to support the findings of this study are included within the article. The secondary data supporting this study are from previously reported studies and datasets, which have been cited.

Conflicts of Interest

The author declares that there are no conflicts of interest regarding the publication of this paper.

References

[1] Ernst and Young, *Global telecommunications study: Navigating the Road to 2020, Building a Better Working World*, EYGM Limited, London, UK, 2015, http://www.ey.com.

[2] S. Beardsley, L. Enriquez, M. Guvendi, and S. Sandoval, "Creating a fibre future: the regulatory challenge," The Global Information Technology Report 2010–2011, pp. 1–411, World Economic Forum, Cologny, Switzerland, 2011.

[3] G. N. Ezeh, C. N. Ogbuehi, N. Eleke, and U. H. Diala, "Severity index analysis of the problems of optical fibre communication in Nigeria: a case study of South Eastern Nigeria," *Academic Research International*, vol. 4, no. 1, pp. 431–438, 2011.

[4] M. Torlak, *Fibre Optic Communications*, EE4367 Telecommunications Switching & Transmission, University of Texas at Dallas, Richardson, TX, USA, 2013.

[5] A. Sankara, *Application of Standard Project Management Processes in Fibre Optic Cable Plant Project Management*, DigiBridge Telecoms Consulting, Richfield, MN, USA, 2014.

[6] N. Massa, *Fibre Optic Telecommunication, Fundamentals of Phonotonics*, Springfield Technical Community College Springfield, University of Connecticut, Springfield, MA, USA, 2013.

[7] S. Crocker, *National Fibre Program. Australian Constructor's Achievement Award. Technical Paper*, Leighton, Mulgrave, Australia, 2012.

[8] Deloitte, "Broadband infrastructure for transforming India," in *Proceedings of the 9th International Conference on ICT and Digital Economy*, India Telecom, New Delhi, India, November 2016.

[9] Huawei Industrial Base, *Gig band network development. White Paper*, Huawei Industrial Base, Shenzhen, China, 2016.

[10] P. W. G. Morris, *The Management of Projects: A New Model*, Thomas Telford, London, UK, 1994.

[11] Y. Qing and A. Dekker, "Stakeholder's management issues and leadership in project management: the way forward," *International Journal of Education and Research*, vol. 2, no. 2, pp. 1–8, 2014.

[12] G. A. Weijde, "Front end loading as an integral part of the project execution model in lean shipbuilding," 2018, https://iglcstorage.blob.core.windows.net/papers/attachment-018e8ada-ba8c-43be-9031-cd4f80341a59.pdf.

[13] W. Karl, "Defining the project scope: context and use case diagram," 2014, http://www.processimpact.com.

[14] M. Martinsuo and P. Lehtonen, "Role of single-project management in achieving portfolio management efficiency," *International Journal of Project Management*, vol. 25, no. 1, pp. 56–65, 2015.

[15] P. R. De Andrade, A. B. Albuquerque, O. F. Frota, and J. F. da Silva Filho, "One approach to the management of IT projects applied in the Brazilian public sector," in *Proceedings of the International Conference on Software Engineering Research and Practice (SERP), Steering Committee of the World Congress in Computer Science*, vol. 49, Computer Engineering and Applied Computing, Las Vegas, NV, USA, July 2015.

[16] D. T. Rajani and R. V. Shobha, "Work breakdown structure of the project in India," *International Journal of Engineering Research and Applications (IJERA)*, vol. 2, no. 2, pp. 683–686, 2012.

[17] R. K. Kawana, "Investigation into the role of leadership in water technology innovations in enhancing job creation in kavango east region in Namibia," Doctoral Dissertation, University of Namibia, Windhoek, Namibia, 2016.

[18] S. M. Kariungi, "Determinants of timely completion of projects in Kenya: a case of Kenya power and lighting company, Thika," *ABC Journal Of Advanced Research*, vol. 3, no. 2, pp. 2312–3203, 2014.

[19] R. O. Moenga and M. Moronge, "Determinants of effective utilization of broadband infrastructure projects in Kenya: a case of national optic fibre backbone infrastructure project phase 1," *Strategic Journal of Business & Change Management*, vol. 3, no. 2, pp. 484–514, 2016.

[20] C. Odoyo, "Factors affecting implementation of community projects: case of Kimira–oluch smallholder farm improvement project in Homa Bay County, Kenya," *Universal Journal of Management*, vol. 1, no. 2, pp. 111–118, 2013.

[21] Government Printer, *Kenya Information and Communications Act Cap*, Vol. 411, Government Printer, Nairobi, Kenya, 2011.

[22] P. Stout, "Equipment specification writing guide," 2012, https://www.yumpu.com/en.

[23] A. Petty, "Leadership and the project manager, developing the skills that fuel high performance, management excellence," 2014, http://artpetty.com.

[24] K. Eikenberry, "Four answers about leadership," 2016, http://www.sideroad.com/leadership–characteristic.html.

[25] H. M. Awan, K. Ahmed, and W. Zulqarnain, ""Impact of project manager's soft leadership skills on project success," *Journal of Poverty, Investment and Development*, vol. 8, no. 1, pp. 27–46, 2015.

[26] A. Aapaoja, H. Haapasalo, and P. Söderström, "Early stakeholder involvement in the project definition phase: case renovation," *ISRN Industrial Engineering*, vol. 2013, no. 1, pp. 1–14, 2013.

[27] N. Kennon, P. Howden, and M. Hartley, "Who really matters? A stakeholder analysis tool," *Extension Farming Systems Journal*, vol. 5, no. 2, pp. 9–17, 2009.

[28] K. Schwalbe, *Managing technology projects*, Course Technology, Cengage Learning, Boston, MA, USA, Sixth edition, 2010.

[29] D. Knapp, *A Guide to Customer Service Skills for the Service Desk Professional*, Cengage Learning, Boston, MA, USA, 2011.

[30] H. W. Ker and J. Y. Yang, "Application of project management framework into the simulation of international commodity exhibition on Campus," *Universal Journal of Management*, vol. 1, no. 2, pp. 63–68, 2013.

[31] R. Mayer, K. Figueredo, M. Jensen et al., "Costing the needs for investment in ICT infrastructure in Africa," 2014, http://www.eu-africa-infrastructure.

[32] T. Zuofa and E. G. Ochieng, "Project failure: the way forward and panacea for development," *International Journal of Business and Management*, vol. 9, no. 11, pp. 59–76, 2014.

[33] G. K. Charles and B. H. Mohamed, "Efficacy of monitoring and evaluation function in achieving project success in Kenya: a conceptual framework," *Science Journal of Business and Management*, vol. 3, no. 3, pp. 82–94, 2015.

[34] L. N. Wambugu, N. D. Kyalo, M. Mbii, and R. O. Nyonje, *Research Methods: Theory and Practice*, Aura Publishers, Nairobi, Kenya, 2015.

[35] A. Bryman, *Social Research Methods*, Oxford University Press, New York, NY, USA, 4th edition, 2012.

[36] M. E. Wewers and N. K. Lowe, "A critical review of visual analogue scales in the measurement of clinical phenomena," *Research in Nursing and Health*, vol. 13, no. 4, pp. 227–236, 1990.

[37] F. Dexter and D. H. Chestnut, "Analysis of statistical tests to compare visual analog scale measurements among groups, anesthesiology," *Anaesthesiology*, vol. 82, no. 4, pp. 896–902, 1995.

[38] P. Vonglao, "Application of fuzzy logic to improve the Likert scale to measure latent variables," *Kasetsart Journal of Social Sciences*, vol. 38, no. 3, pp. 337–344, 2017.

[39] A. G. Mugenda, *Social Science Research*, Applied Research and Training Services, Nairobi, Kenya, 2008.

[40] C. R. Kothari, *Research Methodology Methods and Techniques*, New Age International Publishers, New Delhi, India, 2nd edition, 2004.

[41] A. Bryman and D. Cramer, *Quantitative Data Analysis with SPSS Release 8 for Windows*, Routledge, New York, NY, USA, 2012.

[42] G. G. David, *Testing Statistical Assumptions*, North Carolina State University, School of public and internal affairs: Statistical Associates Publishing, Blue Books Series, Raleigh, NC, USA, 2012.

[43] J. W. Creswell, *Research Design. Qualitative, Quantitative, and Mixed Methods Approach*, SAGE, Thousand Oaks, CA, USA, 2014.

[44] R. B. Russell, *Social Research Method: Qualitative and Quantitative Approaches*, SAGE Publications, Los Angeles, CA, USA, 2013.

[45] D. R. Cooper and P. S. Schindler, *Business Research Methods*, McGraw-Hill, New Delhi, NY, USA, 2006.

[46] A. Bhattacherjee, *Social Science Research: Principles, Methods, and Practices*, Free Press, New York, NY, USA, 2012.

[47] J. K. Akhwaba, O. Bowa, and P. Keiyoro, "Leadership skills, stakeholder management and execution of fibre optic infrastructure," *Journal of Engineering, Projects, and Production Management*, vol. 10, no. 1, pp. 80–86, 2020.