

# PROJECT SCOPE MANAGEMENT AND SUCCESSFUL IMPLEMENTATION OF INFRASTRUCTURAL HEALTH PROGRAM IN NAIROBI COUNTY

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**Abstract:** A poorly defined project scope has been associated with project failure, with an inadequately planned project scope having a negative correlation with project performance. A well-defined scope will allow the stakeholder to have common goals and expectations throughout the life of the project. Scope management integrates clear definition, effective management, and effective communication with stakeholders, all of which safeguard project success. The goal of this study was to establish the role of scope management in the successful implementation of health infrastructural program in Nairobi County. The research was a descriptive study whose objectives are to evaluate four factors affecting the influence of project scope management on infrastructural health program in Nairobi County. The study was guided by the following objectives; scope planning, scope budgeting, project scope scheduling, scope change and successful implementation of health infrastructural program as the dependent variable. The study was based on stakeholder's theory, the pure theory of public expenditure, theory of constraints, and theory of change which provided a theoretical framework upon which project scope management implementation can be understood. The study targeted 120 personnel involved in the construction of 40 health facilities in Nairobi County. A questionnaire was used as a research instrument to obtain data from the respondents. The questions were checked for content validity with the researcher engaging the supervisory panel to ensure that the questions were fit to measure what they are supposed to measure. The study also incorporated a reliability test and an internal consistency test. The reliability limits using Cronbach's Alpha coefficient for this study was a threshold value of 0.7. The Statistical Package for the Social Sciences (SPSS) program was used to analyze the data. Quantitative data was analyzed using descriptive statistics such as mean scores and standard deviations. Multiple regression analysis was used to determine the role of scope management in the successful implementation of health infrastructural program in Nairobi County. From the multiple regression analysis, the results indicated that project scope planning, scope budgeting, scope scheduling and scope control had significant effects on the implementation of infrastructural health projects. The findings revealed that scope management has a positive and significant influence on the successful implementation of infrastructural health program. From the study findings, it was concluded that an increase in scope planning, scope scheduling and scope control would lead to an increase in the successful implementation of infrastructural health program.

**Keyword:** Scope Management, Program implementation, Project Scope Planning, Scope budgeting, Project Scope change.

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## I. INTRODUCTION

A poorly defined project scope has been associated with project failure, with an inadequately planned project scope having a negative correlation with project performance. If project scope limits go unchecked, the final cost of a project

will have severe inflation due to changes interrupting project rhythm, introducing the need for a rework, extending the deadlines for milestone accomplishment, and decreasing overall productivity and motivation among project team members [1]. Project scope management delves into the elements of control and planning which is why managing stakeholder expectations requires effort and tact and can be taxing to the project manager. A discretely defined scope will allow stakeholders to have common goals and expectations throughout the life of the project. Therefore, scope management integrates clear definition, effective management, and effective communication with stakeholders all of which safeguard project success [2]. Failure to have a clear definition of project scope leads to scope creep, an uncontrolled and unwanted transformation in the project progress incited by changes in stakeholder expectations and needs [3].

Scope management has been deemed more important to project success than any other area of knowledge in the project lifecycle. [4] reports that managing the scope of a project effectively and assuredly addresses five of six of the most reoccurring factors leading to cost overrun and scope creep—the five factors are inadequate stakeholder inputs, inconsistent requirements, unrealistic milestones and outcomes, technological incompetence, and thinly defined requirements. Controlling scope uncertainty is a factor of project management functionality. A study conducted on 23 large-scale government projects in Norway showed that some of the shortcomings associated with scope management included insufficient mandates, unclear limitations of responsibility, scope change without supplementary resources, inadequate formal procedures, and random scope transfer [5]. Another study investigating the health of Malaysian construction megaprojects reported that no scope management aspects relating to this country were existent [6]. However, the study listed general factors related to project scope, such as project efficiency, customer impact, and organizational success, as determinants of project success.

A significant number of projects in Kenya have demonstrated the role of proper scope management in achieving project success. One study sought to determine the effect of practices in scope management over project performance for liquid petroleum gas (LPG) companies in Kenya. The study acknowledged the role of project budgeting and scheduling as aspects that affect scope management outcomes. Further, the study recommended the adoption of project scope management practices for all firms engaging in the sale and manufacture of LPG. Another study concluded that defining project scope bears a positive influence on successful project execution for rural road construction in Kenya. The authors reported that having a high level of scope control creates a positive impact on the rollout of rural road construction projects. A study investigating the effect of project management skill and knowledge on the relationship between scope management and project implementation in public secondary schools in Kisumu County presented four key findings [4]. First, the findings indicated a large extent of influence of scope planning on the implementation of projects. Secondly, the study confirmed the influence of proper scope definition on the project implementation process. Thirdly, accurate scope verification was found to have a significant effect on quality control effectiveness during project management. Fourth, the study reported that project managers who exhibited high-level competence in project scope management had a better handle of the project implementation process.

## **II. PROBLEM STATEMENT**

Project scope management is considered among the most important functions demanding the attention of the project manager and that impact the success outcomes of project management [7]. Failures and uncertainties linked to project scope management have direct implications on the cost, delivery timeline, and quality of a project. Failures and uncertainties linked to project scope management have direct implications on the cost, delivery timeline, and quality of a project. Global studies have also indicated that an unclearly defined scope is among the main reasons for project failure. According to the [8], more than half of all projects that fail will have scope creep as a contributing factor—a poorly defined scope thus becomes a main cause for project failure. Health projects in developing countries, especially those in sub-Saharan Africa, fail within their first year of completion [9]. Up to 63% of health projects in Kenya have been known to fail shortly after implementation [9]. In Nairobi County, about 48% of projects remain incomplete while 10% have come to a complete halt [10]. Results from a study conducted at the Kenya Airport Authority (KAA) showed that project scope management contributed 28.6% of the success of projects implemented at KAA [11]. A critical analysis exploring the cause of project failure for Kenyan construction projects found that 60% of them were the result of issues in project scope management [12]. A study on the effect of scope management approaches on economic stimulus projects in Kisumu County reported that project scope planning, scope definition, and scope verification had a positive influence on the implementation of the projects [4].

### **III. OBJECTIVES OF THE STUDY**

The general objective of the study was to establish the effect of project scope management on successful implementation of Infrastructural health program in Nairobi County

Specifically, the study was guided by the following objectives:

1. To assess the effect of scope planning on successful implementation of infrastructural health program in Nairobi County.
2. To assess the effect of scope change on successful implementation of infrastructural health program in Nairobi County

### **IV. THEORETICAL REVIEW**

This study will be guided by the Theory of change and the Theory of Constraints. The Theory of Constraints (TOC) emphasizes the cross-functional and interdependent nature of organizational processes by viewing an organization as a chain (or a network of chains) of interdependent functions, processes, departments or resources where a variety of inputs are transformed into a variety of products and services which when sold become throughput [13]. TOC then defines a constraint as any attribute that limits an organization's higher performance in terms of its goal. When viewed from a functional perspective such as scope management, a list of problems, often loosely defined as constraints, can be long and are usually representations of problems inherent with each function. TOC utilizes the chain analogy which implies that the success of a project is dependent on the activities portraying the weakest chance of success, that is, the weakest link in the chain [14]. However, TOC opens up room for modification where not all problems can be the weakest link in a chain; a certain issue in scope management, for instance, may need to be the most significant with regard to the project's ability to move in the intended goal-oriented direction. The weakest link could be a resource that the project is lacking, called a physical constraint, or a non-physical constraint such as the lack of market demand for a product, poor supplier relationships, project management policies, procedures, or ways of thinking.

Fundamentally, TOC is founded on series of five steps. The sequence involves identifying a system's constraints, deciding how to exploit the constraints in the system, channelling all attention and effort towards making the decision in step 2, elevating the constraint, and finally, in the event that a constraint has undergone rectification, the process reverts to step 1 intent on disallowing the occurrence of the just addressed and other constraints [15]. Ideally, TOC was founded on the idea that a critical chain would address all critical problems inherent in pre-existing project management methods and approaches. Goldratt argued in favour of two conceptual ideas when publishing TOC. First, he proposed the throughput concept whereby cause-and-effect frameworks have decisional impact on a project and, second, he emphasized the manner by which basic behaviour is dispensed in the project management environment. The application of TOC in project scope scheduling follows from what supporters of TOC have called "the TOC way of scheduling." The rationale is that the traditional critical path scheduling approach disregards resource availability while the TOC method espouses it to the extent that activities associated with one resource follow a series-wise schedule. The TOC approach also cushions critical activities from being delayed by non-critical ones this happens through the inclusion of feeding buffers which prevent alterations in the critical chain during project execution.

The Theory of change offers an understanding of the decisions made and the approaches adopted to address an apparent problem. The theory of change informs a set of assumptions defining a project activity, resource, or intervention that will eventually bring the needed change. The theory of change thus refers to a conceptual framework with the objective of linking the desired project outcome with given assumptions designed to necessitate that outcome. More functional definitions of the theory of change, as provided in [16], include a framework illustrating how and why a project works; a cumulative study of connections between project activities, outcomes, and contexts; and an explanation of how the project change manager can understand project activities to facilitate predetermined results that work towards achieving the intended outcome. In considering the above definitions, the overarching theme is that the theory of change is an effective tool for evaluating stakeholder engagement as it predicts the desired outcomes, the approaches needed to convert project activities into outcomes, and the contexts within which activity implementation applies. The theory of change helps the project (change) manager understand how engaging stakeholders can be effective towards promoting expected change in a project. The theory will not only demonstrate the extent of change that occurs due to a modified project scope, but it also illustrates how the change occurs thus highlighting areas where the change may have led to failure. [16] has noted that the feasibility of the theory of change in a scope change scenario is dependent upon the capacity of the stakeholder and project change manager to identify, prioritize, and analyse key project activities and contextual factors. The use of the

theory of change in the current study aligns with its ability to describe mechanisms of project scope change that lead towards the desired outcome. When applied in the context of project scope management, the theory will facilitate a segmental approach towards understanding the various elements of project scope management and thus obtain a full frame of the process.

## V. CONCEPTUAL FRAMEWORK

The successful implementation of infrastructural health program in Nairobi County serves as the dependent variable while the independent variables are scope planning, and scope change. The conceptual framework is presented in Figure I below.

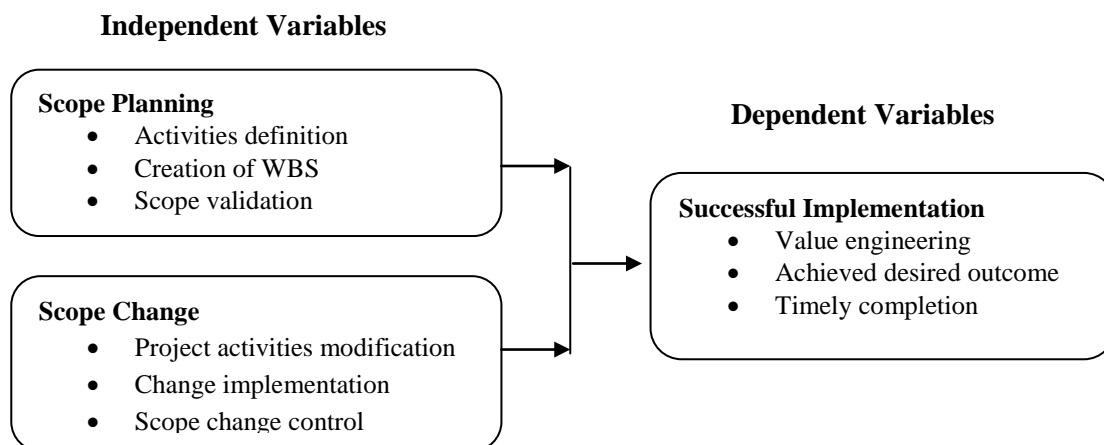


Figure I: The Conceptual Framework

## VI. RESEARCH METHODOLOGY

### A. Research Design

The study adopted the descriptive research design with the goal of prescribing an appropriate research framework for accomplishing the defined objectives [17]. This method provides accurate descriptive analysis of the characteristics of the population from which the study sample is drawn to make inferences about it. A descriptive research framework facilitates information collection on the current status of a person or an object [17].

### B. Target Population

A population is a defined population from where inferences from a properly selected sample refer [18]. The population considered in this study was to be obtained from 40 health projects involving construction and renovation of works in level 2, level 3 and level 4 hospitals within Nairobi County. The study targeted 120 respondents within technical mandate involved in the implementation of the health projects comprising of architects, project engineers (structural, mechanical and electrical engineers), quantity surveyors, project clients (ministry of health representatives and county health representatives), and contractors. Therefore, the unit of observation was 40 health projects while the unit of analysis was the personnel involved in these projects.

### C. Sample Size

Using the Yamane formula and the Krejcie & Morgan formula, a sample size of 92 respondents was drawn from a target population of 120 respondents. The sampling technique adopted for this study was simple random sampling. It is a probability method of selecting a sample. In random sampling, every individual has an equal chance of being selected in the sample from the population [19].

## VII. FINDINGS AND DISCUSSION

### A. Response Rate

The sample size elected for the study constituted 92 respondents each of which received a paper-pencil-style questionnaire. Out of the total distributed questionnaires, 78 were duly filled out and returned. The questionnaires that were handed back accounted for a response rate of 84.78%. According to [18] a high questionnaire response rate would be anything in the range of 75% or higher—therefore, the current study retained a high response rate which was suitable for the analysis of data, drawing inferences, and reporting findings.

**B. Descriptive Statistics of Study Variables**

The components in question and which formed the basis for the study were project scope, and project scope change. The main measures considered will be the sample mean (M) and the standard deviation (SD) of the Likert values under each construct. The five-point Likert scale was labelled as: 1 representing “Strongly Agree”, 2 representing “Agree”, 3 representing “Neutral”, 4 representing “Disagree”, and 5 representing “Strongly Disagree.” Using the mean to interpret findings implied that response outcomes would be categorized in ranges, so that a mean value of 1-1.4 implied strongly agree, 1.5-2.4 was agree, 2.5-3.4 implied neutral/unsure, 3.5-4.4 represented disagree, and 4.5-5 implied strongly disagree. A standard deviation equal to or exceeding 2 implied significant deviation of the responses from the mean while a standard deviation less than 2 implied that responses did not show any significant deviation from the mean.

**i. Scope Planning**

The results of the findings were presented as shown in Table I below.

**TABLE I: DESCRIPTIVE STATISTICS ON PROJECT SCOPE PLANNING**

Statement	1	2	3	4	5	M	SD
All activities to be carried out during the project execution are defined during scope planning	13	33	28	4	0	2.295	0.340
During scope planning, resources and material required for the project are set out in the project plan	33	39	4	1	1	1.692	0.272
The duration of the project is clearly planned for during scope planning	40	34	3	1	0	1.551	0.196
The views of all project stakeholders are taken into account in scope planning	20	17	28	10	3	2.474	0.680
Scope planning is a very important step in ensuring the successful implementation of a project	17	33	24	3	1	2.205	0.388
<b>Aggregate Score</b>						<b>2.044</b>	<b>0.375</b>

According to the findings tabulated in Table I, the respondents, on average, either agreed or strongly agreed with the statements characterizing the nature and role of project scope planning. These responses culminated in an aggregate mean value of 2.044 and a small standard deviation of 0.375. The findings indicated that the respondents generally agreed that scope planning incorporated a definition of all activities performed during project execution (M = 2.295, SD = 0.340). Respondents also agreed that at the scope planning stage, resources and materials needed to conduct the project are specified in the project plan (M = 1.692, SD = 0.272). The findings also indicated that respondent agreed with the statement that project timeframes, which specify durations of various project activities, are clearly planned for at the scope planning stage (M = 1.551, SD = 0.196). The respondents also agreed with the view that the needs of every project stakeholder are taken into account during scope planning (M=2.474, SD=0.680) and that scope planning is crucial towards the successful implementation of a project (M=2.205, SD=0.388). The findings emphasizing the importance of scope planning in successful project implementation dovetail nicely with those reported in [20] and [1] who linked project failure to poor project planning caused by, among other factors, project delays. The finding that project timeframe determination is part of project scope planning lends credence to the link between poor scope planning and project failure.

**ii) Scope Change**

The results for Scope change are as shown in Table II below

**TABLE II: DESCRIPTIVE STATISTICS ON PROJECT SCOPE CHANGE**

Statement	1	2	3	4	5	M	SD
A change in project activities results to change in project timelines	24	39	12	3	0	1.923	0.306
Allocation and use of project resources/materials is affected by a change in project activities	34	39	5	0	0	1.628	0.183
A change in project activities causes a change in project cost	34	34	4	6	0	1.769	0.356

A change in the project scope is adequately communicated to all the stakeholders of the project	2	17	39	16	4	3.038	0.473
A change in project cost interferes with the quality of the deliverables	9	23	31	12	3	2.705	0.566
<b>Aggregate Score</b>						<b>2.213</b>	<b>0.377</b>

In accordance to the findings tabulated in Table II, the respondents, on average, either agreed or were neutral/unsure about the questionnaire statements characterizing the outcomes of a project scope change. The responses produced an aggregate mean value of 2.213 and a standard deviation of 0.377. The tabulated results indicated that respondents were in agreement that a change in project activities resulted to changes in project timelines (M = 1.923, SD = 0.306) and that allocation and use of project resources/materials was affected by a change in project activities (M = 1.628, SD = 0.183). Respondents also agreed that changes in project activities led to changes in project cost (M = 1.769, SD = 0.356). However, respondents were neutral/unsure about whether changes in project scope were adequately communicated to all project stakeholders (M = 3.038, SD = 0.473). The respondents were also unsure whether changes in project cost interfered with the quality of the deliverables (M = 2.705, SD = 0.566). The findings associating changes in project activities to changes in project cost and timelines echoed the results reported in [21] providing that changes in project activities incite changes in scope specifically in terms of cost, time, and quality.

**iii) Project Success**

The responses from the study are shown in Table III below.

**TABLE III: DESCRIPTIVE STATISTICS ON PROJECT SUCCESS**

Statement	1	2	3	4	5	M	SD
When a project achieves the desired outcome, it's considered successful	37	40	1	0	0	1.538	0.139
A project is considered successful when it meets the need of beneficiaries	24	48	3	3	0	1.808	0.226
A project is considered successful when it satisfies quality expectations	28	29	16	4	1	1.987	0.447
A project is considered successful when it meets stakeholder expectations	26	35	15	2	0	1.910	0.312
Project success will be determined by timely completion of the project	42	35	1	0	0	1.474	0.139
<b>Aggregate Score</b>						<b>1.744</b>	<b>0.253</b>

According to the findings in Table III above, respondents, on average, either agreed or strongly agreed with statements about the determinants of project success—responses produced an aggregate mean value of 1.744 and a standard deviation of 0.253. The findings indicated that the respondents agreed with the statement that project a project is considered successful when it achieves the desired outcome (M = 1.538, SD = 0.139). Further, respondents agreed that a project was considered successful if it met beneficiary needs (M = 1.808, SD = 0.226), if it satisfied quality expectations (M = 1.987, SD = 0.447), and if it met stakeholder expectations (M = 1.910, SD = 0.312). Further, respondents strongly agreed project success was chiefly determined by timely completion (M = 1.474, SD = 0.139).

**C. Inferential Statistics**

The study computed Pearson correlation analysis and multiple regression analysis to test the relationship between variables.

**i. Correlation Analysis**

Correlation analysis was applied to the collected data as an approach for determining the statistical significance of the data, the degree of association between the variables, and the extent to which the dependent variable varies in relation to the independent variables. The correlation technique investigates the extent of the relationship between two variables. Results of the correlation analysis are tabulated in Table IV.

TABLE IV: A SUMMARY OF PEARSON’S CORRELATIONS

		Scope planning	Scope change	Project success
Scope planning	Pearson Correlation	1	.553*	.781*
	Sig. (2-tailed)	0	0	0
	N	78	78	78
Scope change	Pearson Correlation	.553*	1	
	Sig. (2-tailed)	0	0	0
	N	78	78	78
Project success	Pearson Correlation	.781*	.810*	1
	Sig. (2-tailed)	0	0	0
	N	78	78	78

\* Correlation is significant at the 0.05 level (2-tailed)

The correlation summary in Table IV above indicates that correlational association between each of the four independent variables and the dependent variable was significant at the 95% confidence level. A multiple correlation analysis was performed to establish the relationship between project scope management and the successful implementation of infrastructural health projects in Nairobi County. The Pearson correlation coefficient was computed and tested at the 5% significance level ( $p \leq 0.05$ ). First, a correlation analysis was performed to establish the relationship between project scope planning and the successful implementation of health projects in Nairobi County. The analysis indicated a strong positive relationship between scope planning and successful project implementation ( $r = 0.761$ ). A second correlation analysis was performed to establish the relationship between project scope scheduling and the successful implementation of health projects in Nairobi County—this also yielded a strong positive correlation ( $r = 0.754$ ).

ii. Regression Analysis

This study employed a multivariate regression analysis to determine the significance of the relationship between the dependent variable (successful project implementation) and the independent variables (project scope planning, and project scope change) pooled together. Table V tabulates the findings of the multivariate regression analysis.

TABLE V: SUMMARY OF REGRESSION COEFFICIENTS

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	1.831	.410		5.132	.000
Scope planning	.058	.099	.067	4.583	.001
Scope change	.020	.088	.026	1.231	.008

a. Dependent Variable: Successful implementation of infrastructural health projects in Nairobi County

The research used a multiple regression model of the form:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon$$

Where;

Y is the dependent variable (successful implementation of health infrastructural programs)

$\beta_0$  is the regression constant

$\beta_1, \beta_2, \beta_3$  and  $\beta_4$  are the coefficients of independent variables

$X_1$  is Scope planning

$X$  is Scope change

$\epsilon$  is the error term

The regression equation will be:

$$Y = 1.831 + 0.058 X_1 + 0.020 X_2$$

*iii. Analysis of Variance (ANOVA)*

The study employed a one-way analysis of variance (ANOVA) to establish whether there was any sign of statistically significant differences between the means of the four independent variables. A p-value of 0.007 rendered the results of the one-way ANOVA significant towards establishing how well the model fit the data—specifically, a p-value of <0.05 implied that the model was suitable for predicting how project scope planning, scope budgeting, project scope scheduling, and project scope change influenced successful implementation of health projects in Nairobi County. The reported F-value of 25.95 was greater than the F-critical value of 2.497 computed at 4 and 73 degrees of freedom respectively. The implication of this difference in F-values is that the model was fit for the data used in the study.

**TABLE VI: SUMMARY OF ONE-WAY ANALYSIS OF VARIANCE**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.463	4	1.116	25.95	.007 <sup>b</sup>
	Residual	3.129	73	.043		
	Total	7.912	77			

a. Dependent Variable: Successful implementation of infrastructural health projects in Nairobi County

b. Predictors: (Constant), scope change, scope budgeting, scope planning, project scope scheduling

**VIII. CONCLUSION**

Regression results revealed that scope planning has a significant positive influence on the successful implementation of infrastructural health programs. Based on the findings, the study concludes that an increase in scope planning would lead to an increase in the successful implementation of an infrastructural health program. The study, therefore, recommends project managers to make scope planning mandatory before initiating project implementation. It is also important to ensure that all activities are defined in the planning phase. The results further revealed that scope change has a positive and significant influence on the successful implementation of infrastructural health program. The study also established that the influence was considered significant. Based on the study findings, it was concluded that an increase in scope change would lead to an increase in the successful implementation of infrastructural health program. The study recommends project managers to have documented guidelines and ideologies to help them overcome an obstacle or a looming failure. They should have clear policies to mitigate and correct internal and external factors that would cause a change in the project scope and be a potential source of project failure.

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