Jilin Daxue Xuebao (Gongxueban)/Journal of Jilin University (Engineering and Technology Edition)
ISSN: 1671-5497
E-Publication: Online Open Access
Vol: 43 Issue: 05-2024
DOI: 10.5281/zenodo.11145701

MEDIATING ROLE OF PROJECT MANAGEMENT PERSONAL COMPETENCE FOR CRITICAL SUCCESS FACTOR ON ROAD PROJECT SUCCESS IN ETHIOPIA

BEREKET ELIAS ERA *
PhD Student, Department of Civil Engineering, Andhra University, Visakhapatnam, Andhra Pradesh, India.
*Corresponding Author Email: bereketeliasera.rs@andhrauniversity.edu.in,
ORCID ID: 0000-0002-7372-7281

C.N.V. SATYANARAYANA REDDY
Professor, Head of Department of Civil Engineering, Andhra University, Visakhapatnam, Andhra Pradesh, India,
Director, Development Center, Andhra University, Visakhapatnam, Andhra Pradesh, India.
Email: prof.cnvsreddy@andhrauniversity.edu.in, ORCID ID: 0000-0002-8684-2529

V. KRISHNA MOHAN
Professor, Department of Commerce and Management Studies, Andhra University, Visakhapatnam, Andhra Pradesh, India. Email: Prof.vkmohan@andhrauniversity.edu.in

Abstract

The majority of developing countries still have fragmented structures and methods for managing projects, which leads to a high failure, abandonment, or collapse rate for both government and private sector projects. Due to poor project management practices, incompetence of project management practitioners, and a lack of understanding of the fundamentals of project management, there is a significant waste of scarce resources, and budget overruns and delays are common. These factors are major barriers to the advancement of project management in developing countries. Moreover, success factors are typically expressed in terms that are either general or specific to a given project. Therefore, this study aims to analyse the project manager and team competence and its mediating role for critical success factors in order to efficiently achieve project completion and improve the effective performance of road construction projects regulated under the south region construction project management directorate of Ethiopian Road Administration. The descriptive and inferential statistical methods were used to analyse the data gathered through questionnaires from 246 participants from contractors, consultants, and clients. Critical success factors were found to have a positively contributed effect on both project management personal competence and project success. Besides project management personal competence has a direct positively contributed effect on project success, it has a partial mediation role for critical success factors on project success. Besides its contribution to knowledge in pertinent areas, it helps construction companies to grow by managing such identified critical success factors.

Keywords: Critical Success Factor, Moderating Role, Project Management Personal Competence, Project Success, Ethiopia.

1. INTRODUCTION

Project management in most developing nations remains fragmented in structures and methods, resulting in a high failure, abandonment, or collapse rate for both public and private sector projects. Therefore, major barriers to the advancement of project management in developing nations include inadequate project management practices, the incompetence of project management practitioners, and a lack of knowledge of the fundamentals of project management.

Jilin Daxue Xuebao (Gongxueban)/Journal of Jilin University (Engineering and Technology Edition)
ISSN: 1671-5497
E-Publication: Online Open Access
Vol: 43 Issue: 05-2024
DOI: 10.5281/zenodo.11145701

These issues result in significant resource waste, frequent project delays, and budget overruns [1]. Several project management practices, tools, techniques, and propositions were based on the authors' experience or conceptual presumptions rather than rigorous empirical study. Their impact on project success was not empirically supported [2]. Moreover, success factors are typically expressed in terms that are either general or specific to a given project. Therefore, project management effectiveness depends on our comprehension of the critical success/failure factors, how to measure them, and how they interact [3].

Project managers must possess expertise in areas that impact successful completion [4]. Project managers who lack the necessary qualifications and administrative skills are connected to project failure [5]. Top project failure reasons were enumerated by the Standish Group [6]: Lack of ability to highlight the significance of the project and organizational features, such as project complexity, project management methodology, tools, and infrastructure; improper project scope definition; inadequate project communication; and inadequate project management competencies.

Therefore, this study aimed to examine project manager and team competence in applying project management practices and its mediating role for critical success factors on the project's success in order to expeditiously achieve project completion and enhance the effective performance of public road construction projects regulated under the south region construction project management directorate of Ethiopian road administration. This study will add to the body of knowledge by producing hypotheses regarding the influence of manager and team competence and how it mediates the effects of critical success factors on project success.

2. LITERATURE REVIEW

2.1 Critical Success Factors

Project success factors, like definitions of success, are not project-universal because different projects and individuals highlight distinct sets of success factors. Critical success factors are the independent variables that can affect and increase the chance of project success [7]. It is widely held that a project's mission is one of the most important factors in defining its scope, direction, goals, and objectives. All project participants must concur on the project's goals and objectives in order for it to succeed. Moreover, the backing and commitment of top management, along with those of senior executives inside the organization, provide a project with a distinct significance and significantly increase its chances of success from the outset [7]–[9].

In order for the project manager and other stakeholders to be informed about the project's progress and take appropriate action in the event of any potential defects or omissions, it is crucial to emphasize that accurate and thorough project monitoring and control are essential. Aside from that, during the project's lifecycle, all stakeholders prioritise and intend to communicate both internally and externally. In project management, however, the "human aspect" is associated with the competence and experience of the project manager or leader.

Jilin Daxue Xuebao (Gongxueban)/Journal of Jilin University (Engineering and Technology Edition)
ISSN: 1671-5497
E-Publication: Online Open Access
Vol: 43 Issue: 05-2024
DOI: 10.5281/zenodo.11145701

A project's ability to succeed often depends heavily on the human aspect. It is also important to note that the project manager has a greater influence on project success than typical technical success factors [7]–[12].

Political and economic environments, the use of project management tools (such as time-scheduling), a project manager and project team with strong managerial skills and experience, adequate financial and technical resources, effective change management, and clearly defined objectives are among the factors that have been shown to have a greater impact on project success [13]. Other critical success factors related to project management that can have a significant impact on project success include: adequate communication, control mechanisms, feedback capabilities, troubleshooting, coordination effectiveness, decision-making effectiveness, monitoring, project organization structure, plan and schedule followed, and related prior management experience [14]–[16].

The project manager is one of the key players in a construction project, and their competency has a big influence on scheduling, communication, and planning [3]. The skills and traits of project managers, as well as their dedication, competence, experience, and authority, are factors that are believed to have a significant influence on the success of projects [15]. Table 2.1 below lists the key success factors that this study found, along with citations for each.

Table 2-1: Project Success Factor

S/N	Critical Success Factor	Reference
1	Clear, realistic objectives	[6]; [8]-[9]; [13]; [17]-[21]
2	Project size and level of complexity	[3]; [8]-[10]; [19]; [21]-[23];
3	Minimal scope change/ effective change management	[24]; [26]
4	Effective consultation with key stakeholders and beneficiaries	[18]; [24]-[26];
5	Project risk and liability management	[18]-[19]; [21]; [24]
6	Good planning and scheduling methods	[8]-[13]; [18]; [21]; [24]-[26]
7	Motivated and well-integrated team/Good leadership	[10]; [24]-[26]
8	Troubleshooting	[27]-[28]
9	Project organizational structure	[3]; [8]-[10]; [17]; [21]-[23]
10	Adequate resource availability (finance, labour, plant, materials)	[13]; [18]; [21]; [24]-[25]
11	Top management and sponsor support	[3]; [6]; [7]-[10]; [13]; [18]; [21]
12	Continuous performance measurement	[10]; [21]; [25]
13	Open and effective communication	[8]-[12]
14	Thorough technical understanding/capability of project	[21]; [24]-[25]
15	Effective Monitoring and feedback	[8]-[10]; [13]; [18]-[19]; [21]-[24];
16	Proven/Familiar Technology/Technological environment	[8]-[11]; [13]
17	Political stability/ Political environment	[8]-[11]; [13];
18	Economic environment, economic factors/risks, the national economy	[8]-[11]

2.2 Project Management Competence

The Latin word "competentia," which means "allowed to judge" and "has the right to speak," is the root of the English term "competence." Competence is the set of skills, knowledge, personal attitudes, and relevant experience needed to carry out a certain task

Jilin Daxue Xuebao (Gongxueban)/Journal of Jilin University (Engineering and Technology Edition)
ISSN: 1671-5497
E-Publication: Online Open Access
Vol: 43 Issue: 05-2024
DOI: 10.5281/zenodo.11145701

[29]. According to Palan [30], the terms "competence" and "competencies" refer to a state or quality of being able and fit. The PMCD framework defines competency for project managers as the ability to carry out activities in a project setting that produce expected results in accordance with specified and acknowledged criteria [31].

In addition to being competent in areas that directly affect successful outcomes, project managers must also possess the competence that is a determining factor in effective project delivery [4]. Abraham et al. [32] further describe competence as a collection of attributes, actions, and traits necessary for efficient work performance. Moradi and Kahkonen, Aaltonen [33] adopted the definition of competency as the ability to use skills, knowledge, and personal traits that enhance project managers' efficiency and effectiveness in their work performance and, consequently, raise the possibility of project success. This definition was based on their comparison of research and industry views on project managers' competencies.

Project management competencies are categorised into three groups under the IPMA Competence Baseline (ICB) competency model [29]:

- ✓ Basic project management skills are characterised by the **technical competency range**. Solid elements, or project management content, are included in this category. Under this group, the ICB consists of twenty technical competence elements.
- ✓ The Personal Project Management Competency Elements are explained by the **Behavioural Competence Range**. This category covers the project manager's attitudes and abilities. Under this group, the ICB consists of 15 behavioural competency elements.
- ✓ The **Contextual Competency Range** is employed to describe project management competencies pertinent to the context of the project. This scope encompasses the project manager's ability to oversee interactions with line management and the ability to work in a project-oriented setting.

Additionally, the three dimensions of project management competency are outlined in the PMCD framework [31]:

- **Knowledge Competence**. What knowledge the project manager possesses on the application of processes, tools, and techniques for project-related tasks. Demonstration of these abilities can come from passing appropriately accredited testing, such as the PMP® exam or an equivalent international project management accreditation.
- **Performance Competence.** The manner in which the project manager applies project management knowledge to fulfil project requirements. They can demonstrate their competence by assessing project-related actions and results.
- **Personal Competence.** The conduct of project managers throughout tasks within the project setting, as well as their attitudes and personality traits. By evaluating the project manager's behavior, this can be proven.

Jilin Daxue Xuebao (Gongxueban)/Journal of Jilin University (Engineering and Technology Edition)
ISSN: 1671-5497
E-Publication: Online Open Access
Vol: 43 Issue: 05-2024
DOI: 10.5281/zenodo.11145701

Humans are the foundation of project management. To effectively collaborate with others, a project manager needs to possess certain abilities, which are referred to as personal competencies. Personal competencies are the attitudes, behaviours, cultural influences, and fundamental personality traits that assist individuals in managing programmes, projects, and portfolios. The PMCD Framework states that personal competence enhances a project manager's ability to apply knowledge and performance competence on projects [31]. This study has focused only on personal competencies which include the personal competence of the project manager and team.

Moradi, Kahkonen, and Aaltonen [33] developed a categorization of project managers' weighty competencies: Personal, Performance, Perspective, and Interpersonal. This was done after a thorough review of the literature that included both prior studies on project managers' competencies and project management standards of practice (ICB.4, PMCD.3, PMBOK, and APM). Leadership, goal orientation, creativity, problem solving, teamwork and cooperation, initiative, analytical thinking, decision making, flexibility, self-confidence, conceptual thinking, information seeking, ethics, proactivity, self-assessment, self-control, conscientiousness, sensitivity, directiveness, experience, assertiveness, emotional resilience, diagnostic of concepts, perceptual objectivity, trustworthiness, stress management, and cognitive capability are the categories of personal competence that emerged from the structuring of weighty competencies. Based on the standards of practice and the Moradi and Kahkonen, Aaltonen study, the followings has been taken into consideration for this study: Communication, Leadership, Teamwork and cooperation, Directiveness, Cognitive Ability, Problem solving, Assertiveness, Flexibility, Goal orientation, Analytical thinking, Proactivity, Decision making, Emotional resilience, Professionalism, and Experience.

2.3 Effects on Project Success

Pinto and Trailer [34] examined a number of characteristics that make a project manager successful. The success of the project benefits from these qualities. More importantly, a great project manager must possess both technical and leadership skills. Additionally, studies have shown that specific managers' personal competence is required for a variety of tasks and positions [35]. In a similar vein, project success is seen to be positively impacted by project manager competence. These studies have shown a relationship between project performance and project management competency [36].

3. RESEARCH METHODOLOGY

3.1 Description of the Study Area

The study area of this research was in different projects under the South Region Construction Project Management Program Directorate which is one of the five regional construction project management program directorates in Ethiopia Road Administration. This region directorate is composed of four construction project management offices, all of which take share of road construction projects. These four construction project management offices are Shashamene area construction project management office regulating nine projects, Wolaita Sodo area construction project management office

Jilin Daxue Xuebao (Gongxueban)/Journal of Jilin University (Engineering and Technology Edition)
ISSN: 1671-5497
E-Publication: Online Open Access
Vol: 43 Issue: 05-2024
DOI: 10.5281/zenodo.11145701

regulating thirteen projects, Jinka area construction project management office regulating eight projects, and Negele Borena area construction project management office regulating three projects. However, the study area excludes the projects regulated under Negele Borena area construction project management office, this is because all projects were inactive and the staffs was not available due to severe security problems in the area.

3.2 Study Population

The parent group from which a sample is to be drawn is referred to as the population, or the total mass of observations [37]. The study populations that have been considered in this research are: five participants from contractors per every project and four participants from consultants per every project, a total of one hundred fifty contractor participants and one hundred twenty consultant participants involved directly in a total of thirty road construction projects regulated under the south region construction project management program directorate, Ethiopia Road Administration. Additionally, twenty clients' participants were from three area construction project management offices under the south region construction project management program directorate, Ethiopia Road Administration. Participants of the main actors/companies were selected from the role in project management as Counterpart Project Engineer, Team Leader, Project Manager/Deputy Project Manager, Resident Engineer/Assistant Resident Engineer, General Manager/Director/Coordinator, and Other Roles in Project Management.

3.3 Sampling Technique

For this study stratified random sampling was adopted so as to ensure representativeness of the sample, hence the study populations who participated in the road construction projects are from different characters and types of firms those are Contractors, Consultants, and Clients. According to Fellows and Liu [38], stratified sampling is appropriate in situations when the population is divided into discrete groups or strata. Using stratified sampling, the researcher splits the population into smaller, homogeneous groups (called strata) based on certain criteria, then randomly selects a predefined number of units from each strata [39].

3.4 Sample Size

According to Dawson [40] notes that the correct sample size in a study is dependent on the nature of the population and the purpose of the study. This study applied the Kish [41] formula adopted by Dawson for the determination of the sample size:

$$n = \frac{n1}{1 + n1/N} \quad = 100/\,(1 + (100/290)) \quad = 75 \tag{1}$$

Where:

N = Total population=290

n = sample size from finite population=75

n1 = sample size from infinite population = S2/E2 =0.25/0.052=100

Jilin Daxue Xuebao (Gongxueban)/Journal of Jilin University (Engineering and Technology Edition)
ISSN: 1671-5497
E-Publication: Online Open Access
Vol: 43 Issue: 05-2024
DOI: 10.5281/zenodo.11145701

S2 = the variance of the population elements = p*(1-p) = 0.5*(1-0.5) = 0.25

P = proportion of the population elements that belong to the defined category

E = standard error of the sampling distribution

Assumptions:

Confidence level = 95%

Population proportion, p = 0.5

Margin of error, E = ±5% =±0.05

In addition to the determined sample size, 228% of the sample size was made for consideration of structural equation modeling sample size minimum requirement and to compensate for non-response. Therefore, the total sample size is 246.

Table 3.1: Sample Frame for Sampling and Data Collection Method

Item No.	Types of firms	Total Population	Sample size	In %	Research instrument
1	Client	20	12	52.84	Questionnaire
2	Contractor	150	130	42.28	Questionnaire
3	Consultant	120	104	4.88	Questionnaire
Total		290	246		

3.5 Data analysis

Both descriptive and demographic data were analysed using IBM SPSS v.23 and Microsoft Excel. The descriptive analysis included presenting the cumulative data in charts and tables that illustrated the frequency distribution. Likert's scale of five ordinal measures of agreement towards each statement (1, 2, 3, 4, and 5) was used to calculate the mean ranking for each project management practice, success criteria, critical success factors, project manager and team competence, and their effects on the project success that is used to determine the mean ranking as shown in the following table 3.2

Table 3.2: Ordinal Scale for Data Measurement for Critical Success Factor

Item	Not Significant	Slightly Significant	Moderately Significant	Very Significant	Extremely Significant
Scale	1	2	3	4	5

Table 3.3: Ordinal Scale for Data Measurement for Project Manager and Team Competence

Item	Not Important	Less Important	Important	More Important	Most Important
Scale	1	2	3	4	5

To establish an appropriate model for testing the research hypotheses regarding the impacts of latent constructs on the other variables, this study used structural equation modeling, which is widely considered the most effective statistical method for this purpose. Structural equation modeling systematically combines confirmatory factor analysis, multiple regression analysis, and path analysis. It incorporates a measurement model for confirmatory factor analysis of how well latent constructs (i.e., group factors

Jilin Daxue Xuebao (Gongxueban)/Journal of Jilin University (Engineering and Technology Edition)
ISSN: 1671-5497
E-Publication: Online Open Access
Vol: 43 Issue: 05-2024
DOI: 10.5281/zenodo.11145701

drawn from factor analysis) are represented by observed indicators and a structural model for multiple regression analysis and path analysis to model relationships between latent variables and a final outcome [42].

In this study, IBM-SPSS-AMOS 24.0 software has been used for Structural Equation Modelling (SEM). This study uses the following indicators as the fitness criteria in Table 3.4:

Table 3.4: Cutoff Criteria [43]

Measure	Terrible	Acceptable	Excellent
CMIN/DF	> 5	> 3	> 1
CFI	< 0.90	< 0.95	> 0.95
SRMR	> 0.10	> 0.08	< 0.08
RMSEA	> 0.08	> 0.06	< 0.06
PClose	< 0.01	< 0.05	> 0.05

A model that fits well does not always imply that it is valid [44]. As a result, the measurement model evaluation involves the assessment of reliability and validity done via factor loadings (average value must be equal/greater than 0.7), Cronbach alpha (value must be equal/greater than 0.7), composite reliability (value must be equal/greater than 0.7), and convergent validity through average variance extracted (AVE) (value must be equal/greater than 0.5). Discriminant validity is also assessed via Fornell & Larker criterion, and Heterotrait-Monotrait ratio (HTMT). They were assessed utilizing Microsoft Excel, Statistical Package for Social Science (SPSS) version 23, and additionally, AMOS provided by James Gaskin in the Stats Tool Package [43].

The degree to which each item in the correlation matrix correlates with the specified principal component is indicated by factor loading. Higher absolute values of factor loadings indicate a stronger correlation between the item and the underlying factor, which can vary from -1.0 to +1.0 [45]. Items with a factor loading between 0.40 and 0.70 should be examined for retention or deletion, according to Hair et al. [46]. If additional measures of validity and reliability are higher than the threshold values required to maintain content validity, these items can be kept in the model; otherwise, they have to be eliminated.

The degree of stability and consistency of a measurement instrument is known as its reliability. Repeatability is the key component of reliability. It provides a response to the query, "Will an instrument yield the same results if administered repeatedly" [47]. The two most popular techniques for assessing reliability are Cronbach Alpha and Composite Reliability (CR). Values of 0.70 and above are the cutoff points for both composite reliability and Cronbach alpha.

The degree of agreement between several attempts (items used) to measure the same concept is known as construct validity. According to this theory, "if two or more measures of the same thing are valid measures of the concept, they should covary significantly" [48]. Average variance extracted (AVE) is a method used to measure convergent validity. When AVE values are greater than 0.50, convergent validity is considered to be maintained [49].

Jilin Daxue Xuebao (Gongxueban)/Journal of Jilin University (Engineering and Technology Edition)
ISSN: 1671-5497
E-Publication: Online Open Access
Vol: 43 Issue: 05-2024
DOI: 10.5281/zenodo.11145701

The degree to which empirical evidence distinguishes one construct from another is known as discriminant validity [46]. HTMT and the Fornell and Larker criteria were used to measure the study's construct validity.

If the square root of a latent variable's AVE value is greater than its correlation values with every other latent variable in the model, discriminant validity is maintained, as per the Fornell and Larcker [49] criterion. Furthermore, in order to establish discriminant validity, Hair et al. [46] suggested using HTMT. The HTMT value scale runs from 0 to 1, with 1 denoting ideal correlation and 0 denoting no correlation. Furthermore, when HTMT values are less than 0.90, ideally less than 0.85, discriminant validity is considered to have been established.

The structural relationships (hypotheses) of project management personal competence, critical success factor, and project success dimensions are shown in Fig. 3.1 below, which is a hypothetical diagram of the structural model.

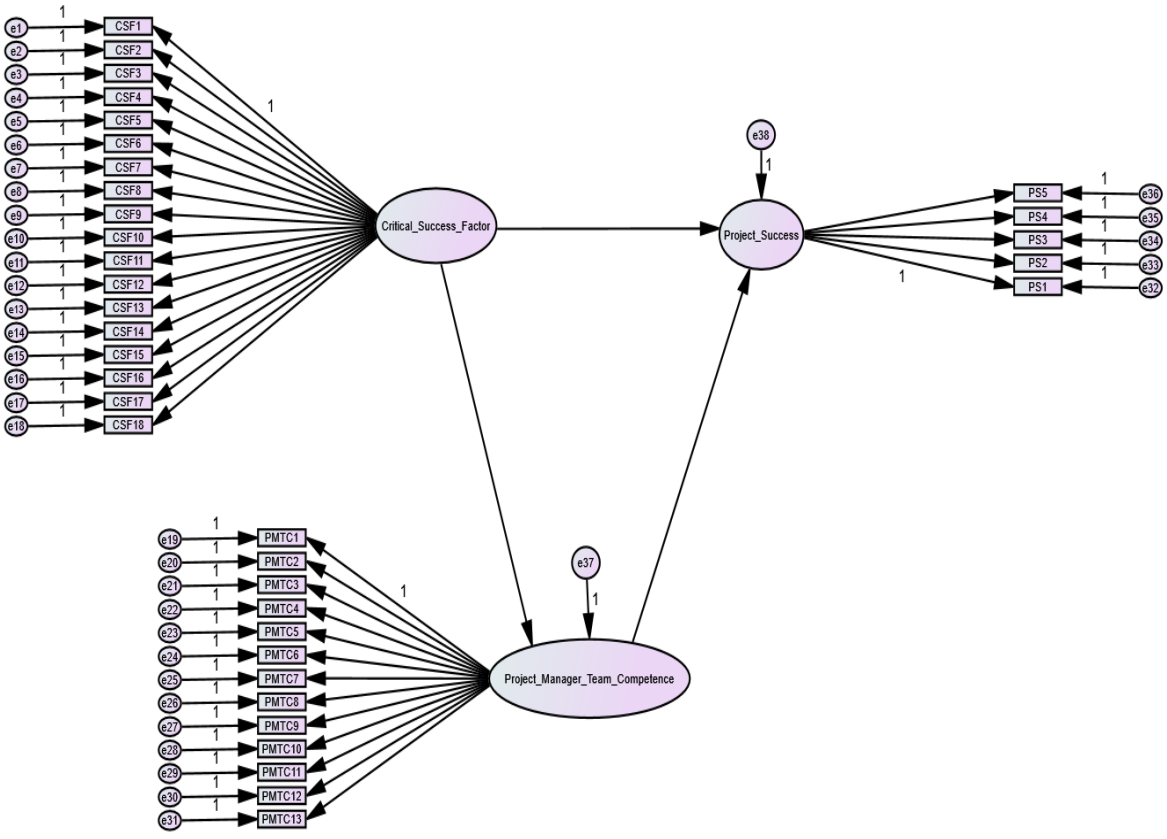

Figure 3.1: A Hypothetical Diagram of the Structural Model for the Relationships between Project Manager and Team Competence, Critical Success Factor and Project Success.

Jilin Daxue Xuebao (Gongxueban)/Journal of Jilin University (Engineering and Technology Edition)
ISSN: 1671-5497
E-Publication: Online Open Access
Vol: 43 Issue: 05-2024
DOI: 10.5281/zenodo.11145701

From figure 3.1 shown in above, four hypotheses represent the relationships between project manager and team competence, critical success factor, and project success, these are:

H1: Critical success factor has a direct positive impact on project success.

H2: Project manager and team competence has a direct positive impact on project success.

H3: Critical success factor has a direct positive impact on project manager and team competence.

H4: Project manager and team competence have the mediating role to the critical success factor for the impact on project success.

4. RESULT AND DISCUSSION

4.1 Response Rate and Types of Respondents Firms

The questionnaire was sent out to a total of randomly selected 246 respondents of construction companies and clients involved in the road construction projects regulated under the south region construction project management program directorate, Ethiopia Road Administration, and requesting their contribution in completing the questionnaire thereby providing the demographic information and ranking the identified project management practices, project success criteria, critical success factor, and project manager and team competence using an ordinal scale. A total of 246 completed questionnaires were returned. From total returned questionnaire 42.3% of respondents with 100% response rate are from consultants, 52.8% of respondents with 100% response rate are from contractors and 4.9% of respondents with 100% response rate are from clients. Hence, this represents a full response rate and can be mentioned as very good workable questionnaire returned.

4.2 Respondent's Highest Educational Qualification

Most of the respondents that were sampled were holder of BSc and Master's degree. Out of 246 respondents, 31% of respondents had Master's degree and 69% of respondents had BSc degree; and this implies that the data were collected from high qualified respondents in their discipline.

4.3 Respondent's Qualification in Project Management

The majority of the respondents with 94.7% have not received the project management qualifications. This implies that the training and certification in project management qualifications is very imperative for those who managing the construction project to be equipped with better project management knowledge and skills.

4.4 Measurement Model

Quality of the constructs in the study is assessed based on the evaluation of the measurement model. This measurement model first proposed to contain the sub-constructs with its pertinent sixteen latent constructs which are the two independent

Jilin Daxue Xuebao (Gongxueban)/Journal of Jilin University (Engineering and Technology Edition)
ISSN: 1671-5497
E-Publication: Online Open Access
Vol: 43 Issue: 05-2024
DOI: 10.5281/zenodo.11145701

variables and one dependent variable. The independent variables are: critical success actors has eighteen measured items: clear and realistic objectives (CSF1), project size and level of complexity (CSF2), minimal scope change/ effective change management (CSF3), effective consultation with key stakeholders and beneficiaries (CSF4), project risk and liability management (CSF5), good planning and scheduling methods (CSF6), motivated and well-integrated team/good leadership (CSF7), troubleshooting (CSF8), project organizational structure (CSF9), adequate resource availability (finance, labour, plant, materials) (CSF10), top management and sponsor support (CSF11), continuous performance measurement (CSF12), open and effective communication (CSF13), thorough technical understanding/ capability of the project (CSF14), effective monitoring and feedback (CSF15), proven/familiar technology/ technological environment (CSF16), political stability/ political environment (CSF17) and economic environment/economic factors/risks/the national economy (CSF18); and project management competence has thirteen measured items: teamwork and co-operation (PMTC1), directiveness (PMTC2), cognitive ability (PMTC3), problem-solving (PMTC4), assertiveness (PMTC5), flexibility (PMTC6), goal orientation (PMTC7), analytical thinking (PMTC8), proactivity (PMTC9), decision making (PMTC10), emotional resilience (PMTC11), professionalism (PMTC12) and experience (PMTC13).

Whereas the dependent variable is project success which was measured by five items: completion within the prescribed schedule (PS1), completion within the allotted budget (PS2), completion with the required quality (PS3), stakeholders' satisfaction (PS4) and completion with the overall success (PS5).

Figure 4.1 below presents the proposed measurement model of critical success actors and project management competence on project success with all items under each pertinent construct, and figure 4.2 below presents the final measurement model of critical success actors and project management competence on project success after deleting items with low factor loadings under each pertinent construct for satisfying model fit and validation.

The measurement model evaluation involves assessment of reliability and validity done via factor loadings, Cronbach alpha, composite reliability, and convergent validity through average variance extracted (AVE). Discriminant validity is also assessed via Fornell & Larker criterion and Heterotrait-Monotrait ratio (HTMT).

Jilin Daxue Xuebao (Gongxueban)/Journal of Jilin University (Engineering and Technology Edition)
ISSN: 1671-5497
E-Publication: Online Open Access
Vol: 43 Issue: 05-2024
DOI: 10.5281/zenodo.11145701

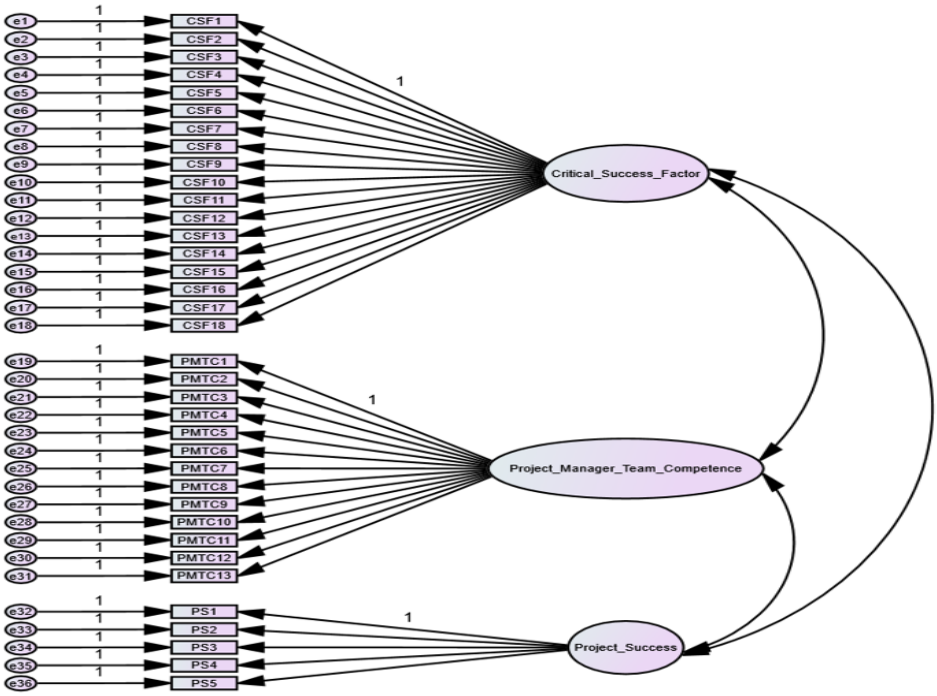

Figure 4.1: Proposed Measurement Model of Critical Success Actors and Project Management Competence on Project Success

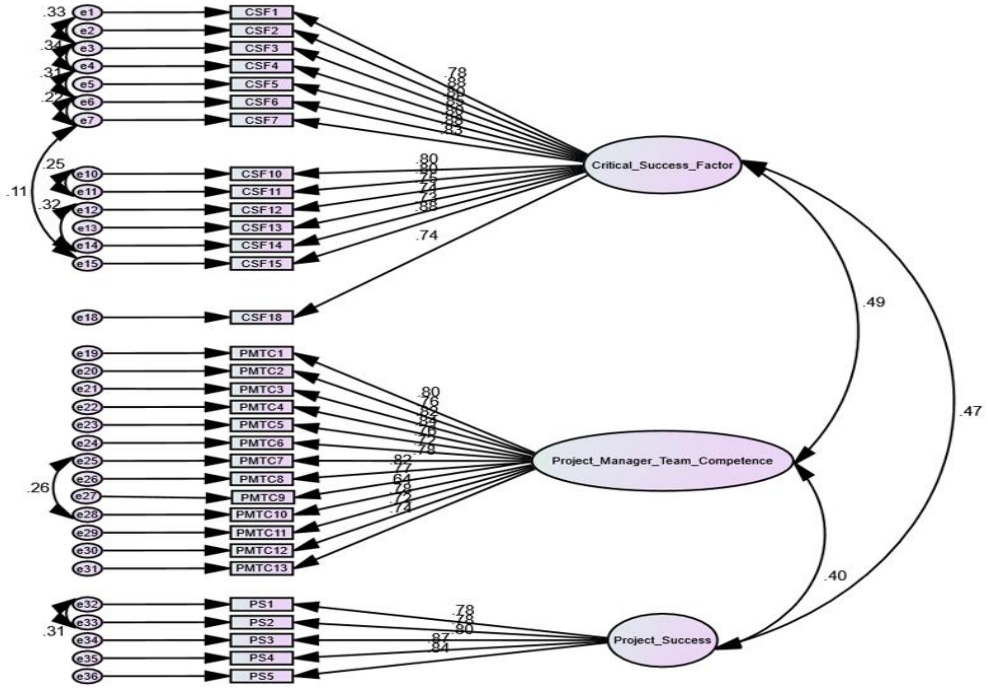

Figure 4.2: Final Measurement Model of Critical Success Actors and Project Management Competence on Project Success

Jilin Daxue Xuebao (Gongxueban)/Journal of Jilin University (Engineering and Technology Edition)
ISSN: 1671-5497
E-Publication: Online Open Access
Vol: 43 Issue: 05-2024
DOI: 10.5281/zenodo.11145701

4.4.1 Model Fit Measures

From the below table 4.1, it can be concluded that the measurement model for constructs has been an excellent model fit with acceptable RMSEA according to criterion by Hu and Bentler [50].

Table 4.1: Model Fit Measures of Critical Success Actors and Project Management Competence on Project Success

Model Fit Measures

Measure	Estimate	Threshold	Interpretation
CMIN	1036.569	--	--
DF	422	--	--
CMIN/DF	2.456	Between 1 and 3	Excellent
CFI	0.956	>0.95	Excellent
SRMR	0.054	<0.08	Excellent
RMSEA	0.077	<0.06	Acceptable
PClose	0.18	>0.05	Excellent

Congratulations, your model fit is acceptable.

Cutoff Criteria*

Measure	Terrible	Acceptable	Excellent
CMIN/DF	> 5	> 3	> 1
CFI	<0.90	<0.95	>0.95
SRMR	>0.10	>0.08	<0.08
RMSEA	>0.08	>0.06	<0.06
PClose	<0.01	<0.05	>0.05

*Note: Hu and Bentler (1999, "Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria Versus New Alternatives") recommend combinations of measures. Personally, I prefer a combination of CFI>0.95 and SRMR<0.08. To further solidify evidence, add the RMSEA<0.06.

**If you would like to cite this tool directly, please use the following: Gaskin, J. & Lim, J. (2016), "Model Fit Measures", AMOS Plugin. Gaskination's StatWiki.

4.4.2 Factor Loadings

Hair et al. [46] recommended that items with a factor loading between 0.40 and 0.70 must be analyzed for deletion or retention. These items can be retained if other measures of reliability and validity are above the threshold values to maintain the content validity otherwise must be removed from the model. After deletion and retention of some items based on fit model, the factor loadings of all the final indicators of each construct are presented in table 4.2 below.

Table 4.2: Factor Loadings of Critical Success Actors and Project Management Competence on Project Success

Variables and Items	Code	Factor Loading
a. Critical Success Factors		
Clear, realistic objectives	CSF1	0.779
Project size and level of complexity	CSF2	0.885
Minimal scope change/ effective change management	CSF3	0.8
Effective consultation with key stakeholders and beneficiaries	CSF4	0.847
Project risk and liability management	CSF5	0.803
Good planning and scheduling methods	CSF6	0.883
Motivated and well-integrated team/Good leadership	CSF7	0.827
Adequate resource availability (finance, labour, plant, materials)	CSF10	0.804
Top management and sponsor support	CSF11	0.796

Jilin Daxue Xuebao (Gongxueban)/Journal of Jilin University (Engineering and Technology Edition)
ISSN: 1671-5497
E-Publication: Online Open Access
Vol: 43 Issue: 05-2024
DOI: 10.5281/zenodo.11145701

Continuous performance measurement	CSF12	0.753
Open and effective communication	CSF13	0.739
Thorough technical understanding/ capability of the project	CSF14	0.725
Effective Monitoring and feedback	CSF15	0.876
Economic environment, economic factors/risks, the national economy	CSF18	0.738
b. Project Management Competence		
Teamwork and co-operation	PMTC1	0.808
Directiveness	PMTC2	0.763
Cognitive Ability	PMTC3	0.814
Problem-solving	PMTC4	0.842
Assertiveness	PMTC5	0.766
Flexibility	PMTC6	0.716
Goal orientation	PMTC7	0.783
Analytical thinking	PMTC8	0.827
Proactivity	PMTC9	0.768
Decision making	PMTC10	0.633
Emotional resilience	PMTC11	0.777
Professionalism	PMTC12	0.709
Experience	PMTC13	0.74
c. Project Success		
Completion within the prescribed schedule	PS1	0.781
Completion within the allotted budget	PS2	0.776
Completion within the required quality	PS3	0.805
Stakeholders' satisfaction	PS4	0.867
Completion with the overall success	PS5	0.839

From the above table 4.2 of factor loadings for constructs: the critical success factors CSF8, CSF9, CSF16 and CSF17 were dropped from the model due to low factor loadings. The remaining 32 items from a total of 36 items were kept in the study as they satisfy the requirements.

4.4.3 Reliability

The reliability of dignified constructs is assessed using Cronbach's alpha and Composite Reliability (CR), using SPSS and AMOS software, and it was stated in table 4.3 shown below.

Table 4.3: Reliability Test Results of Critical Success Actors and Project Management Competence on Project Success

Variables	Cronbach's Alpha	Composite Reliability (CR)	Number of Items
Critical Success Factors	0.963	0.963	14
Project Management Competence	0.946	0.946	13
Project Success	0.911	0.908	5

In above table 4.3, for all the constructs included in this study, cronbach‟s alpha value is greater than the value of 0.7 and composite reliability is also lie above the cut off points which is above 0.7, that indicates no issue of construct reliability [51]. Hence, sufficient construct reliability is established.

Jilin Daxue Xuebao (Gongxueban)/Journal of Jilin University (Engineering and Technology Edition)
ISSN: 1671-5497
E-Publication: Online Open Access
Vol: 43 Issue: 05-2024
DOI: 10.5281/zenodo.11145701

4.4.4 Convergent Validity and Discriminant Validity- Fornell & Larcker Criterion

The convergent validity and discriminant validity- Fornell & Larcker Criterion of dignified constructs is assessed using Average Variance Extracted (AVE) tests, composite reliability (CR) scores and Correlation, using AMOS software, which were stated in table 4.4 shown below. The CR and AVE values are well above the minimum threshold value; hence, sufficient reliability fit was maintained for the constructs [46].

Convergent validity was also assessed for the all constructs with maintaining CR values lie above 0.7, and all the AVE values are well above the lower limit value of 0.50 which indicating sufficient convergent validity is also maintained. Using the Fornell and Larker criterion the square root of AVE (the highlighted diagonal values of table 4.4) for all constructs is higher than their correlation values with all other constructs in the respective rows and the columns that indicate discriminant validity is maintained among the constructs according to the Fornell and Larker criterion.

Table 4.4: Convergent Validity and Discriminant Validity- Fornell & Larcker Criterion Test Results

Model Validity Measures

	CR	AVE	MSV	MaxR(H)	Critical_Success_Factor	Project_Manager_Team_Competence	Project_Success
Critical_Success_Factor	0.963	0.649	0.238	0.966	**0.806**		
Project_Manager_Team_Competence	0.949	0.589	0.238	0.952	0.488***	**0.767**	
Project_Success	0.908	0.664	0.22	0.912	0.469***	0.395***	**0.815**

Validity Concerns

No validity concerns here.

References

Significance of Correlations:
† p < 0.100
* p < 0.050
** p < 0.010
*** p < 0.001

Thresholds From:
Hu, L., Bentler, P.M. (1999), "Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria Versus New Alternatives" SEM vol. 6(1), pp. 1-55.

--If you would like to cite this tool directly, please use the following: Gaskin, J. & Lim, J. (2016), "Master Validity Tool", AMOS Plugin. Gaskination's StatWiki.

4.4.5 Discriminant Validity- Heterotrait-Monotrait Ratio (HTMT)

Hair et al. [46] recommended the use of HTMT to establish discriminant validity. HTMT values range from 0 to 1 where 1 indicates perfect correlation and 0 indicates no correlation. According to Hair et al. [46] discriminant validity is said to be established when HTMT values lie below 0.90, more preferably less than 0.85. Hence, the HTMT ratio for

Jilin Daxue Xuebao (Gongxueban)/Journal of Jilin University (Engineering and Technology Edition)
ISSN: 1671-5497
E-Publication: Online Open Access
Vol: 43 Issue: 05-2024
DOI: 10.5281/zenodo.11145701

this research study as presented in table 4.5 lies below the required threshold value of 0.90 which reveals there is no discriminant validity issue among the constructs. In other words, the HTMT value of this research indicates that the variables included in the model are distinctive of one another.

Table 4.5: Discriminant Validity- Heterotrait-Monotrait Ratio (HTMT) Test Results

	Critical Success Factor	Project Manager and Team Competence	Project Success
Critical Success Factor			
Project Manager and Team Competence	0.506		
Project Success	0.462	0.492	

5. STRUCTURAL MODEL

SEM was used to investigate the causal relationships between the predictor and outcome variables that are hypothesized in the research framework. This was done through the estimation of separate structural models in Amos 23 to test the direct and mediating relationships. The estimates for the test of direct and mediating relationships are presented in table 5.1 and graphically depicted in Figure 5.1.

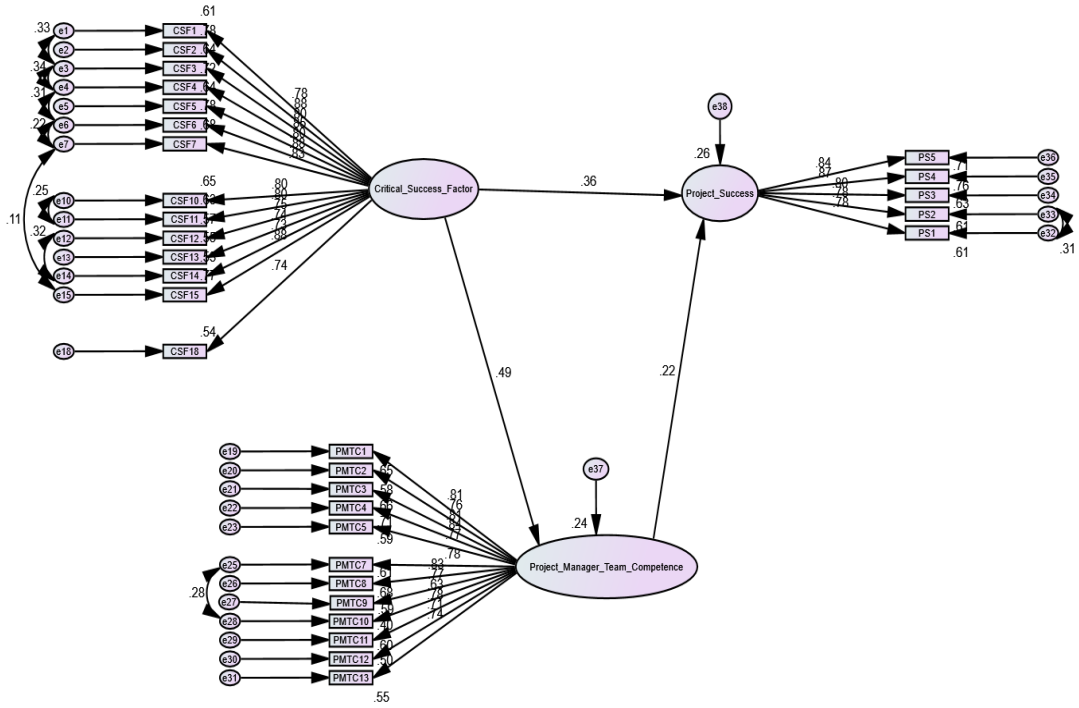

Figure 5.1: Results of Final Structural Model of Critical Success Actors and Project Management Competence on Project Success

Jilin Daxue Xuebao (Gongxueban)/Journal of Jilin University (Engineering and Technology Edition)
ISSN: 1671-5497
E-Publication: Online Open Access
Vol: 43 Issue: 05-2024
DOI: 10.5281/zenodo.11145701

Table 5.1: Path Analysis of Critical Success Actors and Project Management Competence on Project Success

Hypothesis	Path Description	Coff	SE	P <0.05	Results	Adjusted R2
H16	Critical Success Factor -------> Project Success	0.361	0.078	***	Supported	26%
H17	Project Manager and Team Competence -------> Project Success	0.22	0.086	0.002	Supported	
H18	Critical Success Factor -------> Project Manager and Team Competence	0.49	0.059	***	Supported	24%

As can be observed from Table 5.1, all direct effect hypotheses were supported (H16, H17, H18). These are:

H16= Critical success factors were found to have a positively contributed effect on project success (β= 0.361, p= 0.001)

H17= Project management competence was found to have a positively contributed effect on project success (β= 0.22, p= 0.002)

H18= Critical success factors were found to have a positively contributed effect on project management competence (β= 0.49, p= 0.001). Whereas, the mediating effects are shown in the following table 5.2 below:

Table 5.2: Mediating Effects of Project Management Competence on Project Success

Hypothesis	Path Description	Indirect			Direct			Mediation Role
		Coff	P	Results	Coff	P	Results	
H19	Critical Success Factor -------> Project Manager and Team Competence ------->Project Success	0.112	0.006	Supported	0.375	0.001	Supported	Partial Mediation

As can be observed from Table 5.2, the mediating effect of project management competence hypotheses (H19) was supported and has a partial mediation role on project success.

From the above table 5.1, it is clear that the dependent variables in the structural model have sufficient squared multiple correlations (R2) values which is the amount of variance explained by independent variables in a dependent variable. Falk and Miller [52] recommended that R2 values should be equal to or greater than 0.10 for the variance explained by a particular endogenous construct to be deemed adequate. However, Cohen [53] suggested that R2 values for endogenous latent variables are assessed as follows: 0.26 (substantial), 0.13 (moderate), and 0.02 (weak). Overall, it can be concluded that the model has moderately sufficient R2 with 0.26 and 0.24, therefore, the p-values can be relied upon; and the model shows a good fit, with χ2/df or CMIN/DF= 2.456 (p= 0.18), CFI= 0. 0.956, SRMR= 0.054, and RMSEA= 0.077 [50].

Jilin Daxue Xuebao (Gongxueban)/Journal of Jilin University (Engineering and Technology Edition)
ISSN: 1671-5497
E-Publication: Online Open Access
Vol: 43 Issue: 05-2024
DOI: 10.5281/zenodo.11145701

6. CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

6.1 Conclusions

This study aimed at studying the project manager and team competence for implementation of project management practices and its mediating role for critical success factors in the successful completion of the project. According to the gained results, it can be concluded that the critical success factors were found to have positively contributed direct effect on both project management personal competence and project success. Besides project management personal competence has a direct positively contributed effect on project success, it has a partial mediation role for critical success factors on project success.

The results of this study conclude that besides focusing on critical success factors which has a crucial impact on the successful completion of road projects, the project manager and team competence play a vital role in the success or failure of projects and a well-trained Project Manager and team will possess particular uniqueness that will enhance the performance of appropriate and timely project management practices implementations based on their project management skills. This implies that training and certification in project management qualifications are imperative for those who manage construction projects to be equipped with better project management knowledge and skills since the majority of the respondents with 94.7% have not received the project management qualifications. The results will also help the construction companies to more focus while creating paths for project manager and team professional development and/or assigning the right person for the right job in a particular project environment. Furthermore, this study will also help project managers and teams in better understanding of project management competencies such as teamwork and co-operation, directiveness, cognitive ability, problem-solving, assertiveness, goal orientation, analytical thinking, proactivity, decision making, emotional resilience, professionalism, and experience are the measurements that were given to some degree significance in enhancing project performance.

6.2 Recommendations for Further Research

It is better to conduct further research on the areas including different project management knowledge areas and other competency variables which affect project success in the construction industry. Case studies and conducting interviews can further validate the framework of competencies and critical success factors on road project success that have been obtained using quantitative analysis. In addition to the participants from contractors, consultants, and clients; it would be valuable to seek the opinions of academicians and researchers from the university and research institute.

Conflict of Interests

The author(s) declared no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

Jilin Daxue Xuebao (Gongxueban)/Journal of Jilin University (Engineering and Technology Edition)
ISSN: 1671-5497
E-Publication: Online Open Access
Vol: 43 Issue: 05-2024
DOI: 10.5281/zenodo.11145701

References

1) Zuofa, T. & Ochieng, E. G. (2012). Towards the advancement of project management practice in developing countries: the case of Nigeria. Paper presented at PMI® Research and Education Conference, Limerick, Munster, Ireland. Newtown Square, PA: Project Management Institute.

2) Patanakul, P., Lewwongcharoen, B., & Milosevic, D. (2010). An empirical study on the use of project management tools and techniques across project life-cycle and their impact on project success. Journal of General Management, 35(3), 41-66.

3) Belassi, W. and Tukel, O.I. (1996) A New Framework for Determining Critical Success/Failure Factors in Projects. International Journal of Project Management, 14, 141-151, doi: 10.1016/0263-7863(95)00064-X.

4) Crawford, B.A. (2000) Embracing the essence of inquiry: New roles for science teachers. Journal of Research in Science Teaching, 37, 916-937. http://dx.doi.org/10.1002/1098-2736(200011)37:9<916::AID-TEA4>3.0.CO;2-2.

5) Shafieia N. A. and Puttannab K. (2021) an investigation into the factors causing international development project failure in developing countries: Focus on Afghanistan, Journal of Project Management 6 157–170, doi: 10.5267/j.jpm.2021.2.002.

6) Standish Group. (2015). Chaos Manifesto 2015. The Standish Group International, Incorporated. Retrieved from https://www. infoq.com/articles/standish-chaos-2015.

7) Lamproua, A. and Vagionab, D., 2018. Success Criteria and Critical Success Factors in Project Success: A Literature Review. International Journal of Real Estate and Land Planning, 1(2018), 276-284. DOI:10.26262/reland.v1i0.6483

8) Silva, G.A.S.K., Warnakulasuriya, B.N.F., Arachchige, B.J.H., (2016b) 'Critical Success Factors: En Route for success of construction projects', International Journal of Business & Social Science, 7(3), p.27-37.

9) Yong, Y.C., Mustaffa, N.E., (2017) 'Critical Success Factors for Malaysian Construction Projects: An Investigative Review', International Journal of Built Environment and Sustainability, 4(2), p.93-104.

10) Alias, Z., Zawawi, E.M.A., Yusof, K., Aris, N.M., (2014) 'Determining critical success factors of project management practice: A conceptual framework', Procedia - Social and Behavioral Sciences, 153, p.61-69.

11) Montequin, V.R., Cousillas, S., Ortega, F., Villanueva, J., (2014) 'Analysis of the success factors and failure causes in Information & Communication Technology (ICT) projects in Spain', Procedia Technology, 16, p.992-999

12) Osei-Kyei, R., Chan, A.P.C., (2015) 'Review of studies on the Critical Success Factors for Public-Private Partnership (PPP) projects from 1990 to 2013', International Journal of Project Management, 33(6), p.1335-1346.

13) Pandremmenou, H., Sirakoulis, K. and Blanas, N. (2013).Success Factors in the Management of Investment Projects: A Case Study in the Region of Thessaly.Procedia - Social and Behavioral Sciences 74, pp. 438 – 447

14) Belout, A. (1998). Effects of human resource management on project effectiveness and success: toward a new conceptual network. International Journal of Project Management, 16(1), pp. 21-26.

15) Chua, D.K.H. Kog, Y.C. & Loh, P.K. 1999, "Critical success factors for different project objectives", Journal of Construction Engineering and Management, ASCE, Vol. 125 No. 3, pp. 142- 150

16) Walker, D.H.T. & Vines, M.W. (2000) Australian multi-unit residential project construction time performance factors, Engineering Construction Architecture Management, 7 (3), 278-287

17) Cserháti, G., & Szabó, L. (2014). The Relationship between Success Criteria and Success Factors in Organizational Event Projects. International Journal of Project Management, 32, 613-624.http://dx.doi.org/10.1016/j.ijproman.2013.08.008

ISSN: 1671-5497
E-Publication: Online Open Access
Vol: 43 Issue: 05-2024
DOI: 10.5281/zenodo.11145701

18) Ihuah, P. W., Kakulu, I. I., & Eaton, D. (2014). A review of Critical Project Management Success Factors (CPMSF) for sustainable social housing in Nigeria. International Journal of Sustainable Built Environment, 3(1), 62–71. doi:10.1016/j.ijsbe.2014.08.001

19) Inayat, A., Melhem, H., & Esmaeily, A. (2015). Critical success factors in an agency construction management environment. Journal of Construction Engineering and Management, 141(1), 1–7. https:// doi.org/10.1061/(ASCE)CO.1943-7862.0000921

20) Munns, A. K., Bjeirmi, B. F., (1996) 'The role of project management in achieving project success', International Journal of Project Management, 14(2), p.81-87.

21) White, D. & Fortune, J. 2002, "Current practice in project management-an empirical study", International Journal of Project Management, Vol. 20, pp. 1-11

22) Khan, K., Turner, J.R., Maqsood, T., (2013) 'Factors that influence the success of public sector projects in Pakistan', Eleventh International Research Network on Organizing by Projects (IRNOP 2013) Conference, "Innovative Approaches in Project Management", June 17-19, Oslo, Norway, (p.1-25).

23) Wai, S.H., Yusof, A.M., Ismail, S., (2012) 'Exploring success criteria from the developers' perspective in Malaysia', International Journal of Engineering Business Management, 4, p.1-9.

24) Frinsdorf, Olivia; Zuo, Jian; Xia, Bo (2014). Critical factors for project efficiency in a defence environment. International Journal of Project Management, 32(5), 803–814. doi:10.1016/j.ijproman.2013.10.008.

25) Ismail, D., T.A. Majid, R. Roosli, and N. Ab Samah. 2014. Project management success for post-disaster reconstruction projects: International NGOs perspectives. Procedia Economics and Finance 18: 120–127. https://doi.org/10.1016/S2212-5671(14)00921-6.

26) Joslin R., Müller R. (2015). Relationships between a project management methodology and project success in different project governance contexts. International Journal of Project Management, 33(6), 1377–1392. https://doi.org/10.1016/j.ijproman.2015.03.005.

27) Pinto, J. K. and Prescott, J. E. (1988). Variations in Critical Success Factors Over the Stages in the Project Life Cycle. Journal of Management, 14(1), 5–18. doi:10.1177/014920638801400102

28) Belout, A. & Gauvreau, C. 2004, "Factors influencing project success: the impact of human resource management", International Journal of Project Management, Vol. 22, pp. 1–11.

29) International Project Management Association (2006) IPMA Competence Baseline Version 3.0. International Project Management Association, Nijkerk.

30) Palan, R. (2003). Competency management- a practitioner's guide. Specialist Management Resources Sdn Bhd (Co. no. 385604-V) 14-4Jalan Bangsar Utama 1,Bangsar Utama, 59000 Kuala Lumpur, Malaysia

31) Project Management Institute (2017). A Guide to the Project Management Body of Knowledge (PMBOK Guide). 6th ed. Newtown Square, Pennsylvania: Project Management Institute.

32) Abraham, Steven E.; Karns, Lanny A.; Shaw, Kenneth; Mena, Manuel A. (2001). Managerial competencies and the managerial performance appraisal process. Journal of Management Development, 20(10), 842–852. doi:10.1108/02621710110410842

33) Moradi, Sina; Kähkönen, Kalle; Aaltonen, Kirsi . (2020). Comparison of research and industry views on project managers competencies. International Journal of Managing Projects in Business, 13(3), 543–572. doi:10.1108/ijmpb-04-2019-0085

34) Pinto, J. K. & Trailer, J. T. (1998) Leadership skills for project managers. Newtown Square, PA.: Project Management Institute.

35) Berens L. V., Ernst, L. K., and Smith, A.M. (2005). Applying Team Essentials to Creative Effective Teams. Huntington Beach, CA: Telos Publications, 2005.

Jilin Daxue Xuebao (Gongxueban)/Journal of Jilin University (Engineering and Technology Edition)
ISSN: 1671-5497
E-Publication: Online Open Access
Vol: 43 Issue: 05-2024
DOI: 10.5281/zenodo.11145701

36) Westerveld, E. (2003). The Project Excellence Model®: linking success criteria and critical success factors. International Journal of Project Management, Vol. 21, No. 6, pp. 411-418. doi:10.1016/S0263-7863(02)00112-6

37) Pandey, P. and Pandey, M.M. (2015). Research Methodology: Tools and Techniques. Bridge Center, Romania.

38) Fellows, R.F. & Liu, A.M.M. (2015). Research Methods for Construction, 4th edn., John Wiley and Sons. Ltd., New York.

39) Singh, K.Y (2006). Fundamental of Research Methodology and Statistics, New Age International (P) Ltd. Pub., New Delhi.

40) Dawson, C. (2009). Introduction to Research Methods, 4th edt. A Practical Guide for anyone under taking research. London: Sage Publications.

41) Kish, L. (1965). Survey Sampling. John Wiley and Sons Inc, New York.

42) Chou J.S., Kim C., Kuo Y.C., Ou N.C. (2011). Deploying effective service strategy in the operations stage of high-speed rail. Transp. Res. Part E: Logist. Transp. Rev. 2011;47:507–519. doi:10.1016/j.tre.2010.12.004.

43) Gaskin, J. & Lim, J. (2016), "Model Fit Measures", AMOS Plugin. Gaskination's StatWiki.

44) Kenny, D. A. (2020, June 05). Measuring Model Fit. Retrieved from https://davidakenny.net/cm/fit.htm

45) Pett, M. A., Lackey, N. R., & Sullivan, J. J. (2003). Making sense of factor analysis: The use of factor analysis for instrument development in health care research. sage.

46) Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). Multivariate Data Analysis 8th Edition. Cengage Learnings India Private Limited.

47) Mark, R. (1996). Research made simple: A handbook for social workers. Sage.

48) Bagozzi, R. P., Yi, Y., & Phillips, L. W. (1991). Assessing construct validity in organizational research. Administrative Science Quarterly, 421-458.

49) Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research, 18(1), 39–50.

50) Hu, L., Bentler, P.M., (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling: A Multidisciplinary Journal 6, 1–55. https://doi.org/10.1080/10705519909540118.

51) Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. Psychometrika, 16, 297-334.

52) Falk, R. F., & Miller, N. B. (1992). A primer for soft modeling. University of Akron Press.

53) Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd Ed.). New York: Routledge.