

**DETERMINANTS OF SUCCESS OF PUBLIC  
CONSTRUCTION PROJECTS IN ETHIOPIA**

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by

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**to the**



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## CERTIFICATE

This is to certify that the thesis entitled “**Determinants of Success of Public Construction Projects in Ethiopia**”, being submitted by **Ephrem Girma Sinesilassie** to the **Indian Institute of Technology Delhi** for the award of the degree of **Doctor of Philosophy** is a bonafide record of the research work carried out by him under our supervision and guidance. The thesis work, in our opinion, has reached the requisite standard, fulfilling the requirements for the degree of **Doctor of Philosophy**.

The contents of this thesis, in full or in parts, have not been submitted to any other University or Institute for the award of any degree or diploma.

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## **ABSTRACT**

Public construction projects play a vital role in the economic growth of a country. The performance of these projects greatly depends on some critical factors which are responsible for their success/failure. Hence, understanding of the impact of these critical factors on public project performances is considered to be a means of improving their efficiencies and effectiveness.

The study was conceptualized and implemented in two phases. In phase one, a list of 35 attributes responsible for impacting the performance of the projects was identified based on a detailed literature review, and presented to construction professionals in public construction projects in Ethiopia in the form of a structured questionnaire. The responses were collected and analysed. Statistical analysis of responses differentiated them into distinct sets of success attributes and failure attributes. The significant success and failure attributes were then ranked on the basis of different project performance criteria.

For better understanding and to reduce the number of attributes, the success and failure attributes were subjected to factor analysis separately. After factor analysis, multivariate regression analysis were used to explore the relative importance of the factors extracted from factor analysis on various criteria of the success of public construction projects. The factor analysis yielded the following success factors for overall performance: project manager's competence, owner's competence, management support and updates, scope clarity, interaction among project participants, and monitoring and feedback. On the other hand, the following success factors were obtained for schedule performance: project manager's competence, interaction among project participants, scope clarity, monitoring and feedback, owner's competence, understanding responsibilities, pre-qualification, and adequate

plans and specifications. The success factors obtained for cost performance were: project manager's competence, scope clarity, owner's competence, monitoring and feedback, interaction among project participants, top management support, and quality control and assurance. The success factors obtained for quality performance were: quality assurance/control and scope clarity, top management support and resource availability, project manager's competence, owner's competence, and interaction among project participants. Finally, the success factors obtained for no-dispute performance were: availability of resources and pre-qualification, project manager's competence, top management support, owner's competence, interaction among project participants, construction meetings, and schedule and budget updates.

On the other hand, the factor analysis yielded the following failure factors for overall performance: project manager's ignorance and lack of knowledge, indecisiveness of project participant, project specific factors, conflict among project participants, socio-economic and climatic conditions, and owner's incompetence. For schedule performance, the failure factors were: conflict among project participants, project manager's ignorance and lack of knowledge, indecisiveness of project participants, unfavourable socio-economic and climatic conditions, project specific factors, and poor human resource management. The factors responsible for poor cost performance were: conflict among project participants, project specific factors, indecisiveness of project participants, project manager's ignorance and lack of knowledge, socio-economic and climatic conditions, and owner's incompetence. For poor quality performance: conflict among project participants, indecisiveness of project participants, project specific factors, project manager's ignorance and lack of knowledge, poor human resource management, and hostile social and economic environment. For no-dispute performance the failure factors were: conflict among

project participants, indecisiveness of project participants, project manager's ignorance and lack of knowledge, socio-economic and climatic condition, and project specific factors.

The relative importance of identified success factors was established with multiple regression analysis for overall performance, schedule performance, cost performance, quality performance, and no-dispute performance. Accordingly, the most important success factor for overall performance is found to be 'scope clarity'. 'Owner's competence' is the most important success factor when the objective is schedule performance. The factor 'scope clarity' is the most important success factor when the objective is cost performance. The factor 'quality assurance/control and scope clarity' is the most important success factor when the aim is quality performance, and the success factor 'owner's competence' is the most important when the aim is no-dispute performance.

The relative importance of identified failure factors was also established with multiple regression analysis for overall performance, schedule performance, cost performance, quality performance, and no-dispute performance. The most important failure factor for overall performance is found to be 'project manager's ignorance and lack of knowledge'. 'Conflict among project participants' is the most important failure factor when the objective is schedule performance. The factor 'conflict among project participants' is the most important failure factor when the objective is cost performance. The factor 'project manager's ignorance and lack of knowledge' is the most important failure factor when the objective is quality performance, and the failure factor 'conflict among project participants' is the most important when the objective is no-dispute performance. These results would be helpful to public

construction project professionals in enabling them to take appropriate proactive measures for the successful completion of public projects.

In phase two of the study, identification of success criteria for each phase of public construction projects was done. Based on an extensive literature review a list of eleven success criteria was identified for public projects. This was followed by a questionnaire survey employing the Delphi method. The results show that success criteria such as time, cost, quality, technical performance, satisfaction of key project participants, and social responsibility are the most important criteria for the pre-construction phase, while time, cost, quality, no-dispute, health and safety, satisfaction of key project participants, technical performance, and social responsibility are the most important criteria for the construction phase. In the post-construction phase satisfaction of end-users and outsiders, environmental sustainability, and satisfaction of key project participants are found to be the most important criteria. It is pointed out that the relative importance of different success criteria depends on the different phases of a construction project. Validation of the results is provided through case studies. The study offers valuable resources for the improvement of public construction project performance.

**Keywords:** Critical factors, success criteria, public construction projects, factor analysis, multiple regression analysis, structural equation modeling.

## सार

किसी देश के आर्थिक विकास में सार्वजनिक निर्माण परियोजनाएं महत्वपूर्ण भूमिका निभाती हैं। इन परियोजनाओं का प्रदर्शन बहुत महत्वपूर्ण कारकों पर निर्भर करता है जो कि उनकी सफलता / विफलता के लिए जिम्मेदार हैं। इसलिए, सार्वजनिक परियोजना प्रदर्शन पर इन महत्वपूर्ण कारकों के प्रभाव को समझना उनकी क्षमता और प्रभावशीलता में सुधार लाने का एक साधन माना जाता है।

अध्ययन को दो चरणों में अवधारणा और कार्यान्वित किया गया था एक चरण में, परियोजनाओं के प्रदर्शन को प्रभावित करने के लिए उत्तरदायी 35 विशेषताओं की एक सूची, विस्तृत साहित्य समीक्षा के आधार पर पहचान की गई थी, और रचनात्मक प्रश्नावली के रूप में इथियोपिया में सार्वजनिक निर्माण परियोजनाओं में निर्माण पेशवरों को प्रस्तुत किया गया था। प्रतिक्रियाओं को इकट्ठा और विश्लेषण किया गया। प्रतिक्रियाओं का सांख्यिकीय विश्लेषण उन्हें सफलता विशेषताओं और असफलताओं के अलग-अलग सेटों में विभेदित करता है। महत्वपूर्ण सफलता और विफलता विशेषताओं को तब विभिन्न परियोजना प्रदर्शन मानदंडों के आधार पर स्थान दिया गया था।

गुणों की संख्या को बेहतर समझने और कम करने के लिए, सफलता और असफलताओं के गुणों को कारक विश्लेषण के आधार पर अलग-अलग किया गया था। कारक विश्लेषण के बाद, मल्टीवीयेट रिपरेशन विश्लेषण का उपयोग सार्वजनिक निर्माण परियोजनाओं की सफलता के विभिन्न मानदंडों पर कारक विश्लेषण से निकाले गए कारकों के सापेक्ष महत्व की खोज के लिए किया गया था। कारक विश्लेषण ने समग्र प्रदर्शन के लिए निम्नलिखित सफलता कारकों को प्राप्त किया: प्रोजेक्ट मैनेजर की क्षमता, मालिक की क्षमता, प्रबंधन सहायता और अद्यतन, गुंजाइश स्पष्टता, परियोजना प्रतिभागियों के बीच बातचीत, और निगरानी और प्रतिक्रिया। दूसरी ओर, समय-समय पर प्रदर्शन के लिए निम्नलिखित सफलता कारक प्राप्त किए गए: प्रोजेक्ट मैनेजर की क्षमता, परियोजना प्रतिभागियों के बीच संपर्क, गुंजाइश स्पष्टता, निगरानी और प्रतिक्रिया, मालिक की योग्यता, जिम्मेदारियों को समझना, पूर्व-योग्यता और पर्याप्त योजनाएं और विशिष्टताओं। लागत प्रदर्शन के लिए प्राप्त सफलता कारक: परियोजना प्रबंधक की क्षमता, गुंजाइश स्पष्टता, मालिक की क्षमता, निगरानी और प्रतिक्रिया, परियोजना प्रतिभागियों के बीच बातचीत, शीर्ष प्रबंधन समर्थन और गुणवत्ता नियंत्रण और

आश्वासन। गुणवत्ता के प्रदर्शन के लिए प्राप्त सफलता कारक: गुणवत्ता आश्वासन / नियंत्रण और गुंजाइश स्पष्टता, शीर्ष प्रबंधन सहायता और संसाधन उपलब्धता, परियोजना प्रबंधक की क्षमता, मालिक की योग्यता और परियोजना प्रतिभागियों के बीच बातचीत। अंत में, कोई विवाद प्रदर्शन के लिए प्राप्त सफलता कारक: संसाधनों की उपलब्धता और पूर्व-योग्यता, प्रोजेक्ट मैनेजर की क्षमता, शीर्ष प्रबंधन समर्थन, मालिक की योग्यता, परियोजना प्रतिभागियों के बीच बातचीत, निर्माण की बैठकों और कार्यक्रम और बजट अपडेट।

दूसरी ओर, कारक विश्लेषण ने समग्र प्रदर्शन के लिए निम्न विफलता कारकों को प्राप्त किया: परियोजना प्रबंधक की अज्ञानता और ज्ञान की कमी, परियोजना प्रतिभागियों की अनिर्णायकता, परियोजना विशिष्ट कारक, परियोजना प्रतिभागियों, सामाजिक-आर्थिक और जलवायु परिस्थितियों में संघर्ष, और मालिक की अक्षमता कार्यक्रम के निष्पादन के लिए, विफलता कारक थे: परियोजना प्रतिभागियों, परियोजना प्रबंधक की अज्ञानता और ज्ञान की कमी, परियोजना प्रतिभागियों की अनिर्णायकता, प्रतिकूल सामाजिक-आर्थिक और जलवायु परिस्थितियां, परियोजना विशिष्ट कारकों और गरीब मानव संसाधन प्रबंधन। खराब लागत के प्रदर्शन के लिए जिम्मेदार कारक थे: परियोजना प्रतिभागियों, परियोजना विशिष्ट कारकों, परियोजना प्रतिभागियों की अनिर्णय, परियोजना प्रबंधक की अज्ञानता और ज्ञान की कमी, सामाजिक-आर्थिक और जलवायु परिस्थितियों और मालिक की अक्षमता के बीच संघर्ष। खराब गुणवत्ता के प्रदर्शन के लिए: परियोजना प्रतिभागियों के बीच संघर्ष, परियोजना प्रतिभागियों की अनिर्णय, परियोजना विशिष्ट कारक, परियोजना प्रबंधक की अज्ञानता और ज्ञान की कमी, गरीब मानव संसाधन प्रबंधन, और शत्रुतापूर्ण सामाजिक और आर्थिक वातावरण। बिना वाद-विवाद के प्रदर्शन के लिए विफलता कारक थे: परियोजना प्रतिभागियों के बीच संघर्ष, परियोजना प्रतिभागियों की दुविधा, परियोजना प्रबंधक की अज्ञानता और ज्ञान की कमी, सामाजिक-आर्थिक और जलवायु परिस्थिति, और परियोजना विशिष्ट कारक

पहचान की गई सफलता कारकों का सापेक्ष महत्व समग्र निष्पादन, अनुसूची प्रदर्शन, लागत प्रदर्शन, गुणवत्ता प्रदर्शन, और कोई विवाद प्रदर्शन के लिए कई प्रतिगमन विश्लेषण के साथ स्थापित किया गया था। तदनुसार, समग्र प्रदर्शन के लिए सबसे महत्वपूर्ण सफलता कारक 'स्कोप स्पष्टता' पाया जाता

है 'स्वामी की योग्यता' का उद्देश्य सबसे महत्वपूर्ण सफलता का कारक है, जब उद्देश्य का समय-सारण प्रदर्शन होता है। कारक 'गुंजाइश स्पष्टता' सबसे महत्वपूर्ण सफलता का कारक है जब उद्देश्य लागत प्रदर्शन है। कारक गुणवत्ता आश्वासन / नियंत्रण और गुंजाइश स्पष्टता सबसे महत्वपूर्ण सफलता का कारक है जब लक्ष्य गुणवत्ता का प्रदर्शन होता है, और सफलता का कारक 'मालिक की योग्यता' सबसे महत्वपूर्ण है जब उद्देश्य कोई विवाद प्रदर्शन नहीं है।

पहचाने गए विफलता कारकों का सापेक्ष महत्व भी समग्र प्रदर्शन, अनुसूची प्रदर्शन, लागत प्रदर्शन, गुणवत्ता प्रदर्शन, और कोई विवाद प्रदर्शन के लिए कई प्रतिगमन विश्लेषण के साथ स्थापित किया गया था। समग्र निष्पादन के लिए सबसे महत्वपूर्ण विफलता कारक 'परियोजना प्रबंधक की अज्ञानता और ज्ञान की कमी' पाया जाता है 'परियोजना प्रतिभागियों के बीच संघर्ष' सबसे महत्वपूर्ण असफलता का कारक है, जब उद्देश्य का समय कार्यक्रम का प्रदर्शन होता है। परियोजना प्रतिभागियों के बीच कारक 'संघर्ष सबसे महत्वपूर्ण असफलता का कारक है जब उद्देश्य लागत प्रदर्शन है। कारक 'प्रोजेक्ट मैनेजर की अज्ञानता और ज्ञान की कमी' का उद्देश्य सबसे महत्वपूर्ण असफलता का कारक है, जब उद्देश्य गुणवत्ता का प्रदर्शन होता है, और विफलता का कारण 'प्रोजेक्ट प्रतिभागियों के बीच संघर्ष' सबसे महत्वपूर्ण होता है जब उद्देश्य कोई विवाद नहीं होता है। ये परिणाम सार्वजनिक परियोजनाओं के सफल समापन के लिए उपयुक्त सक्रिय उपाय करने के लिए सार्वजनिक निर्माण परियोजना पेशेवरों के लिए उपयोगी होंगे।

चरण के दो अध्ययनों में, सार्वजनिक निर्माण परियोजनाओं के प्रत्येक चरण के लिए सफलता मानदंड की पहचान की गई थी। व्यापक परियोजनाओं के आधार पर सार्वजनिक परियोजनाओं के लिए ग्यारह सफलता मानदंडों की सूची की पहचान की गई। इसके बाद डेल्टा पद्धति का इस्तेमाल करने वाले एक प्रश्नावली सर्वेक्षण का पालन किया गया। परिणाम बताते हैं कि समय, लागत, गुणवत्ता, तकनीकी प्रदर्शन, प्रमुख परियोजना प्रतिभागियों की संतुष्टि और सामाजिक जिम्मेदारी जैसे सफलता मानदंड पूर्व-निर्माण चरण के लिए सबसे महत्वपूर्ण मानदंड हैं, जबकि समय, लागत, गुणवत्ता, कोई विवाद, स्वास्थ्य और निर्माण, प्रमुख परियोजना प्रतिभागियों की सुरक्षा, तकनीकी प्रदर्शन और सामाजिक जिम्मेदारी के निर्माण के चरण के लिए सबसे महत्वपूर्ण मानदंड हैं। बाद के निर्माण चरण में अंत

उपयोगकर्ताओं और बाहरी लोगों की संतुष्टि में, पर्यावरण की स्थिरता और महत्वपूर्ण परियोजना प्रतिभागियों की संतुष्टि को सबसे महत्वपूर्ण मानदंड माना जाता है। यह बताया गया है कि विभिन्न सफलता मानदंडों के सापेक्ष महत्व एक निर्माण परियोजना के विभिन्न चरणों पर निर्भर करता है। मामले के अध्ययन के माध्यम से परिणामों की मान्यता प्रदान की जाती है। अध्ययन सार्वजनिक निर्माण परियोजना के प्रदर्शन में सुधार के लिए मूल्यवान संसाधन उपलब्ध कराता है।

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## LIST OF ABBREVIATIONS

AAHCP	Addis Ababa Housing Construction Project
ANOVA	Analysis of Variance
AVE	Average Variance Extracted
BSc	Bachelor of Science
CCECC	China Civil Engineering Construction Corporation
CFA	Confirmatory Factor Analysis
CCF	Critical Failure Factor
CFI	Comparative Fit Index
CM	Construction management
CPP	Conflict Among Project Participant
CR	Construct Reliability
CRG	China Railway Group
CSF	Critical Success Factor
CWE	China International Water and Electric Corporation
DBST	Double Bitumen Surface Treatment
EEPC	Ethiopian Electric Power Corporation
EIR	Executive Intelligence Review.
ERA	Ethiopian Roads Authority
ERC	Ethiopian Railways Corporation
ETB	Ethiopian Birr
EWWCCE	Ethiopian Water Works Construction Enterprise
GLM	General Linear Modeling
GoF	Goodness-of-Fit
IAPP	Interaction Among Project Participants
ICB	International Competitive Bidding

IFI	Incremental Fit Index
IPP	Indecisiveness of Project Participant
IQR	Inter-Quartile Range
KMO	Kaiser-Meyer-Olkin
LISREL	Linear Structural Relations
MF	Monitoring And Feedback
MOE	Ministry of Education
MoUDC	Ministry of Urban Development and Construction
MR	Multiple Regression
MSU	Management Support And Updates
NBS	National Building Specification
NNFI	Nonnormed Fit Index
OC	Owner's Competence
OI	Owner Incompetence
OWWCE	Oromia Water Works Construction Enterprise
PE	Professional Engineer
PM	Project Manager
PM4DEV	Project Management for Development
PMBOK	Project Management Body of Knowledge
PMC	Project Manager's Competence
PMILK	Project Manager's Ignorance And Lack Of Knowledge
PPP	Public-Private Partnership
PSF	Project Specific Factors
RIR	Relative-Interquartile-Range
RMSEA	Root Mean Square Error of Approximation
SC	Scope Clarity
SECC	Socio Economic And Climatic Condition

SEM	Structural Equation Modeling
Sig	Significance
SNNPR	Southern Nations, Nationalities, and Peoples' Region
SPSS	Statistical Package for Social Science
TIUDB	Trade, Industry and Urban Development Bureau
TLI	Tucker Lewis Index
TQM	Total Quality Management
UK	United Kingdom
USA	United State of America