MBEYA UNIVERSITY OF SCIENCE AND TECHNOLOGY

A FRAMEWORK OF STRATEGIES TO REDUCE ROAD CONSTRUCTION PROJECTS' DELAY IN TANZANIA: A CASE OF TARURA ROAD PROJECTS

SEPERATUS GABRIEL

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE MASTERS OF CIVIL ENGINEERING OF MBEYA UNIVERSITY OF SCIENCE AND TECHNOLOGY

AUGUST 2025

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ABSTRACT

The construction industry is globally recognised as one of the fastest-growing sectors, contributing directly and indirectly to the development of several other sectors of the economy. Despite its significant importance, and based on persistent reasons, the industry has often been overwhelmed with various challenges, including the inability to finish the road construction projects within a given schedule. This study aimed to examine the stakeholder's perception of prevailing best practice measures to reduce construction project delays in Tanzania. The study adopted the questionnaire tool and the survey interview to collect the respondent's opinion from 208 respondents having experience of more than five years obtained through purposive sampling. The mean scores and the relative importance index (RII) of the data were computed using the SPSS 24 tool to obtain the descriptive information and inferential statistics. The findings have revealed ten potential factors for construction project delays and thirteen best practices that, whenever implemented, can assist in minimising delays. Moreover, the identified best practice measures were categorised in clusters to indicate the project participant who plays the significant role in minimising the delays. Furthermore, the findings acknowledged strategies were categorised in six clusters, namely effective project management, procurement and supply, resource adequacy (monetary or financial), design or technical, information and communication, and external strategies. The current study proposes future research to focus on identifying the relationship between the strategic cluster categories in recognising which cluster category correlates highly towards minimising the construction project delays.

DECLARATION

I, **Seperatus Gabriel,** declare to neither the Senate that this dissertation is my own original work and that it has neither been submitted nor being concurrently submitted in any other institution.

Signature: Seperatus. G. K ..... Date: 01/10/2025

Seperatus Gabriel

Signature: ..... Date: 1/10/2025

Dr. Ramadhani Said Tekka (Main Supervisor)

Signature: ..... Date: ..01 October 2025

Dr. Yazidi Mwishwa (Co-Supervisor)

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DEDICATION

I dedicate this research to:

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ii. My beloved wife, Emmanuela Sanka, for her unwavering support and prayers.

iii. My beloved children, Faraja Seperatus and Neema Seperatus, for their patience and sacrifice in staying away from their parent.

iv. The Chief Executive Officer of TARURA, for granting me the opportunity to expand my knowledge for the betterment of our nation.

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LIST OF ABBREVIATIONS AND SYMBOLS

ACCT	Association of Citizen Contractors in Tanzania
ADR	Alternative Dispute Resolution
AIA	American Institute of Architect
AIC	Advanced industrialized country
ANOVA	Analysis of Variance
AQRB	Architect and Quantity Surveyors Registration Board
AVE	Average Variance Extracted
BIM	Building Information Modelling
CAF	Contractors Assistance Fund
CATA	Contractors Association of Tanzania
CB	Capacity Building
CI	Construction industry
CIB	Construction Industry Budget
CIP	Construction Industry Policy
CMPR	Construction Management Process Reengineering
CPD	Continuing Professional Development
CPI	Cost Performance Indexes
CCPM	Critical Chain Project Management
DRC	Democratic Republic of Congo
ERB	Engineers Registration Board
ERP	Economic Recovery Program
EPS	Extranet Project System
FA	Factor Analysis
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
IC	Industrialized Country
ITA	Institute of Tax Administration
KM	Knowledge Management
KMO	Kaiser-Meyer-Olkin
LDC	Less Developed Countries
M	Management
MoE	Margin of Error
MoWTC	Ministry of Works, Transport, and Communications
MCB	Mbeya University of Science and Technology Consultancy Bureau
MUST	Mbeya University of Science and Technology
NBS	National Bureau of Statistics Tanzania
NCC	National Construction Council
NBS	National Bureau of Statistics Tanzania
NCC	National Construction Council
NESP	National Economic Survival Programme
NGP	National Gross Product
OL	Organizational Learning
OSHA	Occupational Safety and Health Administration
PCA	Principal Component Analysis
PI	Performance Index
PPA	Public Procurement Acts

PPRA	Public Procurement Regulatory Authority
QS	Quantity Surveyor
RII	Relative Importance Index
RFB	Roads Fund Board
RM	Research methodology
SAP	Structural Adjustment Programme
SD	Secondary Data
SDG	Sustainable Development Goal
SEAP	Structured Engineers Apprenticeship Programme
SEM	Structural Equation Modelling
SMLC	Small-Medium Local Contractor
SP	Strategic Planning
SPSS	Statistical Package for Social Science
SSTP	Skills Development through Sustainable Structured Training Program
TANROAD	Tanzania National Roads Agency
TARURA	Tanzania rural and urban roads agency
TBA	Tanzania Building Agency
T	Technology adoption and use
TQM	Total Quality Management
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
USA	United States of America

CHAPTER ONE
INTRODUCTION

1.0 Background

The construction industry (CI) is globally believed to be a multiplier sector, as it touches the daily lives of every individual and accelerates social-economic development in both developed and developing countries. Furthermore, the United Nations (UN), through its sustainable development goal (SDG) of 2015, declared the construction industry as a new lens to facilitate the translation of global wants and needs into business solutions (Wenmei *et al.,* 2021). The construction sector is a multiplier sector that touches the daily lives of every individual, and it powerfully affects the economy, the environment, and society when transforming the physical infrastructures (Suphian, 2009).

More importantly, the sector stimulates activities in other sectors of the economy, such as providing shelters, infrastructures, and employment and boosting domestic consumption (Giang & Pheng, 2011). Moreover, the CI is believed to facilitate accelerating and promoting an income distribution, reducing poverty, and providing a larger small-to-medium business ecosystem for their long-term social-economic growth, stability, and well-being (Anugwo *et al*., 2018). More importantly, the CI has been well-known to serve as a source of societal advancement and civilisation, urbanisation, and industrial development. Fundamentally, the construction sector donates significantly to the formation and creation of the Gross Domestic Product (GDP) of nearly all global nations (Tunji-Olayeni *et al*., 2017).

Additionally, the construction sector enhances the productivity, performance, and quality of other global sectors; it creates employment opportunities that offer various jobs. Furthermore, the construction sector plays a great role in domestic resource consumption in building the infrastructures that help to facilitate the determination for social-economic development that enhances and stimulates the growth and advancement of other linked sectors, enhancing national economic growth (Tesha *et al*., 2017). The construction sector contributes about 13% of global GDP (David, 2020) and accounts for more than 10% of the GDP in developed-industrialised

economies. Equally, the construction sector has been recognised to contribute significantly to the economic expansion or growth and social development of developing countries, as it witnessed over 7% of their GDP (Jorge, 2017). Researchers have established that there is a significant relationship that exists between the growth rate of the construction industry and the rate of macroeconomic growth of emerging countries (Boadu *et al*., 2020).

Similar to developing countries, the construction sector facilitates the growth of other industrial sectors of the economy through the construction industry's products. An example is drawn from constructing roads, highways, harbours, water supplies, railways, electricity lines and other infrastructure to boost an improved productivity of goods and services that eventually creates employment opportunities for the society. Further, since the unemployment rate is higher in developing countries, the construction industry becomes important and acts as a source of jobs and consumes the unemployed and/or unskilled labour.

Thus, it is evident that developing countries primarily rely on the construction sector for sustainable development, as this sector both provides jobs and directly influences socio-economic growth (Alaloul *et al., 2021).* Therefore, a lack of adequate infrastructure will inevitably hinder the growth of a country's other economic sectors, resulting in substandard living standards, uneven income distribution, and poverty, all of which ultimately contribute to the country's economic downfall.

The CI in Tanzania has become exciting and ranks among the top three sectors, superseded by agriculture and trade, contributing significantly to uplifting the country's GDP. Its contribution to country GDP has attained a steady growth from 8.8% (2008) to 15% (2017) with an average rate of 11.1% (NBS, 2018b) and with a high share rate of the gross fixed capital formation (GFCF) ranging between 25% and 34% of GDP (Kikwasi and Escalante, 2018). In addition, the sector also offers more than 9% of employment opportunities (UNESCO, 2010).

Moreover, the industry has been stimulating other sectors of the economy. Tanzania's construction industry, which includes both formal and informal organisations, private

and government engineering institutions, and individuals working as contractors, subcontractors, or consultants, as well as merchants, engineers, technicians, and suppliers, is a rapidly expanding sector. As of the year 2020, it contributed to about 14.4% of the country's Gross Domestic Product (GDP) (NBS, 2021).

Recently, Tanzania has witnessed significant growth in the construction industry for both private projects, such as residential and commercial real estate, and public projects, such as the construction of roads, railways, bridges, water systems, telecommunications, and air transport networks, to mention a few. This has equally shown a consistent yearly increase in government spending on infrastructure development in the past decade, which has stimulated the continuous inflows of investments in the construction industry and foreign investors (ITA, 2022). Despite its significance, the construction industry has been overwhelmed with numerous challenges that have been limiting the growth of the firms and the construction industry in general.

The frequently reported construction challenges include intensive competition from foreign firms, lack of experience, low productivity, lack of skilled workforce, low technology adoption to guide the construction project such as Extranet Project System (EPS) (Yazid, 2022),poor industry performance history (Tekka, 2022), health and safety issues, disputes, corruption, late payments, variations caused by poor design, poor quality of the completed project which does not provide value for money, low profit gain to contractors, frequent construction project delays (Donati, 2022) and impractical and unfeasible general strategies (Kisunge, 2020).

All these challenges have been accelerated by ineffective estimates; incompetent designers, contractors and subcontractors; poor designs; ineffective contract planning and management; poor construction planning techniques; and lack of communication between the parties involved in construction (Bartsiotas, 2014), to name a few. Thus, the prolonged challenges have caused the sector to attain a continuously non-guaranteed, unsustainable, inadequate, and underprivileged performance (MOF, 2016) measured in terms of time and cost overruns, low quality of work constructed, low productivity, poor safety leading to frequent accidents, and environmental

unsustainability (Ngowi, 2014) that has necessitated extra efforts and a constant follow-up towards problem resolution. The issue of construction project delay has become a chronic world problem and a topic of concern, as noted from the majority of construction projects (Durdyev *et al*., 2017).

Generally, construction project delay is described as the project time overrun beyond the scheduled project, or it is an activity that extends the time required to deliver the project, which manifests itself as additional days of work. Delays are a critical problem that occurs in almost every construction project. However, its magnitude varies considerably from one project to the other. Some projects experience only a few days behind the schedule, while other projects are delayed for even over a year (Obodoh & Obodoh, 2016). Various numbers of factors have been stated to contribute to construction project delays. Various literature has categorised the delay factor into internal- and external-related factors. Further, they have been categorised into material-related, labour-related, finance-related, and equipment-related. However, factors have been further classified under contractor-, client- and consultant-related factors (Obodoh & Obodoh, 2016).

Generally, factors such as weather conditions, poor communication, coordination and conflicts among stakeholders, effective/improper planning, material and equipment/plant shortages, financial problems, payment delays, lack of project stakeholders' experience/qualification/competence, construction labour shortages and poor site management, to mention a few, were mentioned in various literatures and highly ranked in ascending order in significantly influencing project schedule delays (Serdar & Reza, 2018). Similarly, the Tanzania construction industry suffers frequently from the problem of delay in completing road construction projects.

A study by Ngowi (2014) showed that 72.5% of 80 randomly selected road construction projects from 2004 to 2008 were delayed (Ngowi, 2014). This represents a significant burden on the course of economic development that hampers the development plans of the country and has a negative impact on the economy in general (Habtoor, 2001). Moreover, analysing the performance of TANROAD construction projects within eight years (2005 to 2013) recognised that out of ninety-

three (93) studied projects, 68%, representing 65 projects, went beyond the contracted time, which proved inadequate performance.

In addition, a recent study by Donati *et al*. (2022) acknowledged that delays in road construction projects in Tanzania are a common problem that have extended to about 110% of the contracted time (Donati *et al*., 2022). Road construction projects constitute a large portion of infrastructure that forms a significant part of the entire construction sector and act as a major component that encourages economic growth. The roads assist in connecting people to employment, enabling goods and services delivery, and promoting exchange among different people. The roads help create smooth travel with higher efficiency. It provides quicker connectivity for business premises, better shipping, and better distribution time (Kaare, 2016).

The road construction projects are always complex, following the dynamic nature of construction site operations during their stages of planning, design, procurement, construction and maintenance. The projects are mostly facing difficulties and uncertainties due to weather or environmental changes and social, cultural, economic, technical and management-related problems. In Tanzania, road transport is the most widely used form of transport, facilitating over 90% of the passengers and 75% of the goods carried in the country (Ngowi, 2014).

Currently, the road network in Tanzania comprises 86,472 km , of which 12,786 km are trunk roads and 21,105 km are regional roads supervised by TANROADS (Benson and Elisther, 2022). However, the remaining 144,429.77 km constituting district, urban and feeder roads (TARURA, 2021) are under the Tanzania Rural and Urban Roads Agency (TARURA). TARURA was officially established under government agency law, section 245 followed by the Government notice GN 211 aimed to develop and maintain the rural and urban roads network, carry out engineering traffic and economic studies for the maintenance and improvement of the road network, establish, maintain and update road management systems, undertake procurement and management of contracts for design, maintenance, emergency repairs, spot improvements, rehabilitation, upgrading and construction of roads, improve road safety and manage environmental impact in the road network,

establish and maintain appropriate rural and urban road databank and provide technical support, supervision, road quality assurance and control as well as to undertake research or collaborate with any research organization with a view to facilitate the Agency plan, development and maintenance activities to mention a few (TARURA, 2021).

As a nascent agency, TARURA grapples with inadequate funding and substandard road network conditions, with approximately 43% of the tertiary network deemed unsuitable for normal motorised vehicle use during the rainy season. Also, there is a shortage of staff, lack of office space, resource allocation constraints and delays in completing construction projects caused by multiple challenges (TARURA, 2021). However, the practical example noted from TARURA road construction projects has shown that most projects have been delayed from their contracted time. Thus, construction delays in the sector have predominantly become a normal problem that has long been studied by various researchers globally. A study conducted by Aziz and Abdel-Hakam (2016) recognised that one hundred thirteen (113) pieces of research on construction project delay were conducted before 2016. These findings have shown the emphasis on the severity of the problem (Aziz & Abdel-Hakam, 2016).

In 2017, the findings of another study reported 70% of all global construction projects experienced construction project delays with an overrun magnitude between 10% and 30% of the contracted time (Gebrehiwet & Luo, 2017). Various factors causing construction project delays were identified from various literatures. These includes; financial calamities, lack of formal and informal training to project executors, low or contractor inexperience, weather related factors, equipment problem, poor project documentation, poor contractual relationship, construction resources or material delayed on deliveries, frequently design changes or variation and design errors, awarding contracts to lowest bidder who is incompetent and unexperienced one, ineffective project planning, scheduling and management, poor or low project time estimates, associated project risks and uncertainties, lack of regulation on management, evaluation and control, lack of competent and skilled

labor, adoption of low or outdated technology, hiring incompetent subcontractor, inaccurate time estimates and late or delayed payments of completed works (Hameed *et al.,* 2023) as among the significant and critical factors.

Moreover, in their study on causes and effects of construction project delays in the Nigerian construction industry, Obodoh and Chikasi (2016) identified fifty-seven factors categorised into eight groups and thirty-five methods to be adopted to minimise construction delays. Amongst the top ten ranked factors are insufficient number of equipment, inaccurate project time and cost estimates, interim payment difficulties, change orders, poor site management and supervision, lack and/or inadequate modern construction equipment, shortage of construction materials, incompetent project team, improper project planning and scheduling and contractors' financial difficulties (Obodoh & Chikasi, 2016).In the same vein, a study conducted by Bajjou and Chafi (2020) in Morocco identified multiple factors causing delays in the construction industry.

The study by Bajjou and Chafi (2020) identified several factors contributing to delays in the construction industry, such as clients' unrealistic long contract durations, an overreliance on subcontractors, and prolonged wait times for permits from local authorities. Furthermore, Głuszak and Leśniak (2015) reported that changes in weather, labour shortages, shortages of construction materials and equipment, design changes, and lack of proper documentation are fundamental contributors to construction project delays (Głuszak & Leśniak, 2015). In addition, contractors' financial constraints, a client's delay on payments for completed works, contracts awarded to the lowest but less experienced and incapable bidder, change orders during construction, ineffectiveness, shortage of manpower, and poor contractor's project planning, scheduling, and site management and supervision (Alshihri *et al*., 2022). Consequently, a thorough literature review conducted to establish the causative factors in developing countries classified the factors in eight clusters in relation to materials, labour, finance, equipment, contractor, client, consultant and external-related factors (Obodoh & Chikasi, 2016). Another study categorised the factors into six major clusters, namely resource

management, site management and contract management-related factors, client responsibilities factors, design and project management factors, and technology and information and communication-related factors (Hameed *et al*., 2023).

However, the most recent research came to the conclusion that the factors contribute to six clusters of delay in construction projects: client responsibilities, contract management, design and project management, formation and communication, resource management, and site management. Table 1 below provides a schematic list of factors or challenges of construction project delay in developing countries as itemised from the literature.

Table 1: A summary of factors for construction project delay in developing countries

Factor cluster	Contributing factors	Sources
Financial factor	Late or delayed payment Financial difficulties to executors/contractors Inadequate of poor fund allocation High interest rate imposed by institutions Currency fluctuation/inflation	(Ansah, 2011; Alshihri *et al*., 2022; Obodoh & Chikasi, 2016; Tesha *et al*., 2017; Kavishe *et al*., 2019; Aftab Hameed *et al*., 2023)
Technical/design factor	Frequently change of design Poor or delayed design Poorly adopted construction method Lack of professionalism Lack of technical personnel Delay in approving the completed work Inadequate project time and cost estimate	(Ocen. *et al*., 2011; Basheka *et al*., 2012; Lindhard & Wandahl, 2014; Kenyatta, 2016; Momade, 2020; Bentall *et al*., 2020)
Management factor	Lack of chain of commands Lack or poor organizational structure Lack or less motivation and training Poor coordination and communication Lack of management and supervision skills Slow or inappropriate information flow Slow decision making between parties	(Ansah, 2011; Nhabinde *et al*., 2012; Doloi *et al*., 2012; Thabani & Wellington, 2017; Arditi *et al*., 2017; Serdar & Hosseini., 2018, Cruz *et al*., 2018)

Factor cluster	Contributing factors	Sources
Resource factor	Shortage of construction materials Poor quality of construction materials Late order and delivery of materials Lack or shortage of skilled personnel Inadequate of modern technology Frequently equipment breakdown	(Nhabinde *et al.*, 2012; Ssegawa, 2013; Ardonceau, 2018; Marteye *et al*., 2018, Cruz *et al*., 2018)
External factors	Unethical practices and kickbacks (Malpractices) Unforeseen conditions Changes of weather conditions Society strike and conflicts Political interference Lack of experience and exposure	(Lindhard & Wandahl, 2014; Chilongo & Mbetwa, 2017; Akarowhe, 2018; Omopariola *et al*., 2019; Bentall *et al*., 2020)

The construction industry has been found to be a prone of late payment or delay culture. A construction project delay defined as an overrun beyond the project's scheduled completion time or an activity that extends the time required to deliver the project, which manifests itself as additional days of work (Arditi, *et al.*, 2017) have attracted a considerable researcher's attention for many decades now. An increased delayed or late payment culture has currently turned to the point that it tends to decrease the good image of construction industry. Late or delayed payment of completed work by clients is considered to be among the critical factor of concern to all players in any of the construction projects as it leads to multiple problems including severe cash-flow to contractors. Thus, its effects have led to a devastating knock-on problems down the contractual payment chain and have threatening the contractor to suspend work until the payment due to him is paid (Ansah, 2011).

Moreover, the effects of delayed or late payment problem have to a great extent caused a formal dispute resolution such as 'arbitration' or 'litigation'. However, those dispute resolution processes have been found to be costly and take a long time. Literatures have identified multiple factors contributing to delay in construction projects. However, the similarities and inter-relationship between the majority of the causes/factors have been recognized (Serdar & Hosseini, 2018). Factors includes; employer's poor financial capability and management, employer's withholding or refuse for payment to contractor or subcontractor due to various reasons, conflict among parties involved in construction project, late payment culture or attitude,

client's or consultant delay in certification the claim and disagreement on the valuation of work performed.

Furthermore, inadequate and or poor planning, poor site management, contractors and subcontractor's inexperience, poor site management and coordination problems, lack of commitment and communication, unclear project scope; and substandard contracts (Doloi, *et al.*, 2012). Furthermore, lack of resources (labor and material); connecting work; frequent changes in work plans; external conditions such as weather conditions and design-related issues (Lindhard & Wandahl, 2014) to mention a few.

Various measures to reduce the road construction delay were identified from different literatures including: deployment of the strategic management skills, improving planning, scheduling and adoption of advanced technologies, automation and mechanization in construction process (Zhiqiang, *et al*., 2020). Moreover, formation of various government agencies to assist in regulating and promoting professional conduct to enhances performance (Clyde & Co, 2013), establishment of PPRA to facilitate fair, transparent, competitive, non-discriminatory, quality and standard procurement practice systems that would help to obtain a competent contractor and attain value for money (PPRA, 2016) and establishment of Structured Engineers Apprenticeship Programme (SEAP) to facilitate competence acquisition who will assist to supervise the projects (ERB, 2005).

Furthermore, dividing the huge project's tender bid into small lots (Mwishwa, 2014), establishment of Association of Citizen Contractors in Tanzania (ACCT) to advocate and oversee the professional values such as excellent and quality construction labor and services, professional respect, integrity, and conduct to ensure a continuous improved construction performance (ACCT, 2020); and formation of Construction Industry Policy (CIP) to guide the Tanzania's construction industry and its performance. Multiple specific measures have been proposed by different researchers as follows:

A study conducted by Odeh and Battaineh (2002) on causes of construction delay proposed the enforcement of liquidated damages and providing an incentives for early completion contractors as a strong measures to minimize delays (Odeh, & Battaineh, 2002). Another survey based study conducted by Nguyen (2004) recognized five fundamental measures to be itemized within the industry to minimize delays. These comprises availability of enough construction resources, presence of skilled and qualified project team, availability of competent project managers and accurately cost and initial time estimates (Sara, 2017). Moreover, the same added by citing another measures including adoption and implementation of adequate planning from project inception and design phases to completion as major measure to avoid construction delay.

Furthermore, the use of innovative and modern methods such as the use of 3D on printing, robots, artificial intelligence were mentioned to bring the major impacts towards the timely completion of construction projects (Sanni-Anibire *et al*., 2020). Additionally, the findings by Murat and Zeyne (2021) on construction project delay recognized the development of Building Information Modelling (BIM) based delay analysis, adopting an appropriate projects, delay analysis method, Critical Chain Project Management (CCPM) integration, dispute resolution before its occurrence and smart contract to the delay analysis as the most potential and tremendously strategies to be considered to improve delays in construction projects (Murat & Zeynep, 2021).

Similarly, a study by Mohamed and Babikir (2015) on project delay provided a holistic thirty (30) summarized delay minimization measures to construction industry, despite the mentioned above, some of the new stated measures comprised of commitment to projects, make use of current technology, absence or less bureaucracy, clear information and communication channels, proper emphasis on past experience, community involvement and contingency allowance (Mohamed, 2015). Despite the fact that no written literatures that show the specific measures taken by TARURA on its projects to reduce delay, the normal practices have shown that most measures are practiced despite lacking the stated effective strategies. Thus,

this has necessitated the need to establish the model of strategies to minimize the construction delays.

Table: 2: A summary of measures for construction project delay

Measures	Contributing measures	Sources
Planning	▪ Use of overlapping activities during construction. ▪ Plan and analyze the requirements in details ▪ Adopt interactive planning ▪ Adopt human resource planning in construction management process reengineering (CMPR)	(Baar, 2002; Cheng *et al.*, 2005; Shelbourn *et al.*, 2007; Blacud *et al.*, 2009)
Resource	▪ Mapping the availability of enough construction resources. ▪ Presence of skilled and qualified project team ▪ Availability of competent project managers ▪ Accurately cost and initial time estimates ▪ Inclosing adoption and implementation of adequate planning from project inception and design phases to completion. ▪ Resource constraints	(Vaziri *et a.l*, 2007; Sara, 2017)
Technology related	Innovative and use of modern technology methods such as the use of 3D on printing, robots, artificial intelligence and Building Information Modelling (BIM).	(Anibire, *et al*., 2020; Murat & Zeynep, 2021; Mohame, 2015)
Management related	▪ Providing an incentive for early completion contractors ▪ Absence or less bureaucracy, ▪ Clear information and communication channels, - Proper emphasis on past experience ▪ Community involvement and contingency allowance - Commitment to projects. ▪ Use of Collaborative based approach	(Hsiao *et al.*, 2003; Chen *et al.*, 2004; Hamzah *et al.*, 2008; Koch, 2008; Mohamed, 2015; Ardonceau, 2018; Odeh & Battaineh, 2020)

Measures	Contributing measures	Sources
	▪ Training and knowledge transfer. ▪ Knowledge management gained from previous projects	
Risks identification	Early prediction and identification of risks.	(Gawad *et al.*, 2008; Mejtahed *et al.*, 2008; Nelms, *et al.*, 2008; Khamooshi *et al.*, 2009)
Others	▪ Integrated/sustainable decision-makers ▪ Value engineering ▪ Resequencing of activities with minimum disruption ▪ Records and lesson learned feedback	(Hansen *et al.*, 2006; Abdul, 2009)

1.1 Statement of the Problem

The Tanzania construction industry has continued to attain a prolonged inadequacy and a non-guaranteed low performance (Tekka, 2022) caused by multiple factors. Specifically, road construction projects in Tanzania that produce a fundamental infrastructure for socio-economic development have been noted to attain inadequate performance evaluated based on construction time extension (delay) in many construction projects (Mwishwa, 2014).

Correspondingly, the road construction projects under the Tanzania Rural and Urban Roads Agency (TARURA) has frequently experienced a significant delay, leading to cost overruns, poor infrastructure quality, and economic inefficiencies. These delays have hindered the Tanzania's development goals, particularly in improving rural and urban connectivity, necessary for trade, transportation, and social services. Despite TARURA's mandate to enhance road networks, persistent delays have consistently undermined the public confidence and reduce the economic benefits of infrastructure investments. The effects of delays to clients, contractors, and consultants have resulted in mistrust, cost overruns, litigation, and cash flow constraints and hence non-worthy completed projects that always affect the economy of the sector and the country at large.

Various measures (Table 2) have been proposed to improve the construction project performance and thus reduce construction project delays unsuccessfully. Despite the adoption and applicability of previously proposed measures to various projects, multiple road construction projects have continued to face inadequate performance (Muhegi & Malongo, 2020) experienced in terms of project delays. Identifying the root causes and developing a strategic framework to mitigate these delays is critical for ensuring timely project completion and sustainable infrastructure development. The situation has raised the need for a continued study to find the solutions for the construction project delay that has for decades overwhelmed and persisted in the Tanzania construction industry. Thus, this study is sought to develop the framework of strategies that will help to reduce the construction delay on road construction projects in Tanzania.

1.2 Objectives

The objectives of this study have been classified in to two aspects namely: main and specific objectives:

1.2.1 Main Objective

The main objective of this study is to formulate the framework of strategies for improving the road construction projects delay in Tanzania.

1.2.2 Specific Objectives

Specifically, the study is confined to the following specific objectives:

i. To identify the potential factors for road construction project's delay.
ii. To determine the prevailing best practice measures of reducing road projects construction delay.
iii. To examine the potential failure reasons for the prevailing road construction delay best practice measures.
iv. To develop the framework of potential strategies to minimize road construction projects delay.

1.3 Research Questions

The study sought to address the following questions:

i. What are potential factors for road construction project's delay?
ii. What are prevailing best practice measures of reducing road projects construction delay?
iii. What are potential failure reasons for the prevailing road construction delay best practice measures?
iv. How road construction projects delay can be minimized?

1.4 Conceptual Framework

A conceptual framework of the study (figure 1) presents the researcher idea as manifested from the literature review to describe the intended study phenomenon. The framework has conceptualized the construction industry delay factors, prevailing best practices measures, the potential failure reasons for the prevailing measures and a framework of strategies for reducing the construction delays in the Tanzania construction industry that occupy similar attributes of the construction industry environment as of other developing countries.

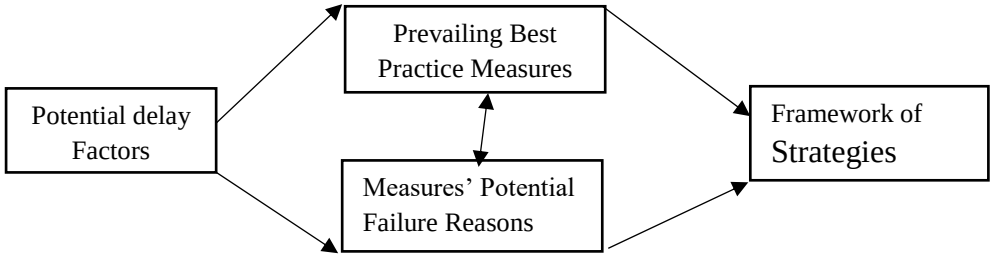

Figure 1: Conceptual framework of the study

1.6 Scope of the Study

The study on developing the strategies to reduce the construction delay on road construction projects in Tanzania can be found to be complicated, as it comprises various elements that need more time and cost to be explored. As noted by (Perry & Jensen, 2018), the scope of the study normally defines only the specific elements in a definite range within the researcher's scope. However, this study will be confined to developing a framework of strategies that can be adopted to reduce the construction project's road delay in Tanzania.

1.7 Significance of the Study

This study will be fundamentally beneficial to construction industry stakeholders, policymakers and practitioners by informing them about the potential strategies to be

adopted to reduce the construction project's road delay in Tanzania. The main study contributions of this study will be reflected in knowledge to be acquired when developing the potential strategies.

1.8 Methodology

The research methodology introduces the type of research methods to be used in this study. It also discusses various features of research including population, sampling techniques to be used, sample size and the methods used in the sample selection. Moreover, the methodology provides the data collection methods, tools to be used, pilot study procedures and its administration process. However, it will provide a brief description of the validity and reliability of the collected data. Table 3 below provide a simplified data collection method to be adopted for each specific objective towards this study completion.

Table 3: Data collection methods for respective specific objectives

Specific objectives	Data collection methods
1	Desk study, Questionnaire survey, interview (face to face ,focus group), Site visit and Statistical analysis (Relative Importance Index-RII)
2	Desk study, Questionnaire survey, document analysis, interview, focus group discussion, case study
3	Document analysis, interview, focus group discussion, case study
4	Focus group discussion, case study, Statistical analysis (Relative Importance Index-RII and Model Fit Indices Test)

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

This chapter provides an introduction before describing various concepts related to the research. The section is devoted to reviewing diverse, relevant literature to understand the construction industry, the challenges of the construction industry in Tanzania, the road construction project, road project performance, and road construction project delays. The literature review helps to provide the research gap, design, and the methodology setup.

2.1 Key Concepts

2.1.1 Construction Industry

It is one of the world's fastest-growing industries and a fundamental sector for the economy, as it plays a great role in national social and economic development around the world by providing infrastructures and other physical structures of the country, creating employment, providing needs to the population and contributing to the country's Gross Domestic Production (GDP) (Shabir *et al*, 2023).

2.1.2 Road Construction Projects

It constitutes a large portion of infrastructure that forms a significant part of the entire construction sector and acts as a major component that encourages economic growth. The roads assist in connecting people to employment, enabling goods and services delivery, and promoting exchange among different people. The roads help to create smooth travel at higher efficiency.

2.1.3 Construction Project Delay

This is described as the project time overrun beyond the scheduled project. It is an activity that extends the time required to deliver the project, which manifests itself as additional days of work. Delays are one of the critical problems that occur in almost every construction project. However, its magnitude varies considerably from one project to the other.

2.2 The Background of the Construction Industry

The construction industry (CI) is defined by (NCC, 2020) as: "…a sector of the economy that converts various resources into constructed physical-economic and social infrastructure necessary for socio-economic development. It embraces how the

said physical infrastructure is designed, procured, built, repaired, maintained, and demolished. The CI is widely recognized in the mainstream of construction economics. The construction industry (CI) is a vital sector having a decisive role in accelerating the wheel of economic growth of any country (Lopes *et al.,* 2011). Moreover, the CI facilitates income distribution, poverty reduction, support creation, and support a large-scale enterprise (Anugwo *et al.,* 2018). Furthermore, it provides a broader eco-system of enterprises for social-economic stability and well-being. Generally, it contributes significantly to both Gross Domestic Product (GDP) and Gross Fixed Capital Formation (GFCF) of all nations (Tunji-Olayeni.*et al*., 2017).

The industry provides various constructed infrastructure facilities (Suphian, 2009) including transportation and communication systems such as road, railway, airport, irrigation, and canal systems, transit systems, pipelines, transmission and power lines; real estates for shelter; and other fundamental social-economic services such as schools, hospitals, electric and water distribution network (Khan, 2008) to mention a few. It enhances productivity, quality, and everyday life (Sitsabo, 2012). Also, it acts as a mechanism for creating employment and offering various job opportunities. Besides, it generates income, increasing domestic resource consumption (Giang and Sui-Pheng, 2011), and acting as a determinant for social-economic development that stimulates the growth and development of other linked sectors which enhance national economic growth (Jackman, 2010).

However, Tesha *et al*., (2017) explain that the construction industry's significant contribution to socio-economic development depends entirely on the small and medium firms' growth. Nevertheless, (Hagstedt & Thideman, 2013) classified two different firm growth meanings as improving quality performance or production and changing in the firm's volume or size because of process developments. The construction industry's substantial role can be demonstrated through its economic contribution to the national Gross Domestic Product (GDP). While the sector represents about 13% of global GDP (David, 2020), it contributes more than 10% GDP of the industrialized and developed economy countries and about 7% of GDP to emerging and Less developed Countries(LDC) (Jorge, 2017).

The construction sector's essentials can be revealed through the bell-shaped development pattern or an inverted U-shaped Development that portrays the

correlation between the construction industry shares to economic growth in terms of National Gross Product (NGP) (Bon, 1992). The data analysis of different development stages of developed countries revealed that the construction shares, expenditure, and output in (NGP) at first rises instantaneously before declines `for a less developed country (LDC), it tends to reach an apex in newly industrialized country (NIC) status (Crosthwaite, 2000).

Further, Lopes, (2009) claimed that at the maturity stage of the country's development, whenever governments change to become more developed, and as an advanced industrialized country (AIC), construction output drops only relative than in absolute terms. Consequently, Yiu *et al*., (2004) cemented on the dynamic of construction, showing that, while the increases of construction undertakings grow or expand at the developing phase of various developing countries, repair and maintenance become a significant focus the developed countries. It is worth noting that the overall construction and maintenance activities are recognized as performed by small-medium local construction firms.

However, despite the considerable contribution of a small-medium local contractor (SMLC), its performance in the domestic market has attained unsatisfactory performance continuously decades (Mohammed *et al*., 2001) in terms of the construction time, cost, quality, environment, and safety (MoW, 1977; Samson, 2003; Mawenya, 2011). Despite the acknowledged importance of SMLC, contraction firms have been confronted by increasingly numerous constraints, including lack of appropriate strategies for firm development (Ofori, 2012), low Productivity, low predictability, Lack of skilled, competent, and experienced labor, low technology adoption and use, poor and adoption of general strategies, poor performance process, lack of enough experience and poor historical performance.

Various led-initiatives have been undertaken to foster SMLC firms to attain adequate performance improvement unsuccessfully. These include the establishment of agencies and boards, the formation of the national construction council (NCC), the establishment of Public Procurement Authority (PPRA), and the formulation of Construction Industry Policy (CIP) of 2003. The CIP aimed to provide mechanisms for improving local contractor's and consultants' capacity and performance, improving quality and productivity, promoting technological development,

promoting sustainable construction practices, mobilizing adequate financial resources, and enhancing construction equipment availability.

2.3 An Overview of Tanzania Construction Industry

Tanzania, officially the United Republic of Tanzania (in Swahili as a national language is *Jamhuri ya Muungano wa Tanzania*), is a result of the unification of two separate countries known as Tanganyika (the Mainland) and the Zanzibar Island (URT, About Tanzania - Tanzania Embassy Site, 2020). It is a relatively large country with approximately a total area of 945,087 km² and an estimated population of a 54.2 million (NBS, 2018). The country is dependent on the agricultural sector, which accounts for more than 40% of the country's GDP (Hussein & Muyingo, 2011). It is located in eastern Africa between 10 00' S and 120 00' S and between 300 00'E and 41 00' E. It is a country in East Africa bordered by Uganda to the north, Kenya to the northeast, and the Indian Ocean. It borders Mozambique and Malawi to the South, Zambia to the southwest, Rwanda, Burundi, and the Democratic Republic of Congo (DRC) to the west (URT, 2020).

Despite insufficient and supportive statistical documentation, it is evidenced that Tanzania's construction activities started during the colonial era (Samson, and Lema, 2003). During this period, the construction activities were under government state-owned firms such as MECCO and NEDCO (MoW, 1997), supervised by communication and works (COMWORKS). Over the period between the 1980s to 1990s, the country was faced with numerous structural programs. In 1980/1981, Tanzania experienced the national Economic Survival Programme (NESP), the Structural Adjustment Programme (SAP) in 1988, and the Economic Recovery Program (ERP) in 1989.

The structural programs established the construction industry private investors and the increased inflow of private capital that enhanced competitiveness in the local market despite low performance (Bjorklof *et al.*, 1992). The second phase of the structural program in 1991 witnessed the flow of more investors in almost every sector of the economy. This led to the demand for more service from the construction industry, which enhanced the increased local firm with inadequate

performance, and foreign private experienced construction firms hence accelerated severe competition for the construction market opportunity (CRB, 2020).

In Tanzania, construction activities take a large proportion of the government budget under the Ministry of Works, Transport, and Communications (MOWTC). Drawing an example in the financial year 2015/2016-2020/2021 (Table 4), the six-budget year plan indicates an increased budget of the construction sector (MoF, 2020).

Table 4: Tanzania construction budget

Financial year	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020
National budget (Billion Tshs)	1.48	2.21	2.23	2.26	2.33
CIB (%)	27.23	28.12	31.64	33.73	41.32

Source: MoF (2020)

NOTE: CIB represents the Construction Industry Budget.

Currently, the Tanzania Construction Industry and its activities are supervised under the Ministry of Transport (MoT). The ministry has various agencies, boards, and institutions, including the Contractors Registration Board (CRB), Engineers Registration Board (ERB), and Architect and Quantity Surveyors Registration Board (AQRB). Others include the National Construction Council (NCC), the Tanzania National Roads Agency (TANROADS), the Tanzania Building Agency (TBA), the Tanzania Rural and Urban Roads Authority (TARURA), and the Roads Fund Board (RFB) (MoWTC, 2020), to mention a few.

The Contractors Registration Board (CRB) is responsible for coordinating all local and foreign contractors working in Tanzania's construction industry. It includes registration, checking and regulating all activities and conduct of contractors, and developing local contractors' skills and capacity. It sets criteria and ensures compliance with governing laws and regulations for registration of contractors in different classes, reviewing these criteria from time to time, and liaising and interacting with local and foreign professional boards and associations related to the construction industry (CRB, 2020). To date (as of April 2020), CRB has registered a total of 6546 involving (3228) civil registered contractors and (3318) building

registered contractors (CRB, 2020) whose classes of registration have been tabulated below:

Table 5: Contractors registration in Tanzania

Contractor category	Contractor type	Classification of contractors						
		I	II	III	IV	V	VI	VII
Local	Building	80	48	59	280	824	769	1220
	Civil	43	24	57	268	729	1200	873
Foreign	Building	38		NIL				
	Civil	34		NIL				

Source: CRB (2020)

It can be noted from Table 5, that most local contractors (93.79% of Class IV to VII) have been registered as small and emerging contractors who are believed to lack the necessary resources and capability to compete (Lema, 2020). However, it is shown that only 6.21% registered as medium to large (Class I to III) contractors can little compete with foreign firms.

Thus, to demonstrate the situation, Kikwasi (2012) acknowledged that the small and medium local contractors have failed to attain a competitive advantage against foreign firms in the local competitive market. In his study Ndulane (2015) noted that the authority that categorizes or classifies firms in a particular category does not ensure their possessed minimum requirements in practice. This situation does not create a fair and real competitive environment for local firms. Ndulane (2015) considered it essential and proposed to all responsible construction industry institutions from emerging economy countries to ensure that firms should be categorized depending on specified resources such as personnel, capital, and equipment.

2.4 The Role of Construction Industry to Tanzania Development

The construction industry is globally viewed as that sector of the economy which transforms various resources into constructed facilities through planning, design, construction, maintenance and repair, modelling and operation. It produces various the types of public and private infrastructure facilities including the residential and non-residential buildings to heavy construction infrastructure such as roads, railways,

highways, dams, irrigation schemes, that plays a significant role in the national development.

The construction industry encompasses multiple disciplinary professionals including the architects, engineers, surveyors, quantity surveyors, management consultants, general contractors, heavy construction contractors, suppliers, procurement experts, subcontractors, and construction workers in relation to clients, operators, and users of the constructed facility.

The Tanzania construction sector has been seen to bring the competitive economy that touches the daily lives of every individual and hence capable of producing sustainable growth and shared benefits. The construction sector has been noted to stimulates various sectors of the economy by providing shelters, modern and efficient transport and communication infrastructure. It offers adequate level of physical infrastructure needed to cope with the requirements of the vision in all sectors. It stimulates and provides employment that eventually boost the domestic consumption **(**Giang & Sui-Pheng, 2011**)**. Additionally, the sector facilitates to accelerate and promote the income distribution and hence poverty minimization (Anugwo, *et al*., 2018). Moreover, the sector has been critically viewed to facilitates urbanization, industrial development, it brings advancement of civilization as well as raising of the Gross Domestic Product (GDP) and easing to raise of living standards of Tanzanian.

2.5 The Impacts of Roads Infrastructure

The fundamental function of road construction is to provide the convenient and efficient connection or linkage, accessibility and mobility. This has made almost all developing countries decide to prioritize the improvement of their road networks as a main factor for shaping their modern society towards development in terms of economy and national growth. Road construction projects are believed and listed as the principal focus in many developing countries' budgets to improve the transportation infrastructure that in turn reduce the transportation cost and time and facilitate a smooth flow of goods and services from one point to another contributing to increased trade and commerce thereby growth of the nation economy. Similarly,

the improved transportation networks support to enhance productivity, local business and agriculture growth, it enriches easy access to the marketplaces, develops better health centers, facilitates quality education, enhances facilities (health, electric power, water, telecommunications and sanitation) distribution and supply that eventually intends to alleviate poverty. Despite the importance of road construction projects, it is considerably whelmed with multiple challenges including lack of funding and lack of engineering input.

2.6 Performance of Tanzania Contractors on Construction Projects

Tanzania has embarked on a long-term strategic vision development plan to achieve sustainable development with all pre-requisites to become a middle-income country by 2025 (URT, 2011). The vision envisages creating a strong, diversified, resilient, and competitive economy that can successfully survive within the challenges of changing market and technological conditions. One of the prioritized as a fundamental catalyst to facilitate the 2025 vision is using the construction industry (NCC, 2003) to develop various infrastructure projects (MOW, 2003). Thus, like many of their counterparts in other emerging economy countries, small and medium Tanzania contractors play a role despite their associated challenges, leading to the construction firms and thus project's poor performance (Ndulane, 2015).

Most construction projects in Tanzania have experienced poor performance state resulted from the poor performance of local firms. In contrast, others closed either without achieving the quality requirements or variations to the original quality requirements provided in the project technical specifications (URT, 2010). The situation has frustrated the nation's development process, leading to immeasurable costs to the project stakeholders, such as the community. It has led to a loss of reputation to local construction parties involved in construction projects, most specifically contractors, consultants, managers, skilled tradespersons, subcontractors, and suppliers (Simon, 2017).

Mlinga (2006) recognized that construction industry practitioners have witnessed malpractices, unethical behavior, and lack of technical procurement skills in Tanzania to hinder local firms' effective performance and, thus, projects. Such

practices have confirmed to become the source of unnecessary delays and costs overruns in executed projects. Therefore, delays the developments. Moreover, the accessible documents postulated that the construction industry was characterized by uncertainty in resource availability (finance, materials, plant/equipment, and labour), resulting in an inferior quality of work and low productivity (Mwishwa, 2019).

Various studies on Tanzania projects' performance have recognized a prolonged inadequate performance when accessed based on the Schedule Performance Index (SPI) and the Cost Performance Indexes (CPI) (Mwishwa, 2019). The schedule performance index defines the earned value analysis, determining whether the project is running ahead or behind schedule (Hegazy, 2019). If the project is completed on time, SPI tends to reach one's worth (1). The SPI value increases or decreases to value one (1) as projects become ahead or behind schedule, respectively.

Furthermore, cost performance indexes signify the earned value of work performed divided by the work's cost (Clayson *et al*., 2018), or the ratio of total closing project cost incurred against the total contracted project contract cost. It was described by Christensen and Payne (1992) that a stable CPI is the evidence that expresses whether a contractor's management control systems (i.e., planning, budgeting, and accounting) are effectively operational and that the contractor's projected final costs can be considered reliable. The project performance of only 194 studied Tanzania Constructed Projects indicates a slow improved performance because of a decrease of SPI from 2.88 to 1.6 and CPI from 1.79 to 1.39 within a period of twenty-five (25) years. However, it becomes difficult to generalize whether the performance could be improved because of lacking documentation. Because the PI was above 1, we can conclude that most Tanzania projects are completed beyond the agreed time.

Moreover, within five years (2001-2005), nine government-funded projects constructed by local firms documented time extension challenges with low quality (Mamiro and Kasuwi, 2005). Furthermore, between 2005 to 2013, Ngowi (2014) noted the poor performance of 68% of ninety-five (95) road projects with an increased cost, time, and lack of value for money. It is generally worth noting that

most completed construction projects in Tanzania have attained unsatisfactory performance measured in time, cost, safety, and quality (Mwishwa, 2019) due to inadequate performance or productivity of small-medium local firms.

Furthermore, the Tanzania contractors' regulating body (Contractors Registration Board, CRB) released its performance evaluation reports after its nine-year routine site visit (2002 to 2010). The report indicated how contractors observe the site safety, provide the signpost, responsibility, and accountability. The report findings (Table 6) indicated the ups and down towards site performance adherence. However, contractors have shown a considerably increased inadequate performance of 33.4 % of measured from (21.6% in 2007 to 38% in 2010). Thus, it is reported that multiple factors, including incapability, have accelerated contractor's inadequate performance (Mwishwa, 2019).

Table 6: Contractors' site conformance

Years	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Number of sites visited	308	675	759	785	1096	1251	1588	1760	2111
Compliant sites	140 (45%)	346 (51%)	540 (70%)	478 (61%)	764 (61.5%)	980 (78.4%)	1122 (70.5%)	1235 (70%)	1307 (62%)
Sites with shortfalls	168 (55%)	329 (49%)	219 (30%0	307 (39%)	422 (38.5%)	271 1.6%)	468 (29.5%)	530 (30%)	805 (38%)

Source: Muhegi (2011)

2.6.1 Consultants Performance

Like other places and depending on the construction method adopted, the consultant firms in Tanzania are engaged in designing, tender preparation, and supervision. Resulted from their responsibilities, they are faced with multiple challenges, including lack of technical personnel ending in many design errors, mistakes leading to a frequent design change during execution. Other challenges encompass a lack of management and business-related knowledge and skills (CRB, 2008; ERB, 2018). It is believed that the consulting firms contribute significantly to contractor's inadequate performance due to poor supervision. The analysis from experienced technical personnel agreed that the consultant needs to be stable, transparent,

accountable with well-equipped personnel and technical competence for the particular project to be free from being part of the contractor's underperformance.

2.6.2 Challenges Facing Construction Industries in Developing Countries

Literature has revealed numerous Challenges facing local construction firms in Ddeveloping Ccountries. The financial barrier has continued to be the greatest critical Challenge for the firms establishment, survival, and progression or growth. Ye and Tekka (2020) noted that the degree of the financial limitations extends from cash flow and financial control and management skills problem (Laryea, 2010), loan inaccessibility (Kauffmann, 2005), the obligatory extra-ordinary-interest rate charged by financial institutions (Nyambura, 2013), and high inflation rate (Kulemeka *et al.*, 2015). Other challenges include the shortage of technical and competent labor (Mba and Cletus , 2014), non-access to plant and equipment (Segokgo.*et al*., 2000), limited skills in modern technology, and difficulty in transfer and development (Chilipunde, 2010) and inappropriate strategies on resource use and re-use (Peter *et al.*, 2012).

The management-related challenges include a lack of human resource training and a lack of management knowledge (Thwala & Mofokeng, 2012). In experience, lack of exposure, construction claim problems (Azmi, 2018), and poor strategic planning and management (Mba & Cletus , 2014). Moreover, unethical and code of conduct such as malpractices and corruption (Temu & Due, 2000) were also identified as substantial Challenges to hinder performance and growth. However, changes in design (Fugar *et al*., 2010), low or wrong estimation (Long, *et al*., 2004), lack of accountability, and transparency during project execution (Kiggundu, 2002) were also noted to inhibit performance improvement.

Furthermore, lack of supportive infrastructures (Mba & Cletus, 2014), weather fluctuations as a result of the global warming effect, project suspension by the previous government (Odonkor, 2011) and political instability, and technical performance (Kim Du *et al.*, 2008). Others involves ineffective, impracticable government policy (Matovu, 2011) and strategy (Vasco *et al*., 2012), weakened Construction industry institutes (Owino *et al*., 2013) were also noted to hinder an

improved performance. Table 7 provides a summarized holistic performance challenge facing small-medium contractors in developing countries.

2.6.3 Efforts to Improve Contractor's Performance in Tanzania

Numerous measures have been undertaken to eliminate inefficiencies in the Tanzania Construction industry to attain improved performance. Considerably, most measures imposed have been managerial rather than technical (Mpangule, 2016). Various scholars suggested various efforts to improve performance. While Arditi, (1985) proposes concentrating on improving planning and scheduling, Zhiqiang *et al.* (2020) suggested adopting the mechanization process to enhance productivity and performance. Additionally, Hellard (1993) commented on adopting the Total Quality Management (TQM) philosophy to attain a performance cultural change believed to reduce the construction sector's inefficiency. Also, it was proposed to avoid a single-loop-learning approach and implement additional double-loop learning techniques to ascertain the organizational learning (OL) and knowledge management (KM) to reduce inefficiencies' root causes (Henderson *et al*., 2020).

Table 7: A summary of Performance Challenges in Various Developing Countries

Country	Challenges														Authors
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	
Tanzania	+	+	+	+	+	+	+	+	+	+	+	+	+	+	(Tesha, D.N. et al., 2017; Kavishe, N. et al., 2019
Uganda	+	+	+	+	+	+	+	+	+	+	+	+	+		
Kenya	+	+	+	+	+	+	+	+	+	+	+	+	+	+	(Ocen.S.J. et al., 2011; Basheka,B.C. et al., 2012)
Zambia	+	+	+	+	+	+	+	+	+	+	+	+	+	+	(Kamunge, M.S. et al., 2014; Kenyatta, 2016; Momade, 2020)
Malawi	+		+	+	+	+	+	+	+	+	+	+	+	+	(Chilongo Sylvia, C. and Mbetwa, S., 2017; Ngomi A., 2017)
Nigeria	+	+	+	+	+	+	+	+	+	+	+	+	+	+	(Kulemeka.P.J. et al., 2015; Bentall, P. et al., 2020)
Mozambique	+	+	+	+	+	+	+	+	+	+	+	+	+	+	(Omopariola, D.E. et al., 2019; Akarowhe, 2018)
Botswana	+		+	+	+	+	+	+	+	+	+	+	+	+	(Nhabinde, V. et al., 2012; Cruz, A.S.et al., 2018)
Ghana	+		+	+	+	+	+	+	+	+	+	+	+	+	(Ssegawa, 2013)
Swaziland	+		+	+	+	+	+	+	+	+	+	+	+	+	(Osei-Kyei, R. and Chan, A.P.C., 2017b; Ardonceau, 2018; Marteye, N.T. et al., 2018)
South Africa	+					+	+	+	+	+	+	+	+	+	(Thwala, 2009; Thwala, W.D. Mvubu.M., 2008)
Zimbabwe	+		+	+	+	+	+	+	+	+	+	+	+	+	(Murray, M. and Apphia-Baiden, J., 2020), (Thabani, N. and Wellington, G.B, 2017)

Note: C1-Financial Related challenges; C2- Contractual challenges; C3-Shortage of local Skills labor; C4-Lack of feasible government, policies, regulations and procedures; C5-Lack of experience and exposure; C6-Lack of modern technology; C7- Inaccessible to plant and equipment; C8-Delays in payment; C9-Procurement challenges; C10-Ineffective performance strategies; C11-nvironmental Challenges; C12-Ethical and code of conduct challenges (Malpractices); C13-Political interference issues; C14-Lack of training.

The summary of performance challenges has generally pointed to the East and Southern African countries, which have almost shown to possess the related problems in their construction firms, projects, and construction industries in general. Furthermore, Milford *et al*. (2000) advocated increasing infrastructure development investment to facilitate the construction industry's development. However, the focus was to bring all stakeholders and participants in play as earlier as possible to ensure a collaborative and an intergrade project delivery as defined by the American Institute of Architect (AIA).

A project delivery approach integrates people, systems, business structure, and practices into a process that collaboratively harnesses the talents and insights of all participants to optimize project results. To increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction.

The following are proposed measures implemented to attain an improved construction performance as described:

The formation of government agencies, regulators, and Institutes (Mawenya, 2011; Mwishwa, 2014) was perceived to raise the firm's performance and the general construction industry. The formed agencies under the Ministry of Works, Transport and Communications encompasses the Tanzania National Roads Agency (TANROADS), established under section 3 (1) of the Executive Agencies Act (Cap 245), an executive agency responsible for the maintenance and development of the trunk and regional road network in Tanzania Mainland (TANROADS, 2020).

Also, Tanzania Buildings Agency (TBA) was established under Act No.30. It came into operation in 2002 accountable to provide quality accommodation to Government, and public servants as well as (TBA, 2020) and Tanzania Rural and Urban Road Authority (TARURA) formed under cap. No. 245 (TARURA, Acts/ Tanzania Rural and Urban Roads authority, 2018). Other agencies include The National Construction Council (NCC) as a government institution established through Act No. 20 of 1979 (CAP 162 R.E. 2008) and became operational in 1981. Its establishment was driven by the need to promote the development of the construction industry in Tanzania, Engineers Registration Boards (ERB; formed under Act No 15 of 1997), Contractors Registration Boards (CRB; under No 17 of

1997), and Architects and Quantity Surveyors Registration Board (AQRB; formed under Act No 16 of 1997).

As mentioned earlier, the agencies aimed to register, regulate and promote professional conduct, enhance the construction industry performance, and develop engineering professionals and practice together with the development of their capacities for protecting consumers of construction services (Clyde & Co, 2013).

i. Establishment of Public Procurement Authority (PPRA) and its regulations:- PPA was formed under Act No. 3 of 2001 (URT, 2011) aiming to ensure the application of fair, transparent, competitive, and non-discriminatory systems that would help to attain value for money, quality and standard procurement practice (PPRA, 2016).
ii. Introduction of Structured Engineers Apprenticeship Programme (*SEAP*): The government established and funded the program to enable young Tanzanian graduate engineers to acquire sufficient professional competence through on-site practical training practice and qualify for experienced registration engineers within the shortest possible period (ERB, 2005).
iii. Formulation of Construction Industry Policy (CIP): The CIP was formed in 2003 to guide Tanzania's construction industry. CIP intended to strengthen local construction firms' competitive edge by increasing their formal construction industry involvement. Ultimately, the CIP intended to stimulate the development and growth of Tanzanian construction industries, which an increased share could reflect to compete nationally and globally (URT, 2003).
iv. Formation of Contractors Assistance Fund (CAF): - It was established under CRB in 2002 to set funds from its proceeds to help contractors secure bid bonds and bank guarantees for advance payments as mobilization loan from the commercial bank (CRB, 2020).
v. Provision of training and skills development through Sustainable Structured Training Program (SSTP) for contractors and Training for labor-based contractors.
vi. Formation of Contractors Association of Tanzania (CATA): - The formation of CATA was predicted to increase contractor’s competence through information sharing to get experience. Besides, CATA served as a pressure

group towards demanding contractor's rights. However, it was also used as a forum to monitor the contractor's ethics and code of conduct practices (Samson & Lema 2002).

vii. Formation of Association of Citizen Contractors in Tanzania (ACCT): -The association was registered in February 2011 under the Societies Act, cap 337 R.E. 2002, to safeguard the Tanzania local contractor's interests while advocating the professionalism within Tanzania construction industry. The association intends to oversee values including; excellent and quality labor and services, respect, integrity, and conduct to ensure a continuous improved construction knowledge and performance (ACCT, 2020).

viii. The last measure undertaken was to divide the massive project's tender bid into small lots to permit the participation of small and medium local firms in project tendering (Mawenya, 2011; Mwishwa, 2014).

Despite the proposed and adopted initiatives to contribute a slow significant improvement in the Tanzanian construction industry, small and medium local firms are still unable to undertake mega and complex projects. The adopted initiative measures' weakness has portrayed that many local contractors have proved inadequate performance compared to foreign firms (Muhegi & Malongo, 2020). However, it is worth saying that neither of the measures has thoroughly adopted and implemented any improvement philosophy specifically focusing on process performance improvement to attain a radical improvement change. The prolonged inadequate performance has necessitated this study to develop alternative strategies to improve the performance of SMLC.

2.7 Categories of Construction Project Delay

The issue of construction project delay has become a world's chronic problem and a topic of concern as noted from majority of construction projects (Durdyev *et al*, 2017). Some projects experiences only a few days behind the schedule while other projects delayed for even over a year (Obodoh & Obodoh, 2016).

Literatures has classified delays into various groups depending on their causes. Despite that some causes of delays are more effective than others, no established set

of causes are agreed upon to be the most effective than the other despite their classification to be different from one study to another. A study by Ahmed (2003) categorized the construction project delay into two categories namely internal and external caused delays. While the internal delays arise from within the project stakeholders such as clients, contractors and consultants, the external factors mostly occur resulted from unforeseen factors that do not arise not from the project participants, rather, they are due to God's will encompassing weather conditions, natural disasters, government actions and material supplies.

A study by Abdullah and Bera (2018) classified delays into two groups namely Excusable and no-excusable. The Excusable delay sometimes known as force majeure is a delay to completion of works caused by various matters considered to be beyond the contractor's control derived to be due to the acts of God. It is further divided into compensable delay that occurs as a consequence of acts or omissions of client or someone for whose acts the owner is liable to and non-compensable which is triggered by the situations that are not attributed to the project participants (Antonio *et al*., 2024). However, the non-excusable delays are always resulted from the foreseeable events which are under the contractor's control and its suppliers (Kazemi *et al*. 2021). An example for a non-excusable delay encompasses the following:

a. Delayed mobilization.
b. Overall late performance and execution.
c. Late materials delivery by supplier.
d. Late of construction works completion by sub-contractors.
e. Poor and or wrong ways or method of work execution by contractor or sub-contractor.
f. Shortage of labor and equipment at the construction site due to various reasons.
g. Employees strike resulted from the contractor's intention to delay.

2.8 Factors for Construction Project Delay

Various factors have been stated to facilitate construction project delays. Various literatures have categorised the delay factor into internal and external related factors. Further, they have been categorised into material-related, labour-related, finance-related and equipment-related. However, factors have been further classified under contractor-, client- and consultant-related factors (Obodoh & Obodoh, 2016).

In general, a variety of factors, including weather conditions, poor communication, coordination and conflicts among stakeholders, effective/improper planning, material and equipment/plant shortages, financial problems, payment delays, lack of project stakeholders' experience/qualifications/competence, construction labour shortages, and poor site management, were mentioned in various literatures and highly ranked in ascending order as significantly influencing project schedule delays (Serdar & Reza, 2018). Additionally, the study on construction project delays conducted in the United States identified the scarcity of labour and construction materials, equipment-related issues, weather fluctuations, design modifications, the absence of design document documentation, and errors or defects that arise during the project's execution as the primary factors contributing to delays (Głuszak & Le´sniak, 2015). According to a study conducted in Sudan, the most significant causes of delay are construction material price fluctuations, material shortages, inaccurate time estimations, and blunders that occur during the construction process.

The causes have contributed to cost overrun, extension of losses, time overrun, negative perception of the country’s construction industry, rise of shame to local construction companies, contractors, consultants and engineers with associated risks including too much pressure on project participants, price inflation of materials, revenue drop, overall cost increase, rise of disputes amongst project stakeholders and eventually project abandonment (Babikir, 2015). Another study by Belachew (2017) recognised that price fluctuation of construction material, construction cost underestimates, delay in supply of raw materials by the supplier, inadequate review of contract documents, lack of coordination and cost planning during the design phase and pre- and post-contract stages, respectively, have indicated the highest

significant impacts on the project performance from the client's, consultants' and contractors' perspectives (Belachew, 2017). A critical review study covering different developing countries to analyse the construction delay acknowledged multiple factors categorised in various clusters depending on delay sources. While other studies classified sources of delays as owner (client), consultant, and contractor related, few studies categorised them in relation to resources, construction materials, equipment, and labour.Beyond the aforementioned related sources of delay, others recognised in multiple literatures include contractual relationships, changes in design, environmental factors, financial factors, managerial factors, government rules and regulations, and related internal and external factors (Islam & Trigunarsyah, 2017). Generally, construction project delays in developing countries have revealed the negative impacts on construction businesses for users, clients, financiers, contractors and developers. It has led to degrading the reputation of both international and local firms and has publicised an increased construction cost when considering the influence of numerous factors such as an increase in the price of construction resources, economic recession, extreme weather conditions, technical aspects, and political reasons.Over multiple literatures, a comprehensive study by Antonio et al. (2024) manifested 893 various causes and 147 mitigation measures. The study used the successive approximations and filtering processes to systematically reduce the number of causes to 432 (52%) and the measures to 140 (5%) (Antonio et al., 2024). The authors proposed the list of classified causes into groups and lately arranged them into multiple clusters, including preliminary phase, engineering, procurement, construction, handover, project management, client and external factors.The Tanzania construction industry suffers frequently from the problem of delay in completing road construction projects. A study conducted on 80 randomly selected road construction projects from 2004 to 2008 showed that 72.5% of projects were delayed. This represents a significant burden on the course of economic development that hampers the development plans of the country and has a negative impact on the economy in general (Habtoor, 2001). Moreover, a study conducted by Ngowi (2014) analysing the performance of TANROADS construction projects within eight years (2005 to 2013) recognised that out of ninety-three (93) studied projects, 68%, representing 65 projects, went beyond the contracted time,

which proved inadequate performance (Ngowi, 2014).In addition, a recent study by Donati (2022) acknowledged that road construction project delays in Tanzania are a common problem that has extended to about 110% of the contracted time (Donati, 2022). Another study conducted to evaluate the construction project performance models using multiple countries Tanzania Inclusive concluded that the construction project delay or time overruns are triggered through various causes such as changes in design, the contractor's late payment, information sharing delays, financial concerns, poor project management, compensation matters, and disagreements as well as conflicts over the valuation of the completed project (Mtana et al., 2023). Thus, it can be concluded that Tanzania occupies almost similar factors leading to construction project delays as other developing countries, as summarised in Table 8 below:

Table 8: Summarized general factors for construction project delay

Factor cluster	No	Code	Contributing factors	References
Construction project management factors	1	CPM1	Ineffective or strategic planning and scheduling	Abdullah, *et al*. (2009) Aibinu, and Odeyinka, (2006) Abd El-Razek *et al* (2008) Owolabi James *et al*. (2014) Assaf., and Al-Hejji .(2006)
	2	CPM2	Poor contract management	
	3	CPM3	Mistake and discrepancies in the contract document	
	4	CPM4	A policy of lowest-cost bidding policy	
	5	CPM5	Bureaucracy in tendering method	
	6	CPM6	Inadequate monitoring and control	
	7	CPM7	Mode of financing, bonds and payments	
	8	CPM8	Economic instability	
	9	CPM9	Lack of constructability	
	10	CPM10	Late obtaining permits from governmental agencies	
			Inaccurate site investigation	
Economic factors	12	EC1	Late or delayed payment by each part (client/contractor)	(Ansah, , 2011; Alshihri, *et al*.,2022; Obodoh and Chikasi,2016; Tesha, *et al*., 2017; Kavishe, *et al*.,2019;
	13	EC2	Financial difficulties to contractors (with poor cash flow management)	
	14	EC3	Inadequate of poor fund allocation	
	15	EC4	High interest rate imposed	

Factor cluster	No	Code	Contributing factors	References
			by institutions	Hameed *et al.*
	16	EC5	Currency fluctuation or inflation	(2023).
	17	TE1	Frequently change of design due to mistakes and errors	(Ocen *et al.*, 2011; Basheka
Technical/design factors	18	TE2	Poor or delayed design	*et al.*, 2012;
	19	TE3	Complicated design	Lindhard &
	20	TE4	Poorly adopted construction method	Wandahl, 2014; Kenyatta, 2016;
	21	TE5	Lack of professionalism	Momade, 2020;
	22	TE6	Inadequate project time and cost estimate	Bentall *et al.*, 2020)
	23	TE7	Delay in inspection and approval of completed design drawing by consultant	
	24	MG1	Lack of chain of commands	(Ansah, 2011;
	25	MG2	Lack or poor organizational structure	Nhabinde, *et al.*, 2012; Doloi, *et*
Management factors	26	MG3	Lack or less motivation and training	*al.*, 2012; Thabani &
	27	MG4	Awarding contract to lowest but unexperienced and incapable bidder	Wellington, 2017; Arditi, *et al.*, 2017; Serdar
	28	MG5	Lack of management and supervision skills	& Hosseini, 2018; Cruz *et*
	29	MG6	Slow decision making between parties	*al.*, 2018)
	30	MG7	Unnecessary interference by the project owner	
	31	MG8	Ineffective procurement planning and incapable supplier	
	32	R1	Shortage or poor quality of construction materials	(Nhabinde, *et al.*, 2012;
Resource factors	33	R2	Late order and delivery of materials	Ssegawa, 2013; Ardonceau,
	34	R3	Lack or shortage of workforce and skilled personnel	2018; Marteye *et al.*, 2018, Cruz *et al.*,
	35	R4	Inadequate of modern technology	2018)
	36	R5	Frequently equipment breakdown	

Factor cluster	No	Code	Contributing factors	References
Information and communication	38	IC1	Lack of coordination between parties	(Majid, 2007; Odeh & Battaineh, 2022; Acharya *et al.*, 2006)
	39	IC2	Lack of communication between arties	
	40	IC3	Slow information flow between parties	
	41	IC4	Bullwhip effects during resource ordering	
External factors	42	E1	Unethical practices and kickbacks (Malpractices)	(Lindhard & Wandahl, 2014; Chilongo & Mbetwa, 2017; Akarowhe, 2018; Omopariola *et al.,* 2019; Bentall *et al*., 2020)
	43	E2	Unforeseen conditions (Changes of weather conditions, society strike and conflicts)	
	44	E3	Political interference.	

2.9 Effects of Construction Project Delays

The occurrence of the construction project delay is common that expressively bring many effects in many ways. The impacts of delays on projects can be multi-layered depending on various factors. Despite of various factors, it is hard to distinguish the effects due to overlapping nature causes of the factors that which construction party or parties are responsible to. Thus, the consequences of delays are different for construction parties to other. Generally, the consequences of the construction delays incorporate but not limited to time overrun, cost overrun, reduced quality of construction facilities or infrastructures, loss of wealth or reduced profit to contractors leaded by extra spending on equipment and materials and hiring the labor and loss of time (Abdullah & Bera, 2018).

2.9.1 Cost Overrun

Cost increase can also be stated as the difference between the initial budgeted cost and the actual cost of the project that cause the infrastructure projects to suffer from cost overruns (Durdyev & Hosseini, 2020). Cost overrun ca be described as unexpected change in the project budget/cost from the project conception phase to construction and finishing phase that leads to an increased total project cost due to various fundamental factors including economic factors that occur due to

erroneousness in project budget and or scope, construction technical factors such as poor or wrong estimates, incorrect data presence of any increase or decrease in project commitment levels, lack of risk management strategies, poof information flow and communication gap between project executors as well as political factors attributed by politicians lie by either underestimating or exaggerating the benefits of projects to make it saleable and for their own political interests (Essa *et al.*, 2022).

2.9.2 Time Overrun

Time overrun is one among the most global common issues in the construction industry. It is defined as the failure to complete a project within the estimate time (Ahmed *et al*., 2012). It can be used as a tool for qualifying a project as failure. Bajjou (2020) carried out a survey to find out the main causes of time overruns in the construction industry . His findings mentioned the most significant factors including design changes, poor labor productivity, inadequate planning and resource shortages. It was found that, whenever the time overrun arises, it leads to the project completion time extension beyond the estimated and consequently leading the contractor to lose the project as might be seen incompetent (Love & Ika, 2021).

2.9.3 Dispute

The Construction disputes is described as the disagreements between two or more parties involved in a contract. The disputes can most commonly arise between the owner and a contractor but also can emerge from other stakeholders such as suppliers, subcontractors, real estate developers, and architects. Dispute is a foremost causative of delay in construction projects. To avoid the significant impacts of disputes on projects in terms of both money and time, the project engineer should play a substantial role as a mediator to resolve any dispute very early as it rises during the construction otherwise will lead to late project completion. Depending the construction nature of the project, there are numerous ways in which construction disputes can arise including change of finish date, lack of focused common goal and quality of materials. Disputes can be resolved through negotiation, risks management, proper communication, clear payment terms, record keeping and effectively following and adhering to contract terms.

2.9.4 Arbitration and Litigation

The construction arbitration has progressed expressively over many decades resulted from the industry continues to evolve, so too do the trends and practices within the construction arbitration. Arbitration is defined as the method applied to resolve the dispute outside the courts using the third party as arbitrator agreed upon by both project parties to solve the dispute (Mishra, 2018). However, the arbitrators should possess adequate skills and experience in construction methods, processes and construction-related matters. Presently, it is an Alternative Dispute Resolution (ADR) method broadly practiced in many of the construction contracts. Moreover, arbitration is expressed as the final decision of a dispute by a private tribunal which distinguishes the importance of arbitration from the other alternative dispute resolution techniques (Mishra & Aithal, 2022). Thus, arbitration is more effective than litigation as in terms of cost and time. Furthermore, litigation is a dispute resolution tactic that necessitates the dispute to be presented in a court of law so as to be decided by a judge or a jury. There are four causes of construction litigation that appear repeatedly including quality of construction, construction project delay, non-payment as well as workplace injuries.

2.10 Measures to Reduce Construction Delays

Literatures have documented various measures to minimize or eradicate overwhelmingly and unfavorable negative factors that hamper or pose as terrorizations to interfere with the project completion and hence leading to construction delays. Despite many studies undertaken to indicate whether causes, factors and effects, very few has conclusively provided a comprehensive measures or solutions to minimize delay in the construction projects.

Most of the derived conclusions as measures were not adequately presentation the measures as the solution as compared to the delay problem stated. Measures including embracing of adequate and effective strategic planning during project inception and design phases, presence of sufficient resources, competent and skilled selected consultant, contractors and experienced project manager, accurately estimated project cost, enforcing the liquidated damages and motivation early and

timely completion projects, project construction postponement until financial is available, ensuring effective communication among project stakeholders were stated (Babikir, 2015).

Moreover, Consistent site meetings between the project teams was emphasized to assist in identifying the challenges and recognizing the project needs and the strategies to accommodate them instantly. This approach will offer the project management a chance to design their work more efficiently that will assist also to ensure the smooth flow of the project resources through timely procurement with perfect resource utilization (Hasan, *et al*., 2014).

A study by Rivera *et al.* (2020) on exposed two potential measures, adoption of new technologies such as Building Information Modeling (BIM) and embracing training to the project human resources specifically in the field of construction management that could assist to increase skills and competence to project executors who at the end could be able to identify the challenges facing and leading the project to delay and hence finding an immediate solution for the problem (Rivera *et al*., 2020). In the same vein, timely delivery of materials, contingency allowance, community participation, less bureaucracy and use of modern technology (Babikir, 2015).

The study of Saiful and Trigunarsyah (2017) in Frimpong *et al*., (2003) is among the comprehensive study that has proposed multiple measures as a guide to lessen delay in construction projects. Among are contractor should accurately compute the total project cost before construction commencement to circumvent payment delay for project employees, organizing various training to help in improving managerial skills and competence through up-to-date modern management system, ensuring timely, effective and well-organized procurement systems of construction resources (materials and equipment) as well as allocating appropriately adequate contingency to subsidize an increased cost resulted from multiple factors such as inflation of material and other resources within the entire construction period (Islam & Trigunarsyah, 2017).

2.11 Road Construction Delays Causes and Effects

Over many studies published related to road construction, its history had revealed the persistently construction project's delays caused by multiple factors including delaying decision-making in choosing the best strategies to adopt to reduce delays. Delays in road construction projects are due to multiple reasons and the incapability to finish the project promptly within the given time has continued to persist and become a major global problem facing the construction sector that has led to failure to meet the immediate road needs of stakeholders. Moreover, it has to a great extent affected the economies throughout the world by slowing down the development of all other related fields.

Delays in construction projects are defined as the incapability of attaining the schedule goals causing increased cost, interruption of work, loss of productivity, being behind schedule; leading to disputes, third-party claims, termination of contracts and dissatisfaction of the primary stakeholders. Delays exists in various types such as excusable that are caused by the reasonably unforeseen conditions that are not within the contractor's control such as labor strikes, most natural disasters (fires, floods, earthquakes), errors in the plans and design docs, differing site conditions, lack of action by oversight bodies to mention a few; non-excusable delays exemplified to the inefficiency of contractor to manage the construction site, the contractor's financial muscle, labor lack, failure to supervise and manage the work as per contract schedule and failure to meet owner's specification. These non-excusable delays are believed to be within owners or contractor's control and are fully responsible for the activity delays. Other types of delays encompass critical delays (or non-critical delays), compensable delays and concurrent delays that occur when two or more delays arise at the same time or overlap to some degree. Several causes or factors of delays have been manifested as of Table 9.

Various effects of delays have been documented including a construction cost escalation, increased construction project resources, a source of claim and disputes among project participants, arbitration or litigation, delayed payments and cash flow problems, construction project time extension, greatly reduced contractor's profit,

reduced or productivity losses, mistrust among project participants, poor quality of work, difficult to advance the contractor's business market value, destructive and reduced firms reputation and eventually abandonment of the projects. The elongated delays effects have upraised and compelled the necessity for the research to examine the correlation between strategies to minimize road construction projects delay in Tanzania.

Table 9: Manifested factors for road construction project delay

Category	No	Code	Contributing factors	References
Management, procurement and supply factor	1	PMF1	Poor strategic planning and scheduling	(Abdullah *et al.*, 2009; Aibinu & Odeyinka, 2006; El-Razek *et al.*, 2008; Owolabi *et al.*, 2014; Assaf & Al-Hejji 2006; Ansah, 2011; Nhabinde *et al.*, 2012; Doloi *et al.*, 2012; Thabani & Wellington, 2017; Arditi *et al.*, 2017; Serdar & Hosseini, 2018; Cruz *et al.*, 2018)
	2	PMF2	Poor contract management	
	3	PMF3	Mistake and discrepancies in the contract document	
	4	PMF4	Bureaucracy in tendering method	
	5	PMF5	Inadequate monitoring and control	
	6	PMF6	Late obtaining permits from governmental agencies	
	7	PMF7	Lack of chain of commands	
	8	PMF8	Lack or poor organizational structure	
	9	PMF9	Lack or less motivation and capacity building	
	10	PMF1	Awarding contract to lowest bidder but inexperienced and incapable	
	11	PMF11	Poor management and supervision by PM and foreman	
	12	PMF12	Slow decision making between parties	
	13	PMF13	Unnecessary interference by the project owner	

	14	PMF14	Ineffective procurement planning and incapable supplier	
	15	PMF15	Lack of joint venture with foreign firms	
Monetary/ financial factor	1	MF1	Late or delayed payment by each part (client/contractor)	(Ansah, 2011; Alshihri *et al.*, 2022; Obodoh & Chikasi 2016; Tesha. *et al*., 2017; Kavishe *et al.*, 2019; Hameed *et al.*, 2023).
	2	MF2	Financial difficulties to contractors (with poor cash flow management)	
	3	MF3	Inadequate of poor fund allocation	
	4	MF4	High interest rate imposed by institutions	
	5	MF5	Currency and price luctuation/inflation	
Technical or design factor	1	DF1	Frequently change of design due to mistakes and errors	Ocen *et al.*, 2011; Basheka *et al.*, 2012; Lindhard & Wandahl, 2014; Kenyatta, 2016; Momade, 2020; Bentall *et al.*, 2020)
	2	DF2	Complicated design beyond client or user requirement	
	3	DF3	Poorly adopted construction method	
	4	DF4	Lack of professionalism and low design skills of team	
	5	DF5	Inadequate project time and incorrect cost estimate	
	6	DF6	Delay in inspection and approval of completed design drawing by consultant	
	7	DF7	Less design development time	
Resource and technology factor	1	RF1	Late and shortage of quality construction resources	(Nhabinde *et al.*, 2012; Ssegawa, 2013; Ardonceau, 2018; Marteye *et al.*, 2018, Cruz, *et al.*, 2018)
	2	RF2	Lack or shortage of workforce and skilled personnel	
	3	RF3	Inadequate adoption	

			and use of modern technology	
	4	RF4	Frequently equipment breakdown	
	5	RF5	Use of non-operative planning and monitoring tools/software	
Information and communication	1	ICF1	Lack of communication and coordination between parties	(Majid, 2007; Odeh & Battaineh, 2022; Acharya *et al.*, 2006)
	2	ICF2	Slow information flow between parties	
	3	ICF3	Bullwhip effects during resource ordering	
External factors	1	EF1	Unethical practices and code of conduct (Malpractices)	(Lindhard & Wandahl, 2014; Chilongo & Mbetwa, 2017; Akarowhe, 2018; Omopariola *et al.*, 2019; Bentall *et al.*, 2020)
	2	EF2	Unforeseen conditions (weather changes)	
	3	EF3	Political interference	
	4	EF4	Society strike and conflicts	

2.12 Strategies to Reduce Construction Project Delays

To mitigate road construction delays, attention is paid to various efforts and strategies imposed on-site and off-site throughout the whole construction project life cycle. Numerous strategies have been itemized to lessen CPD including engaging competent, experienced and capable contractors, consultants and suppliers, early identifying and assessment of risks, appropriate and effective construction planning beginning from project commencement, design phases to execution, mapping and timely availability of quality resources, adoption and application of the knowledge and experience gained from preceding projects and accurately established user and client requirement (Wu *et al.*, 2019).

Additional strategies to reduce CPD embraces a collaborative working between the design and construction teams throughout the construction project lifecycle, undertaking regular site meetings to recognize and discuss various challenges facing the project. Also the strategic and interactive planning and scheduling which entails

an integrated program that defines the project key milestones, constraints and identifies the major issues observed to affect the project.

Moreover, two latent strategies include adoption of new technologies such as Building Information Modeling (BIM) and embracing construction project management training to project participants to support rising skills, knowledge and competence for recognizing the challenges facing the project and finding the instantaneous resolution for the challenges (Waqar *et al.,* 2023). Furthermore, developing the detailed project execution schedule, the contractor's accurately computation of the actual project cost before construction initiation to avoid payment delay for project participants. Further, the use of current technology, absence or less bureaucracy, establish a clear information and communication channels, establish a comprehensive contract documentation, enforcing liquidated damage clauses, offer an incentive for timely completion were recognize. Additionally, guaranteeing timely, effective and well-organized procurement systems for the required resources as well as allocating adequate and appropriate funds to subsidize an increased cost caused by several features such as inflation of material were celebrated.

Furthermore, a study by Prasad (2018) recognized various strategies to reduce delay encompassing local subcontractors' capabilities to complete their scope within the approved schedule and provision of transparent information about the liability and capability of local subcontractor to handle and manage the assigned projects (Prasad, 2018). Besides, imposing the preventive and sanctioning penalties for those who fail to complete their contracted scope within the approved schedule, instruct and emphasize on continuous safety training to reduce accidents and emphasize on joint venture project with foreign firms to gain experience and capability. Generally, the prevention of CPD is likely when all project participants play their part to ensure a successful project (Karimi, *et al*., 2024).

CHAPTER THREE
RESEARCH METHODOLOGY

3.0 Introduction

These chapters present a blueprint outline of the research design and procedural methodology approach adopted in this study. It also covers the data collection and analysis methods, tools used for quantitative data collection, measurement variables, validity and reliability of data collected. The chapter also describe the population and units of analysis, sampling size, sampling frame, and sampling procedure or technique, data presentation, ethical considerations throughout the entire research progression which guarantees the integrity and efficacy of research finding and eventually signifies their motivation for use in this study.

3.1 Research Design

The term research is derived from the Latin word which means 'to know'. Alternatively, the word means to re-search. As described by Cooper and Schindler, 2003), "Research is a systematic inquiry aimed at providing information to solve managerial problems (Cooper & Schindler, 2003). Research aims to produce a new study knowledge on a particular area of interest based on primary and secondary sources of information collected via research tools encompassing surveys, interviews, questionnaires, and focus groups discussion (Saunders *et al*,. 2009).

Research design (RD) is defined as a critical portion of research activity anticipating to advance an effective plan, strategy, structure and a roadmap of shaping the research for investigation to obtain answers to the stated research questions (Cooper & Schindler, 2006). Moreover, Teddlie and Tashakkori (2009) added that, a research design is a "glue" that holds all elements in a research project. However, due to the nature of this study, two design research namely case study and survey (explanatory) design. This study adopted the explanatory based on cross-sectional survey research design not only to systematically providing a rapid, effectual and precise means of assessing information, describe the facts of respondent's characteristics but also to examine the correlation between the strategies towards minimization of delays on road construction projects. This study adopted the sample survey method. As stated

by Denzin and Lincoln (2011) the application of sample survey method allowed the researcher to gather information from the specified sample size representing part of the targeted population of the study (Denzin & Lincoln, 2011).

3.2 Research Approach

A research approach can be defined as an effective strategy or a plans and or procedure for a research to increase the validity of social research that span the steps from broad assumptions to specific methods of data collection, analysis, and interpretation (Creswell, 2014). The research approach can be commonly divided into three categories namely qualitative, quantitative and mixed research approach (Yin, 2009). In addition, selection of a proper research approach is fundamental as it helps the researcher to successfully address the stated objectives which increase the validity of the research (Creswell, 2014).

A quantitative approach is mainly derived from the scientific method, such as mathematical models, as an organized process of finding the numerical data, tests, and describe the theory deductively to verify which hypothesis is true (Charoenruk, 2020). The quantitative approach mainly entails the quantitative data collected, including the descriptive and inferential statistics data such as frequency and percentages to test the raw data and unveil the facts accordingly (Dakhil, 2013).

A qualitative approach deals with people's perception and ideas basing on the given topic. It is primarily grounded upon the developed social science hypothesis, which collects qualitative data in words, pictures, and objects (Dakhil, 2013) and its strength and validity depend on the close collaboration between a researcher and respondents. Moreover, a quantitative approach is preferred whenever empirical statistical is needed. According to Neill (2007), a quantitative approach aims at classifying features, counting them and constructing statistical models in an attempt to explain that is observed, it is recommended during the latter phases of the research, data are in form of numbers and it uses tools like questioners or equipment for collecting numerical data. Despite the above, the two approaches (qualitative and quantitative) possess an obvious and clear comparison difference. However, as described in Table 10 below provide a comparison between the two approaches.

Despite the two approaches described above, a mixed research approach is the one which occupies the advantages of both quantitative and qualitative method during data collection and analysis for a clear understanding of the research problem (Creswell, 2014). The mixed method permits the researcher to collect various data from several sources.

Table 10: A comparison between qualitative and quantitative approach

Item	Qualitative approach	Quantitative approach
Overall aim	Understanding and explanation of the phenomenon	Generalization and confirmation
Data presentation	Textual raw data	Mathematical raw data
Question formats	Open-ended	Closed-ended
Relationship to respondent	One-to-one-close relationship	Almost no direct relationship
Analytical method objectives	-To describe variation. -To describe and explain relationships. -To describe individual experiences.	-To quantify variation. -To predict causal relationships. -To describe characteristics of a population
Flexibility in study design	-Participant responses affect the next or following researchers' question(s) -Study design is iterative; that is, data collection and research questions are adjusted according to what is learned.	-Participant responses do not influence or govern the next researchers' question(s) -Study design is subject to statistical assumptions and conditions.
Approach framework	-It uses semi-structured methods such as in-depth interviews, focus groups, and participant observation.	-It exceedingly uses structured methods such as structured observation and questionnaires surveys
Data analysis technique	It contains a tedious thematic content analysis which consumes more time	-It uses simple and quick statistical analysis technique with computer-aided programs
Results interpretation	More interpretation is required	-Concise interpretation because of application of statistics

Source: Haq (2014)

A mixed-method provides more extensive research evidence of the prior stated research problems than qualitative or quantitative alone. Since the method comprises both approaches, implementing it becomes complex and requires more time and resources to collect and analyze data qualitatively and quantitatively.

3.2.1 A Selected Research Approach for the Study

As it was pinned by Perry and Jensen (2018) that, it is honestly incredible for researcher to separate qualitative and quantitative approaches because in most of the research, both of them are always involved simultaneously . This study exploited both qualitative and quantitative approaches. However, the nature of the study enforced the domination of quantitative approach pursued to tackle questions such as: how many? To what extent? How frequently? How often? and how important? Furthermore, it intended to measures the respondent's views from the given questions described on tools to generate and generalize the respondent's results. Qualitative approach was intended to address the way the strategies was formulated within the selected road construction projects. Thus, it anticipated to answer the questions such as: why? how? and in what way? Mixing both approaches assisted to provide a clear understanding of the research problems more clearly. Similarly, it helped to describe the relationship between the used latent variables.

3.2.2 Advantage of the Selected Approach

Towards developing a framework of strategies to reduce the road construction project's delay in Tanzania, a researcher adopted a deductive reasoning to attain a valuable and feasible conclusion. The deductive approach begins from an intensive literature review on road construction projects delays, studying to documents the prevailing road construction project performance weaknesses, and identifying the strategic processes/activities to minimize the road construction project delays to be used for delays minimization model conceptualization. However, due to abundance literature, the short and tight study time frame available, the possibility and opportunity of explaining the relationships between the study concepts and variables, the likelihood of measuring the concepts quantitatively which would lead to the

viable and feasible possibility of generalizing the study findings and other factors necessitated the adoption of deductive approach for this study.

3.3 Research Methodology

Research methodology (RM) is the path through which researchers need to conduct their research. It shows the path through which these researchers formulate their problem and objective and present their result from the data obtained during the study period. RM is a systematic, theoretical analysis of the research methods applied to a field of study. It comprises a method and its associated principles as well as various concepts such as paradigm, theoretical model, and either qualitative or quantitative technique (Irny & Rose, 2005). Research Methodology embraces various steps adopted by the researcher in studying his research problems along the logic behind them (Kothari, 2004). Equally, selection of a specific methodology approach should base on the researcher's decision and choice while supported with a reasonable and justifiable reasons. Figure 2 indicates the research methodology flowchart followed throughout the entire study from identifying the problem statement to the concluding remarks of the study. The flow was followed so as to provide a better sequential of the study that yielded a better finding, conclusion and recommendation of the study.

Figure 2: A research methodology flow diagram

3.4 Location of Study

This study was conducted in Tanzania (Figure 3) occupying five regions namely Ilala-Dar es Salaam, Dodoma, Arusha, Mbeya, and Mwanza representing five zones namely, eastern zone, central, northern, southern and lake zone respectively (Figure 1). The chosen case study regions were leading in traffic, occupying more budgets and thus leading in undertaking many road construction projects leaded by Dodoma city, a region with many construction projects following the government capital city shift from Dar es Salaam.

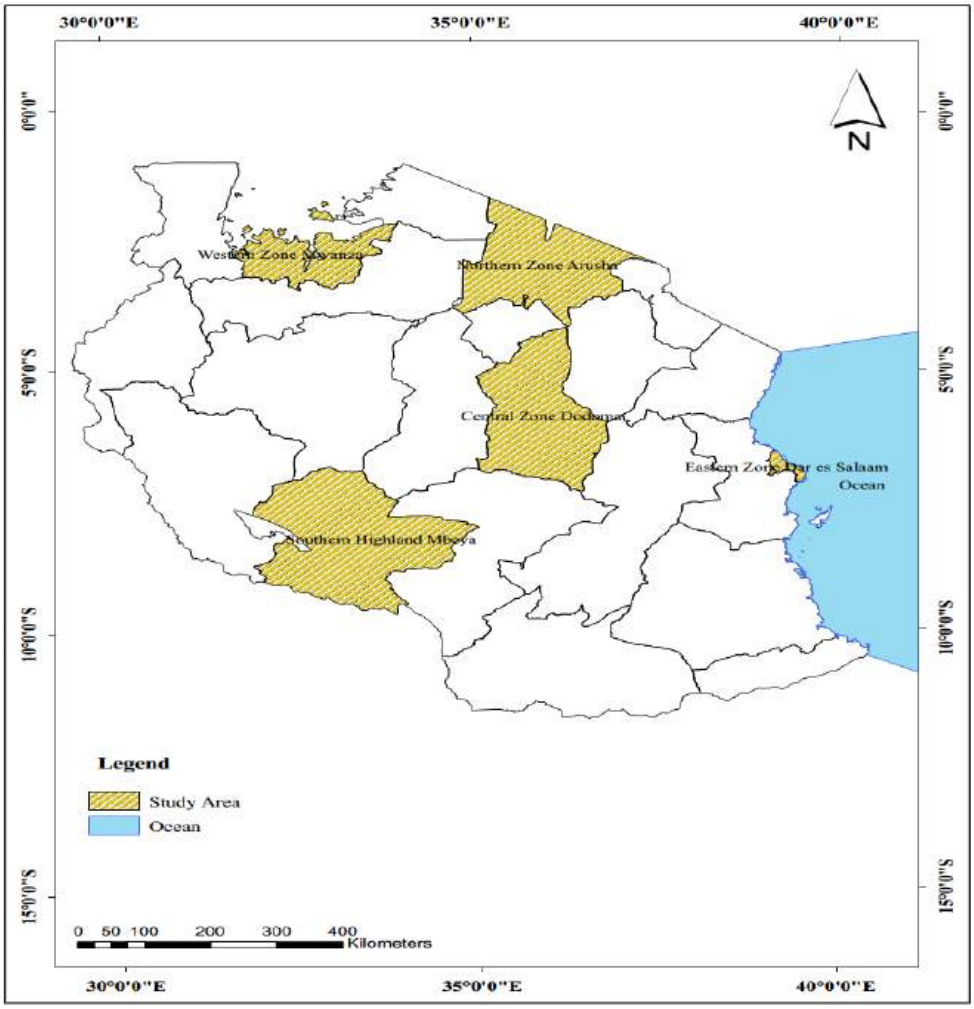

Figure 3: A map showing the case study area

3.5 A Study Participants, Sampling Frame and Sampling Technique

3.5.1 Participants/Population

Attaining a study specific objective always needs a sample of respondents representing the entire study population. A population is the collection of specified group of human beings or of non - human entities such as objects, institutions or geographical area drawn by individual. Also, a population can be defined as the total collection of elements intended to make some inferences or interpretations (Cohen *et al.,* 2011) Population is properly defined so that there is no ambiguity as to whether a given unit belong to the population. In this research, the population includes different experienced employee working as clients, consultants and contractors

represented by engineers, surveyors, quantity surveyors and technicians from both private and government companies found on various road construction projects who have more than five years working experience in road construction projects.

3.5.2 Sample

A sample is referred as the small part of people taken from the targeted population (Kothari, 2006). Also Babbie (1992) defined sample as a segment of population in which the researcher is interested in gaining information and drawing conclusion. The fundamental objective of identifying and recognizing the sample elements of study participants from the selected population intends to provide and represents the characteristics of the population. The targeted sample population of this study comprise of employees working under private and government firms and agencies under clients, contractor and consultants within the selected road construction projects with a stated working period of more than three months. However, the list of road construction projects was obtained from the Contractors Registration Boards (CRB) found within the particular regions. However, as coined by Burke (2007), the limited time, financial resources scarcity, geographical location of the projects and limited experience to mention a few, necessitated inclusion of only the sample to represent the whole construction industry population and stakeholders or professionals .

Furthermore, firms with satisfactory performance in road construction projects (as noted from the relevant board and clients) such as having more than ten years working on road construction project were contacted. In addition, those performed successfully more than five road construction projects but also occupying at least one-ongoing project were contacted for focus group discussion. This aimed to collect the view on strategies they adopt to continue attaining a good working performance history.

3.5.3 Sampling and Sampling Technique

In order to tackle the stated research questions, it is uncertain that a researcher should be able to collect data from all cases. Accordingly, there is a necessity for a researcher to choose a sample for the study. Since there are different types of

sampling techniques, researcher should clearly understand the differences between them for his or her proper selection of the research sampling technique.

Sampling is the set of act, process or technique of selecting a suitable sample or a representative part of a population for the purpose of determining parameters of characteristics of the whole population. Sampling minimizes bias and maximizes the liability of the data collected and analyzed. The sampling techniques is an approach(s) or strategies applied by various researchers for sampling process. There are two types of sampling technique encompassing probability and non-probability sampling. In probability sampling there is a known probability of each member of the population to be selected in the sample and can be categorized in to random sampling, systematic sampling, multistage sampling and cluster sampling.

Non-probability sampling is the type of population where each member of the population does not have known probability of being selected in the sample (Taherdoost, 2016). This study adopted the purposive non-probability sampling in obtaining information to be used in the study. The adopted purposive sampling intended to sample with a *purpose* in mind with advantage of a likelihood to get the opinions from the targeted population and an opportunity to overweight sub-elements or subgroups in the more readily accessible sample (Showkat & Parveen, 2017).

3.5.4 Sample Size Determination

Determination of the sample size for the study was referred through a parallel approach using the mixed research methods (qualitative-quantitative) adopted for the study. The qualitative methods were opted to get qualitative information from the experienced construction experts within government agencies including CRB, PPRA, AQRB, OSHA, ERB. Also, it includes regulator and academicians working at higher institute or universities. The data saturation points concepts were adhered during qualitative data collection. Data saturation is defined as a point in the research process when no new information/data is discovered and no new insights are given by additional sources of data. It can further be described as a point at which a researcher can be sensibly and reasonably guaranteed that additional collected data would produce similar findings which may assist to confirm the conclusions (Sandra

et al., 2017). The quantitative methods were opted to collect data from experienced employees under contractors and consultant groups. The study used the Taro Yamane's formula for calculation the sample size to be used in the collection of data as shown below and resulted to (216) respondents.

$$\text{Sample Size } (n) = \frac{N}{(1+Ne^2)} =$$

Whereby:

N is the total population identified within the road construction projects.

n is the sample size required for data collection

e is the margin of error 5% (standard value of 0.05)

It is worth to note that "*n*" represent the minimum number of respondents required, "N" is the population size (the total number of an employee on sampled construction project), and "e" is the Margin of Error (MoE) representing a level of precision or acceptable sampling error. For this study, the confidence level was assumed to be 95% within an acceptable alpha level (MoE=5%). Table 11 below present the research respondent distribution.

Table 11: A research respondents

Respondent's category	Sampled population (N)	Percentage of sampled (%)
Clients	19	8.80
Contractors	133	61.57
Consultants	12	5.56
CRB	12	5.56
AQRB	6	2.78
ERB	6	2.78
OSHA	9	4.17
PPRA	5	2.31
Academician	14	6.48
Total	**216**	**100**

3.5.5 Prioritization of Potential Factors and Strategies

The literature review, which comprised the theoretical and frameworks review provided a list of the manifested factors, prevailing construction project delay practice measures, failure reasons and strategies to minimize road construction projects delay. Referring to specific objectives one to three, the need for determining

and examining the potential factors, prevailing best practice measures, potential failure reasons and potential strategies to minimize the road construction projects delay, the Relative Importance Index (RII) was opted to calculate the preferential rank towards prioritization of strategies.

The Relative importance index technique is the most frequently used statistical analysis to indicate the order and a contribution or significance of a particular variable from a group of variables. RII was opted in this study to compute the order of potential strategies to minimize the road construction projects delay as collected from respondents. That is from a client, contractor consultants, construction industry regulator and academician. Also, the RII technique was used to rank the potential factors, prevailing best practice measures, potential failure reasons. However, the RII formula (Stella, 2024) has been provided:

$$\mathbf{RII} = \mathbf{\Sigma W} / (\mathbf{A} * \mathbf{N})$$

Where:

W – is the weight given to each factor by the respondents that range from 1 to 5

A – Is the highest weight (i.e., 5 in this case) and;

N – Is the total number of respondents

3.6 Data Collection: Types, Methods and Procedure

3.6.1 Data Collection Methods

Data collection is considered as an important attribute of any kind of a research study. It can be defined as the systematic and an organized process of gathering and measuring an information from various resources on identified variables which enable a researcher to answer the stated research questions and validate or confirm the findings reached. In addition, Fellows *et al.,* (2015) defined data collection as the communication process between the researcher and the respondents applied commonly to almost all fields of research including business, construction, engineering, management, social science and humanities (Fellows *et al.*, 2015). There are various tools and or methods of gathering an information (data collection) for the research study such as questionnaires, interviews, direct observation, focus group interview, direct observation, case studies, documents and other research materials, record reviews or diaries, critical incidents and portfolios (Saunders *et al.*,

2007). Very few methods that will be adopted in this study to assist the researcher to achieve the study objectives have been explained hereunder.

3.6.1.1 Interviews

Various road construction project stakeholders including firm directors or general managers, project and or site managers, procurement experts, supplier, gang supervisors or foremen will be interviewed to collect their opinions on best strategies to be used to reduce road construction project delays. The researcher will employ interviews so as to explore feelings, attitudes and perceptions of the stakeholders on strategies to be used to reduce the road construction project delays and lately to suggest the best measures to be taken in construction projects to reduce delays. Interview will be useful as it is flexible, allowing the researcher to change modality, sequence and use probing questions so as to get rich and detailed data about the problem under study. Each semi-structured interview will last for 20 minutes while taking notes for future reference.

3.6.1.2 Questionnaires

Questionnaires will be filled by the representatives from contractors, consultants, Site managers, gang supervisors, contractors, Project Managers, regulatory bodies and representatives from academic institutes on engineering or construction related cadre who will be included in the sample to provide their views on various set questions intending to collect the opinions so as to assist in reaching the conclusion of the study. Thus, the questionnaires will comprise of close-ended questions with very minimal open-ended. Since the questionnaire cannot capture all variables, the open-ended questions will allow free response from participants' own references and thus the respondents will be free to express their feelings and give out their experiences on best strategies to reduce the construction project delays and suggest the potential measures to be taken to reduce the delays. Meanwhile the closed-ended questions will help the participants to answer questions quickly and objectively. The questionnaires will be administered on face to face basis and others will be distributed to respondents using email, social media and telephone and the respondents will be asked to respond to them at their conducive free time.

3.6.1.3 Observation and Discussion

The collection of data using this type of collection method include encompass visiting the construction sites so as to study the current construction technique with its appropriate measures adopted to reduce delays on site. Moreover, Site Managers, Gang Supervisors, Project Managers and Workers will be asked questions and provide the room for discussion on various matters related to delays, the related strategies and measures to be adopted to reduce the delays. This approach will enable the researcher to get all necessary information and work on all objectives of this study hence get the data that will answer the research questions for this study.

3.6.1.4 Documentary Review

The Documentary review involves a review of earlier records that could be used by the researcher in obtaining the relevant information (Saunders *et al*., 2007). The study journal articles and provided government reports, books and media references to collect secondary information. The documentary review for this study will use previous researches reports conducted on related field. Moreover, it will include various published sources of information such as books, journals, articles, and various records files from the site managers, gang supervisors, workers, contractors, project managers and regulatory bodies.

3.6.2 Data Collected Types

The collection of research data is always undistinguishably connected to the type and nature of the research. Two data collection methods including primary and secondary methods has resulted to types of data; primary and secondary which are mostly collected in case for both qualitative and quantitative methods. Primary data are the data collected for the first time exclusively for the purpose of research directly from the first-hand source using the feasible procedure which perfectly fit the research problems (Hox & Boeije 2005). The primary source of primary data include survey, observations, experiments, in-depth interview or focus group discussion, questionnaire, personal interview etc.

The secondary data (SD) are every data set not obtained by the author (Boslaugh, 2007) or data which have been previously collected for other purpose rather than the

purpose at hand. A secondary data is a data that have been gathered by someone else other than the current researcher (Schmidt & Hollensen 2006). The secondary data are fundamental information used to obtain a deep and a comprehensive understanding and or explanation of the research problem from a different view point. The common sources of secondary data mostly include censuses, literature review, data collected by government publication, organization records, websites, diaries, newspaper, books, journal articles, video recordings and internal records (Ajayi, 2017). Table 12 presents a comparison basis between a primary and secondary data.

Table 12: A comparison Between Primary and Secondary Data

S/N	Comparison Factor	Primary Data	Secondary Data
1	Definition	Are first-hand data collected by author	Data collected by others rather than author
2	Data	Current or real time data	Past collected data
3	Process	Very involved and demanding	Quick and easy
4	Source	Survey, observations, experiments, questionnaire, personal interview	Government publication, diaries, books, websites, articles, journal organization records, newspaper, internal records
5	Cost effectiveness	Very expensive	Economical
6	Collection time	It takes a long time	Not time consuming
7	Specific	Specific to the researcher's objective	Not specific to the researcher's objective
8	Available	Rude form	Refined form
9	Accuracy and Reliability	More accuracy	Relative accuracy

Generally, from the previous analysis, the advantages of using primary data has risen in terms of quality and securing the best possible data for the needs of the ongoing research. However, the advantage of secondary data falls in terms of resources such as cost. Furthermore, collection of primary research data has found to possess more advantage against the secondary data as explained hereunder:

a) The primary research data collection method is intentionally designed for the particular or specific research approach which make the data to be

collected during the same time of on-going-study. However, the research design covers the specific purpose that completely serve the same particular research hypothesis or research questions. As detailed by Robson (2002), the researcher which ought for proper planning and opt to use an appropriate data collection tools, can directly draw from the source data which fit with the intended research (Robson, 2002). This is certainly not the direct case in the secondary data collection method (Parginos, 2019).

b) Unlike for secondary data where the researcher depends entirely on the level of objectivity referred to the previous first-place collected data for other purposes, when opting for a primary data, the researcher or author always ensure his/her objectivity during data collection (Hox, and Boeije, 2005). Thus, the inherently mistake or error from previous collected data can be inherited when using secondary data.

c) Contrasting the secondary data which are collected at different time, place, different condition, by different researcher, using different data collection tools, with different purpose of research which must be adjusted to fit the ongoing study (Saunders *et al.*, 2003). The collected primary data does not require any adjustment, conversion or standardization to fit or get compatibility with the ongoing research since they have been designed or collected to match the need of the ongoing research.

This study includes both secondary data and a dominance primary data. The collected primary data for this study were collected using a questionnaire survey and personal interview on various matters including the potential factors for the delays, the potential failure reasons as well as the potential strategies to minimize road construction projects delay. Moreover, the secondary data were collected mainly to assess the prevailing best practice measures as strategies adopted by the surveyed firm to reduce the road construction project delays.

3.6.3 Data Collection Tools

To conduct a critical and attain the accurate findings of the research, it needs an accurate and a systematic collected data using a viable and feasible data collection

tools. Depending on research type, several specific tools and or method of data collection can be applied. The most popular and widespread of these tools are questionnaire, experiment and observation. The latter two are mostly adopted on scientific research with great success in industries e.g. medicine, psychology and management (Parginos, 2019). However, Saunders, *et al.* (2003), and, Hox, and Boeije (2005) observed that, the use of questionnaire method has overwhelmingly outweighed other research methods of data collection in quantitative research in terms of its acceptance and efficiency. Thus, this study adopted the questionnaire tool for data collection.

3.6.3.1 Questionnaire Design

A questionnaire is a group or sequence of questions intended to elicit information from the respondent when questioned by the researcher (Mathers, 2009). The questionnaire can be cheaper than personal interviewing and quicker if the sample is large and widely dispersed. This study adopted a structured questionnaire tool with definite, actual and pre-determined questions to collect the primary data quantitatively. The tool was adopted so as obtain an information from the intended key respondents allocated zone-wise in five regions. Thus, according to the nature of the study, the type of the questionnaire used was close-ended questionnaire with limited to the stated alternatives which helped respondents to responded to the same presented questions limited only to the stated alternatives and answers.

The questionnaire presented a thoroughly coverage which captured all-important issues depicted within the conceptual framework of the study. Therefore, it was designed to cover and collect the information that can help to achieve the study objectives. That is to cover all study dimensions of the model which describe the study specific objectives. Thus, the questionnaire was divided into four sections: Part one aimed to obtain the respondent's demographic information. Part two expected to collect the information on the prevailing construction condition ("As Is") which provided the performance weaknesses of the firms. Part three intended to get an information on construction core and organizational processes together with their relationship. Part four focused to identify the measures to create the new potential

('To be") process and strategies under the business process re-engineering philosophy embraced from the core construction and organizational Process.

The structured questionnaire was adopted for collecting the primary data as it allows the interview through mails and or on-line, face-to-face and telephone for respondent's self-completion with following merits and demerits as described by Schmitz, (2012) and tabulated in Table 13 below: Since the researcher intended to obtain a high response rate, to ensure enough elaboration and clarification of the dimensions for good understanding of the respondents before providing answers, to avoid skipping some questions during self-completion questionnaire, the study opted for an interview-based survey which allowed the face-to-face interview. In addition, phone and hands-on directly delivered questionnaire survey were used for very few respondents who were not available during the researcher visit. However, to preserve the ethical, researchers tried the best to avoid influencing the decision of the respondents which potentially lead to a bias response.

Table 13: Merits and Demerits of Questionnaire Survey Methods

Face to face	It provides a good response rate More extended interviews can be more tolerated Attitude can be observed	It is expensive and time consuming. May produce a non-representative sample
Mail	Easy to conduct and cost-efficient Respondents may be more willing to share information	Response rates are typically low. Not suitable for illiterate respondents. Respondents cannot be probed
Phone	Extensive scale accessibility in many countries It allows a rapid data collection Quality control by researcher is high It entails an anonymity It allows flexibility to both respondents and Researcher	Lack of visual materials Call screening is common Limited open-end questions It causes fears or suspicion Inattentiveness
Online	Low costs because of low tariff, less time needed Automation and real-time access Convenience for respondents Design flexibility Respondents may be more willing to share Information	Access to unlimited sampling Possible cooperation problems Respondents cannot be probed

3.6.3.2 Pilot Survey

In order to have a definite, comprehensive and a more elaborative questionnaire which can be easily understood by respondents, the designed questionnaire was required to undergo a pre-test for a pilot survey to fifteen (15) professionals with more than ten years of experience in construction industry working mostly with MUST Consultancy Bureau (MCB) of Mbeya University of Science and Technology, a consultancy and contractor firm and offers the construction courses. Moreover, ten (10) questionnaires were distributed to fourth year students pursuing the Bsc. in Civil Engineering. The questionnaire was attached with a cover letter explaining to participants about the purpose of the pilot study. The intension of pilot survey was to get views and comments on the questionnaire set up and questions as refereed to the study specific objectives. The pilot survey was intended to test and identify error, mistakes, blunders and incorrect, unnecessarily wordy and unambiguous terms in the questionnaire. The pilot study facilitated to identify and review the questionnaire to produce a clear and elaborative questionnaire that could be simply understood by every respondent during questionnaire administering.

Further, it assisted to agree and improve the dimensions or variables as per specific objectives of study. Respondents were told to be free to provide answers and comments on questionnaire set up and promised and assured on their answers to remain anonymous and confidential. All twenty-five (25) returned questionnaire was tested for a reliability analysis using a Cronbach's cut-off point. The result of pilot study yielded a good reliability. However, some questionnaire had some minor errors for rectification including typos, misword, wrong written and long sentences as well as too wordy in a sentence. After a thorough review of the suggested opinions from respondents, it resulted to good-excellent Cronbach's alpha value which proved the reliability of the questionnaire tool.

3.7 Statistical Data Analysis Methods

After data collection, the questionnaire was scrutinized, checked and coded and plugged into the software ready for analysis for the purpose of answering the research objectives. The collected data through questionnaire were to be statistically interpreted to obtain the findings of the study for each specific questions. IBM SPSS

Statistic version 24 was used to check the construct reliability and construct validity of the items of the questionnaire tool. The data reliability was examined to test the internal reliability of the 5-point Likert scale. The examination intended to check if the questionnaire survey tool provides equivalent results at different sets of tests. the Construct validity was performed to measure the extent to which all items on a scale measure the same construct. The obtained tables and charts were used to indicate the trend and patterns that will facilitate discussions. The descriptive information including frequency, percentage, mean, standard deviation which measured the dispersion and closeness of the scores around the mean were obtained and discussed.

Other findings were computed such as the significance and confidence interval, t-Test, Analysis of Variance (ANOVA) which determine the significant differences between the mean, the Pearson-correlation coefficient which portray the strength of the correlation between two variables, multiple linear regression which describe the relationship between one dependent variables with two or more independent variables and others. Descriptive statistics using graphs, tables, and charts were used to describe the respondent's numerical characteristics. However, the inferential statistics were performed to test and determine the presence or absence of statistical correlation between the established dependent and independent research variables regarding research questions. Besides, SPSS_AMOS software was used to give power to researcher to easily perform and create the structural equation modeling (SEM) which could be used to test and confirm the relationships among the stated observed and latent variables.

3.7.1 Factor Analysis

Factor Analysis (FA) is a statistical method used to describe the variability among the observed and correlated variables in terms of a potentially lower number of unobserved variables called factors (Yong & Pearce, 2013). FA operates on the notion that measurable and observable variables can be reduced to fewer latent variables that share a common variance. It also assists to simplify complex relations and or association that exist among a set of observed variables (Ather &

Balasundaram, 2009). However, in this study, the factor analysis was opted to reduce the large number of variables into a fewer number of factors.

3.7.2 Structural Equation Modelling

Structural Equation Modelling is a powerful statistical modelling technique widely used to combine complex path models with latent variables (factors). SEM encompasses the factor analysis model, regression model, and path model (Hox & Bechger, 2010). SEM's objective is to indicate or represent the correlation among the theoretical construct represented by regression or path coefficients of the identified factors. SEM, therefore, portrays the structure for the directional relationship between observed variables, which sometimes can represent the means of observed variables. In this study's SEM end product incorporated the simultaneous factor and path analysis showing the factor loading or factor score weight, the correlation effects between construct factors, and the estimates to performance improvement to reduce the road construction delays. SEM has been preferred in this study because it provide the framework between variables and supports the critique mentioned by (Breitsohl, 2018) and provides a useful feature to the researcher that show the correlation between construct variables with their factor loadings towards reducing the construction project delays.

CHAPTER FOUR
FINDINGS AND DISCUSSIONS

4.0 Introduction

This Chapter presents the findings and discussion resulted from the data collected through quantitatively and qualitatively. The chapter commence by discussing the results containing the descriptive information obtained after data analysis. The chapter continue to present the potential factors of delays, the prevailing best practice measures of reducing road projects, the potential failure reasons and it propose the framework of potential strategies to minimize road construction projects delay as the results from the data collected using the questionnaire and analyzed using the SPSS software. However, the findings were presented descriptively using tables, the bar charts, the pie chart and the mean.

4.1 Respondent's Demographic Information

The respondents' demographic information has been presented in Table 14 below. The level of education, working experience and profession of the respondents were considered among the fundamental factor in the decision-making and thus getting the accurate information that helped to reach the conclusion and or generalization of the findings.

Table 14: Descriptive analysis

Education level	**Number of respondents**	**Percentage**
Diploma	23	11.1%
Degree	114	54.8%
Masters	64	30.8%
PhD	7	3.40%
Years of experience	**Number of respondents**	**Percentage**
Less than 10 year	39	18.8%
11-20 years	51	24.5%
21-30 years	67	32.2%
31-40 years	32	15.4%
More than 40 years	19	9.1%
Profession	**Number of respondents**	**Percentage**
Engineer	113	54.33%
Architects	17	8.17%

Education level	Number of respondents	Percentage
Quantity Surveyor	36	7.31%
Surveyor	31	14.90%
Procurement Officer	8	3.85%
Human Resource Officer	3	1.44%
Category	**Number of respondents**	**Percentage**
Client	19	9.13%
Consultant	21	10.10%
Contractor	123	59.13%
Regulator	4	1.92%
Supplier	27	12.98%
Academician	14	6.73%

Most respondents in this study Table 13 composed various educational level from a diploma (11.1%), degree graduate (54.8%), master's holder with (30.8%) to PhD (3.4%) holder. Moreover, the respondent's characteristics occupies the well-deserved and experienced professionals. Most respondents (81.3%) have worked for more than ten years. In addition, most engineers and surveyors who directly works in most road construction projects provided their opinions.

However, the construction site stakeholders including more contractors (59.13%), clients (15.87%), Supplier (12.98%) and consultant (10.10%) participated in the study to provide their views related to the to study in question. This justify that the respondents whose opinion facilitated the findings of the study were professionals, had better education level and enough experience in the industry and thus has provided valuable answers for the study.

Generally, given the above findings, the respondents' demographic characteristics have acknowledged enough and experienced experts from the construction industry working in road construction project. They directly involved in setting up the project objective, mission, vision, and strategies, attending the site works and engaging directly on construction and project management processes.

Thus, the participating respondents were convinced to have provided useful answers, constructive and trustworthy opinions as potential data towards the study findings conclusion.

4.2 Potential Factors for Road Construction Project's Delay

In order to understand the potential factors of road construction delays, the general list of factors was provided to respondents in the questionnaire and told to rank the factors in order of their effectiveness in causing construction project delays. The relative importance index formula was opted to compute and rank the factors. Over forty-four (44) general factors listed from the literatures, only ten potential factors were identified (Table 15) and discussed thereafter.

The findings of the study represented pictorially (Figure 4) have recognized ten potential factors contributing significantly to construction project delay categorized under six clusters namely management factor, external factor, technical/design factor, economic factor, resource factor and construction project management factor. The significance of the factors towards construction delay contribution has been shown using the RII. The high the RII (Table 15) the most potential the factor is considered in contribution delays. Thus, economic factor was highly ranked (EC2, RII=0.834) and (EC1, RII=0.791), followed by construction project management factor (CPM1, RII=0.777). While the fourth potential factor was management factor (MG4, RII= 0.757) the fifth was noted to be (R1, RII=0.745) followed with (R3, RII=0.736) both noted to be resource related factor. The seventh identified potential factor was concerned with management factor (MG8, RII=0.730.

Table 15: Top-ten ranked potential factors

No.	Code	Potential factors Description	Respondent's Frequency (N)						RII	Rank	Factor Cluster
			5	4	3	2	1	ΣW	ΣW/AN		
27	MG4	Awarding contract to lowest but unexperienced and incapable bidder	69	60	54	15	10	787	0.757	4	Management Factor
31	MG8	Ineffective procurement planning and incapable supplier	74	56	26	35	17	759	0.730	7	Management Factor
43	E2	Unforeseen conditions (Changes of weather conditions, society strike and conflicts)	49	51	40	37	31	674	0.648	10	External Factor
17	TE1	Frequently change of design due to mistakes and errors	73	49	35	32	19	749	0.720	8	Technical/Design Factor
23	TE7	Delay in inspection and approval of completed design drawing by consultant	48	47	72	27	14	712	0.685	9	Technical/Design Factor
13	EC2	Financial difficulties to contractors (with poor cash flow management)	94	74	27	7	6	867	0.834	1	Economic Factor
34	R3	Lack or shortage of workforce and skilled personnel	64	56	57	19	12	765	0.736	6	Resource Factor
32	R1	Shortage or poor quality of construction materials	64	57	58	24	5	775	0.745	5	Resource Factor
1	CPM1	Ineffective strategic planning and scheduling	57	87	54	3	7	808	0.777	3	Construct Project Management Factor
12	EC1	Late or delayed payment by each part (client/contractor)	81	63	44	14	6	823	0.791	2	Economic Factor

Conversely, there were two technical or design factors (TE1, RII=0.720 and TE7, RII= 0.685) and ending with external factor (E2, RII=0.648). The findings of this study is in line with findings of other recent studies including (Alshihr *et al*., 2022; Banobi, 2019).

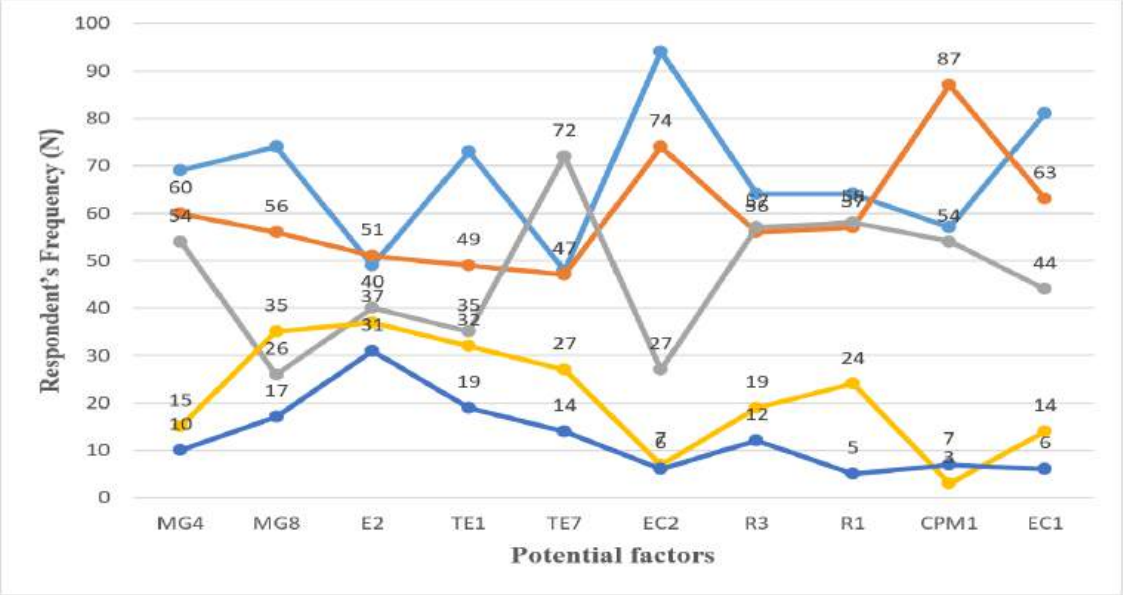

Figure 4: Potential factors for road construction project delays

Besides, during a face-to-face interview, one of the experienced engineer was qualitatively recorded saying that:

> *Government and other private clients should be cautious on selecting the contactor based on lowest bidder as a stated condition from Tanzania Procurement Act. Sometimes, following this condition may lead to the selection and awarding the contract to incompetent contractor provided has tendered low.*
>
> Respondent

The findings of the research provide a good lesson to many developing countries' construction industries where there is high demand of new and complex construction projects but facing a great challenges of economic constraints that necessitate them to depend on loan from the financial institution that always impose high interest rate together with a challenge of skilled workforce that force to depends on foreign experts. Additionally, the study is alarming to consider the general management and

construction project management skills and knowledge in particular as an important occupation necessary to be possessed by the project manager in any of construction project and neglecting the consideration of possession of engineering profession merely.

The finding of the study reconcile that of Ralf (2022) who concluded that, the project management knowledge entails the application of skills, knowledge, tools, and various management techniques to project activities to attain the intended project goals . The Project management encompasses the creation of a new or improved product, service, or process and guarantees that the new created organizational product occurs within the stated time, costs and quality. Thus, it insures minimization of delays on construction projects.

One of the experienced contractors was qualitatively quoted saying:

> *We engineers do consider that anyone provided that he/she is a graduate or a registered engineer can become the best project's manager, however, the situation is different. We need to understand that for a project manager to play a critical role in ensuring the successful execution of construction projects, he/she need to have a project management technique accompanied by a thorough and practical skills and knowledge.*
>
> Respondent

4.3 Prevailing Best Practice Measures of Reducing Road Projects Construction Delay

Before establishing the best practice measures to reduce road construction projects delays, the study intended to understand the current prevailing best practice measures mostly used in the construction industry. The prevailing best practice measures in Tanzania to mitigate the construction project delay were assessed using the descriptive analysis and a one sample -t-test by computing the mean scores. Subsequently, using a mean score, the standard deviation, T-values and confidence interval (CI), the prevailing best practice measures to be adopted were ranked. Considering the threshold value of grade 3.41 of the 5-Likert scale that represent

important of the best delay measures, measures occupying a mean score of or above 3.41 as a criterion for selection were considered significant towards minimization of construction project delay.

Thus, it can be seen from (Table 16) that thirteen 13 best prevailing measures met this criterion and were grouped in their occurring related group categories including client (4) related pertaining best practices, contractor (6), consultant (2), Contractor and supplier (2), client and contractor (7), client and consultant (3), contractor and consultant (2) as well client, contractor and consultant (1) related prevailing best practices. It is noteworthy to note that, if two or more measures coincide by having identical scale mean value, the one having lower standard deviation was highly ranked. However, since it is not practical to discuss the implication of all best measures, only the highly ranked top ten best measures were considered for the discussion.

The findings of the study (Table 17) acknowledged the client related delay measure-procuring a skilled, competent and experienced contractor the highest ranked the best measures for minimization of construction project delay Scoring a mean (M=4.53) followed by three client-contractor related best measures-ensuring a proper project finance and cash flow (M=4.47), warranting a timely payment to contactor's and supplier (M=4.41) and establishing a regular training to capacitate employees and leaders (M=4.37). The finding of the study coincides with that of (Kikwasi, 2012) who declared that, although Tanzania have many local construction firm and multiple and huge construction projects, it faces a challenges of having low number of competent and experienced local firms that are frequently facing the financial calamities and thus causing more complex projects to be occupied by foreign firms (Kikwasi, 2012).

Moreover, the current research also identified the client related-exercising the liquidated damages (M=4.34) and ranked the fifth, the sixth being client-contractor related-establishment of Tanzania construction bank scoring (M=4.31) to facilitate easily fund accessibility and effective flow of funds, effective and timely procurement of project resources (M=4.23)-client-supplier related ranked the

seventh. Besides, the findings recognized the eighth-client-contractor related-appointing a skilled project manager and competent workforce (4.15), client-consultant-set the maximum deadline for approving changes in design scoring (M=4.09) ranked the 9th and the last being the client-contractor related encompassing entailing motivation to project executors (M=4.01). The findings of the current study identified in Tanzania construction industry were previously identified in other developing countries including. This has led to a generalization of the most identified delay best measures to be adopted in almost all developing counties having similar working environment and market as that of Tanzania.

One of an experienced retired engineer was qualitatively quoted saying:

> *For a successful implementation of the project's work and in order to minimize or reduce delays, it is essential to take a strong measure since the commencement of the project that involves: effective and strategic planning, coordination, and implementation to ensure projects are completed on time, within budget, and to the required quality standards. He added that, a project manager needs to act as the central link between stakeholders—including clients, architects, contractors, and regulatory authorities who will facilitate a clear communication and resolving conflicts to prevent delays.*
>
> Respondent

Another respondent was noted explaining that:

> *Among the best measure to reduce delays is to have a construction project manager who possess a unique blend of technical expertise, leadership skills, and problem-solving abilities to ensure project success. The manager should have a strong communication and negotiation skills which are essential factors for coordinating between diverse stakeholders within the project. Also, a collaborative team which can manage risks, have decision-making confidence, integrity and can ensure efficient resource allocation and utilization.*
>
> Respondent

Table 16: Best prevailing measure

Code	Best Practicing Measures	Mean	Std. Deviation	T-Scores	95% Confidence Lower	95% Confidence Upper	Related Group Category
1	Procure a skilled, competent and experienced contractors	4.53	1.683	29.708	3.930	5.170	CL
2	Ensure a proper project finance and cash flow.	4.47	1.428	26.021	4.087	5.417	CL &CO
3	Warranting a timely payment to contactor's and suppliers	4.41	1.408	25.639	2.839	4.149	CL & CO
4	Establish regular training to capacitate employees and leaders	4.37	1.718	19.799	3.349	4.969	CL&CO
5	Exercise liquidated damages	4.34	1.508	23.172	4.387	5.197	CL
6	Establishment of Tanzania construction bank	4.31	1.748	19.01	3.467	5.117	CL&CO
7	Effective and timely procurement of project resources	4.23	1.578	21.34	3.407	3.589	CO&S
8	Appointing a skilled project manager and competent workforce	4.15	1.398	24.819	2.353	3.653	CL & CO
9	Set the maximum deadline for approving changes in design.	4.09	1.648	19.167	3.307	5.227	CL & CONS
10	Entails motivation to project executors	4.01	1.588	23.516	3.277	4.737	CL & CO
11	Ensure a proper site supply chain and logistics management	3.86	1.658	23.476	4.257	5.277	CO & S
12	Contract termination	3.61	1.528	24.096	3.567	4.967	CL
13	Warrant a timely strategic planning and scheduling.	3.49	1.688	23.676	3.827	4.108	CO
14	Abide to construction ethics and code of conduct	3.39	1.921	24.536	2.608	4.408	CL,CO & CONS
15	use of modern construction technologies and equipment	3.31	1.540	21.782	3.657	5.067	CO

Code	Best Practicing Measures	Mean	Std. Deviation	T-Scores	95% Confidence Lower	95% Confidence Upper	Related Group Category
16	Ensure a timely site meeting to discuss challenges	3.27	1.780	23.169	3.857	5.507	CO & CONS
17	Ensure a thorough government support	3.22	1.671	23.849	3.567	4.402	CL & CONS
18	Establish the causes and settle disputes earlier	3.20	1.848	23.709	3.827	4.737	CL & CO
19	Ensure an efficient communication and corporation	3.17	1.829	16.921	2.922	5.147	CL
20	Adopt an Integrated team structure.	3.11	1.416	23.359	3.437	4.400	CO
21	Emphasize on early warning to builder	3.05	1.666	23.789	3.627	5.047	CL & CONS
22	Prepare risk management plans during contract execution	3.03	1.931	23.962	2.940	4.767	CO& CONS
23	Ensure accurate cost estimation to ensure project financing.	2.97	1.829	18.629	3.517	4.142	CL & CO
24	Involve construction management specialist companies.	2.61	1.416	21.729	3.367	4.920	CO

4.4 Potential Failure Reasons for the Prevailing Road Construction Delay Best Practice Measures

The finding of the research has acknowledged poor strategic project planning and management as the first top ranked potential failure reason with RII=0.7942 Strategic project planning, design and management is critical in defining project objectives, resource allocation, timelines as well as their management. When planning is inadequate, delays become inevitable due to misaligned goals, unrealistic schedules, and resource shortages. Poor planning often leads to overly optimistic schedules that fail to account for contingencies, resulting in inevitable delays.

However, it is effective project management that serves as the backbone of successful execution. Weak management practices—such as inadequate communication, poor risk assessment, and lack of coordination—directly lead to delays. The findings of the study reconcile the findings in the study of Doloi *et al.*

(2012) who recognized effective strategic planning and management as the potential strategies towards implementing the measures to reduce the construction project delays.

The research findings documented lack of government commitment and support with RII=0.7913. A The Government commitment and support are critical for the success and plays a pivotal role in ensuring the timely and successful execution of construction projects. A lack of such support undermines the implementation of best practices, resulting in significant delays.

The respondents mentioned the effects of lacking the government supports towards exacerbating delays and failure of implementation of the best practices includes, complex and uncoordinated government procedures often result in prolonged timelines, negating the benefits of efficient project planning, financial planning measures, such as phased funding or contingency budgets, fail when governments delay payment schedules or reallocate funds to other priorities, long-term strategic planning and multi-phase road construction schedules become irrelevant if policies change mid-project or political will is absent as well early community consultations fail if governments do not enforce or expedite land acquisition processes to mention a few.

Lack of appropriate strategies to handle the best practice measures was ranked third with RII= 0.7837. The absence of operational strategies to implement best practice measures in road construction contributes significantly to project delays. When the best practices are poorly handled or mismanaged results to failure to deliver their intended benefits. Such effects Below is an analysis of the effects, highlighting how strategic gaps exacerbate delays and hinder project success. strategies including effective project planning and scheduling, effective risk management, strong stakeholder engagement, adequate resource utilization and management, technological integration in construction, efficient monitoring and evaluation as well as sufficient training and capacity building were mentioned among the proper strategies to be adopted for effective implementation of best practice measures to reduce the construction project delays.

The fourth ranked potential failure reason with RII=0.7760 was insufficient or lack of project management knowledge. Project management knowledge is critical for the successful implementation of best practice measures in road construction projects. A lack of this expertise significantly undermines efforts to mitigate delays and implement effective measures, leading to inefficiencies, cost overruns, and substandard outcomes. The findings of the research have reconciled with that of Olander and Landin (2005) who observed that insufficient stakeholder management knowledge leads to poor implementation of measures designed to address delays (Olander& Landin,. 2005). Thus, lack of project management knowledge is a critical barrier to implementing best practice measures in road construction projects. Addressing this gap through targeted training, capacity building, and adoption of modern management tools is essential to reduce delays and improve project outcomes.

The last top five ranked potential failure reason for the prevailing road construction delay best practice measures was noted to be non-preference of on-job training to project's executors that scored the R=0.7750. On-the-job training is essential for equipping construction personnel with the skills and knowledge required to implement best practice measures effectively. When training programs are insufficient or poorly executed, workers and project managers are ill-prepared to apply advanced tools, technologies, and processes, resulting in delays and inefficiencies. Thus, Inadequate on-the-job training undermines the effective implementation of best practices in road construction projects. Targeted and ongoing training programs are essential to ensure personnel are equipped with the necessary skills to mitigate delays and deliver high-quality infrastructure.

Conversely, the last top-ranked potential failure reason for the prevailing road construction delay best practice measures includes Technological inefficiency, Lack or inadequate joint venture practices with foreign firms, Absence or inadequate motivation as well as Lack of fund and improper cash flow.

Table 17: Potential failure reasons for the prevailing road construction delay best practice measures

Potential failure reasons	N	∑W	RII	Ranking
Lack of government commitment and support	208	823	0.7913	2
Lack or inadequate joint venture practices with foreign firms	208	786	0.7558	9
Poor strategic project planning and management	208	826	0.7942	1
Technological inefficiency	208	803	0.7721	6
Lack of on-job training to project's executors	208	806	0.7750	5
Absence or inadequate motivation	208	792	0.7615	8
Lack of fund and improper cash flow	208	795	0.7644	7
Lack of appropriate strategies to handle the best practice measures	208	815	0.7837	3
Insufficient or lack of project management knowledge	208	807	0.7760	4

Source: Field data (2024)

4.5 The Framework of Potential Strategies to Minimize Road Construction Projects Delay

Table 18 presents the findings for the Kaiser-Meyer-Olkin (KMO) and Bartlett's Test Results. In theory, it is urged that KMO value greater than 0.5 is acceptable (Samuels, 2016). Thus, the findings yielded twelve potential strategies whose factor loading owned the acceptable threshold value and have met the requirement for a good model fit (Table 18 with KMO value of (0.815) at the associated Bartlett's test value of 0.842.895 and a significance level of 0.000 (which is less than 0.05). This indicated that the population correlation matrix is not an identity matrix and therefore is suitable for principal analysis and the validity of the questionnaire is acceptable. However, the data were proved to be adequacy for factor analysis process.

Table 18: Kaiser-Meyer-Olkin (KMO) and Bartlett's test results

KMO measure of sampling adequacy		0.815
Bartlett's Test of Sphericity	Approx. Chi-Square	842.895
	df	362
	Sig.	0.000

Table 19 below provides the factor analysis results with varimax rotation. The analysis provided the cluster matrix with pattern of twelve (12) potential strategies

each of the obtained strategies belonged to only one of the four components. The intensive analysis and thorough evaluation of strategies constituting a particular cluster facilitated the strategic cluster's naming for easy identification and interpretation. Therefore, four strategic clusters were namely, Strategic Planning (SP), Capacity Building (CB), Technology Adoption and Use (T) and Management (M). On top of that, the composite reliability and the average variance extracted (AVE) of each construct was computed with values found to be above the acceptable value of (0.7 and 0.5) respectively (Prudon, 2015). The findings (Table 19) suggests the presence of a related convergent validity between construct variables.

Table 19: A rotated component matrix of potential strategies

Code	Strategies	Clusters					
		1	2	3	4	CR	AVE
ST5	Enable early risks prediction and set their management strategies	0.839					
ST6	Compromise a continuous, Project control, monitoring and evaluation	0.793					
ST7	Establish a collaborative framework for problem and dispute solving skills	0.937				0.783	0.976
ST9	Appoint an experienced project manager with strong leadership skills	0.748					
ST1	Entails Project's Joint Venture with foreign Firms		0.809				
ST3	Capacitate project participants through on-going training		0.702			0.749	0.892
ST8	Optimize adequately the allocation and utilization of resources		0.822			0.736	0.838
ST2	Leverage the adoption and use of modern advanced technology			0.829			
ST11	Use an Alternative Industrialized Construction technique			0.737		0.856	0.8
ST4	Ensure a realistic and Strategic				0.683		

	Project Planning and management				
ST10					0.962
	Establish a collaborative framework for problems and disputes solving				
ST12					0.752
	Motivate the firms for a timely finished project				
	NOTE: 1. Extraction Method: PCA				
	2. Rotation Method: Varimax rotation				
	3.Initial Eigen Values	7.199	1.721	1.388	1.236
	4. Percentage of Variance (%)	59.864	9.587	7.272	5.701
	5. Cumulative percentage of initial Eigenvalues	59.864	64.451	76.723	82.424

Similarly, SPSS software was used to compute and attained the eigenvalues extracted from PCA, accounting for 82.424% of the variance. The cumulative percentage of initial eigenvalues have represented the proportion of total variance explained by a subset of principal components or factors.

Table 20: Computed initial eigenvalues

Component	Eigen values	% of Variance	Cumulative %
1	7.199	59.864	59.864
2	1.721	9.587	69.451
3	1.388	7.272	76.723
4	1.236	5.701	82.424
5	.563	3.856	87.893
6	.347	2.891	90.784
7	.290	2.519	93.203
8	.243	2.138	95.225
9	.181	1.890	96.735
10	.167	1.794	98.129
11	.131	1.492	99.221
12	.093	.996	100.000

4.6 Reliability Analysis of Potential Strategies

Table 21 indicate the four construct variables having higher Cronbach alpha values as a coefficient of reliability (or consistency) attained the recommended threshold limit of above 0.5. Thus, since the lowest Cronbach Alpha value is .734 under strategic planning construct it can be generally concluded that all items (strategies)

have a relatively high internal consistency. Thus, the findings suggest that all four constructs have attained an appropriate condition for structural equation modelling (SEM) analysis.

Table 21: Reliability of Potential Strategies

Construct variables	Remark	Potential strategies	Clusters		
			Corrected item-total correlation	Cronbach's alpha if item deleted	Cronbach's alpha
Management	ST5	Enable early risks prediction and set their management strategies	.746	.849	.853
	ST6	Compromise a continuous, Project control, monitoring and evaluation	.818	.729	
	ST7	Establish a collaborative framework for problem and dispute solving skills	.975	.771	
	ST9	Appoint an experienced project manager with strong leadership skills	.934	.828	
Capacity building	ST1	Entails Project's Joint Venture with foreign Firms	.693	.774	.912
	ST3	Capacitate project participants through on-going training.	.827	.821	
	ST8	Optimize adequately the allocation and utilization of resources	.782	.702	
Technology adoption and use	ST2	Leverage the adoption and use of modern advanced technology	.818	.832	.822
	ST11	Use an Alternative Industrialized Construction technique	.839	.694	
Strategic planning	ST4	Ensure a realistic and Strategic Project Planning and Management.	.858	.741	.734
	ST10	Establish a collaborative framework for problems and disputes solving	.838	.810	
	ST12	Motivate the firms for a timely finished project	.729	.792	

4.7 A Framework of Strategies to Reduce Road Construction Project's Delay

The primary purpose of the structural framework or structural model equation (SEM) is to validate the theoretical models by evaluating the model fit indices between the model construct. The SEM helps in realising and indorsing relationships among multiple variables (Hair *et al*., 2015). One of its most substantial strengths lies in scrutinising the correlation among numerous constructs variables. This feature allows the assessment and elimination of variables with weak measurements (Chin *et al*.,

2008). SEM comprises two primary models namely: the measurement model that evaluate the relationships between observed variables and constructs variables (Hair *et al*., 2014). It aims to evaluate how the observed variables (noted in this research as strategies) are related to the underlying constructs. On the other hand, the structural model examines the causal relationships between the constructs variables and how their influence on observed variables.

In this study, the structural equation modelling (SEM) technique was chosen to test the theories or model between relative observed and construct variables. The structural model was built based on literature and correlation as defined in conceptual framework of the study. During data manipulation and processing using SPSS-AMOS 24, all variables in a construct were drawn and retrieved for processing. After naming the path coefficient for correlation and regression of a construct variable in relation to an observed variable was drawn. Errors associated with observed variables were established, followed by determining the correlation covariance between construct variables. The path diagram (Figure 5) of the model were drawn and undergone model modification to indicate the positive relationships between each latent variable towards reducing the construction project delay. The computed model fit indices were assessed based on the stated threshold values (Table 22).

Table 22: The model indices' threshold values for SEM evaluation

Type	Index	Threshold Value	Reference
Absolute Fit Measures	χ^2	The lower, the better; p-value =0.000	Hair *et al.* (2014); Hooper et al. (2008).
	χ^2/df	< 2,3	Hair *et al.* (2014)
	GFI	>0.90	Scherm); Hair et al., (2014); Alaloul *et al*., (2020).
	AGFI	>0.90	Alaloul *et al*. (2020)
Incremental Fit Measures	RMSEA	<0.07	Steiger, (2007; Hair *et al*.,(2014).
	TLI	>0.90	(Hair *et al*.,(2014); Fan et al., (2016)
	NFI	>0.90	Bentler and Bonett (1980, cited in Hooper *et al.*, 2008)
	CFI	>0.92	Hair *et al*.,(2014; Fan *et al*., (2016),
Parsimonious Fit Measures	PCFI	>0.50	Mulaik *et al*. (1989, cited; Hooper et al., 2008)

4.8 Assessment of Developed Structural Framework

The evaluation of the final structural model involved a comprehensive examination of the inter-relationships among constructs and the overall model fit including the structural model estimates and path coefficients (Koh, & Rowlinson, 2007). However, in order to evaluate the model's suitability and capacity to capture the underlying data and theoretical framework, a number of goodness-of-fit indexes were taken into consideration and computed. The results are presented in (Table 23).

Table 23: The Computed Model Fit Indices of the Final Structural Model

Type	Fit Index	Threshold	Value Attained	Remarks
Absolute fit measures	χ^2 p-value	0.000	0.000	Realized
	χ^2/df	< 2 or 3	1.782	Realized
	GFI	>0.90	0.911	Realized
	RMSEA	< 0.07	0.061	Realized
Incremental fit measures	TLI	>0.90	0.969	Realized
	CFI	>0.90	0.972	Realized
Parsimonious fit measures	PNFI	>0.50	0.619	Realized
	PCFI	>0.50	0.693	Realized

The observed standardized regression weights for the final structural model recognized the insightful observations showing the relationships between the latent variables namely; Capacity Building (CB), Management (M), Technology adoption and use (T) and Strategic Planning (SP). The findings of the study have acknowledged a positive statistically significant relationship at a significance level of < 0.000 for CB, M, T and SP signifying a strong and significant effects towards reducing the construction project delays.

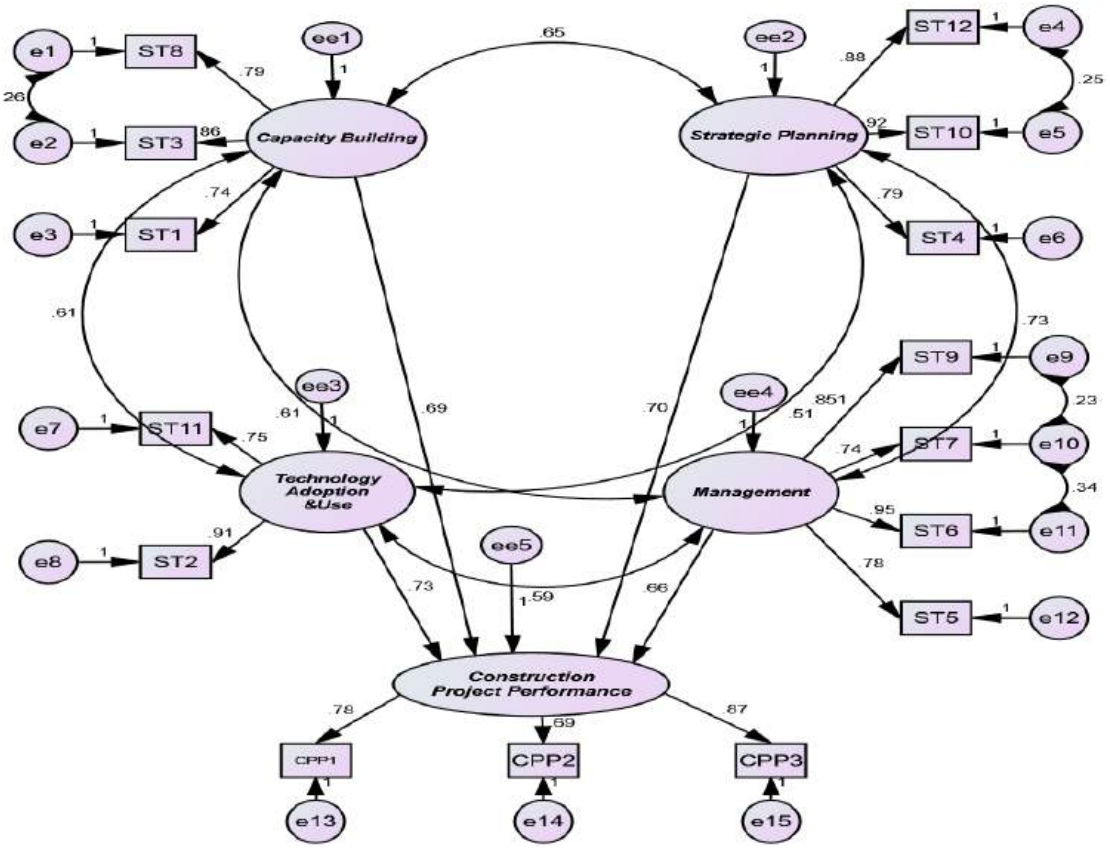

Figure 5: A final path diagram with standardized parameter estimates after model adjustment

The structural equation model (SEM) presented appears to illustrates the relationships between various latent constructs and their observed indicators. The latent constructs, including "Capacity Building," "Technology Adoption and Use," "Management," and "Strategic Planning," are each measured by specific indicators encompassing (ST1, ST3, ST8, ST2, ST11, ST4, ST10, ST12, ST5, ST6, ST7 and ST9) with numbers associated with the relationships representing the regression weights or factor loadings (0.74;0.86;0.79;0.91; 0.75; 0.79; 0.92; 0.88; 0.78; 0.95; 0.74; and 0.85) respectively has shown the significance contribution to reduce the construction project delays and thus improve the construction project performance.

Moreover, the regression weights in this model are necessary and crucial for understanding the impact of each latent variable on its indicators and on other latent variables. For instance, the high regression weight of .91 between "Technology Adoption and Use" and its indicator ST2 suggests a strong relationship, indicating

that ST2 is a reliable measure of this construct. Since, all factor loading values have attained the acceptable threshold value above 0.5, they have suggested to be s reliable degree in producing a strong relationship between latent variables.

Furthermore, the correlations implied by the paths and weights of the four latent variables incorporating management (66%); capacity building (69%); strategic planning (70%, and technology adoption and use (073%) has acknowledged and provided an insight into how these constructs influence or play a significant role in reducing the construction project delays and hence improve the performance.

Generally, the model has demonstrated a network of relationships where the latent constructs representing the strategies has seen to influence each other measured by their respective indicators. The regression weights and correlations have highlighted the strength and significance of the strategic relationships, providing a comprehensive understanding of the factors for reducing the construction project delays and hence affecting the construction project performance. The observed high weights and correlations have suggested that capacity building, technology adoption and use, strategic planning, and management strategies are critical components that collectively helps to reduce the construction delays and thus impact the project performance. This model can be used to confirm the necessary strategies for reducing the project delays and improving the project outcomes by focusing on these key strategies.

CHAPTER FIVE
CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This study was aimed at formulating the framework of strategies for improving the road construction projects delay in Tanzania. To achieve the intended aim, the study was organized into five Chapters. Chapter one has presented the introduction to the study, objectives and the problem statement. The literature was reviewed and discussed in Chapter Two. Chapter Three presented the research methodology adopted to achieve the study objectives. The study findings, analysis and discussions were presented in chapter Four. Lastly, this chapter presents the conclusion of the research works by highlighting the main research findings, contribution to the knowledge from this study. This chapter also summarized the achievements of research objectives, the research contributions and the implications of the study in practice. Further in this chapter, research limitations are presented with a future area for research which can enhance the knowledge regarding strategies for minimizing the construction project delays.

5.1 Conclusion

The primary research question has been what are the potential strategies for improving the road construction projects delay in Tanzania? The response to this question needed a combination of practitioner's perspective and or opinion when referred to their best practices. To respond to the question and reach the research findings with concluding remark, the research passed various stages as derived from the research questions prescribed in chapter one.

This study intended to develop a framework of strategies to minimize the road construction project in Tanzania. The study was sectioned into five parts including chapter one as a foundation or proposal of the study followed by a thorough literature review to understand the general situation of the construction industry and provided the gap of the study followed by the methodology that provided the study direction to reach the findings and conclusions. This part provide the conclusion of the study as summarized from the previous chapter.

To obtain the findings and attaining the conclusion of the study, a quantitative method for data collection using the questionnaire and interview from two hundred and two (208) respondents were conducted including the client, contractor [[], consultant, regulator and academician selected using a random probability sampling technique. The data were analyzed using SPSS-24 software to obtain the descriptive and inferential statistics presented in Tables, graphs and figure. However, the SPSS-AMOS was adopted to develop a framework of potential strategies represented using the structural equation model (SEM). The conclusion of the findings as referred to each specific objective are presented hereunder:

5.1.1 Factors for Road Construction Project's Delays

From the review works, a list of manifested factors was developed. The analysis made after collection revealed ten potential factors contributing significantly to construction project delay including awarding contract to lowest but unexperienced and incapable bidder, ineffective procurement planning and incapable supplier, unforeseen conditions (changes of weather conditions and society strike and conflicts). Moreover, frequently change of design due to mistakes and errors, delay in inspection and approval of completed design drawing by consultant, financial difficulties to contractors (with poor cash flow management) and lack or shortage of workforce and skilled personnel. Furthermore, shortage or poor quality of construction materials, ineffective strategic planning as well as scheduling and late or delayed payment by each part (client/contractor). Conversely, the identified factors were categorized into six clusters namely management factor, external factor, technical/design factor, economic factor, resource factor and construction project management factor. This concluded achievement of objective one of this research.

5.1.1.1 Prevailing Best Practice Measures of Reducing Road Projects Construction Delay

Thirteen prevailing best practice measures were acknowledged including procuring the skilled, competent and experienced contractor, guaranteeing a proper project finance and cash flow, warranting a timely payment to contactor's and suppliers, and establish regular training to capacitate employees and leaders. In addition, exercising

liquidated damages, establishment of Tanzania construction bank, effective and timely procurement of project resources, appointing a skilled project manager and competent workforce. More include, setting the maximum deadline for approving changes in design, entailing the motivation to project executors, ensuring a proper site supply chain and logistics management, contract termination as well as warranting a timely strategic planning and scheduling. Besides, the prevailing best practice were clustered in their eight group categories including 4-client related, 6-contractor related, 2-consultant related, 2-contractor and supplier related, 7-client and contractor related, 3-client and consultant related, 2-contractor and consultant related as well 1-client, contractor and consultant related prevailing best practices.

5.1.1.2 Potential Failure Reasons for the Prevailing Road Construction Delay Best Practice Measures

It is concluded that nine (9) potential failure reasons were documented in the findings including lack of government commitment and support, lack or inadequate joint venture practices with foreign firms, poor strategic project planning and management. Additionally, includes technological inefficiency, lack of on-job training to project's executors, absence or inadequate motivation, lack of fund and improper cash flow, lack of appropriate strategies to handle the best practice measures as well as insufficient and or lack of project management knowledge.

5.1.2 A Framework of Potential Strategies to Minimize Road Construction Projects Delay

The findings of the framework (figure 4) demonstrated four-dimensional pillars encompassing the model strategies identified and confirmed to be of extreme importance for reducing the road construction project delays. Thus, the model's result finally revealed the model dimensions that significantly influence the road construction project delays performance improvement, including Capacity Building, Strategic Planning. Technology Adoption and Use and Management.

5.2 Contribution to Knowledge

The literature review has spotted a gap in the knowledge of strategies for reducing the road construction project delays. Although the strategies for promoting and

improving the road construction project have been developed and implemented in developed countries context, those strategies are seldom reviewed nor classified. Therefore, this research has meant to fill the gaps identified in the literature. The critical contribution of this research is the development of the framework/model of strategies to minimize the road construction project delays. The framework will help practitioners and governments improving performance on road construction project delays as a means of reducing the road construction project delays and thus solving construction industry challenges in developing countries.

The research has significant contributions to the existing road construction project delays knowledge. The research has provided knowledge on the potential factors for road construction project's delay, the prevailing best practice measures for reducing road projects construction delay and as documented the potential failure reasons for the prevailing road construction delay best practice measures in Tanzania. The finding can be used by governments in policymaking or firms such as Architectural, Engineering and Construction in developing strategic plans. In the real world, the contribution of this research will be reflected through a minimized road construction project delays as an overwhelming problems in the construction industry.

5.3 Implications of Research Findings

The current study has not only made a contribution to knowledge minimizing the road construction project delays but also has implications for the broader body of knowledge. A research implication is defined as the logical connection between a condition and its outcome. The researcher illustrated the implications into two subsections, such as theoretical and practical implications.

5.3.1 Theoretical Implications

The current research contributed to the theoretical understating of road construction project delays and its fundamental strategies towards reducing delays. This study implies providing further opportunities for future researches. The study developed a framework of strategies for reducing the road construction project delays and promoting the adoption of recognized strategies to enhance the improvement of the road construction project performance. The study has provided a framework of

strategies encompassing Capacity Building, Strategic Planning. Technology Adoption and Use and Management which were acknowledged to be fundamental in reducing the delays and thus improving the road construction project performance.

5.3.2 Practical Implications

Practical implication is defined as the reality that would occur if certain conditions were fulfilled. Determining the practical implications of a range of options can help decide which ones produce the desired results. The findings of this research study have presented a reasonable perception of stakeholder's in road construction project performance improvement strategies. It has also uncovered the prevailing best practice measures for reducing road projects construction delay and documented the potential failure reasons for the prevailing road construction delay best practice measures. The research outcome has brought a few practical implications about the road construction project delay strategies.

The framework of strategies was developed to provide a structured approach for reducing the road construction project delay and thus promoting the road construction project performance improvement. It also helps the construction industry stakeholder's decision making on the best strategies to be adopted to reduce delays. The model is based on Structural equation modelling(SEM) approach developed using four groups of construct variables to be considered for application in the broader context of the construction industry.

5.4 Study Limitations

Although the study was focused on, developing the framework of strategies road construction project delays in Tanzania, the findings can be applied with attention needed while generalizing the findings in a different context. Therefore, the study can be limited generalized to countries only having the same or almost the same environment with that of Tanzania Construction Industry.

5.5 Recommendation of Future Research

This thesis developed a framework of strategies for reducing the road construction project delays. The study was focused on developing countries context where there

are many construction challenges as compared to developed countries. Several potential areas for future research remain to be explored includes:

This study surveyed only a limited sample size of 208 respondents from the construction industry practitioners, including client, contractor, consultant, regulator, and academician. The incorporated respondents could not accommodate enough to portray well the variations of some variables. Future research is proposed to cover or accommodate a higher sample size and more participants, including suppliers and other stakeholders who play a significant role in construction to substantiate the findings' generalization.

Moreover, since both Technology adoption and use were identified as a combined fundamental strategic factor to reduce delays, future study is suggested to determine their separate effects on reducing delays and improving performance with much attention on its risks.

Furthermore, this study has examined and hence addressed very few strategies that influence delay reduction and thus performance improvement. Future research needs to investigate more construction firm related strategies including management culture, organizational structure, relationship, communication and collaboration, risk management and contingency planning, supply chain management, project monitoring and evaluation as well as employee’s behaviors in relation to their influence or importance to reduce road construction delays and hence improve performance.

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APPENDICIES

A FRAMEWORK OF STRATEGIES TO REDUCE ROAD CONSTRUCTION PROJECT S' DELAY IN TANZANIA

Please, I am requesting for your time to participate fully to fill my questionnaire intending to fulfill the above subjected topic as a research requirement towards my Masters of Civil engineering graduation. Kindly read thoroughly and respond positively. (Seperatus Gabriel)

Respondent's Demographic Information

1. Name of Respondent (Optional)…….….

2. Email address: ……Mobile No……...……

3. Education level

- ◯ Secondary Level
- ◯ Diploma Level
- ◯ Degree
- ◯ Masters
- ◯ PhD

4. Your working Experience (in Years)

- ◯ ≤10
- ◯ 11-20
- ◯ 21-30
- ◯ Above 30

5. What is your Profession?

- ◯ Engineer
- ◯ Architect
- ◯ Quantity Surveyor
- ◯ Surveyor
- ◯ Procurement Officer
- ◯ Human Resource Officer

Other…….

6. What is your current title/Position in the firm?

- ◯ General Manager
- ◯ Project Manager
- ◯ Departmental Manager
- ◯ Site Engineer
- ◯ Technician/Foremen

Other……

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7. What is the nature of the firm you work for?

- ◯ Consultant
- ◯ Contractor
- ◯ Client (Government and or its Agency)
- ◯ Client (Private)
- ◯ Financial or Procurement Institution
- ◯ Training Institute

Other……

8. For how long has your firm been in operation since registration? (in Years)

- ◯ ≤10
- ◯ 11-20
- ◯ 21-30
- ◯ Above 30

9. Has your firm ever experienced road construction delay in any executed projects?

- ◯ Yes
- ◯ No

10. If Yes, Use the Likert scale **5= Very Important, 4= Important, 3=Moderate Important, 2= Not Important and 1= Not Very Important** to rank the following factors in order of their importance towards their contribution on the road project's construction delays. *(Mark only one tick per row).*

Table 1: Factors Contributing to Road Project's Construction Delay

S/N	**Factors**	**Likert Scale**				
			4	**3**	**2**	**1**
1	Late or delayed payment					
2	Financial difficulties to executors/contractors					
3	Inadequate of poor fund allocation					
4	High interest rate imposed by institutions					
5	Currency fluctuation/inflation					
6	Frequently change of design					
7	Poor or delayed design					
8	Poorly adopted construction method					

9	Lack of professionalism					
10	Lack of technical personnel					
11	Delay in approving the completed work					
12	Inadequate project time and cost estimate					
13	Lack of chain of commands					
14	Lack or poor organizational structure					
15	Lack or less motivation and training					
16	Poor coordination and communication					
17	Lack of management and supervision skills					
18	Slow or inappropriate information flow					
19	Slow decision making between parties					
20	Shortage of construction materials					
21	Poor quality of construction materials					
22	Late order and delivery of materials					
23	Lack or shortage of skilled personnel					
24	Inadequate or lack of modern technology					
25	Frequently equipment breakdown					
26	Unethical practices and kickbacks					
27	Lack or improper supply chain					
28	Changes of weather conditions					
29	Society strike and conflicts					
30	Political interference					
31	Lack of experience and exposure					
Others (Mention) and rank them						
1						
2						

11. Various prevailing best practice measures have been adopted to reduce road projects construction delay in Tanzania Construction industry. Use the Likert scale 5= Very Important, 4= Important, 3=Moderate Important, 2= Not Important and 1= Not Very Important to rank the best practice measures in order of their importance to reduce the road project's construction delays. (Mark only one tick per row).

S/N	**Prevailing Best Practice Measures to Reduce Delays**	**Likert Scale**				
		5	**4**	**3**	**2**	**1**
1	Set the maximum deadline for approving changes in design					
2	Prepare risk management plans during contract execution					
3	Ensure an efficient communication and corporation					
4	Appointing a skilled project manager and competent					

	workforce					
5	Establish regular training to capacitate employees and leaders					
6	Involve construction management specialist companies					
7	Establishment of Tanzania construction bank					
8	Effective and timely procurement of project resources					
9	Procure a skilled, competent and experienced contractors					
10	Warranting a timely payment to contactor's and suppliers					
11	Entails motivation to project executors					
12	Ensure accurate cost estimation to ensure project financing					
13	Ensure a proper site supply chain and logistics management					
14	Contract termination					
15	Warrant a timely strategic planning and scheduling.					
16	Adopt and use of modern construction technologies and equipment					
17	Ensure a timely site meeting to discuss challenges					
18	Exercise liquidated damages					
19	Establish the causes and settle disputes earlier					
20	Ensure a proper project finance and cash flow					
21	Adopt an Integrated team structure.					
22	Emphasize on early warning to builder					
23	Abide to construction ethics and code of conduct					
24	Ensure a thorough government support					
25	Plan and analyze the requirements in details					
26	Adopt interactive planning					
Others (Mention) and rank them						
1						
2						

12. Despite the presence of best practice measures to reduce the road project's construction delays, the industry has continued to attain a prolonged project's inadequate performance measured in terms of projects construction delay. Using the 5-Likert scale **5= Very Important, 4= Important, 3=Moderate Important, 2= Not Important and 1= Not Very Important**, rank the potential failure reasons for the prevailing road construction delay best practice measures. *(Mark only one tick per row).*

S/N	Potential Failure Reasons for the Prevailing Best Practice Measures to Reduce Delays	Likert Scale				
		5	4	3	2	1
1	Lack of government commitment and support					
2	Lack of on-job training to project's executors					
3	Lack or inadequate joint venture practices with foreign firms					
4	Insufficient or lack of project management knowledge					
5	Slow decision making and administration by project participants					
6	Lack of experienced Construction project manager					
7	Poor strategic project planning and management					
8	Lack of appropriate strategies to handle the best practice measures					
9	Low willingness and commitment of project's executors					
10	Absence or inadequate motivation					
11	Lack/ absence of common understanding of project's goals					
12	Lack or improper communication between project's executors					
13	Lack of transparency and accountability during decision making					
14	Conflict or disagreements among Stakeholders					
15	Failure or late to settle dispute					
16	None adherence/enforcement of disciplinary measures imposed					
17	Technological inefficiency					
18	Lack of best practice measures implementation framework					
19	Lack of fund and improper cash flow					
Others (Mention) and rank them						
1						
2						

13. For a successful minimization and or reduction of road project's construction delays, presence of a framework of potential strategies is always of paramount important. Using the 5-Likert scale 5= Very Effective, 4= Effective, 3=Moderate Effective, 2= Not Effective and 1= Not Very Effective, rank the potential strategies in order of their effectiveness toward road construction project's delay minimization. *(Mark only one tick per row).*

S/N	Factors	Likert Scale				
		5	4	3	2	1
1	Establish Local institutions for financial Support					
2	Entails Project's Joint Venture with foreign Firms					
3	Ensure presence of qualified and competent workforce					
4	Use of Local/imported Materials					
5	Leverage the adoption and use of modern advanced technology					
6	Adopt financial Partnership					
7	Research and development for Knowledge and Skills					
8	Capacitate project participants through on-going training					
9	Ensure effective information flow					

10	Divide the bids into manageable lots					
11	Adopt creative and Innovative construction methods					
12	Ensure a realistic and Strategic Project Planning and management					
13	Motivate the firms for a timely finished project					
14	Guarantee transparency, accountability and commitments					
15	Enable early risks prediction and and set their management strategies					
16	Undertake Research and Review Strategies as per Global Changes					
17	Compromise a continuous, Project control, monitoring and evaluation					
18	Establish government owned Plant and Equipment section					
19	Enhance operative Stakeholder communication and Coordination					
20	Government Support by enforcing adherence to construction principles					
21	Use of Alternative industrialized Construction technique					
22	Optimize adequately the allocation and utilization of resources					
23	Secure all necessary permits early before project lifecycle starts.					
24	Appoint an experienced project manager with strong leadership skills					
25	Ensure a clear, comprehensive and robust contract management					
26	Establish a collaborative framework for problems and disputes solving					
Others (Mention) and rank them						
1						
2						

14. Use the 5-Likert scale 5= Very Effective, 4= Effective, 3=Moderate Effective, 2= Not Effective and 1= Not Very Effective; to rank the key performance parameters to be used in evaluating the performance of any of the road project's construction. *(Mark only one tick per row).*

S/N	Factors	Likert Scale				
		5	4	3	2	1
1	Timely project's completion with value for money (VFM)					
2	Projects completion beyond the time but within the set budget					
3	Projects completed within time, cost and quality					
4	Good project's payment to employee that rise their living standard					
5	Attained quality work beyond the time					
6	Rise on profitability after project's completion					
7	Increased use of technology with project's timely delivery					
8	Increased stakeholder's satisfaction on completed projects					
Others						
1						
2						

15. Provide your explanation on the factors and measures to reduce the construction project delays.

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Thank You for Your Participation