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The Effect of Scope Creep on Project Performance: The case of Federal Road Projects

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Certification

This is to certify that Rahel Yoseph has carried out a thesis entitled **"**The Effect of Scope Creep on Project Performance: The Case of Federal Road Projects**"** submitted in partial fulfillment of the requirements for the degree of Master of Arts in Project Management, the Graduate Program of the School of Commerce, Addis Ababa University, under my supervision.

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Abstract

Scope of a project is the total sum of work that is required to deliver service, a product or a result, with the specified characteristics and functions. Scope change in projects is inevitable as projects can often experience dynamic changes. Even though a predefined scope changes at the early stages of a project can keep the scope of a project on track, an uncontrolled scope change, scope creep, is the most common and major cause of project failure. This study aimed to assess the effect of scope creep on the performance of federal road construction projects which hinders the projects from meeting their specific goals within the set of budget and time. The objective of this study was to identify the key variables of causes and effects of scope creep as well as to outline mitigation measures. A combination of descriptive and explanatory research type was followed whereas quantitative surveys approach was used to collect primary data from three parties of the project (the client, contractor, and consultant). A sampling frame was drawn from the target population on the basis of projects that are under implementation phase which reached >50% accomplishment and experiencing scope creep. Using simple random sampling, 20 projects (60sample units) were selected and questionnaires were disseminated. Identified variables gathered from different literatures were employed with a lickert's scale measurement in order to measure the attitudes of respondents. Data were imported and analyzed using descriptive and inferential analysis in terms of weighted mean, standard deviation and correlations in SPSS. Moreover, secondary data was gathered from the organization in order to strengthen the attitudes of respondents. Results of the study showed that the most common causes of scope creep as gathered from the respondents are poor understanding of scope changes, issues related with design & specifications, issues related with scope planning, issues raised internally, and external issues based on the output of the analysis. On the other hand, the frequent impact of scope creep was shown with regard to time/schedule overrun, overall project performance (such as personnel of projects), with regard to cost overrun, and quality of end result. Possible mitigation measures were also drawn from the study.

Key words: scope creep, project performance, project scope management

Chapter One

1. Introduction

1.1 Background of the study

In project management, project performance holds a great value, as it emphasizes on continuous improvement via different project types. It can be outlined that the primary objective of project performance is to increase the success of a project's outcome (Majid and Dania, 2021).Project management is "*the process of managing, allocating, and timing resources in order to achieve a given objective in an expedient manner*". The objective of a project may be stated in terms of time (schedule), performance output (quality), or cost (budget) (Sullivan and Harris, 1986).

Projects can often experience dynamic change, and this usually results in overspending, reduced quality delays in on-time delivery, and other such failings in achieving their intended objectives (Alexia and Anthony, 2017).Thus, performance of project should be analyzed against cost, scope and schedule baselines or other components of the project management plan which may sequentially result in a change request to these baselines (PMBOK, 2017).

Project Scope Management includes the processes required to guarantee that the project includes all the work required, and only the work required, so as to complete the project successfully. Managing the project scope is primarily concerned with defining what is and is not included in the project as well as and controlling the works to be done (PMBOK). On the other hand, Scope creep is a major issue that mostly, out of many reasons, is caused by incomplete definition of scope that, in turn, leads to changes in scope that adversely affect time, cost, and quality or risk of a project (Dekker &Forseluius, 2007). A study proved that 19% of all projects fail, and more than 50% of those suffered scope creep (Project Management Institute, 2017).Scope creep is not an industry-specific problem but rather project practitioners all over the world suffer from this issue in almost all kinds of industries and sectors.

A study revealed that the most important factor that could potentially impact project performance of 40/60 housing project in Addis Ababa is the change in Project schedule/time cost and quality and these scope changes reflect cost of rework cost of variation orders and also affects the cash flow of the project (Kalkidan, 2019). The cost impact of change orders on Road projects in Ethiopia was studied by Mekonen, 2015, which demonstrated that Design Errors and Omissions, Change of Scope, Unforeseen Conditions, Value Engineering, Force Majeure and Others as categories of major causes of change orders have an incremental (Negative in his case) consequential cost impacts.

1.2 Background of the organization

Ethiopian Roads Administration (ERA), has been administering the road sector starting from the commencement of the organization. ERA was established in 1967 by proclamation No 256/67 for the reason of providing the control and regulation of travel and transport on the road. The organization has a vision of "*Global Competence and Great Roads to Prosperous Ethiopia by 2030"* (ERA Website). The ERA is responsible for the construction and management of all federal roads within Ethiopia, vehicles using these roads, and all matters relating to road transport activities of the country.

Road transport plays a vital road in the context of Ethiopian geography, patterns of settlement and economic activity, as 95% of the movements of people and goods are still carried out by road transportation in facilitating economic development. Road transport provides the means for the movement of peoples and agricultural products from rural areas to urban areas and movement of industrial goods and modern agricultural inputs from urban to rural areas. Road transport also provides a means for the utilization of land and natural resources, improved agricultural products and marketing, access to social services, and opportunities for sustainable growth (ERA, 2014)

The Ethiopian Roads Administration is also the custodian of a series of technical manuals, standard specifications and bidding documents that are written for the practicing Engineer in Ethiopia. These series of manuals describes current and recommended practice and sets out the national standards for roads and bridges. The manuals are based on national experience

and international practice and are approved by the Director General of the Ethiopian Roads Authority (ERA, 2013).

The Ethiopian government formulated the Road sector development program (RSDP) in 1997. One of the core objectives of this program is to enhance the quality and size of road infrastructure so as to meet poverty reduction targets. From the indistinct objectives of RSDP one is increasing the capacity of local contractors. However, the performance of these local contractors has faced various challenges and the immediate consequence of their performance increases project costs as compared against the originally budgeted cost as well as delays, among others (ERA, 2014).

Ethiopian Roads Administration (ERA), being the client of all federal road construction projects, faces different challenges during undertaking of the projects (Yoseph et al., 2017). These challenges usually lead to cost and time overrun and to the extent of project failure; one of these challenges is scope creep. This project work is, therefore, proposed to study the impact of scope creep on project performance in the case of federal road construction projects.

1.3 Statement of the problem

Scope of a project as one of project management knowledge areas is "*the total sum of work that is required to deliver service, a product or a result, with the specified characteristics and functions*" (PMBOK, 2017). Hence, it is vivid that the scope of a project is concerned with how objectives of the project will be achieved within the given set of constraints. However, scope change is mostly inevitable, especially in road construction projects. Even though a predefined scope changes at the early stages of a project can keep the scope of a project on track (Theyab and Rizwan, 2021), an uncontrolled scope change, scope creep, is the most common and major cause of project failure (Brook, 2020)

The current Ethiopian Roads Administration (ERA), being the client of all federal road construction projects, faces different challenges during undertaking of the projects (Yoseph et al., 2017).It is a specified fact that these challenges usually lead to cost and time overrun and to the extent of project failure. One of these challenges is scope creep (Yoseph et al.,

2017).It was studied that scope changes of schedule, cost and quality have a negative impact on the success of housing construction projects (Kalkidan, 2019) whereas change orders on Road projects in Ethiopia have a significant cost impact on the performance of the project (Mekonnen, 2015).

Based on different literatures, different types of projects face changes in scope of a project, scope creep, which has an adverse effect on performance of the project. (Moenke (2016), Moayyad (2018), Theogene & Patrick (2019)) However, exhaustive studies haven't been conducted on the effect of scope creep in the performance of Ethiopian federal road construction projects in terms of cost and time (schedule) overruns, quality, project performance as well as the risks attributing to this problem by outlining preventive measures. Thus, the purpose of this study is to assess the impact of scope creep on the performance of federal road construction projects which hinders the projects from meeting their specific goals within the set of budget and time.

1.4 Research questions

- What are the key factors which causes scope creep in federal road construction projects?
- What is the effect of scope creep on the performance of federal road construction projects?
- What recommendations can be outlined in order to minimize the effect of scope creep in road construction projects?

1.5 Objectives of the research

1.5.1 General objectives

The general objective of this study was to examine the effect of scope creep on the performance of Ethiopian federal road construction projects.

1.5.2 Specific Objectives

The specific objectives of this study were:

- To determine the key factors that causes scope creep in federal road construction projects
- To examine the effect of scope creep on the performance of federal road construction projects
- To outline recommendations to minimize the adverse effect of scope creep on road construction projects

1.6 Significance of the study

This study is expected to identify the key factors attributing to the frequent occurrence of scope creep in federal road construction projects and the effect of scope creep on the performance of the projects in terms of cost and time overrun as well as quality of the work. This will help the client, Ethiopian Roads Administration, to have the notion on the extent of scope creep as one of the major contribution factors to the backward dragging force in the road construction projects. Moreover, the findings of this study will provide ERA and project team members to adopt solutions to overcome the consequences resulted from scope creep of the projects as the government allocates wage amount of money every year for the road construction sector.

1.7 Scope of the Study

The study was conducted on the road construction projects administered by the organization Ethiopian Roads Administrations and the scope of the study is to examine the effect of scope creep on the performance of Ethiopian federal road construction projects. The projects were selected using a sample frame and they are located in all geographic regions of the country. The target populations of the research comprise three parties of the contract (the client, contractor, and consulting firm).

1.8 Limitations of the study

All respondents selected for data collection were professionals involved in construction of federal road projects that encountered scope creep in Ethiopia (client, contractor, and consultant). This study is limited to the case study of road construction projects under Ethiopian Roads Administration.

1.9 Organizations of the study

This study paper includes five chapters and organized as follows: the first chapter contains introduction part of the study, which includes background of the study aas well as the organization, statement of the problem, research questions, objectives and significance of study, and limitation of the study. The Second chapter is the preliminary review of theoretical and empirical literature and conceptual framework. Chapter three comprises research design and methodology which is inclusive of research approach sampling technique, sampling instrument and data analysis whereas on chapter four, results and discussion is presented. Under chapter 5 of the paper, summary of major findings of the study, conclusion and recommendations from the study are outlined. Lastly, References and Annex are presented.

1.10 Definition of key terms

Project: is a sequence of unique, complex, and connected activities that have one goal or purpose and that must be completed by a specific time, within budget, and according to specification

Project management: is the application of knowledge, skills tools and techniques to project activities to meet the project requirements.

Scope of a project: the work performed to deliver a product, service or result with the specified features and functions.

Project scope management: includes all the processes required to the project includes all the work required, and only required, to complete the project successfully.

Scope Creep: refers to changes, continuous or uncontrolled growth in a project's scope, at any point after the project begins. When a project's scope changes, the project work starts to extend, or "creep", beyond what was originally agreed.

Project Performance: the attainment of operations relating to a set of objectives.

Variation: the alteration to the scope of works in a construction contract in the form of an addition, substitution or omission from the original scope of works.

Chapter Two

2. Review of Related Literature

2.1 Overview

In project management context, project scope management is defined as an inclusive of the processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully (PMBOK, 2017). It is explored in different literatures that there are studies conducted in scope change management as well as the impact of scope creep in different types of projects. This chapter, thus, presents the theoretical review, literature review about the topic, and the identified gaps that the project work intends to fill at the end of the study.

2.2 Theoretical Review

2.2.1 Project Scope Management

The scope of a project states what the project holds responsibilities for what is included in the scope of the project and excluded from its scope (Erling et al. 2009). It is the mission breakdown structure that will be made in order to discuss the boundaries between the included as well as excluded objectives from the project.

Project management enlarges beyond skillful and competent management of individual projects, to a complete set of systems, processes, structures, and capabilities that will enables an organization to undertake the right projects (Drouin&Besner, 2012).Project Scope Management includes the process necessary to ascertain that the project includes all the work required, and only the work required, to complete the project successfully. Managing the project is mainly concerned with defining and controlling what is and is not included in the project. The project scope management process are (PMBOK):

- ***Plan scope management:*** *The process of creating scope management plan*
- ***Collect Requirements:*** *The process of determining, documenting and managing stakeholder needs requirements to meet project objectives.*

- ***Define Scope:*** *The process of developing a detailed description of the project and product.*

A deeper understanding of project scope management was conducted by Orlando (2013), where he shared the best practice in reviewing project scope using the charter, change management, communication, statement of work, and critical alignment with project stakeholder management. A study elaborated the different causes of project scope change (Jones et al., 2014). In their study, they proposed error in defining product scope, external event, value-adding change, implementing a contingency plan or work around beneficiaries as common causes of scope changes.

Managing the scope of a project is vital to the success of any project. If it is not keenly controlled throughout the course of a project, there are a number of issues which may ascend to its schedule and the project goes beyond its finances (Arupiyoti and Mohammed, 2014). The study established that in either of these cases, there is a speculated risk that the project might get annulled either because the budget is immovable or has a delivery deadline that is not accessible. According to the study by Al-Rubaiei et al. (2018), without having the project scope management process, the cost or/and time of the project will be difficult to be controlled, and scope creep will exist. Moreover, the project may lose its credibility if it is unable to control the planed budget or timescale and when it has lost credibility, the stakeholders are more likely to cancel the project.

2.2.2 Scope Creep

Unforeseen changes to project scope are often the factors that kill a project. *Project scope management* includes authorizing the job, developing a scope statement that will define the boundaries of the project, subdividing the work into manageable components with deliverables (preparing work breakdown structure), verifying that the amount of work planned has been achieved, and specifying scope change control procedures (Joseph, 2012). There are many ways scope creep can occur on projects. Executives at the sponsor level frequently don't want to be involved in every decision, hence, project teams make them (Richard, 2011). Some change requests appears to be small, as a result, the project teams act on them instead of following a formal change management process. Moreover, an inflexible

and cumbersome change control process may also contribute to unauthorized scope additions. (Richard, 2000).

Very few projects are ever completed according to the original plan. The changes to the plan commonly result from increased knowledge, a need for competitiveness, or changing customer/consumer tastes. Once these changes are made, there is always going to be an accompanying increase in the budget and/or cost of construction leading to elongation of the schedule (Harold, 2009). Usually projects finish late and over budget, thus causing organizations heavy penalties and damage their prestige (Moshe). Moreover, as projects are hardly ever completed without introducing changes to their original baseline plan, a major challenge is to accurately estimate the project delivery time, while understanding the effects of other factors that create the discrepancy between estimated and actual project completion times.

Scope creep is highly influencing other project success modulation factors such as cost, time and henceforth the quality of software whenever projects are developed using traditional models. However, there is negligible impact of scope creep on projects that are developed using agile approach. This awareness of influence of scope creep on projects developed using various models ensures the project manager to effectively manage the project (Suma & Madhuri, 2013). Furthermore, the possible causes and effects of scope creep on large scale public sector construction projects were studied by Moneke & Echeme (2016). The study proved that lack of knowledge and poor understanding of product versatility/complexity was the highly causative factor of scope creep whereas its effects were divided into two; i.e the effect on the project performance and on the project manager.

A clear and well managed scope is a key element to successful projects. To this effect scope models and diagrams can be developed by the analyst that will aid to clarify scope, leading to a more effective sharing of mental models with stakeholders (Richard, 2011). As presented above, most challenging issues in project scope management is scope creep. Scope creep persists to be a problem for most organizations because of the complexity and size of the products and solutions that are being built. The more complex the result of the

project, the more difficult it will be at the beginning to anticipate every feature that may be needed/desired (Carkenord, 2014).

2.2.3 Project Performance

Performance of a project refers to the attainment and fulfillment of operations relating to a set of objectives and successful project achievement is possible through the team members' maintenance of high-quality performance and effective skills to achieve project activities (Procurement, communication and support project integration) (Majid and Dania, 2021).The road construction industry is a large and complex industry involving various stakeholders (government, industry, private parties, and investors), each of which attributes directly or indirectly to construction (Abadir, 2011).The practices of performance management influence many construction firms, Consultants and both public and private clients, among other types of project stakeholders. The performance measurements are used to judge wider project performance, both in terms of the project's financial and non-financial aspects, as well as by comparing and contrasting the project's performance with other projects (Dilanthi& Baldry, 2002).

The performance of these projects can be evaluated against what was originally planned by using a variety of performance indicators such as time, cost, quality, client satisfaction, business performance, health, and safety. However, experts in construction management further gives their argument that time, cost and quality are the three main performance indicators in construction projects. (Dilanthi& Baldry, 2002).

In project performance, its achievement typically calculates the performance of project management according to clear parameters such as scope, time and costs, known as the iron triangle or the triple limit (Atkinson, 1999). It is demonstrated in the study by : Florenciano & Arviansyah, (2020) that performance of a project is the function of the triple constraint (i.e scope, timeline and cost) and uses the this as a criterion for the success of the project. The concept is diagrammatically represented below.

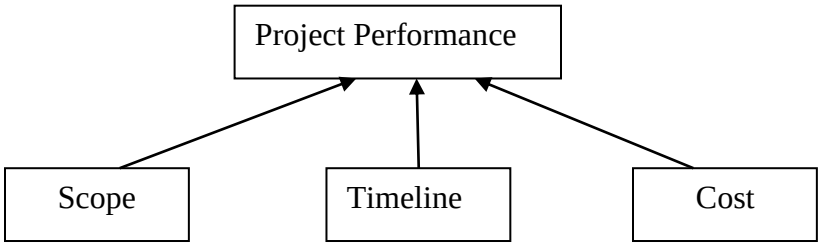

Figure 1: Project performance measurement (Source: Florenciano & Arviansyah, 2020)

2.3 Empirical Review

The impact of project scope management on performance of construction projects was studied by Kalkidan, 2019. The study shows that the procedures of the scope management processes resulted different findings in the causes of scope management such absence of expertise with specialized education, knowledge, skills, experience creates additional cost of rework and variation orders and longer completion time. Also, poor definition of project scope has an impact of the project performance criteria's such as time and cost of the construction projects. A research indicates that the type, causes and consequential impacts of change order in road projects in Ethiopia (Mekonnenn, 2015). The study outlined The most common reasons of change orders encountered during the construction of road projects in Ethiopia and categorized into the following major causes of change orders: *Design Errors and Omissions, Change of Scope, Unforeseen Conditions, Value Engineering, Force Majeure and Others.* The most common causes of such projects are identified and their consequential impact was shown based on desk study and questionnaire surveys conducted.

On a research conducted to study the prevention strategy of project distress in Addis Ababa City Roads Authority, project distress was found to be attributed to be lack of requirement gathering and documentation, poor project plan, lack of risk management plan, lack of stakeholder involvement, lack of scope change management, poor WBS, lack of senior management support and contract management. The lack of scope change management is mainly caused by poor documentation, poor change control, poor information transformation, and external factors associated with it (Mesfin, 2019).

Project scope management is not only limited to construction projects. The practices and challenges of project scope management on a bank (Awash) were studied by Meskerem,

2019. The study indicates that the most challenging issues in managing IT projects is scope creep. Even though, the bank has been used tools and techniques to define scope and to avoid stakeholder disagreements, there was a problem in proper identification of stockholders and the involvement of stakeholders was not sufficient to include all stakeholders' opinions and reflected in the scope definition in accordance with their importance in the project.

In a perfect world, changes will be confined to the planning stages, however, late changes often occur during construction, and frequently cause serious disruption to the project (Oracle, 2009). The projects undertaken by AACRA are mostly subjected to scope and design changes and most of the changes are inherent since certain underground conditions of the project area are not known before the beginning of project execution; yet the authority has no strategy towards change management. One of the causes of delays of the project was mostly found to be caused by delay in provision of resources and machineries, poor Designs and design and scope changes (Tigist, 2017).

Causes of scope changes were categorized in 9 groups in a study byYibekal, (2019). These categories are Contractual scope change causes, Market related scope change causes, Technical scope change causes, internal scope change causes (Contractor related), Material related, Equipment related, Labor related, Consultant related, External scope change causes.

Most of referred literatures studied different causes of scope changes on different organizations. However, exhaustive studies haven't been conducted on the impact of scope creep on Federal Road Projects (Ethiopian Roads Administration). As it was said that, ERA, the client of all federal road construction projects, faces different challenges during undertaking of the projects (Yoseph et al., 2017). And these challenges mostly lead to time and cost overrun which is a major bottleneck in infrastructure construction in developing countries like Ethiopia. Therefore, this study is aimed to fill this research gap and will try to identify the current causes of scope creep in Federal road projects and analyze these in order to indicate its impact on the deliverables of the project as well as will try to outline preventative measures to minimize scope creep during implementation phase of the projects.

2.4 Conceptual Framework

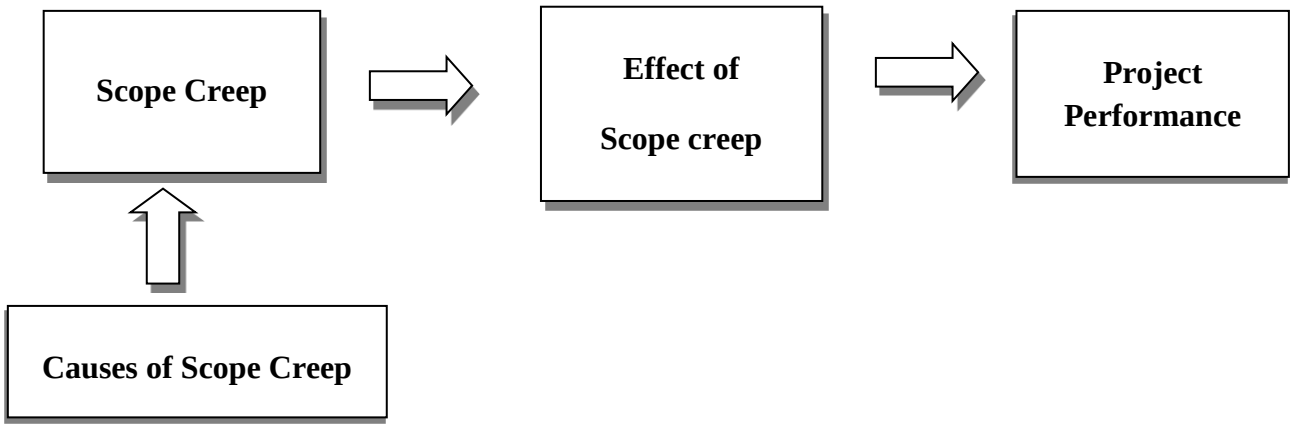

Figure 2: Conceptual framework of the study (Source: own)

Chapter Three

3. Methodology

3.1 Introduction

This chapter deals with the methodology of the study comprising the research strategy, research design, data collection and analysis. The methodology used in this study aimed at realizing the objective of the study through collecting and analyzing appropriate data that enable to identify the key factors of causes of scope creep, its impact on project performance and possible recommendations to overcome scope creep in federal road construction projects under Ethiopian Roads Administration.

3.2 Research Design

According to Inaam (2016), a research design is a general term referring to the plan, structure, strategy and investigation conducted so as to reach out to the research questions and control variance. A combination of descriptive and explanatory research type was followed in this study for the better understanding and investigation of the research problem. A descriptive study is used to provide a picture of situation or event and show how things are related to each other (Blumberg et al., 2011) whereas explanatory research sets out to account for the conducted descriptive study (Grey, 2014).

In order to achieve the objective of the study, quantitative or numerical description of attitude or opinions of participants (parties) involved in the federal road construction process was employed. The goal of quantitative research is to maintain objectivity by reducing the influence of the researcher on data collection as much as possible (Sarah et al, 2016). This research type will enable the study to describe and validate the contribution of identified key factors of causes and impact of scope creep, which were obtained by intensive literature review, to the performance of roads construction project for the case study Ethiopian Roads Administration.

For this reason, questionnaires were designed for the survey based on different literatures and possible key factors identified in the organization. The questionnaire comprised close

ended questions with possible options for respondents. A 5 point Lekert's scale was used to measure the attitudes of key participants of the selected road construction projects. Secondary data for the study were collected from project counterpart engineers in Ethiopian Roads Administration head office. These secondary data obtained composes list of identified projects, construction vs revised costs, original schedule vs revised schedule of the projects, and other essential information about the projects.

3.3 Sampling Design

3.3.1 Target Population

The target population of the study comprised client, contractors and consultants who are involved directly in the construction of the road projects and those who are well experienced in federal road construction projects under Ethiopian Roads Administration. However, since this study aimed at exploring the causes and impacts of scope creep, a sample frame was constructed by considering the following criterions:

1. Projects which are under implementation phase [A]
2. Projects which are experiencing scope creep [B]
3. Projects whose status at the time of data collection are above 50% accomplishment [C]

A sampling frame drawn from target population defines a set of elements based on defined criterions from which a researcher can select a sample unit (Cornelis, 2014). In this regard, the researcher collected the ongoing list of projects from ERA and drew a sample frame based on the above criterions. Therefore, the number of projects in the sample frame was 24 projects and a total of 72 target population on the sampling frame. The relationship between these criterions is represented in the Venn diagram below:

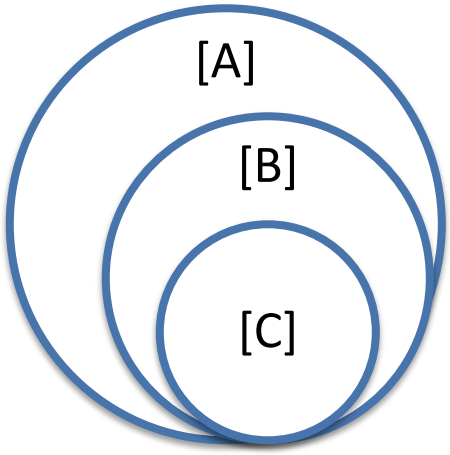

Figure 3: Diagrammatical Representation of target population

3.3.2 Sampling Technique

The target population of the sampling contains three parties of the Federal Road Construction Sector with profound information or experience on the research topic due to their involvement in the selected projects. In order to minimize biased representation of samples that might occur, the researcher utilized simple random sampling technique from the constructed sample frame. This type of sampling method considers that subjects in the target population are selected by a random process, i.e using either a random number generator or a random number table, in order that each sample in population has the same probability of being selected as a sample (Frerichs, 2008).Therefore, this study followed this sampling method because it uses randomization and it only involves a single random selection form the sample frame.

3.3.3 Sample Size

The research population was drawn from three parties of the contract participating in federal road construction projects. These are: The client (ERA engineers), contractors, and consulting firms. As much as possible attempts were made so that the samples drawn from the population of sample frame are best representatives for the objectives of the study. The list of contractors and consultants currently involved in the selected road construction projects were obtained from the organization.

Yamane (1967:886) provides a simplified formula to calculate sample sizes which are determined by considering the time available for conducting the research work, available funding for the study and the reliability of the respondents. Thus, the researcher utilized the following equation for the computation of sample size

$$n = \frac{N}{(1 + N(e)^2}$$

N= Target population = 72 (24projects)

n= Sample size

e= Level of precision = 0.05

According to the computation, a sample size of 20 projects (60sample units) was resulted. The sample units were selected randomly from the sample frame and the following list of projects were identified.

No.	Project Name
1	Construction Works of DebreBirhan - Ankober
2	Construction Works of Muketuri - Kokebmesk
3	Construction Works of Sansusi – Tatek Kella
4	Construction Works of Sodo –Tericha Road Upgrading Project, Contract 2: Omo River - Tercha
5	Construction Works of Degolo - Kelela
6	Construction Works of Daye - Chiri - Nansebo
7	Construction Works of Adaba - Angetu
8	Construction Works of Jinka - Mender
9	Construction Works of Omorate - Omo Bridge- Gyanagtom - Kangaten
10	Construction Works of Laska - Salayish
11	Construction Works of Kong – Begondi - Wenbera
12	Construction Works of Assosa- Daleti Lot-2

No.	Project Name
13	Construction Works of Gambella - Eliya
14	Construction Works of Durgi - Gibe River
15	Construction Works of Ambo - Gedo Overlay Road Project
16	Construction Works of Dongoro – Kingi - Mekebilla
17	Construction Works of Gedo - Menebegna
18	Construction Works of Asaita – Afembo - Djibouti Border Project
19	Construction Works of Babile - Fik Road upgrading project
20	Construction Works of Fik – Hamero - Imi

Table 3.1: List of selected sample projects

3.4 Sources of Data

3.4.1 Primary Source

Primary data are data that are collected using the procedures that can best fit the research which is used for the specific research problem at hand (Joop & Hennie, 2005). In this study, the primary source of data was obtained with the help of survey questionnaires. A questionnaire survey is carried out when the researcher is interested in collecting data on the observations, attitudes, feelings, experiences or opinions of a sample population (Joop & Hennie, 2005).The questionnaires utilized were prepared by the researcher which are structured and self-administered type comprised closed ended questions whereas some open ended questions were included to comprehend the general information of the respondents.

The Five Point Likert's Scale (1932), which uses the principle of measuring attitudes by asking participants to respond to a series of statements that are clustered in similar categories, was used in the questionnaire to obtain the response of quantitative data from parties of the sample projects. This method uses a range of responses: "Strongly Disagree", "Disagree", "Neutral", "Agree", and "Strongly Agree", with their corresponding numeric values of 1-5, in their respective order.

Questionnaires were disseminated to selected respondents of the three parties of the contract for each project, i.e Contractor, Consultant, and Client to get their perception on causes and effect of scope creep on the road construction projects that they are currently involved in. It was also achievable to get their response on the possible remedial measures of scope creep on road construction projects.

3.4.2 Secondary Source

According to Joop & Hennie (2005), secondary data are data collected earlier by other researchers or interested parties for the use of a research or other purposes. The secondary data used in this research are data from counterpart engineers of the selected projects in ERA. In this data, list of selected projects, their commencement date, original vs revised schedule, original construction cost vs revised cost of the project, elapsed time, and status of the projects were obtained. Essential data for this study is tabulated under results section.

Other information's are gathered through literature reviews which are in one way or another related with scope creep in Federal Road Construction Projects. Meanwhile, some information's were obtained from different books, journals, reports, and other research papers that helped the researcher to enhance the understanding of theory regarding the research problem. From these sources the information, which were found relevant, were used as a benchmark to the primary data collected to support the study.

3.5 Data Collection

The study employed a survey method as it enables the researcher to collect the opinion on the research problem, i.e causes, effect and remedial measures of scope creep in federal road construction projects. A survey research provides a quantitative or numeric description of trends, attitudes, or opinions of the selected sample population. It eases the collection of samples for such types of exploratory researches like this study. As indicated on Slake (l995) cited on Creswell 2008, case studies are strategical investigations in which the researcher tries to conduct an in depth exploring on a given program, event, activity, or process. Accordingly, the researcher tried to collect detailed information using the below stated procedures from different parties of the contract.

The methods and procedures followed in order for the achievement of the objectives were started from intensive literature review. Literatures from different researches, journals, books, theses were collected at the first stage of the data collection phase. Afterwards, questionnaires were prepared by identifying key factors which contributes to the research problem. The survey questionnaires includes different personal information about the respondents (personal experience, academic qualification, his/her stay as worker in the road project, responsibility, and others) as well as some general information regarding respondent's concept on project scope creep were incorporated. The Five Point Likert's scale questionnaire (from very little impact to highest impact factor) was employed to investigate the severity level of causes, effect and mitigation measures of scope creep. Questionnaires were then disseminated to the selected expertise from the client, contractor's and consultant's office, and finally the questionnaires were gathered, organized and transferred to the data analysis procedure.

3.6 Data Analysis

The data which were obtained from the sample population was analyzed according to the objective of the study. The questionnaires which were collected from respondents were imported and analyzed by quantitative data collection method using descriptive and explanatory analysis in SPSS. Data editing and coding was carried out by the researcher so as to ensure completeness and consistency of responses. In this regard, the quantitative (ordinal) data were computed using different descriptive statistical techniques like frequency, percentage, simple tabulation, cross tabulation, mean and standard deviation as well as correlations analysis.

3.7 Validity and Reliability

3.7.1 Validity

Validity is the credibility of the research tool by checking if it actually measures what it was intended to measure. This study employed internal and external validity measures to ensure the manipulations between dependent and independent variables as well as the strength of the tool to be correlated with other peoples. In order to check the validity, the researcher tried to follow some validity techniques ahead of the dissemination of questionnaires and

after the return of questionnaires. The prepared questionnaires were submitted to advisor, comments were received and it was corrected accordingly. Moreover, pilot data collection was conducted by disseminating questionnaires to friends, and peoples with the knowledge of project management ahead of the actual data collection procedures.

3.7.2 Reliability

It is known that reliability conceptualizes the degree to which the employed research tool is capable of producing consistent results as we go from one test to the next. The level of reliability of the instrument is checked by the Cronbach's alpha statistics. Alpha was developed by Lee Cronbach in 1951 and it aims to provide a measure of internal consistency of a scale. It is expressed as a number between 0 and 1 where acceptable values range from 0.70 to 0.95 (Mohsen and Reg, 2011). The Cronbach's alpha value of the instrument in this study was 0.787 which was found in an acceptable range.

3.8 Research Ethics

All the participants in this research were asked for their permission and they were informed that their identity is kept anonymous and the data to be collected will only be used for this intended research study.

Chapter Four

4. Results and Discussion

This chapter deals with the analysis and discussions of the results of collected data from the survey. As it is depicted in the methodology section of the study, the procedures used in analyzing questionnaire survey results aimed to identify the possible causes and effect of scope creep as well as to draw recommendations to overcome its consequences in federal road construction projects.

From secondary data collected, list of selected projects, their commencement date, original vs revised schedule, original construction cost vs revised cost of the project, elapsed time, and status of the projects were obtained and investigated thoroughly. This helps to understand the level of scope creep and percentile computations of projects. Moreover, this chapter presents analyzed data of questionnaire using Descriptive Analysis and Correlations. The data obtained from questionnaire are represented in tables as shown throughout the chapter.

4.1 Questionnaire Response Rate

For the randomly selected road construction projects in ERA, questionnaires were properly designed in order to explore the causes, effects, and remedial measures to overcome scope creep in federal road construction projects. Questionnaires were disseminated to three parties of the contract for each project (client, contractor, consulting firm). Based on the computed sample size numeric under methodology section of the study, a total amount of 60 questionnaires were distributed. Due to that, 48questionnaires were returned; i.e 80% response rate.

No	Respondents role	Disseminated Questionnaire		Returned Questionnaire		Response Rate
		No	%	No	%	
	Client	20	33.33	18	37.50	90
	Contractor	20	33.33	14	29.16	70
	Consultant	20	33.33	16	33.34	80
Total		60	100	48	100	80%

Table 4.1. Questionnaire response rate. (Source: Survey results)

4.2 Demography about the Respondents

The response rate for the general information of the respondents is presented in the following table:

No.	Category	Parameter	Frequency	Percentage
1	Field of study	Civil Engineering	42	87.50%
2		CoTM	6	12.50%
3	Years of	1-5 years	19	39.58%
4	experience	6-10 years	10	20.83%
5		11-15 years	9	18.75%
6		>15 years	10	20.83%
7	Academic	BSc	33	68.75%
8	qualification	MSc/MA	15	31.25%
9		PHD	-	-
10		Other	-	-
11	Role in the	Client	18	37.50%
12	project	Contractor	14	29.16%
13		Consultant	16	33.34%
14		Other	-	-

Table 4.2. Demography results from the questionnaire responses. (Source: Survey results)

The table demonstrates that 87.50% of the sample populations are specialties in Civil Engineering, whereas more than 60% of the respondents have more than 5 years of experience in the construction sector. This result shows that respondents of the questionnaires are well experienced expertise in the construction sector and can be trusted with their response of the technical questions in the questionnaire. It can also be drawn that all of the sample units have a BSc degree qualification while 31.25% of the respondents holds MSc/MA degree. This result contributed to the study to further strengthen the reliability of the data obtained during the survey.

4.3 Respondent's concept on scope creep

In this section of the research, the respondent's opinion and concept on scope creep in project performance is studied. This was intended to explore the familiarity of the term scope creep in the road construction sector. Results are presented in the following table.

No.	Parameter	Scale	Frequency	Percentiles
1	Have you pursued/ Participated in any kind of Project Management Courses/trainings?	Yes	42	87.50%
		No	6	12.50%
2	Do you have a clear understanding of the term "scope creep" as it operates within the construction industry?	Yes	38	79.17%
		No	10	20.83%
3	Do you differentiate the terminologies "scope change" and "scope creep" in the construction industry?	Yes	38	79.17%
		No	10	20.83%
4	Did you ever have any experience of scope creep within a construction project that you are/were involved in?	Yes	31	64.58%
		No	17	35.42%

Table 4.3(a). Respondent's concept on scope creep from the questionnaire responses. (Source: Survey results)

No.	Parameter	Strongly Disagree	Disagree	Neutral	Agree	Disagree
1	Do you believe that Project Scope Creep has a very significant impact on project Performance?	-	-	8	23	17
Percentiles		**-**	**-**	**16.67%**	**47.92%**	**35.42%**

Table 4.3(b). Respondent's opinion on scope creep from the questionnaire responses. (Source: Survey results)

The above table 4(a) shows that most of the respondents (87.5%) have previously participated in project management courses and in addition 79.17% of the sample populations are familiar with the term scope creep. More than half (50%) of the respondents stated that they have been engaged in a construction project which has a problem of scope creep. However, in the general type of question asked by using likert's scale (table 4(b)), the respondent's attitude on its effect on project performance appears to create ambiguities. In the next parts of the results session, the detailed causes and possible effects of scope creep will be investigated.

4.4 Descriptive Analysis Results

4.4.1 Possible causes of scope creep

In this part of the study, respondents were primarily requested to rank their level of agreement on the possible causes of scope creep in Road construction projects. In analyzing the data from survey questionnaires, descriptive and explanatory analysis was employed as mentioned in the methodology session. Descriptive Analysis helps to describe, show or summarize data points in a constructive way. One of the common techniques in conducting descriptive analysis is constructing tables of means, methods of dispersion such as variance or standard deviation, and the like. In this study, weighed mean and standard deviation methods are employed.

No.	Parameter	N	Mean	Standard Deviation
Issues related with scope planning				
1	Lack of clearly defined scope at the project initiation phase	48	3.826	1.141
2	Lack of defined and disciplined procedure for project management	48	3.261	1.124
3	Uncertainty in manufacturing/ supply of materials	48	3.13	0.859
4	The absence of a proper document that provides detailed activities, and scheduling information about each component of the work	48	3.087	1.151
5	The absence of formal agreement/discussion on scope changes between parties of the project.	48	3.087	1.029
Poor understanding of Scope Changes				
6	Lack of knowledge and poor understanding of product versatility/complexity	48	3.565	0.935
7	Poor understanding of customer requirements prior to project scope definition and contract signing	48	3.739	0.801
Issues related with design and specifications				
8	Poor quality of design	48	3.652	0.706
9	Poor quality of work break down structure	48	3.783	0.841
10	Scope changes due to unplanned design changes	48	3.565	1.068
11	Scope changes due to changes in Specification	48	3.174	1.217
12	Substitution of materials as a result of shortages in resources	48	3.348	0.875
13	Final drawings not fully completed and hence need for design change	48	3.348	1.059
Issues related Internally				
14	Clients' requirements changes and lack of change control contingency plan	48	3.391	1.39

No.	Parameter	N	Mean	Standard Deviation
15	Poor formal communication between parties of the project	48	2.87	1.002
16	Scope changes due to needs for additional functionality (In addition to the original scope of the project)	48	3.609	1.064
17	Scope change as a result of verbal instructions at the site	48	2.696	1.008
18	Changes requested by end user requirements	48	3.522	0.658
19	Changes requested by the contractor	48	2.957	0.965
20	No regular meetings held between the client and the Contractor to inform the up to date state of the project	48	2.87	0.859
21	The absence of a system of monitoring the scope creep and change requests within the defined boundaries considering the delay and cost incurred	48	3.217	1.073
External Issues				
22	Environmental changes/force majeure	48	3.609	0.881
23	Scope changes due to Political biasness	48	3.261	1.273
24	Scope changes due to Covid-19 Pandemic	48	2.261	0.923
25	A new regulation imposed by an external agency	48	2.783	1.031
26	Lack of beneficiary support	48	2.739	0.953
27	Unexpected price incremental	48	3.348	1.100

Table 4.4: Possible causes of scope creep (Source: Survey result)

For the sake of simplicity the results of the grouped variables are tabulated below under table 4.5. The mean and standard deviations of each categories are stated in order to assess the opinion of respondents on the possible causal factors of scope creep in road construction projects.

No.	Codes	Categories	Parameters	Mean	Std. Deviation
1	C1	Issues related with scope planning	5	3.278	.5940
2	C2	Poor understanding of scope changes	2	3.652	.6043
3	C3	Issues related with Design & Specifications	6	3.478	.5359
4	C4	Issues raised internally	8	3.141	.3843
5	C5	External issues	6	2.996	.5725

Table 4.5 Possible causes of scope creep-grouped (Source: Survey result)

Based on table 4.5, the major causes of scope creep in road construction projects are those key parameters related with poor understanding of scope changes (mean value 3.652). This parameter includes the uncertainty of manufacturing/ supply of materials and the absence of a proper document that provides detailed activities, and scheduling information about each component of the work during scope changes that may arise after the project initiation phase.

The next causal parameters of the occurrence of scope creep are issues that are related with design and specifications which comprised poor quality of design and work breakdown structure (WBS), changes in design and specifications, incomplete drawings, and substitution of materials as a result of shortages in resources. Before the construction works of a project began, the design, drawings and specifications has to be properly finalized especially in DBB (Design-Bid-Build) type of projects. In this survey result, respondents somehow agreed that changes in these key parameters can arouse scope creep in road construction projects.

Moreover, issues which are related with scope planning such as the lack of clearly defined scope and procedures of project management at the project initiation phase, the absence of documentation and proper agreement of scope changes ahead of project initiation and the uncertainty in supply of materials held the consequent value according to the survey analysis. During a construction project, the conceptual and engineering stage of a project

initiation phase should be implemented with greater care. As it is stated in the Literature review of this study, project scope planning must work to ensure that the project includes all the work require to complete the project successfully.

Analysis of survey results demonstrated that internal issues that are related with clients' requirements, poor communications between parties of the contract (mainly client, contractor and consultant),verbal instructions and change requests by either the contractor or end user of the project, and the absence of a system of monitoring the scope change requests within the defined boundaries considering the delay and cost incurred did attribute to scope creep in road construction projects which can be seen from different perspectives. Nonetheless, externally employed issues such as force majeure, environmental and Covid-19 pandemic impact, new regulations by external agency as well as price incremental does not attribute to the occurrence of scope creep according to the opinions of the respondents. This can be understood that the contract document of federal road construction works projects comprises the force majeure procedures incase of their occurrence as well as price escalation can be attributed to price adjustments imposed according to ERA specification manual.

4.4.2 The effects of scope creep

In this part of the study, the possible effects of scope creep on road construction projects that are administered by ERA were investigated. The mean value and standard deviation of the identified key parameters as the measure of agreement of the respondents is presented in Table 4.6.

No.	Code	Parameter	N	Mean	Standard Deviation
With regard to Cost Overrun					
1	I001	Increase in project cost (Variation)	48	4.217	.593
2	I002	Decrease in Return on investment (Profit of your company)	48	3.261	.743
3	I003	Delay in payments	48	3.304	.963
4	I004	Shortages of materials	48	3.435	.886

No.	Code	Parameter	N	Mean	Standard Deviation
With regard to time/schedule overrun					
5	I005	Failure to attain objectives at the scheduled time.	48	4.130	.687
6	I006	Waiting longer time to purchase materials	48	3.696	.866
7	I007	Methods of construction in scope change may take longer time than anticipated	48	3.913	.725
8	I008	Longer period of time needed to adopt scope changes to the project leading to delays of the project	48	3.913	.661
9	I009	Longer time required for approvals.	48	3.870	.749
With regard to Quality of end result					
10	I010	Failure to attain the objectives of the project	48	3.478	.983
11	I011	Unclear methodologies during scope change	48	3.565	.886
12	I012	Lack of quality control of the project	48	3.261	.953
13	I013	Wastage of materials, resources	48	3.609	.829
14	I014	Lack of the techniques to manage the scope changes	48	3.696	.813
With regard to overall project performance (Labor Productivity)					
15	I015	It creates more stress on the Project Manager.	48	3.783	.786
16	I016	It has an adverse impact on labor productivity.	48	3.870	.806
17	I017	Leads to lack of collaboration between co-workers.	48	3.652	.875

No.	Code	Parameter	N	Mean	Standard Deviation
18	I018	Arising of disputes between/within parties of the project	48	4.000	.667
19	I019	Failure to involve beneficiaries	48	3.304	.695

Table 4.6 The Effect of scope creep (Source: Survey result)

As it is presented in Table 4.6, the identified variables of the effect of scope creep are grouped in to 4 categories. Respondents agreed that scope creep is high likely to increase the cost of construction (Mean value 4.217), hence variations will be arouse. Meanwhile, it can be drawn from the results that failure to achieve objectives in the scheduled time and the arousal of dispute between parties of the project (client, contractor, and consultant and other stakeholders) as well as within the parties of the project is taken as the second rated impact of scope creep on road construction projects (Mean 4.13 and 4.0 respectively).

No.	Codes	Categories	Parameters	Mean	Std. Deviation
1	C1	With regard to cost overrun	4	3.554	.4500
2	C2	With regard to time/schedule overrun	5	3.904	.3286
3	C3	With regard to quality of end result	5	3.522	.4351
4	C4	With regard to overall project performance (Personnel of projects)	5	3.722	.3412

Table 4.7 The effect of scope creep-grouped (Source: Survey results)

As it can be depicted from table 4.7, respondents agreed that scope creep has a friction force on the projects performance with respect to schedule, performance, cost, and quality of end result respectively. Therefore, we can conclude that expertise rated the effect of scope creep on project performance is mainly because of time/ schedule overruns. This category includes failure to attain objectives at the scheduled time, longer times taken to adopt scope changes to the project, methods of construction, different approvals which leads to delays of the

project. According to Kerzner (2009), successful project management is defined as having achieved the objectives of the project within time, within cost, at the desired performance/technology level while utilizing the assigned resources effectively and efficiently and is accepted by the customer. Hence, in this section of the study, respondents rated that scope creep is a causative factor primarily for schedule overrun of a project followed by project performance and cost overrun. The analysis of this study demonstrated that quality of end result of the project is also affected by scope creep.

It is also shown in table 4.7 that overall performance of a project with regard to personnel of projects is affected by scope creep in a project. This category of the results includes creating more stress on the project manager, the adverse effect on labor productivity, lack of collaboration between co-workers which leads to arousal of disputed between co-workers as well as the failure to involve beneficiaries. Project team development is one of the leadership competencies of a project manager (Riaz et al., 2020) and it is the most critical concerns in project management procedures.

The third rated effect of scope creep on project performance is with respect to cost overrun. Increase in cost of the project (variation), decrease in return on investment, payment delays and shortage of resources (materials) are the parameters found in this category which are rated to be resulted by uncontrolled growth of a project scope (scope creep). It is stated in PMBOK (2017) that one of the key constraints of a certain project is time or schedule and cost (budget) constraint. Hence, it is comprehensible that uncontrolled changes in scope of a project can result cost overrun of the project due to high amount of variations to be incurred for the completion of the project (refer section 4.6).

Quality of end results are also rated to be affected by scope creep in a project which comprised failure to attain project objectives, unclear methodologies during scope change, lack of quality control and techniques to manage scope changes and wastage of materials. It can be depicted from the response of parties of the contract with scope creep, the uncontrolled growth in a project's scope can also adversely affect quality of end result but has a less significant impact as compared to the above three parameters. Ethiopian Roads Administration has quality control and assurance manual as well as checklist for possible

risk management. Hence, proper utilization of this manuals may attributed to the less significance of this parameters. However, these manuals have not be thoroughly assessed in this study.

Generally, the performance measurements are used to judge wider project performance, both in terms of the project's financial and non-financial aspects, as well as by comparing and contrasting the project's performance with other projects (Dilanthi& Baldry, 2002). Hence, in this case, respondents rate scope creep to have an adverse effect on cost of the project, schedule of the project, quality and overall performance of the project. This result will motivate to outline some mitigation measures to keep the project on track when scope creep emerges.

4.4.3. Mitigation measures to overcome the effect of scope creep

This subsection of the results of the study, respondents were asked to give their opinions on which of these eleven parameters can attribute to overcome the consequences of scope creep on project performance. The responses of the participants are outlined in table 4.8 below.

No.	Code	Parameter	N	Mean	Standard Deviation
1	M001	Ensuring the availability of enough Contingency funds for the proposed scope changes.	48	3.957	.815
2	M002	Proper estimation of the time needed in order to implement proposed scope changes.	48	4.174	.643
3	M003	Ensuring the availability of Resources before implementing the scope changes.	48	4.043	.815
4	M004	Reviewing the scope change proposal with respect to the possible impacts (such as impacts on quality, process of the project, and the organization) by the Project	48	4.087	.939

No.	Code	Parameter	N	Mean	Standard Deviation
		Manager			
5	M005	Predicting possible scope changes ahead of the project start up.	48	4.000	.894
6	M006	Prioritize tasks in the proposed scope change in order of their importance.	48	4.043	.918
7	M007	Identifying the important tasks which could be dependent on the scope change to be made and are affected by it.	48	4.217	.786
8	M008	Risk assessment (qualitative & quantitative) should be conducted on scope change proposal and figure out the most crucial changes that are going to be made to the project.	48	4.000	.894
9	M009	Appropriate Monitoring and Evaluation techniques should be used on the implementation phase of the project.	48	4.348	.482
10	M010	Conducting meetings with parties of the contract to keep each party updated and discuss upcoming issues.	48	4.304	.628
11	M011	Implementation of appropriate dispute Resolution/Prevention mechanisms.	48	4.217	.593

Table 4.8 Mitigation measures of scope creep (Source: Survey results)

It is presented in table 4.8 that, based on different literatures and experiences, 11 key mitigation measures for scope creep was proposed in road construction projects. As a result, it can be seen here that *implementing appropriate monitoring techniques and strengthening of meetings* (4.348 mean value) rated as the most relevant mitigation measures for scope creep effect on project performance. On the other hand, implementing *appropriate dispute*

resolution methods and *prioritizing tasks in their level of importance* comes as the next option to overcome such problems. Furthermore, *proper estimation of time, ensuring the availability of resources, reviewing scope change program, and risk assessment* can also be utilized as a mitigation measure to reduce the impact of scope creep on road construction projects.

All the said parameters attributes to overcome the effects of scope creep discussed under section 4.4.2. Moreover, they are related with the causes of scope creep under section 4.4.1 by acting as a prevention mechanism that can hinders the occurrence of scope creep in the first place.

4.5 Correlation Analysis Results

In this section of the study, inferential statistical analysis of the effects of scope creep on project performance was performed. Table 4.9 shows the results of correlation analysis outputs from SPSS. The variables took under this study are cost overrun, schedule overrun, quality of end result and overall performance of a project.

	I1	I2	I3	I4
I1	1.00	0.53	0.31	0.63
I2	0.53	1.00	0.72	0.52
I3	0.31	0.72	1.00	0.19
I4	0.63	0.52	0.19	1.00

*****I1= cost overrun; I2= schedule overrun; I3= quality of end result; I4= overall performance of a project

Table 4.9 Spearman's correlation analysis results (Source: Survey result)

Correlation analysis investigates the linear relationship between variables of the study. The correlation coefficient (Cr), which ranges from -1 to +1, determines the strength of the correlation. The correlation direction can be either positive or negative. When higher values of one variable go along with the higher values of another variable, there is a positive correlation (0&1). Negative correlation occurs when higher values of one variable are accompanied by lower values of another (-1&0).

In this study, the effects of scope creep have a positive correlation between one another. That is as one variable increases, the other parameter also increases. However, their significant values vary in a high range. The highest correlation occurred between quality of end result and schedule /time overruns (Cr = 0.72). It can also be depicted from table 4.9 that overall performance of a project and cost overrun are significantly related with one another (Cr= 0.63). Moreover, the lower correlations was found around the right edge of the table; i.e between quality of end result and overall performance of a project (Cr = 0.19).

This result can be supported by the concept from project management body of knowledge (PMBOK, 2017), that the three constraints of a project include cost, time and quality of a project. Here in this analysis, these three parameters showed strong relationships in a positive direction which implies that as one parameter is affected by scope creep in a project, the other constraint factor will also be significantly affected by the consequences of scope creep that can be exerted on the project.

4.6 Assessment of Scope creep with regard to construction cost

The ongoing road construction projects that are under implementation phase, who are facing scope creep currently and their progress status at the time of data collection were >50% were took to conduct some analysis. In this section of the study, these projects are analyzed in terms of cost variations. Table 4.10 presents the original vs revised cost of constructions as collected from Ethiopian Roads Administration ERA.

$$\text{Cost Variations (CSV\%)} = \frac{Revised\ Contract\ Amount - Original\ Contract\ Amount}{Original\ Contract\ Amount} * 100\%$$

Project Name	Contract Amount (Birr)		Variations	
	Original	Revised	Variation (Birr)	
Construction Works of Debre Birhan - Ankober	1,083,570,868.24	1,354,463,586.31	270,892,718.07	125.00%
Construction Works of Muketuri - Kokebmesk	768,622,711.45	778,731,121.97	10,108,410.52	101.32%
Construction Works of Sansusi - TatekKella	736,910,324.89	825,067,522.68	88,157,197.79	111.96%
Construction Works of Sodo – Tericha Road Upgrading Project, Contract 2: Omo River - Tercha	1,674,383,031.77	1,805,510,307.00	131,127,275.23	107.83%

Project Name	Contract Amount (Birr)		Variations	
	Original	Revised	Variation (Birr)	
Construction Works of Degolo - Kelela	1,299,846,199.62	1,469,861,944.62	170,015,745.00	113.08%
Daye-Chiri-Nansebo	1,682,275,009.43	1,771,335,169.23	89,060,159.80	105.29%
Adaba-Angetu	1,249,684,230.55	1,441,107,219.65	191,422,989.10	115.32%
Jinka-Mender	1,214,208,380.51	1,373,268,271.09	159,059,890.58	113.10%
Omorate- Omo Bridge-Gyanagtom- Kangaten	965,890,930.37	972,658,698.71	6,767,768.34	100.70%
Laska-Salayish	689,885,000.00	692,496,973.93	2,611,973.93	100.38%
Kong-Begondi-Wenbera	400,602,188.69	1,587,200,899.42	1,186,598,710.73	396.20%
Assosa-Daleti Lot-2	731,580,244.22	772,048,982.83	40,468,738.61	105.53%
Gambella-Eliya	1,029,229,136.43	1,065,574,658.87	36,345,522.44	103.53%
Durgi-Gibe River	474,662,802.12	618,949,405.50	144,286,603.38	130.40%
Ambo-Gedo Overlay Road Project	483,546,735.51	532,584,443.85	49,037,708.34	110.14%
Dongoro-Kingi-Mekebilla	416,237,136.06	477,299,213.10	61,062,077.04	114.67%
Gedo-Menebegna	942,471,547.72	952,077,623.28	9,606,075.56	101.02%
Asaita-Afembo-Djibouti Border Project	1,518,683,761.46	1,691,940,084.78	173,256,323.32	111.41%
Babile-Fik Road upgrading project	408,482,768.21	432,482,654.80	23,999,886.59	105.88%
Fik-Hamero-Imi	819,129,220.55	831,971,036.87	12,841,816.32	101.57%

Table 4.10 Scope creep with regard to cost

As it is vividly shown in Table 4.10 that, from the randomly selected ongoing projects that are being administered by ERA, up to 396% cost variation has occurred. Even though, the projects are selected from the sample frame, as discussed in chapter 3 of the study, most of the selected projects in this study are suffered from scope creep. Thus, this is a presentation of the impact of scope creep with regard to cost overruns.

There could be various reasons for the causes of these variations; however, project specific causes are not incorporated here as it does not lie with the objective of the study. Rather, as

the respondents of the survey in (section 4.4.1 - 4.4.3) are parties who are directly involved in these projects, the causes of scope creep can be drawn from Table 4.4.

4.7 Assessment of Scope creep with regard to time/schedule of the project

Same as section 4.6, this section of the study explores the degree of schedule variations on the selected projects. Table 4.11 presents the original vs revised schedule of the projects as collected from Ethiopian Roads Administration ERA.

$$\text{Extension of Days (EoT\%)} = \frac{Extension\ of\ Time\ given - Original\ Contract\ time}{Original\ Contract\ time} * 100\%$$

Project Name	Completion date		Extension of time (EoT)	
	Original date	Revised date	Days	(%)
Construction Works of Debre Birhan - Ankober	22-Oct-20	13-Nov-21	387.00	100.88%
Construction Works of Muketuri - Kokebmesk	7-Feb-20	24-Feb-22	748.00	101.71%
Construction Works of Sansusi – Tatek Kella	16-May-20	30-Apr-22	714.00	101.62%
Construction Works of Sodo – Tericha Road Upgrading Project,Contract 2: Omo River - Tercha	13-Nov-18	18-Dec-21	1,131.00	102.60%
Construction Works of Degolo - Kelela	7-Apr-20	8-Feb-22	672.00	101.53%
Daye-Chiri-Nansebo	26-Sep-20	15-Mar-21	170.00	100.39%
Adaba-Angetu	17-Nov-17	25-Jan-21	1,165.00	102.71%
Jinka-Mender	1-Feb-18	31-Aug-20	942.00	102.18%
Omorate- Omo Bridge- Gyanagtom-Kangaten	7-Feb-22	14-Oct-22	249.00	100.56%
Laska-Salayish	4-Aug-14	8-Mar-18	1,312.00	103.13%
Kong-Begondi-Wenbera	10-Jan-16	28-Feb-20	1,510.00	103.56%
Assosa-Daleti Lot-2	1-May-20	23-Aug-21	479.00	101.09%
Gambella-Eliya	9-May-20	23-Aug-21	471.00	101.07%
Durgi-Gibe River	31-Jul-20	22-May-21	295.00	100.67%

Project Name	Completion date		Extension of time (EoT)	
	Original date	Revised date	Days	(%)
Ambo-Gedo Overlay Road Project	12-Jul-20	28-May-21	320.00	100.73%
Dongoro-Kingi-Mekebilla	30-Jan-22	30-Nov-22	304.00	100.68%
Gedo-Menebegna	10-Oct-21	8-May-22	210.00	100.47%
Asaita-Afembo-Djibouti Border Project	26-Aug-19	26-Aug-22	1,096.00	102.51%
Babile-Fik Road upgrading project	1-May-20	22-Dec-20	235.00	100.53%
Fik-Hamero-Imi	1-May-20	29-Jun-21	424.00	100.96%
Total			12,834	101.48

Table 4.11 Scope creep with regard to time (schedule)

It is indicated in table 4.11 that out of the randomly selected 20 projects which already experienced scope creep, up to the date of data collection, 12,834 days of extension of time (EoT) is given to these projects. This is a clear presentation of the effect of scope creep on project performance with regard to schedule overruns (delay). The percentages of EoT demonstrate that the projects schedule is revised almost in 100% rate.

According to the secondary data collected, all the selected projects have reached more than 50% accomplishment in their status. However, a high amount of EoT is given up until this stage of their project life. Analytically, if this trend continues throughout the contract duration, the organization will be in high risk of profit loss, delay and other related factors that comes after scope creep in a project occurs.

Chapter Five

5. Summary of Major Findings, Conclusions and Recommendations

This chapter will summarize the overall findings of the study, gives conclusions, and outlines recommendations as per the results of the study. As it is depicted in the results and discussions section, descriptive analysis method was employed to investigate the causes and impact of scope creep on project performance. Moreover, from questionnaire survey, possible mitigation measures to overcome the impact of scope creep on project performance is investigated. The general overview of major findings of the study is summarized in the next session.

5.1 Summary of Major Findings

The main aim of this study is to assess the impact of scope creep on the performance of federal road construction projects which hinders the projects from meeting their specific goals within the set of budget and time. Hence, quantitative survey was used to collect data and descriptive analysis method was used in data analysis. Some of the major findings of this study are concluded here under as per the steps of objectives of the study.

- Causes of scope creep

Results from chapter 4 reveals that the most possible causes of scope creep in federal road construction projects is *Poor understanding of scope changes* (Mean values 3.652). The second possible cause scope creep is with regard to *Issues related with Design & Specifications* and *Issues related with scope planning.* (Mean values are 3.478 and 3.141). In addition, *Issues raised internally* held the consequent values according to the response gathered. However, *External issues* did not attribute to scope creep in federal road construction projects according to the results of descriptive analysis.

- Effects of scope creep

Out of the identified variables of the impact of scope creeps in road construction projects, respondents agreed that scope creep is high likely to increase the *cost of construction* in the

project (Mean value 4.217). It also results in *failure to achieve objectives in the scheduled time* and *arousal of dispute between parties of the project* (client, contractor, consultant or other stakeholders) as well as within the parties of the project (Mean 4.13 and 4.0 respectively).

- Mitigation measures of scope creep

Amongst the key mitigation measures identified from literatures and experience, *implementing appropriate monitoring techniques* and *strengthening of meetings* (Mean 4.348 and 4.304 respectively) rate as the most relevant mitigation measures to overcome the impact of scope creep on project performance. On the other hand, *implementing appropriate dispute resolution methods* and *prioritizing tasks in their level of importance* holds the next option to overcome such problems. Also, *proper estimation of time, ensuring the availability of resources, reviewing scope change program,* and *risk assessment* are identified as a mitigation measure to reduce the impact of scope creep on road construction projects.

5.2 Conclusion

This research was conducted to explore and analyze the causes, impacts and possible mitigation measures of scope creep in federal road construction projects with the objectives of identifying key variables that attributes to scope creep in road construction projects and their possible outcomes resulted from this problem. Questionnaire surveys were used to collect primary data from three parties of the project (the client, contractor, and consultant). Identified variables gathered from different literatures were employed with a lickert's scale measurement in order to measure the attitudes of respondents. Data were imported and analyzed using descriptive analysis in terms of weighted mean and standard deviation. Moreover, secondary data was gathered from the organization in order to strengthen the attitudes of respondents.

Based on the finding of the study the following conclusions are drawn:

1. The most common causes of scope creep as gathered from the respondents are Poor understanding of scope changes, Issues related with Design & Specifications, Issues

related with scope planning, Issues raised internally, and External issues based on the descriptive analysis of the weighted mean.

2. From the identified variables, the frequent impact of scope creep was shown with regard to time/schedule overrun, Overall project performance (such as personnel of projects), with regard to cost overrun, and quality of end result. This result showed the schedule of the project is relatively more affected by scope creep.
3. Possible mitigation measures were drawn from the study. From the 11 possible recommendations that were outlined for respondent's opinions, implementing appropriate monitoring techniques and strengthening of meetings rated the as the most relevant mitigation measures for scope creep impact on project performance whereas other frequent options includes implementing appropriate dispute resolution methods and prioritizing tasks in their level of importance. Also, proper estimation of time, ensuring the availability of resources, reviewing scope change program, and risk assessment were chosen as a mitigation measure of the impact of scope creep in road construction projects.
4. On the other hand, comes as the next option to overcome such problems. Furthermore, could not be ignored to utilize as a mitigation measure to reduce the impact of scope creep on road construction projects.

5.3 Recommendation

Based on the findings of this study, the following recommendations as part of the objectives of the study are made:

- The organization, Ethiopian Roads Administration, should give high emphasis on the term scope creep as it leads to schedule and cost overrun whereas resulting poor performance of the project. In order to achieve that, the organization can take the rated mitigation measures in this study as a spring board for when scope creep occurs in the projects.
- Different stakeholders should be familiarized with the terminology of scope creep, since one of the major causes of scope creep lies in miscommunication between parties of the project and improper monitoring of scope changes.

- Serious precautions should be made on the project planning phase since scope shall be well defined at that stage in order to prevent the incident of scope creep in the projects
- Future researchers should conduct an intensive research by incorporating open ended questions so as to gather relevant solutions from expertise who has direct involvement in the construction projects.

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Annex

Questionnaire for Data Collection

Dear respondents,

I am studying Master's degree program of Project Management in Addis Ababa University School of Commerce. The main purpose of this questionnaire survey is to collect information on: **Exploring the impact of Scope Creep on Project Performance: the case of Federal Road Projects.**

You are requested to answer the questions in the questionnaire based on your personal knowledge and experience. The questionnaire has four sections. The first section (Section I) consists of questions aimed at collecting General information about the respondent. The second section (Section II) is aimed at finding out the general concept of respondent on project scope creep. The third section (Section III) is focused on the contributing factors of scope creep in Road Construction Projects. The final section of the questionnaire (Section IV) aimed at possible mitigation measures in order to overcome the problems encountered during scope changes.

Hence, I kindly ask you to fill up the questionnaire which will have an immense help for my study. I assure you that, this study is solely intended for academic purposes and confidentiality of your response is much guaranteed. Please provide the information as soon as you can.

Finally, I would like say thank you in advance for your kind cooperation.

The main Objective of my study is to:-

- To identify the key factors on the causes of scope creep in road construction projects in ERA
- To assess the impact of scope creep on road construction projects
- To outline recommendations to road construction projects to prevent the negative impact of scope creep

Part-1 General Information

In this section of the questionnaire, respondents are required to answer the general information about them. Please mark your response on the space provided or fill the appropriate answer on the space provided. All answers will be treated in strict confidentiality.

1. Name (Optional)……..
2. Field of study……
3. Years of experience in Road Projects

   ☐ 1-5 ☐ 6-10 ☐ 11-15 ☐ >15Years

4. What is your highest qualification?

   ☐ Bachelor's Degree (BSc) ☐ Master's Degree (MSc)

   ☐ PHD Other……☐……

5. What is your role in the project?

   ☐ Client ☐ Contractor ☐ Consultant Other…….

Part-2: Respondent's concept on Project Scope Creep

In this section of the questionnaire, respondents are required to answer their concept on project scope creep. Please mark your response on the space provided.

1. Have you pursued/ Participated in any kind of Project Management Courses/trainings?
   - ☐ Yes
   - ☐ No
2. Do you have a clear understanding of the term "scope creep" as it operates within the construction industry?
   - ☐ Yes
   - ☐ No
3. Do you differentiate the terminologies "scope change" and "scope creep" in the construction industry?
   - ☐ Yes
   - ☐ No

4. Did you ever have any experience of scope creep within a construction project that you are/were involved in?
   - ☐ Yes
   - ☐ No
5. Do you believe that Project Scope Creep has a very significant impact on project Performance?
   ☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

Part-3: The Causes of Scope Creep on Federal Road Construction Projects

Scope Creep: refers to changes, continuous or uncontrolled growth in a project's scope, at any point after the project begins. When a project's scope changes, the project work starts to extend, or "creep", beyond what was originally agreed.

In your opinion, what could be the ***possible causes of scope creep in Road construction Projects?*** Please use the scale indicated below the statements below indicate your level of agreement or disagreement. **N.B** There are no correct or wrong answers.

Please use the scale indicated below: 1=strongly disagree 2=Disagree3=Neutral4=Agree 5=Strongly Agree

No.	Parameter	5	4	3	2	1
Issues related with scope planning						
1	Lack of clearly defined scope at the project initiation phase					
2	Lack of defined and disciplined procedure for project management					
3	Uncertainty in manufacturing/ supply of materials					
4	The absence of a proper document that provides detailed activities, and scheduling information about each component of the work					
5	The absence of formal agreement/discussion on scope changes between parties of the project.					

Poor understanding of Scope Changes						
6	Lack of knowledge and poor understanding of product versatility/complexity					
7	Poor understanding of customer requirements prior to project scope definition and contract signing					
Issues related with design and specifications						
8	Poor quality of design					
9	Poor quality of work break down structure					
10	Scope changes due to unplanned design changes					
11	Scope changes due to changes in Specification					
12	Substitution of materials as a result of shortages in resources					
13	Final drawings not fully completed and hence need for design change					
Issues related Internally						
14	Clients' requirements changes and lack of change control contingency plan					
15	Poor formal communication between parties of the project					
16	Scope changes due to needs for additional functionality (In addition to the original scope of the project)					
17	Scope change as a result of verbal instructions at the site					
18	Changes requested by end user requirements					
19	Changes requested by the contractor					

20	No regular meetings held between the client and the Contractor to inform the up to date state of the project					
21	The absence of a system of monitoring the scope creep and change requests within the defined boundaries considering the delay and cost incurred					
External Issues						
22	Environmental changes/force majeure					
23	Scope changes due to Political biasness					
24	Scope changes due to Covid-19 Pandemic					
25	A new regulation imposed by an external agency					
26	Lack of beneficiary support					
27	Unexpected price incremental					

Part-4: The impact of Scope Creep on Federal Road Construction Projects

Regarding this aspect of the study i.e ***the effect of scope creep in your road construction project***, respondents are required from the statements below indicate your level of agreement or disagreement on the effects of scope creep on Project Performance. There are no correct or wrong answers. Please use the scale indicated below the statements below indicate your level of agreement or disagreement.

Please use the scale indicated below: 1=strongly disagree 2=Disagree3=Neutral4=Agree 5=Strongly Agree

No.	Parameter	5	4	3	2	1
	With regard to Cost Overrun					
1	Increase in project cost (Variation)					
2	Decrease in Return on investment (Profit of your company)					
3	Delay in payments					

4	Shortages of materials					
	With regard to time/schedule overrun					
5	Failure to attain objectives at the scheduled time.					
6	Waiting longer time to purchase materials					
7	Methods of construction in scope change may take longer time than anticipated					
8	Longer period of time needed to adopt scope changes to the project leading to delays of the project					
9	Longer time required for approvals					
	With regard to Quality of end result.					
11	Failure to attain the objectives of the project					
12	Unclear methodologies during scope change					
13	Lack of quality control of the project					
14	Wastage of materials, resources					
15	Lack of the techniques to manage the scope changes					
	With regard to overall project performance(Personnel of projects)					
16	It creates more stress on the Project Manager.					
17	It has an adverse impact onlabor productivity.					
18	Leads to lack of collaboration between co-workers					
19	Arising of disputes between/within parties of the project					
20	Failure to involve beneficiaries					

Part-5: Possible Solutions/Recommendations on how to manage Scope Creep on Federal Road Construction Projects (ERA)

Regarding this aspect of the study i.e ***the effect of scope creep in your road construction project,*** respondents are required from the statements below indicate your level of agreement or disagreement on ***possible mitigation measures*** that you think will fit scope creep in Road

construction projects. There are no correct or wrong answers. Please use the scale indicated below the statements below indicate your level of agreement or disagreement.

Please use the scale indicated below: 1=strongly disagree 2=Disagree3=Neutral4=Agree 5=Strongly Agree

No.	Parameter	5	4	3	2	1
1	Ensuring the availability of enough Contingency funds for the proposed scope changes					
2	Proper estimation of the time needed in order to implement proposed scope changes					
3	Ensuring the availability of Resources before implementing the scope changes					
4	Reviewing the scope change proposal with respect to the possible impacts (such as impacts on quality, process of the project, and the organization) by the Project Manager					
5	Predicting possible scope changes ahead of the project start up					
6	Prioritize tasks in the proposed scope change in order of their importance.					
7	Identifying the important tasks which could be dependent on the scope change to be made and are affected by it					
8	Risk assessment (qualitative & quantitative) should be conducted on scope change proposal and figure out the most crucial changes that are going to be made to the project					
9	Appropriate Monitoring and Evaluation techniques should be used on the implementation phase of the project					
10	Conducting meetings with parties of the contract to keep each party updated and discuss upcoming issues					
11	Implementation of appropriate dispute Resolution/Prevention mechanisms					

Declaration

I the undersigned, declare that this thesis entitled **The Effect of Scope Creep on Project Performance: The case of Federal Road Projects** is my original work and that all sources of materials used for the thesis have been dully acknowledged.

Name of student: **Rahel Yoseph**

Signature: _____