



Seek Wisdom, Elevate your Intellect and Serve Humanity



ADDIS ABABA UNIVERSITY
COLLEGE OF BUSINESS AND ECONOMICS
SCHOOL OF COMMERCE

**EFFECT OF PROJECT SCHEDULING MANAGEMENT PRACTICES ON
PROJECT PERFORMANCE OF OXYGEN BOTTLE IN-HOUSE CAPABILITY
DEVELOPMENT PROJECT: CASE COMPANY ET-MRO SERVICES.**

By: Natanim Kassu

*A Project Submitted to Addis Ababa University, School of Commerce in Partial
Fulfillment of the Requirements for the Degree of Master of Arts in Project Management.*

Advisor; Seifu Mamo, PhD

June 2022

Addis Ababa, Ethiopia

ADDIS ABABA UNIVERSITY
COLLEGE OF BUSINESS AND ECONOMICS
SCHOOL OF COMMERCE

**EFFECT OF PROJECT SCHEDULING MANAGEMENT PRACTICES ON
PROJECT PERFORMANCE OF OXYGEN BOTTLE IN-HOUSE CAPABILITY
DEVELOPMENT PROJECT: THE CASE OF ET-MRO SERVICES.**

By: Natanim Kassu

*A Project Submitted to Addis Ababa University, School of Commerce in Partial
Fulfillment of the Requirements for the Degree of Master of Arts in Project Management.*

Approved by Board of Examiners and Advisor:

.

Dr. Seifu Mamo		
_____	_____	_____
Advisor	Signature	Date
_____	_____	_____
Examiner (Internal)	Signature	Date
_____	_____	_____
Examiner (External)	Signature	Date

Declaration

I, Natanim Kassu, declare that this paper is a result of my independent research work on the topic entitled “EFFECT OF PROJECT SCHEDULING MANAGEMENT PRACTICES ON PROJECT PERFORMANCE OF OXYGEN BOTTLE IN-HOUSE CAPABILITY DEVELOPMENT PROJECT: CASE COMPANY ET-MRO SERVICES” in partial fulfillment of the requirements for the Degree of Master of Arts in Project Management at Addis Ababa University. This work has not been submitted for a degree to any other university. All the references are also duly acknowledged.

Natanim Kassu

Signature: _____

Date: _____

(Candidate)

This is to certify that the candidate's above declaration is correct to the best of my knowledge.

Dr. Seifu Mamo

Advisor

Signature

Date

Acknowledgment

I'd like to express my gratitude to my advisor Dr. Seifu Mamo for his commitment on reviewing and commenting this research from the inception to the end.

Secondly, my gratitude goes to my colleagues and respondents for responding the questionnaires within short period of time.

Thirdly my heartfelt gratefulness goes out to my special wife Abeba Molla for her courage and continuous support during my study and my little kid Yemariam for being a strong pillar of my life.

Abbreviations and Acronyms

ANOVA	.....	Analysis of Variance
AON	.....	Activity on Node
CPI	.....	Cost Performance Index
CPM	.....	Critical Path Methodology
CV	.....	Cost Variance
EASA	.....	European Aviation Safety agency
ECAA	.....	Ethiopian Civil Aviation Authority
Eqn.	.....	Equation
ET MRO	.....	Ethiopian airlines Maintenance, repair and Overhaul
FAA	.....	Federal Aviation Administration
FF	.....	Finish-to-finish
FR	.....	Foreign Repair
FS	.....	Finish-to-start
MRO	.....	Maintenance, Repair and Overhaul
PDM	.....	Precedence diagramming method
PERT	.....	Program Evaluation and Review Technique
PMBOK	.....	Project management Body of Knowledge
PMIS	.....	Project Management information system
PMP	.....	Project Management Plan
PPG	.....	Planning Process Group

PTMProject Time Management
SFStart-to-finish
SMEsubject matter expert
SPI Schedule Performance Index
SPSSstatistical package for social studies
SS Start-to start
TVTime Variance
VIFvariance inflation factor
WBSwork breakdown structure

0 Table of Contents

0 Table of Contents..... VI

1 Chapter One: Introduction..... - 1 -

1.1 Background of the study - 1 -

1.2 Background of the Company..... - 3 -

1.3 Statement of the Problem..... - 4 -

1.4 Basic Research Questions..... - 5 -

1.5 Objectives of the Study - 6 -

1.5.1 General objective of the study - 6 -

1.5.2 Specific objective of the study..... - 6 -

1.6 Hypothesis of the Study - 6 -

1.7 Significance of the study..... - 6 -

1.8 Delimitation/Scope of the Study - 7 -

1.9 Definition of Terms..... - 7 -

1.10 Organization of the study..... - 8 -

2 Chapter Two: Literature review..... - 9 -

2.1 Introduction..... - 9 -

2.2 Conceptual Review - 9 -

2.2.1 Project scheduling management - 9 -

2.2.1.1 Plan schedule management..... - 10 -

2.2.1.1.1 Inputs of plan schedule management - 10 -

2.2.1.1.2 Tools and techniques for plan schedule management..... - 11 -

2.2.1.2 Define activities - 11 -

2.2.1.2.1 Tools and techniques to define activities - 12 -

2.2.1.3 Sequence activities - 12 -

2.2.1.3.1 Tools and techniques to sequence activities - 12 -

2.2.1.4 Estimate activity resources..... - 13 -

2.2.1.4.1	Tools and techniques to estimate activity resources.....	- 14 -
2.2.1.5	Estimate activity durations.....	- 14 -
2.2.1.5.1	Tools and techniques to estimate activity durations.....	- 15 -
2.2.1.6	Develop schedule.....	- 16 -
2.2.1.6.1	Tools and Techniques to Develop Schedule.....	- 16 -
2.2.1.7	Control schedule	- 17 -
2.2.1.7.1	Tools and techniques to develop schedule	- 17 -
2.2.2	Project Performance indicators.....	- 18 -
2.2.2.1	Cost Performance Index (CPI).....	- 18 -
2.2.2.2	Cost Variance (CV)	- 19 -
2.2.2.3	Schedule Performance Index (SPI)	- 19 -
2.2.2.4	Time Variance (TV).....	- 19 -
2.2.2.5	Quality Performance.....	- 19 -
2.3	Empirical Literature Review	- 20 -
2.4	Conceptual Framework.....	- 21 -
3	Chapter-Three: -Research Methodology.....	- 23 -
3.1	Research Approach:	- 23 -
3.2	Design of research.....	- 23 -
3.3	Population and Sampling Techniques.....	- 24 -
3.4	Sources of Data Collection	- 24 -
3.5	Data Collection Procedures	- 24 -
3.6	Method of Data Analysis	- 25 -
3.7	Testing Reliability of the Data.....	- 25 -
3.8	Ethical Consideration.....	- 26 -
4	Chapter Four: Data Analysis, Results and Discussion	- 27 -
4.1	Introduction.....	- 27 -

4.2	Demographic Information of the respondent	- 27 -
4.3	Level of project time management practices on bottle overhaul in-house capability development project	- 29 -
4.3.1	Plan schedule management practice.....	- 29 -
4.3.2	Activity definition practice	- 30 -
4.3.3	Activity sequencing practice.....	- 32 -
4.3.4	Activity resource estimation practice	- 33 -
4.3.5	Activity duration estimates practice	- 34 -
4.3.6	Practices on developing schedule	- 35 -
4.3.7	Practice of control schedule	- 36 -
4.4	Rating project performance of bottle overhaul in-house capability development project	- 37 -
4.4.1	Pearson Correlation coefficient	- 39 -
4.4.2	Multiple linear regression analysis	- 41 -
4.4.2.1	Sample size	- 42 -
4.4.2.2	Multicollinearity	- 42 -
4.4.2.3	Normality	- 43 -
4.4.2.4	Homoscedasticity and linearity.....	- 44 -
4.4.3	Statistical relationship between scheduling management practices and project performance.....	- 45 -
4.4.3.1	Effect of project scheduling management practice on project performance ...-	46 -
4.4.4	Research hypothesis summary.....	- 47 -
5	Chapter Five: Summary, Conclusion and Recommendation.....	- 48 -
5.1	5.1 Summary.....	- 48 -
5.2	Time management practice summary	- 48 -
5.2.1	Plan schedule management practice.....	- 48 -
5.2.2	Activity definition practice	- 49 -
5.2.3	Activity sequencing practice.....	- 49 -

5.2.4	Activity resource estimation practice	- 49 -
5.2.5	Activity duration estimates practice	- 50 -
5.2.6	developing schedule Practices	- 50 -
5.2.7	Control Schedule Practices	- 51 -
5.3	Project performance summary	- 51 -
5.4	Conclusion	- 51 -
5.5	Recommendation.....	- 53 -
5.6	Suggestions for further Studies	- 53 -

List of Tables

Table 3.1 Reliability test - 26 -

Table 4.1 Demographic profiles of respondents..... - 28 -

Table 4.2 Descriptive Statistics on plan schedule management practice Source - 30 -

Table 4.3 Descriptive statistics on activity definition practice - 31 -

Table 4.4 Descriptive Statistics on Activity sequencing practice - 32 -

Table 4.5 Descriptive statistics on activity resource estimation practice..... - 33 -

Table 4.6 Descriptive Statistics on Activity duration estimates practice..... - 34 -

Table 4.7 Descriptive statistics on activity resource estimation practice..... - 36 -

Table 4.8 Descriptive Statistics on Control Schedule Practices - 37 -

Table 4.9: Descriptive statistics on project performance - 38 -

Table 4.10 SPSS results for Pearson’s correlation between project time management practice and project performance..... - 40 -

Table 4.11: Multicollinearity results of independent variables - 42 -

Table 4.12 Linear Regression - Model Summary - 45 -

Table 4.13 Results for ANOVA with Project Performance as Dependent Variable and time management practice as independent variable - 45 -

Table 4.14: Regression Coefficients - 46 -

Table 4.15 Summary of the overall outcome of the research hypotheses - 47 -

List of figures

Figure 2. 1 Conceptual Framework..... - 22 -

Figure 4. 1: Histogram and P-P plot..... - 43 -

Figure 4.2 1 : Scatterplot of Dependent Variable..... - 44 -

Abstract

This study presents the effect of project scheduling management practices on project performance and set forth methods to enhance project performance. This research employed a quantitative research approach and a descriptive research design. The target population of this study consists of a sample population of 150 Ethiopian airline employees whose tasks were related to this project. Questionnaires collected from 108 respondents were used as primary data. The secondary data obtained from company reports and documents are also used. The researcher used SPSS revision 26 to perform analysis and presented the results using descriptive statistics such as mean, standard deviation, percentile and frequency. Correlation and multiple linear regression analysis were also employed for data analysis to check the correlation between dependent and independent variables. The assumptions of multiple regressions were carefully checked for sample size, normality, multicollinearity, homoscedasticity and linearity. The correlation coefficient and regression analysis showed project scheduling management practices and project performance have high level of positive association and linear relationship. Based the cutoff point interval, this project is considered as moderate on its overall performance. The performance of this project is mainly affected in terms of time and cost wise. However; it is ranked as high performance on quality perspective. Based on the findings and result, the research concluded that project scheduling management practices and project performance have high level of positive association and linear relationship. Lastly, the researcher recommends the use of project management software for the project team since this software is highly important for planning and estimation, cost control and scheduling, management of budget, communication and project status control by higher management.

Key Words: *Project, Project scheduling management, Project performance.*

1 Chapter One: Introduction

This research is conducted at Ethiopian airlines maintenance, repair and overhaul (MRO) services on bottle overhaul in-house capability development project to investigate the effect of project scheduling management practice on project performance. Taking project triangle into consideration, we find time; just like scope and budget, plays a major role in the project life cycle. Alumbugbu, Abdulazeez, Saidu, Ola-awo & Tsado (2015) agreed with the 'iron triangle' as the most crucial criteria to measure project performance and to meet the needs of both the client and/or the end users. Throughout the project phases, time, budget, cost and scope all demand careful consideration. Although time management process has been given more attention mainly in the planning phase, there is a need to manage time from designing and planning, implementation, control and monitoring, close out and evaluation, it is the responsibility of the project manager to plan the project activities and to meet the desirable project duration within scope and planned budget.

The main focus under the introduction session is background of the study, statement of the problem, research questions, and research objectives, significance of the study, scope of the study, limitation of the study and organization of the study.

1.1 Background of the study

By definition, a project has an official end date. In order to meet the project deadline, every project needs a schedule management. Mostly projects won't get done on time and may not even get done at all. The concepts of scheduling management are applied to ensure projects are carried out per the schedule. Project scheduling management is basically the ability to organize and plan the time spent on all activities. Oburu (2020) stated that the outcome of a good time management practice is to increase productivity and effectiveness. Time is a key aspect of project management and includes skills such as planning, goals setting and prioritizing for an improved project performance. Schedule management practice can be supposed to be the act of planning, scheduling and exercising sensible control over the restricted amount of time spent on specific activities, specifically to increase their efficiency, effectiveness and productivity. Project is principally about achieving certain sets of goals and objectives within constraint of time, cost, and scope. These factors should be well planned and controlled to guarantee the

project success. Project schedule management starts at the very beginning of project initiation by identifying the required project duration and its milestones, before entering an in-depth planning (Hazar, 2014).

According to Oburu (2020), schedule management system currently is designed in combination of processes, tools, techniques and methods and it is predictable in any project development as it governs the project duration. Project schedule management (PTM) consist of a number of planning and controlling processes. These processes are recommended to comply with requirements related to project time. Time more than half of the references Chang and Nguyen (2011) demonstrated "time" or "schedule" as one of the most important project success criteria for any project. Time has been addressed as a criterion by which to evaluate the degree of success of a project. It has also been stated as a factor, which can help the other factors/criteria be met. It is found in this study that the definition of "time" is of great significance. "time" as the date when a project is most likely to end can be criteria, but "time" as a manageable component might be considered as a factor.

In an increasingly volatile and competitive environment, projects are of growing strategic importance to the existence of any organization for the following reasons (Smith,2002).

- (a) The timing and successful implementation of projects can greatly enhance an organization's competitive situation.
- (b) Projects consume an organization's resources such as cash flow, people and equipment.
- (c) Projects normally take part on a significant change to the infrastructure.

Due to the nature of the business, aviation projects should be carried out with utmost care to achieve project target completion date. This is because any delay on projects entails associated cost penalty. While looking at bottle overhaul in-house capability development project in Ethiopian airlines maintenance, repair and overhaul (ET MRO), the project came across with a significant delay implying that the project performance is affected. The driving factor for the project initiation at the inception was the unavailability of in-house capabilities to maintain oxygen bottles. These bottles are components that are found on aircraft system which is used to supply pure oxygen for high altitude breathing and therapeutic use to the cockpit crew (pilots) during an emergency situation or when they feel unpleasant condition of their health

status during flight (Federal Aviation Administration Aviation Safety Civil Aerospace Medical Institute, 2021). These bottles are also used to supply pure oxygen to passengers during emergency flight if cabin pressure is lost. This component is a mandatory item which must be available at every flight. During inspection, if oxygen bottles are found defective; it should be removed and routed to repair shops for remark rectification, test, inspection and refilling of oxygen.

Previously, the Ethiopian airlines MRO component workshops had no the capability to perform these maintenances and obliged to send this component to foreign repair (FR) and then received it after all maintenance is carried out and pay the maintenance cost to the repair center. The feasibility study on bottle overhaul in-house capability development project had shown up that this project is profitable for the company. Therefore, the project was launched and sponsored by the higher management of the Ethiopian airlines. The current status of the project is now found on its full capacity to perform the maintenance on aircraft oxygen bottles.

1.2 Background of the Company

Ethiopian Airlines was founded on December 21, 1945 and began operations on April 8, 1946 with international flights beginning in 1951 with the first five C-47 aircraft, which were relics from WWII, on a route from Asmara to Cairo. Ethiopian started operation with the first 5 C-47 aircraft, scraps of 2nd World War, back in 1946 during its debut flight to Cairo via Asmara. Ethiopian Airlines is wholly owned by the country's government and found in the capital city of Ethiopia, Addis Ababa, with its head office located at Bole International Airport from where it serves a network of 125 passenger destinations(104 international and 21 domestic). Ethiopian currently runs 134 of the newest and most advanced fleets with another 41 on order (Source: https://en.wikipedia.org/wiki/Ethiopian_Airlines).

One sub-division of Ethiopian airlines is maintenance, repair and overhaul (MRO) services established in 1957 to provide MRO services for aircraft, engines and components of Ethiopian and third-party customers. The primary base of Ethiopian is at Bole International Airport, Addis Ababa, Ethiopia. Ethiopian MRO is an Approved Maintenance Organization (AMO) with approvals from Ethiopian Civil Aviation Authority (ECAA), Federal Aviation Administration (FAA) and European Aviation Safety Agency (EASA). Among the financial development pillars of ET MRO, component capability development is one sector in which the

company is working aggressively to surmount the business across the margin of aviation maintenance of its property as well as the customer work to avoid or minimize the foreign repair (FR) cost.

When a new aircraft is planned to entry to service, a feasibility study is conducted to decide on new capability developments of aircraft components. Once it is believed that the project is feasible, capability development project will be initiated. Capability development projects includes the following but not limited: construction of workshop with clear lay out and full facility, personnel training provision, tool manufacturing and procurement of machineries, consumable fulfilment, Securing approval from regulatory body like (FAA), (EASA) and (ECAA).

1.3 Statement of the Problem

Many projects fail around the world, causing companies to lose millions of dollars. Several project management experts have attempted to identify the influencing elements that must be addressed head-on in order to generate a successful project management outcome as a result of this ongoing difficulty (Mortensen,2013). The aviation business industry is in a state of dynamism and becoming ever more complex. The industry is compelled to refocus on new emerging higher value-added services, which often require significant investment.ET MRO service is now focusing on strategies of capability development for its own fleets as well as external customer maintenance requirement. ET MRO services has a dedicated project management office in charge of capability development of different area of discipline. An interview with different project engineers showed that the project performances are not as satisfactory as expected due to different reasons like scheduling management practice, monitoring and control, lack of well-defined project management methodologies. Oxygen bottle overhaul in-house capability development project was one of the projects this department handed over to user repair shops after completing the project with significant delay. Time, when regarded as “delay” is one of the triple project constraints which has tremendous financial impact in an airline industry in making difference among the competitors.

Even though this project encounters a significant delay, it is now on its full capacity to maintain oxygen bottles. On those delayed times the company was sending oxygen bottles to foreign repair (FR) and faced to unnecessary financial expenses. Had the bottle overhaul in-house

capability development project been completed on time, huge amount of cost would have been saved. This is an implication of gaps on project scheduling management practices of this project. Scheduling management is considered essential in project management because: time is a scarce resource, once time has been used or incurred, it cannot be recovered (Drucker,2017). This demonstrates that we cannot save time for later use; time that is not used is lost forever; and ultimately management goals and strategies cannot be achieved without the exertion of effort which demands the application of scheduling management.

Allen (2001) and Lucchetti (2011) declares that the management of time is fundamental to project performance. Time management typically involves goal setting, creating priorities, budgeting timetable given to a particular activity and planning and scheduling the steps required for the accomplishments of goals and it is an essential resource; it's irrecoverable, limited and dynamic (Osawe, 2017).

Therefore, the researcher aimed to investigate the effect of project scheduling management practice on project performance, specifically on oxygen bottle overhaul in-house capability development project.

1.4 Basic Research Questions

In order to achieve research objectives, this study answered the following research questions:

- What is the effect of plan schedule management on project performance?
- What is the effect of defining activities on project performance?
- What is the effect of sequencing activities on project performance?
- What is the effect of estimating activity resource on project performance?
- What is the effect of estimating activity duration on project performance?
- What is the effect of developing schedule on project performance?
- What is the effect of controlling a schedule on project performance?

1.5 Objectives of the Study

1.5.1 General objective of the study

The General objective of the research is investigating the effect of schedule management practices on bottle overhaul in-house capability development project and set forth methods to enhance project performance.

1.5.2 Specific objective of the study

The followings are the specific objectives of the research:

- To identify the effect of plan schedule management on project performance.
- To identify the effect of defining activities on project performance.
- To identify the effect of sequencing activities on project performance.
- To identify the effect of estimating activity resource on project performance.
- To identify the effect of estimating activity duration on project performance.
- To identify the effect of developing schedule on project performance.
- To identify the effect of controlling a schedule on project performance.

1.6 Hypothesis of the Study

Based on the problem statement described in the above section, this research aims at testing the below hypothesis which is a central focus of the study.

Ho: Project scheduling management practice has no significant effect on project performance.

HA: Project scheduling management practice has significant effect on project performance.

1.7 Significance of the study

The result of the research will create awareness among project engineers, project team leaders and project managers on how scheduling management practices affect project performance. They will have a clear visibility on actionable items which contribute to project performance and how the top management is able to handle their project more effectively to advance project performance. Besides that, the research also enlightens the internal employees of the benefits

of project time management practices and standards hence allow them to learn how to cope with these activities in the future. Academically, this research also further will improve the existing theories and materials collected that was defined by recent studies by adding in new possible theories and explanation that is beneficial to future researcher and project management student.

1.8 Delimitation/Scope of the Study

Ethiopian airlines is a very broad company. It has about seven vast business unit divisions and each division has its own different projects. The study may have the following limitation.

- It covered only one project called bottle overhaul in-house capability development which is found on ET-MRO division.
- The allotted time to conduct the research is not sufficient. Due to the broadness of the subject under the study; time pressure may enforce not to cover all scenarios related to time management practice.
- Due to technicality issues, some respondents were confused on some terms during questioner survey.

1.9 Definition of Terms

Project: A temporary endeavor undertaken to create a unique product, service, or result.

Time: the progression of events from the past to the present into the future.

Time management: The process of planning, organizing and exercising control over the amount of time spent on particular activity in order to improve efficiency, effectiveness, or productivity.

Project time management: A subset of project management that includes the processes required to ensure timely completion of the project.

Project Performance: A sum of product performance and process performance with respect to financial, duration, quality, scope and customer aspect (James, 2005).

Plan schedule management: Process targets to establish the policies, procedures, and documentation for planning, developing, managing, executing, and controlling the project schedule.

Defining activities: Identifying the specific tasks that must be completed in order to produce the project's various deliverables.

Estimating activity resource: Estimate the types and quantity of materials, personnel, equipment, and supplies needed to complete each task.

Estimating activity duration: Estimating the time it takes to complete an activity.

Developing schedule: The analysis of activity sequences, durations, resource requirements and schedule constraints to create project schedule model.

Controlling schedule: The practice of monitoring the status of project activities in order to update project progress and manage changes to the schedule baseline so as to meet the plan.

1.10 Organization of the study

This research is structured as follows:

Chapter One: Introduction- In the introduction part of the paper, the background of the study, statement of the problem, research questions, research objectives, significance of the study, scope and definition of terms are discussed

Chapter Two: Literature Review- In this chapter related literature review about Project scheduling management practice and project performance were reviewed and conceptual frame work developed.

Chapter Three: Research Methodology-In this chapter the research approach, research design, population and sampling techniques, source of data collection, data collection procedure, method of data analysis, reliability test and ethical consideration were discussed

Chapter Four: Data Analysis, Results and Discussion-In this chapter the research results were presented and analyzed using IBM SPSS revision 26.

Chapter Five: Summary, Conclusion and Recommendation-In this Chapter the research summary was discussed, conclusion made and set forth the recommendation.

2 Chapter Two: Literature review

2.1 Introduction

This chapter brings together material from various scholars who had conducted similar studies on this subject matter and tried to summarize existing literature on time management practice and their effect on project performance. Conceptual literature review, empirical literature review and conceptual framework are covered under this chapter.

2.2 Conceptual Review

2.2.1 Project scheduling management

According to Nonis, Fenner and Sager (2011) scheduling management practice is critical and has an effect for organizational success due to the effect on project performance. Project scheduling management is the processes required to manage timely completion of the project. Indeed, time management is a process that records and controls time spent to complete each activity (PMI, 2013). Time management is the basic idea of properly organizing the limited time and scheduling it accordingly (Barkema et al., 2015).

It allows the project manager to control and measure the time of spent on every action inside the project. “Delay in construction projects is defined as the time difference between the date of termination of the project listed or specified in the contract and the actual date of completion of the project” (Falqi, 2004), or “the time difference between the planned time and the actual time of project activities” (Gonzalez et al., 2008). According to Romel et.al (2016), the delays on the deliveries are resulted from a poor application of project time management. It is impossible to satisfy the project management necessities and apply its parts without planning for the project (Zwikael et al.,2014). Meredith, Shafer and Mantel (2017) demonstrated that project scheduling management is to serve the project manager as a guide to determine the track from project start date to its completion date. Without having the guide, the project manager cannot succeed the project responsibilities which leads to failure in achieving objectives of project (Mantel et.al, 2017).

The definition of project as a “temporary endeavor...” refers that project has to be done within a restricted timeframe. While dealing with project management, project scheduling management is about using the total time allocated to a project wisely in order to achieve the

scheduled deliverables and conclude all work by or before the project completion date. The activity and processes involved in project scheduling management include (PMI,2013):

- Plan Schedule Management
- Define activities
- Sequence activities
- Estimate activity resources
- Estimate activity durations
- Develop schedule
- Control schedule

2.2.1.1 Plan schedule management

This process targets to establish the policies, procedures, and documentation for planning, developing, managing, executing, and controlling the project schedule. Before the 5th Edition project management body of knowledge (PMBOK)® Guide, there was no time management process which covered the creation of this plan, which was done as part of the integration management knowledge area under the develop project management Plan process.

The objective of establishing schedule management process is to stipulate a consistent approach/guideline at organizational level for planning, creation, baseline, and manage the schedule throughout the project lifecycle. It includes (but not limited to) policies, procedures, guidelines, templates, thresholds and contingencies.

The plan provides a high level/detailed approach to define and manage the schedule. This may depend on the size and type of the Project and will be mainly driven by organizational scheduling guidelines.

2.2.1.1.1 Inputs of plan schedule management

1. Project charter: The project charter defines the summary milestone schedule and project approval requirements that will influence the management of the project schedule. It is a high-level milestone which may actually be tied to project approval requirements. For example, project final delivery date may be fixed.

2. Project management plan: The main component used is the scope baseline developed in the project scope management process include the following: scope baseline, project scope statement, WBS, WBS dictionary assumptions, risks, high level duration estimates.
3. Enterprise Environmental Factor: Project management software like project management information system (PMIS) and work authorization systems used in an organization published benchmark data such as throughput factors, resource and skill availability.
4. Organizational process assets: The main consideration here are organizational planning related policies, procedures, standards, templates, guidelines for schedule management, project historical information and lessons learned from prior similar projects are also the main inputs.

2.2.1.1.2 Tools and techniques for plan schedule management

1. Expert judgment: Subject matter experts on schedule management from within the project or external to the project validate the approach of the project to assess adequacy of controls and accuracy of data available from project scope, WBS and work packages.
2. Analytical techniques: This technique uses the following tools to plan schedule: scheduling methods, schedule management tool, parameters setting, approach for crashing and fast tracking and associated risks and project contingencies.
3. Meetings: It is a formal review of the scheduling approach by relevant Stakeholders to obtain commitment on the thresholds and reporting requirements.

2.2.1.2 Define activities

Defining activities are applied to meet the project deliverables and need to be done with enough detail to estimate what resources and time will be required to complete them. The main inputs are the scope baseline consisting of the approved project scope statement, the work breakdown structure (WBS), and the WBS dictionary. This process uses decomposition to take the work packages identified in the WBS, to divide the project into smaller pieces that can be easily managed and controlled. The basic tools and techniques to define activity process are decomposition, rolling wave planning, templates, expert judgment.

2.2.1.2.1 Tools and techniques to define activities

1. **Decomposition:** decomposition is a technique used by a project team by taking a top-down approach to breakdown the work packages in a WBS into smaller pieces, more manageable components called activities. Activities are the work or effort required to complete a work package that can be realistically estimated, scheduled, executed and managed by the project manager. Decomposition is a technique used in work breakdown structure (WBS) creation and to define the required activities involving the following steps.
2. **Rolling wave planning:** It is a form of progressive elaboration planning when decomposition may not be possible for a deliverable as it will be finished in future. In rolling wave planning WBS components may exist in different level of detail in the structure.
3. **Expert judgment:** The knowledge and skills of subject matter experts, from within the project or external to the project are used to define activities. Their experience on creating project scope statement, WBS and schedule development can be utilized in defining the activities.

2.2.1.3 Sequence activities

It is process of identifying the logical relationship among the activities and the succession in which those are to be executed in the project. The development of the activity sequence is performed on project logic to determine the order in which the activities will be completed. Leads and lags are applied for each activity to achieve realistic project schedule. The activity sequencing may be done by using project management software.

2.2.1.3.1 Tools and techniques to sequence activities

1. **Precedence diagramming method (PDM):** Precedence diagramming method is a method of constructing a logical network using boxes to represent the activities and connecting them by lines that show dependencies in critical path methodology (CPM). The PDM is also called as activity on node (AON) diagramming method, and it is also necessary to define the relationship

between the predecessor activity and the successor activity. It includes four types of dependencies or logical relationships (Baker, 2004).

- Finish-to-start (FS): A logical relationship in which the successor activity cannot start until its predecessor has been completed.
- Finish-to-finish (FF): the successor activity cannot be completed before its predecessor has been completed.
- Start-to start (SS): the successor activity cannot start until after its predecessor has started.
- Start-to-finish (SF): successor activity cannot be finished until before its predecessor has been started.

2. Dependency determination: Dependency determination is a method to determine how each activity in a project depends on the predecessors or successor activity. There are four types of dependency

- Mandatory dependencies
- Discretionary dependencies
- External dependencies
- Internal dependencies

3. Applying leads and lags: Lead mentions the relationship whereby the successor activity starts before the predecessor activity ended, while lag is the relationship whereby the successor activity can't begin right after the end of its predecessor's.

4. Schedule network diagram: Project network diagrams are generated on performing the sequence activity process to expedite preparation of networks of project activities. Project network diagram are the graphical representation of the project schedule activities, showing their logical relationships

2.2.1.4 Estimate activity resources

The next step after identifying activities and the sequence in project time management is the estimation of the resources required to perform each activity. Estimating an activity resource is an element of planning process group (PPG) which is used to estimate the type and quantities

of material, people, equipment, or supplies required to perform each activity. The estimate activity resource process is thoroughly synchronized with the estimate costs process.

2.2.1.4.1 Tools and techniques to estimate activity resources

1. Expert judgment: The skills and knowledge of subject matter expert (SME) from within the project or external to the project.
2. Alternative analysis: The use of different optional techniques to estimate activity resources.
 - Different approaches or methods
 - Different levels of resource capability or skills,
 - Different size or type of machines,
 - Different type of tools like automated or manual and
 - Make or buy decisions
3. Published estimating data: Many organizations routinely publish the production rate for various tasks and the costs of various tradeoff human resources, machines and material.
4. Bottom-up estimating: The activity can be decomposed to more detailed tasks and then the project team can estimate the resource required to perform each task and aggregate.
5. Project management software: There is project management software available which has the capability to help plan, organize, manage resource pools and develop resource estimates.

2.2.1.5 Estimate activity durations

The act of determining effort and number of resources required are dealt under the estimate activity duration part. In this process estimating the time it takes to complete an activity is determined by the project management team. Estimating activity duration is an element of planning process group which is dependent on the scope of the activity, activity resource estimates, resource availability and resource calendars. The assumption and constraints used for estimating the activity duration will be documented by the project team.

After the project team has created the WBS, reviewing and evaluating each activity takes place to determine the duration (how long will it take to accomplish from the start to the end) and

what resources (time, materials, facilities, and equipment) are needed. An estimate is an educated guess based on experience, knowledge and inference the process. Estimation accuracy depends on the quality of the knowledge and the way knowledge is applied. Multiple inputs and detailed WBS help reduce bias on duration estimate: decisions based on a prejudged perception. The unit of time used to the activity duration is a function of the level of detail needed by the user of the schedule. More details are needed when projects are larger and more complex which usually condenses into shorter durations of activities. Durations process involves the estimate of the required the amount of work effort and resources to be applied to estimate the time it will take to finish the activity.

2.2.1.5.1 Tools and techniques to estimate activity durations

1. Expert judgment

The use of skills and knowledge of SME from within the project or external to the project to estimate information or recommended maximum activity durations from prior similar projects.

2. Analogous estimating: Analogous duration estimating is top-down estimation approach by expert judgment or historical estimation from previous, similar schedule activity which is used in the early phase of a project. It is less costly and time consuming than other estimating technique and generally less accurate and unreliable.

3. Parametric estimating: A statistical relationship between the variables to calculate the estimate parameters such as cost, duration and budget by multiplying the quantity of work to be performed by the productivity rate.

4. Three-Points estimating: Estimating is done by taking in to account the estimation uncertainty and the risk while estimating the duration. An average of the three-point estimates is used to construct activity duration estimate. This estimating technique originated from the program evaluation and review technique (PERT) to estimate the activity duration. The three types of estimates are optimistic (to), pessimistic (tp), and most likely (tm) estimates.

5. Reserve analysis: It is contingency reserves, time reserves(buffers), into the overall project schedule as acknowledgment of schedule risk for the project team.

A percentage of the projected activity time, a predetermined number of work periods, or a quantitative schedule risk analysis could be used to build the contingency reserve (Cert IV Project Management,2012).

2.2.1.6 Develop schedule

Activity sequences, durations, resource requirements and schedule constraints are analyzed to create project schedule and provide a useful 'road map' that can be used by the project manager and the project team to help them in completing the project successfully. Well-designed project schedule model is a dynamic tool that can be used to forecast when the remaining project work may be reasonably expected to be completed. At the same time, it lets the project team to know the performance of the project to date and use that data to make more precise forecasts about their intended work and actions in the future.

The project schedule expresses what work is to be done, who will take the work, and when it should be done. 'How' to do the work is defined by other documents in the overall project plan as defined by the project management body of knowledge guide. Establishing a achievable and realistic project schedule is one of the critical initial actions in setting up a project. Equally important is the regular stat using and updating of the project schedule to support the on-going monitoring and controlling of progress as the project work is executed.

2.2.1.6.1 Tools and Techniques to Develop Schedule

Here are tools and techniques to develop the schedule (PMI, 2013):

1. **Schedule network analysis:** This is a diagram representation of project's activities, the time required to accomplish them, and the order in which they must be completed. Typically, project management software is utilized to create these evaluations. Gantt charts and PERT charts are also common formats.
2. **Critical Path Analysis:** This is the process of computing the "best line" from all of the actions that must be accomplished. or critical path to take so that you will complete the project in the shortest period possible.
3. **Schedule compression:** This tool aids in reducing the overall duration of a project by reducing the amount of time allotted to specific activities. After you've created the basic timetable, double-check it to ensure that the timing for each task corresponds to the available resources.

Tools commonly used to do this are listed below (PMI, 2013):

1. “What if” scenario analysis: The consequences of several scenarios on a project are compared and measured using this method.
2. Resource leveling: You alter the order of actions here to address the potential of unavailable resources and to ensure that undue pressure on resources is not placed on them at any time.
3. Critical chain method: This also addresses resource availability. You plan activities using their latest possible start and finish dates. This gives you more time between activities, which you might employ to deal with job interruptions.
4. Risk multipliers: Because risk is unavoidable, you must plan for its consequences. One strategy is to devote more time to high-risk pursuits. Another option is to apply a time multiplier to certain tasks or resources to compensate for overly optimistic time estimates.
5. It's a good idea to have other team members evaluate the original schedule after it's been reviewed and improvements have been made. Include persons who will be performing the work; their observations and assumptions are more likely to be correct and relevant.

2.2.1.7 Control schedule

The practice of monitoring the status of project activities in order to update project progress and manage changes to the schedule baseline so as to meet the plan is known as control scheduling. The main advantage of this process is to take preventive and corrective actions so that risks are minimized.

2.2.1.7.1 Tools and techniques to develop schedule

1. Performance reviews: A schedule performance is measured, compared, and analyzed by percent complete, actual start and finish dates and the remaining work on progress.
2. Project management software: Used to towpath planned date against actual date which helps to report the variance from the base line and to predict the effect of modifications to the project schedule model.
3. Resource optimization techniques: Taking into account both project timeline and resource availability.
4. Modeling techniques: review various scenarios by considering risk monitoring and align project management plan with approved baseline.

5. Leads and lags: Make an alignment of project activities that are behind during network analysis.
6. Schedule compression: use fast tracking technique or crashing schedule to complete the remaining work that are behind into alignment.
7. Scheduling tool: The actual work of the project and the remaining work is reflected using scheduling tool. It is used in conjunction with project management software in order to do project schedule network analysis.

2.2.2 Project Performance indicators

Samsonowa (2014) defines performance indicators as “a performance indicator is an auxiliary metric that partially reflects the performance of an organizational unit” and conclude that performance is not something that can be captured and quantified precisely, and therefore several different indicators of performance are needed. Parmenter (2015) have devised a detailed framework for performance indicators that includes key performance indicators.

Project performance can be measured using different parameters. James (2005) mentioned different parameters of project performance. The definition of project success often includes completing the project on time, within budget and quality focus on the end product or service deliverables that reflect the purpose of the project (PMBOK Guide).

2.2.2.1 Cost Performance Index (CPI)

The CPI is a measure of cost efficiency. It's calculated by dividing the value of the work actually performed (earned value) by the actual costs that it took to achieve the earned value. The ability to accurately predict cost performance allows organizations to allocate capital confidently, reducing financial risk, perhaps reducing the cost of capital. CPI standard deviation is an improved metric that shows the accuracy of budget estimating (James, 2005). When CPI is equal to one then the project is ideally on budget. When CPI is less than one, then the project is over budget. When CPI is greater than one, it means the project is under budget. A project with good performance must sustain its CPI value as near to one as possible.

$$\text{Cost Performance Index} = \text{Earned Value} / \text{Actual Cost}$$

2.2.2.2 Cost Variance (CV)

When CV is equal to zero, the project is perfectly on budget. When CV is greater than zero, the earning of project has more value than the planned earning; therefore, it is under budget. When CV is less than zero, the earning of project has less value than the planned earning; hereafter it is over budget

$$CV=BCWP-ACWP,$$

Where: BCWP represents budgeted cost of work performed

ACWP= represents actual cost of work performed.

2.2.2.3 Schedule Performance Index (SPI)

The SPI is the ratio of total original authorized duration versus total final project duration. The ability to precisely forecast schedule helps meet time-to-market gaps. The SPI Standard Deviation is an even better metric for determining the accuracy of schedule estimation.

$$\text{Schedule Performance Index} = \text{Earned Value} / \text{Planned Value}$$

2.2.2.4 Time Variance (TV)

From the perspective of client, end users and stakeholders; the primary criteria to measure success of the project will be the completion time. Therefore, it is very crucial to complete the construction project on time when people judge the project success from the macro view. Time variance (TV) has been recommended as one of the techniques of assessing performance of project.

$$TV=BTWP-ATWP,$$

Where: BTWP represents budgeted time of work performed and ATWP represents the actual time of work performed.

2.2.2.5 Quality Performance

Quality is defined as the sum of features required by a product or service to satisfy a given need, fitness for purpose. In other words, quality emphasizes the capability to establish requirements with conformance to the quality standard. In a contract agreement, the client will

describe the requirements, which will include the established qualities of products, processes, and services. To produce a comprehensive project that fulfills the clients' quality expectations, all parties involved in the project must thoroughly comprehend those criteria and expectations. Quality performance can be determined by taking clients' satisfaction into consideration (James, 2005).

2.3 Empirical Literature Review

Amade, Henry, and Ubani (2013) conducted a study on the effectiveness of scheduling techniques in the success of mechanical construction projects and discovered that a combination of scheduling techniques helped to evolve a synergy for quality planning of the scheduled project. Their corresponding outputs were used to evolve a sequence of work activities, resources, and duration for the given project elements. This gave a blueprint of work activity outline to the project team members and hence a yardstick for the evaluation of progress, performance index, and identification of risks. The various techniques of scheduling applied herein (CPM & Gantt chart) with the aid of Microsoft Project software helped to enhance the preparation of a timeline which formed the basis for the evaluation of the project's progress and control.

Suresh and Sivakumar (2019) stated that Schedule Management Plan has a positive impact on project management effectiveness and identifying the factors helped the organization in maintaining coordination, planning the entire working process, timely completion of the tasks, and achievement of the goals of the organization. The analysis on their study showed that mostly the biggest advantage of schedule management plan is related to time management practice. Hyvari (2006) demonstrated that project scheduling is an essential sub process of project management which is used as an outline frame to know which project need to be completed, with respect to associated resource cost and labor requirements.

Hoseini (2015) demonstrated that one of the most common project delay factors is that "poor project planning and management" which is an element of project time management practice and pre-project planning and management techniques reduces preliminary construction duration by 30%. Safework (2019) studied on the relation between time management practice and project performance and found out that if project time management procedures are

properly controlled, there is a very good chance of having a viable project that will ensure strong business success.

Solís-Carcaño et al. (2015) emphasize on preparing a project schedule for every separate duty benefits project manager to summarize the starting and finishing to obtain graphical illustration on how the project will end up. In schedule management planning, using Gantt charts are highly advised at each key stages complex project (Beleiu, Crisan & Nistor., 2016).

2.4 Conceptual Framework

In most empirical studies, a conceptual framework is an analytical tool with various modifications depending on the setting. It can be employed in a variety of fields where an overall image is required. A conceptual framework is a hypothesized model that seeks to identify the concepts being studied and their relationships (Mugenda & Mugenda, 2003). It presents in a diagrammatic form the way the researcher has conceptualized the relationship between the independent and the dependent variables. A conceptual framework is a graphic that depicts the connections between various aspects that may influence the achievement of goals and objectives. It aids in determining which factors will have an impact on the outcomes, as well as how each of these elements may relate to and affect the outcomes (Wachamba E.,2009).

Many chains of events occurred before a project under the study comes to end. Among all, the effect of project scheduling management practice on project performance discussed here. After examining relevant literature, the researcher created the following conceptual framework. The dependent variable is project performance, and the independent variables are plan schedule management, define activities, sequence activities, estimate activity resources, estimate activity durations, develop schedule, control schedule.

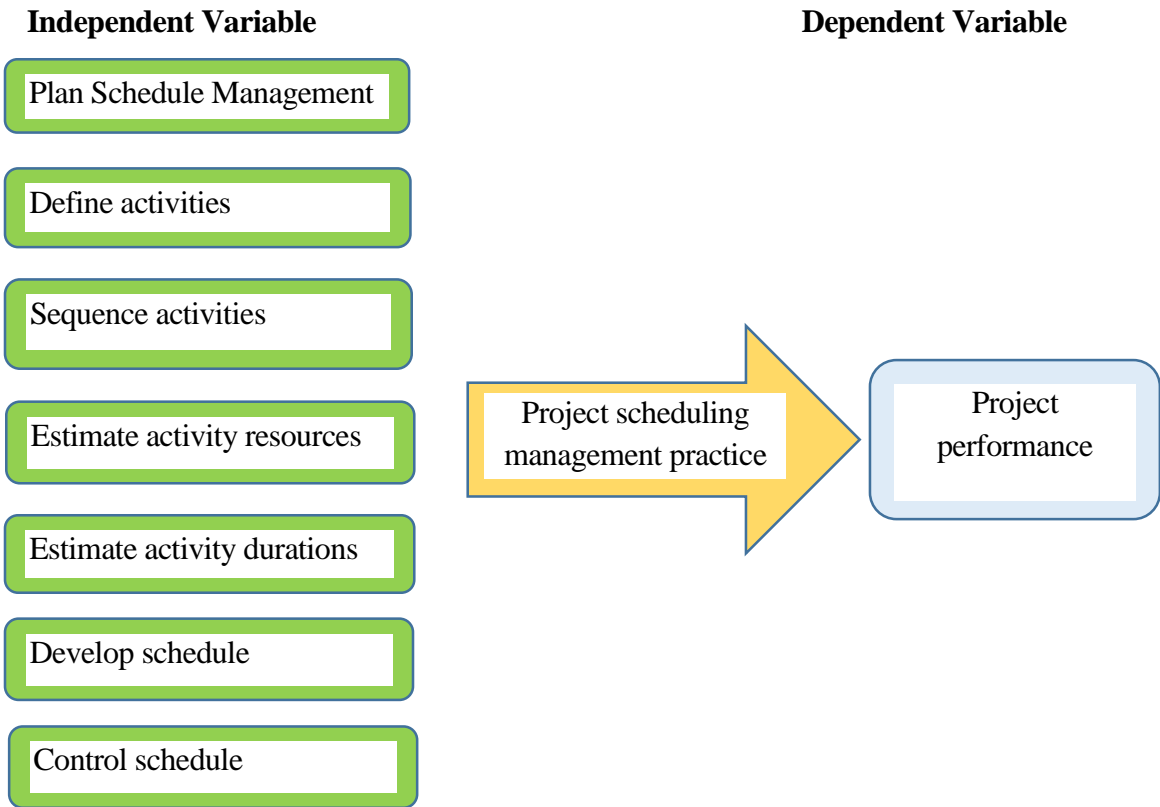


Figure 2. 1 Conceptual Framework

(Source: adapted from different literatures by the researcher,2022)

3 Chapter-Three: -Research Methodology

Under this chapter, concepts such as research approach, research design, population and sampling techniques, data sources and types, ethical consideration, and research reliability were discussed

3.1 Research Approach:

There are two main research approaches, the deductive and the inductive approach. The deductive approach is constructed from scientific principles where a new theory is built out of existing theories and then tested in real life. On the inductive approach the data is first collected to build new theories based on the result. On the other hand, the inductive approach uses qualitative data and the deductive approach uses quantitative data. The other alternate approach is when using research approach to combine both the inductive and deductive approach called abductive approach (Saunders, Lewis & Thornhill, 2015).

This study employed deductive(quantitative) approach particularly a survey studies on the effect of project time management practice on bottle overhaul in-house capability development project.

3.2 Design of research

According to Kombo et al. (2006), a research design can be viewed as an arrangement of conditions for collection in a way that focuses at combining relevance with the research purpose. As the research was to investigate the effect of time management practices on project performance, descriptive research design was employed. Descriptive analysis refers to statically describing, aggregating and presenting the constructs of interests or associations between these constructs.

This approach aimed at collecting data without manipulating the research variables or the respondents in an attempt to assess the effect of time management practices on project performance: In the case of bottle overhaul in-house capability development in ET-MRO Services.

3.3 Population and Sampling Techniques

A population, as defined by (Mugenda and Mugenda, 2003), is a group of humans or objects who have the same set of characteristics. They are the representatives of the totality cases that confirm to certain standards, which defines the elements that are contained or omitted in the target group. The target population of this study consist of sample population of 108 Ethiopian airlines employees. The population includes the project Engineers and project team leaders, project supply chain management officers, procurement officers, facility planner and mechanics of Machine installations.

3.4 Sources of Data Collection

For research it is common to use both primary and secondary data since time and resources can be limited (Saunders et al., 2009). The researcher also used primary and secondary sources of data on the study. The primary Sources of data were collected through observation, questionnaires or interviews. The researcher used questionnaire as a primary data and the secondary data is obtained from company reports and documents.

3.5 Data Collection Procedures

Secondary Data: Secondary data were collected from different company sources like project status report, component maintenance weekly component status report. The primary data were gathered through questioners and interview.

Questionnaire Surveys: The researcher distributed questionnaires to the selected respondents at their working offices and collect the questionnaires. The questionnaire survey was sent out to the participants of 150 stuffs out of which only 108 of them filled and collected.

This study uses questionnaires as a research instrument that are adapted from the PMBOK. The questionnaire had two sections. The first section is about respondents' demographic information variables such as age of the respondent, gender, experience, and educational level were analyzed. And the second section contain questions about project scheduling management practice and project performance. Likert scale ranging from 1 (very Poor) to 5 (Very Good) is used to measure the components of the questionnaire. The respondents were advised to indicate the degree of project schedule management practice as 'Very Poor, 'Poor',

‘Neither’ ‘Good’ and ‘Very Good’. The researcher developed the questionnaires using Google online form and shared the link to respondents via email and received the response online.

3.6 Method of Data Analysis

The researcher used IBM statistical package for social studies (SPSS) revision 26 to get the required analysis results for study and the researcher presented the results using descriptive statistics such as mean, standard deviation, percentile and frequency. Correlation and multiple linear regression analysis also employed for data analysis. The assumptions of multiple regressions were carefully checked for sample size, normality, multicollinearity, homoscedasticity and linearity. For the purpose of this study the researcher considered seven major variables of schedule management practice and correlate them with project performance indicators. And hence both the independent and dependent variables are continuing variables as they are consistently related with the assumptions of correlation and multiple linear regression.

3.7 Testing Reliability of the Data

Reliability of the data collection instrument is the consistency of measurement and frequently assessed using a test-retest reliability method (Mugenda and Mugenda, 2003). Reliability assisted the researcher to detect the vagueness and inadequate items in the research instrument; where the instrument reliability is the dependability, consistency or trust worthiness of a test. Coefficient alpha (also known as “Cronbach’s alpha”) is the most broadly used reliability coefficient. It estimates test-score reliability from a single test administration using information from the relationship among test items. Mohsen et al. (2011) stated that Cronbach’s alpha less than 0.5 is unacceptable, a less than or equal to 0.6 is poor, a less than 0.7 is questionable, a less than 0.8 and greater than or equal to 0.7 is acceptable, a less than 0.9 and greater than or equal to 0.8 is good and finally a greater than or equal to 0.9 is excellent. Accordingly, a Cronbach’s alpha for the population of 108 staff and 102 questioners was found to be 0.961 which is on excellent range.

Research instrument that had been used for this study is the questionnaire that was adapted from the PMBOK and (Safework,2019). Furthermore, the researcher was present as respondents filled out the questionnaire, in case explanation is required. The reliability test of

variables measuring the effect of project scheduling management practice on project performance are shown on table 3.1 below.

Cronbach's Alpha	N of Items	Variables
.755	7	Practices of plan schedule management
.829	11	Practices of defining activities
.775	11	Practices of Sequencing activities
.728	13	Practices of Estimating activity resources
.834	15	Practices of Estimating activity durations
.816	22	Practices of Developing schedule
.849	13	Practices of Controlling schedule
.780	10	Project performance
.961	102	Project time management practice and project performance

Source: own research, 2022

Table 3.1 Reliability test

3.8 Ethical Consideration

The goal of ethics is to guarantee that no one is harmed or hurt from the adverse consequence of research activities. To ensure ethicality of the research, prior to distribution of the questionnaire, the respondents were briefed about the purpose of the study and the respondents were informed that the data obtained from them will be kept confidentially and it is only used for research purpose. And then consent of the respondents were asked and based on their willingness data were be collected. The purpose of the research was clearly communicated to the respondents and the company's data owners so that they can provide accurate information. Name of respondents are not mentioned on this study.

4 Chapter Four: Data Analysis, Results and Discussion

4.1 Introduction

On earlier chapters it was tried to investigate the effect of project time management practices on project performance. Data was collected from primary and secondary sources via questionnaires and review of reports respectively. This chapter wind up and present the research finding, analyzing the result, and discussions on the research finding on the data that was gathered through both sources.

4.2 Demographic Information of the respondent

This section presented and analyzed the demographic data of the respondents. The demographic data addressed here are gender, age, roles in the organization, experience in project management, and educational status of respondents.

	Demographic Variable	Frequency	Percent	Valid Percent	Cumulative Percent
Gender					
Valid	Male	96	88.9	88.9	88.9
	female	12	11.1	11.1	100.0
	Total	108	100.0	100.0	
Age of respondents					
Valid	25-30	30	27.8	27.8	27.8
	31-36	54	50.0	50.0	77.8
	37-42	24	22.2	22.2	100.0
	Total	108	100.0	100.0	
Role in the organization					
Valid	Project Engineer	32	29.6	29.6	29.6
	project team leader	4	3.7	3.7	33.3
	project supply chain management	20	18.5	18.5	51.9
	Mechanics on Machine installations	22	20.4	20.4	72.2
	procurement officer	19	17.6	17.6	89.8

	Facility planner	11	10.2	10.2	100.0
	Total	108	100.0	100.0	
Educational Status					
Valid	Bachelor's Degree	84	77.8	77.8	77.8
	Master's Degree	13	12.0	12.0	89.8
	College Diploma	11	10.2	10.2	100.0
	Total	108	100.0	100.0	
Experience (Years)					
Valid	1-3	36	33.3	33.3	33.3
	4-6	36	33.3	33.3	66.7
	7-10	30	27.8	27.8	94.4
	11-14	6	5.6	5.6	100.0
	Total	108	100.0	100.0	

Source: research data 2022

Table 4.1 Demographic profiles of respondents

As it is shown on table 4.1, out of the 108 respondents 96(88.9%) of them are male and the rest 12(11.1 %) are female. This implies there are more male employees than female on the project assignments.

As it is seen on the table 4.1, out of 108 respondents 30(27.8%), 54(50%) and 24(22.2%) of the respondents were in the age range of 25-30, 31-36 and 37-42 respectively. This implies all of the respondents are in a productive age.

Table 4.1 shows 32(29.6%) of the respondents are the project engineers,4(3.7%) of the respondents are project team leaders,20(18.5%) of the respondents are project supply chain management officers,22(20.4%) are Mechanics on Machine installation,19(17.6%) are procurement officers and the remaining 11(10.2%) are facility planners.

Concerning educational status of the respondents, table 4.1 illustrates that out of the 108 total respondents 84(77.8%) of the respondents have Bachelor degree and 13(12.0%) of the respondents have Master degree and the remaining 11(10.2%) have college diploma. This demonstrates that most of the respondents were educated up to Bachelor degree.

According to the data analyzed on table 4.1, 36(33.3%), 36(33.3%), 30(27.8%), 6(5.6%) of the respondents have 1-3,4-6,7-10,11-14 years of experience on project management.

The demographic data analysis shows that most of the employees assigned on projects are male at young productive age with educational status of first-degree having project management experience 1-10 years majorly.

4.3 Level of project time management practices on bottle overhaul in-house capability development project

With regard to project scheduling management practice, respondents were requested to evaluate their organization's project scheduling management practice by choosing very poor (1), poor (2), neither (3), good (4) and very good (5) and representing their answers from 1 to 5, in which they gave 1 for (Very Poor) and 5 for (very Good) accordingly. The Questions were prepared under eight major sections and respondents results are statistically analyzed and presented below.

Cutoff point is set out to create a category on the mean values. For this research, a cutoff point is set by dividing the difference between Likert scale maximum and minimum to N. (where: N is the number of categories intended to be created). This research classifies the interval values in to three categories as low, moderate and high. Accordingly, Cutoff point= $(5-1/3) = 1.33$, which is the interval value. The three categories are calculated and listed below.

Category 1: Low (1 - 2.33)

Category 2: Moderate (2.34 - 3.66)

Category 3: High (3.67 - 5)

The measure of central tendency and dispersion for an interval scale are mean and standard deviation. Further this data set can be statistically treated with Pearsons' correlation, analysis of variance (ANOVA) and regression analysis (Ankur et al.,2015).

4.3.1 Plan schedule management practice

Respondents were requested to answer seven questioners regarding schedule management practice and the level of practice rating to all questions are presented below on descriptive statistics.

Plan schedule management practice questioners	Number of respondents	Mean (M)	Std. Deviation (SD)
The practice of using Project Management Plan to prepare schedule management plan in your company	108	3.54	0.677
The practice of formulating Project Charter to prepare plan schedule management	108	3.44	0.765
The practice of assessing enterprise environmental factors before preparing plan schedule management	108	3.39	0.593
The practice of considering organizational process assets to prepare plan schedule management	108	3.44	0.715
To what extent Expert Judgment tools and techniques is used to prepare plan schedule management	108	3.40	1.013
The degree of using Analytical Techniques	108	3.36	0.662
To what extent Meetings are used as tools and techniques	108	3.24	0.682
Average		3.40	

Source: research Survey, 2022

Table 4.2 Descriptive Statistics on plan schedule management practice Source

As it is analyzed on the table 4.2, the average mean of plan schedule management practice is 3.40. Referring the cutoff point at section 4.3, it indicates the practice of plan schedule management practice is ranked as moderate.

4.3.2 Activity definition practice

Eleven questioners were prepared and distributed to the respondents regarding activity definition and the level of practice rating by the respondent to all questions are presented below on descriptive statistics.

Activity definition practice questioners	Number of respondents	Mean (M)	Std. Deviation (SD)
The practice of using Schedule Management Plan to prepare activity list	108	3.83	0.942
The practice of using Schedule Management Plan to prepare milestone list	108	2.84	0.713
The content of scope statement, which includes the products scope description of the project deliverables and defines the product user acceptance criteria.	108	3.27	0.635
The content of work breakdown structure, which defines each deliverable and the decomposition of the deliverable into work packages	108	3.25	0.582
The content of WBS dictionary, which contains a detailed description of work and technical documentation for each WBS element.	108	3.18	0.695
The practice of using Project Charter to prepare plan schedule management	108	3.4	0.956
The degree of assessment of enterprise environmental factors to prepare plan schedule management	108	3.57	0.776
The practice of considering organizational process assets to prepare plan schedule management	108	3.2	0.770
To what extent Expert Judgment is used as tools and techniques	108	3.85	0.863
The degree of using Analytical Techniques	108	4.19	0.919
To what extent Meetings are used as tools and techniques	108	4.03	0.742
Average		3.51	

Source: research Survey, 2022

Table 4.3 Descriptive statistics on activity definition practice

According to table 4.3, the average mean of activity definition practice is 3.51. Referring the cutoff point at section 4.3, it indicates the practice of activity definition is ranked as moderate.

4.3.3 Activity sequencing practice

Respondents were requested to answer Eleven questioners which are prepared about activity sequencing practices and the level of rating of the 108 respondents to all questions presented below on descriptive statistics.

Activity sequencing practice questioners	Number of respondents	Mean (M)	Std. Deviation (SD)
The practice of using schedule Management Plan to prepare project schedule network diagram	108	3.67	1.005
The practice of using activity list to prepare project documents updates	108	2.96	0.995
The practice of using activity attributes to rearrange the sequence of the activities	108	3.92	0.898
The practice of identifying and using milestone list to prepare project documents updates	108	3.04	0.808
The practice of using project scope statement to prepare project documents updates	108	3.81	0.971
The practice of applying Dependency Determination analysis for preparing project schedule network diagram	108	3.94	1.035
The degree of enterprise environmental factors assessment to prepare project schedule network diagram	108	3.85	0.863
The practice of considering organizational process assets to prepare project schedule network diagram	108	3.59	0.928
The practice of applying Precedence diagram method (PDM)	108	3.80	1.083
To what extent Dependency Determination is applied	108	3.48	0.859
The practice of using Leads and Lags	108	3.94	0.950
Average		3.63	

Source: research Survey, 2022

Table 4.4 Descriptive Statistics on Activity sequencing practice

According to table 4.4, the average mean of activity sequencing practice is 3.63. Referring the cutoff point at section 4.3, it indicates the practice of activity sequencing is ranked as moderate.

4.3.4 Activity resource estimation practice

Thirteen questioners were prepared and distributed regarding schedule management practice and the level of rating of the 108 respondents to all questions presented below on descriptive statistics.

Activity resource estimation practice questioners	Number of respondents	Mean (M)	Std. Deviation (SD)
The practice of using Schedule Management Plan to prepare activity resource requirements	108	3.59	0.670
The practice of using Activity List to prepare resource break down structure	108	3.58	0.958
The practice of using Activity Attributes to prepare project document updates	108	3.56	0.584
The practice of using Resource Calendars to prepare activity resource estimation	108	2.26	0.951
The practice of using Risk register to prepare activity resource estimation	108	3.86	0.483
The practice of using activity cost estimates to prepare activity resource estimation	108	2.69	0.850
The practice of considering organizational process assets	108	2.84	0.799
The degree of enterprise environmental factors assessment to activity resource estimation	108	2.47	0.891
To what extent Expert Judgment is used	108	3.89	0.824
The degree of using Alternative analysis	108	3.89	0.910
To what extent Published estimating data are used	108	3.57	0.630
The degree of using Bottom-up estimating	108	3.62	0.707
To what extent Project management software is used	108	3.05	1.370
Average		3.29	

Source: research Survey, 2022

Table 4.5 Descriptive statistics on activity resource estimation practice

As per table 4.5, the average mean of activity resource estimation practice is 3.29. Referring the cutoff point at section 4.3, it indicates the practice of activity resource estimation is ranked as moderate.

4.3.5 Activity duration estimates practice

Fifteen questioners were prepared and distributed regarding schedule management practice and the level of agreement of the 108 respondents to all questions presented below on descriptive statistics.

Activity duration estimates practice questioners	Number of respondents	Mean (M)	Std. Deviation (SD)
The practice of using schedule management plan to prepare activity duration estimates	108	3.72	0.653
The practice of using activity list to prepare project document updates	108	3.39	0.734
The practice of using activity attributes to prepare activity duration estimates	108	3.60	0.669
The practice of using activity resource requirements to prepare activity resource estimation	108	3.06	0.905
The practice of using resource calendars to prepare activity resource estimation	108	3.52	0.814
The practice of using project scope statement to prepare activity resource estimation	108	3.77	0.913
The practice of using project resource breakdown structure to prepare activity resource estimation	108	3.26	0.728
The practice of considering organizational process assets to prepare activity duration estimates	108	3.34	0.751
The degree of enterprise environmental factors assessment to prepare activity duration estimates	108	3.48	0.814
The practice of applying expert judgment	108	3.20	0.770
The practice of applying analogous estimating	108	3.86	0.901
The practice of applying parametric estimating	108	4.10	0.976
The practice of applying three-point estimating	108	3.70	0.600
The practice of applying Group Decision Making Techniques	108	3.83	0.991
The practice of applying reserve analysis	108	2.79	0.821
Average		3.50	

Source: research Survey, 2022

Table 4.6 Descriptive Statistics on Activity duration estimates practice

The analysis on table 4.6 shows that the average mean value of activity duration estimate practice is 3.5. Referring the cutoff point at section 4.3, it indicates the practice of activity duration estimate is ranked as moderate.

4.3.6 Practices on developing schedule

Eleven questioners were prepared and distributed about developing schedule practice and the level of agreement of the 108 respondents to all questions presented on the below table 4.8 as descriptive statistics.

Questioners on developing schedule Practices	Number of respondents	Mean (M)	Std. Deviation (SD)
The practice of using Schedule Management Plan to prepare schedule baseline	108	3.90	0.896
The practice of using Activity List to prepare project schedule	108	3.08	0.877
The practice of using Activity Attributes to prepare schedule data	108	3.53	0.676
The practice of using Project Schedule Network Diagrams to prepare project calendars	108	3.81	0.978
The practice of using Risk register to prepare activity resource estimation	108	2.72	0.818
The practice of using activity resource requirements to prepare project management plan updates	108	3.66	0.672
The practice of using activity resource requirements to prepare project management plan updates	108	2.87	0.671
The practice of using resource calendars to prepare project document updates	108	3.79	1.005
The practice of using duration estimate to prepare project schedule	108	4.19	0.908
The practice of using project scope statement to prepare project schedule	108	4.02	0.761
The practice of using risk register to prepare project schedule	108	3.66	0.978
The practice of using resource breakdown structure to prepare project schedule	108	3.89	1.122
The practice of considering project staff assignments	108	3.84	1.185
The practice of considering organizational process assets	108	4.06	0.94
The degree of enterprise environmental factors assessment to develop schedule	108	3.59	0.684

The practice of applying Schedule Network Analysis	108	3.41	0.774
The practice of applying Critical Path Method	108	3.58	0.495
The practice of Critical Chain Method	108	2.11	0.900
The practice of applying Resource Optimization Techniques	108	4.00	0.000
The practice of applying Modeling Techniques	108	2.41	0.494
The practice of applying Leads and Lags	108	2.60	0.492
The practice of applying Schedule Compression	108	2.25	0.738
Average		3.40	

Source: research Survey, 2022

Table 4.7 Descriptive statistics on activity resource estimation practice

According to Table 4.7, the average mean value of developing schedule practice is 3.4. Referring the cutoff point at section 4.3, it indicates the practice of developing schedule is ranked as moderate.

4.3.7 Practice of control schedule

Twenty-two questioners were prepared and distributed regarding control schedule practice and the level of rating of the 108 respondents to all questions presented below on descriptive statistics.

Questioners on Control Schedule Practices	Number of respondents	Mean (M)	Std. Deviation (SD)
The practice of using Project Management Plan to prepare Work Performance Information	108	3.56	0.688
The practice of using project schedule to prepare schedule forecasts	108	2.94	0.807
The practice of using work performance data to accommodate change requests	108	3.31	0.571
The practice of using project calendars to prepare project management plan updates	108	3.24	0.639
The practice of using schedule data to prepare project document updates	108	2.88	1.15
The practice of considering organizational process assets to prepare organizational process assets updates	108	2.91	0.972
The practice of using Performance Reviews	108	3.36	0.755
The practice of using Project Management Software	108	3.59	0.684
The practice of using Resource Optimization Techniques	108	2.87	0.75
The practice of using Modeling Techniques	108	3.25	0.643
The practice of applying Leads and Lags	108	3.24	0.545
The practice of applying Schedule Compression	108	3.18	0.695
The practice of using Scheduling Tool	108	3.12	0.68
Average		3.14	

Source: research Survey, 2022

Table 4.8 Descriptive Statistics on Control Schedule Practices

As per the analysis on table 4.8, the average mean value of control schedule practice is 3.14. Referring the cutoff point at section 4.3, it indicates the practice of developing schedule is ranked as moderate.

4.4 Rating project performance of bottle overhaul in-house capability development project

Ten questioners were prepared and distributed regarding project performance and the level of project performance rating of the 108 respondents to all questions are presented below on descriptive statistics on the below table 4.9.

Questioners on Project performance	Number of respondents	Mean (M)	Std. Deviation (SD)
How is on time Completion of projects?.(A head or behind schedule completion is used to evaluate Performance Schedule Variance)	108	3.15	1.058
How efficiently are we using time?.(Efficient utilization of time is used to evaluate Schedule Performance Index (SPI))	108	3.27	1.09
How is budget utilization of projects?.(under or over our budget utilization is used to evaluate Cost Variance (CV))	108	3.19	0.9
How efficiently are we using our resources? (Effective resource utilization is used to evaluate Cost Performance Index (CPI))	108	3.25	0.929
How efficiently must we use our remaining resources? This is used to analyze Evaluation To-Complete Performance Index (TCPI)	108	3.36	0.722
The practice of what project likely to cost? .This is used to study Estimate at Completion (EAC)	108	3.21	0.978
The practice of forecasting the project be under or over budget? .This is used to examine To Evaluate Variance at Completion (VAC)	108	3.09	0.818
The practice of what will the remaining work cost?. This is used to examine Estimate to Complete (ETC)	108	3.35	0.896
Level of quality non-conformance report after the project is completed?	108	4.31	0.671
Number of accidents happened due to quality?	108	4.52	1.005
Average		3.47	

Source: Own research survey, 2022

Table 4.9: Descriptive statistics on project performance

Table 4.9 shows that the performance of bottle overhaul in-house capability development project is expressed by the mean of cost, time and quality. The average mean of this project performance is 3.47. Moreover; while rating the project performance in terms of time, cost and quality, the average mean obtained is 3.21, 3.25 and 4.42 respectively. According to the cutoff

point interval set on section 4.3, this project is considered as moderate on its overall performance. However, time(M=3.21) and cost(M=3.25) were the major determinant factors of the project performance.

4.4.1 Pearson Correlation coefficient

Pearson's correlation coefficient is the test statistics that measures the statistical relationship, or association, between two continuous variables. It is known as the best method of measuring the association between variables of interest because it is based on the method of covariance. It gives information about the magnitude of the association, or correlation, as well as the direction of the relationship.

Obilor and Amadi (2018) explored the test of the significance of Pearson correlation using the t-distribution, the z-transformation and the Statistical Package for Social Packages (SPSS). This research uses SPSS version 26 to calculate Pearson correlation coefficient.

Correlations									
		Practices Schedule Manage ment Plan	Practices of activity definitio n	Practic es of activity sequen cing	Practices of activity resources estimation	Practices of activity duration estimation	Practices of schedule develop ment	Practices of controlli ng schedule	Project perfor mance
Practices Schedule Management Plan	Pearson Correlation	1	.480**	.480**	.654**	.490**	.455**	.830**	.467*
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.015
	N	108	108	108	108	108	108	108	108
Practices of activity definition	Pearson Correlation	.480**	1	.753**	.639**	.928**	.838**	.480**	.845**
	Sig.(2-tailed)	.000		.000	.000	.000	.000	.000	.000
	N	108	108	108	108	108	108	108	108
Practices of activity sequencing	Pearson Correlation	.480**	.753**	1	.639**	.928**	.838**	.480**	.845**
	Sig.(2-tailed)	.000	.000		.000	.000	.000	.000	.000
	N	108	108	108	108	108	108	108	108
Practices of activity resources estimation	Pearson Correlation	.654**	.639**	.639**	1	.720**	.757**	.544**	.546**
	Sig.(2-tailed)	.000	.000	.000		.000	.000	.000	.000
	N	108	108	108	108	108	108	108	108
Practices of activity duration estimation	Pearson Correlation	.490**	.928**	.928**	.720**	1	.895**	.524**	.881**
	Sig.(2-tailed)	.000	.000	.000	.000		.000	.000	.000
	N	108	108	108	108	108	108	108	108
Practices of schedule development	Pearson Correlation	.455**	.838**	.838**	.757**	.895**	1	.594**	.917**
	Sig.(2-tailed)	.000	.000	.000	.000	.000		.002	.000
	N	108	108	108	108	108	108	108	108
Practices of controlling schedule	Pearson Correlation	.830**	.480**	.480**	.544**	.524**	.594**	1	.645
	Sig.(2-tailed)	.000	.000	.000	.000	.000	.002		.003
	N	108	108	108	108	108	108	108	108
Project performance	Pearson Correlation	.467*	.845**	.845**	.546**	.881**	.917**	.645	1
	Sig.(2-tailed)	.015	.000	.000	.000	.000	.000	.003	
	N	108	108	108	108	108	108	108	108

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

** Correlation is significant at the 0.01 level (2-tailed).

Source: research Survey, 2022

Table 4.10 SPSS results for Pearson’s correlation between project time management practice and project performance

Obilor et.al (2018) stated that correlation coefficients can be high or low in magnitude, and positive or negative in direction. It varies from -1 to +1: where -1 and +1 indicate perfect negative and perfect positive correlation respectively. A correlation coefficient of 0 implies no correlation which means the dependent and the independent variables has no relationship. Further, correlation coefficients lower than ± 0.40 are said to be low, between ± 0.40 and ± 0.60 are moderate, and above ± 0.60 are high. Table 4.10 shows project time management practices and project performance have high level of positive correlations.

4.4.2 Multiple linear regression analysis

The main purpose of this analysis is to know to what extent is the project performance being affected by the seven independent variables of project scheduling management practices and what measures need to be taken based on the results obtained using SPSS (C. Constantin, 2006). Regression analysis is one of the most commonly used statistical techniques in social and behavioral sciences as well as in physical sciences which involves identifying and evaluating the relationship between a dependent variable and one or more independent variables, which are also called predictor or explanatory variables (Mohamed ,2015).

Multiple regression is an extension of simple linear regression. we utilize this technique, when we want to forecast the value of a dependent variable based on the values of two or more independent variables. Multiple regression allows to determine the overall fit (variance explained) of the model and the relative contribution of each of the predictors to the total variance explained.

Independent variables are characteristics that can be measured directly; these variables are also called predictor or explanatory variables used to predict or to explain the behavior of the dependent variable.

Dependent variable is a characteristic whose value depends on the values of independent variables.

According to Julie (2005), the researcher has to check first the following assumptions such as sample size, multicollinearity, normality, homoscedasticity and linearity before proceeding to multiple regressions analysis to know they are not a problem for the researcher. The assumption of multiple regression analysis is explained and evaluated below for the data used.

4.4.2.1 Sample size

The sample size needs to have a certain size in order to domain the generalizability of the results (Pallant, 2005). A formula to calculate the required sample size is $N \geq 50 + 8m$ to test multiple correlations (where m is the number of independent variables) (Tabachnick and Fidell,1996). In this research, there are seven independent variables implying $N=50+8*7=106$. Since the sample size used in this research is 108, the requirement for generalizability is met.

4.4.2.2 Multicollinearity

Multicollinearity results from two independent variables that are highly correlated (Pallant, 2005). If either the tolerance value falls below 0.10 or the variance inflation factor (VIF) exceeds 10, there can be a concern of multicollinearity (Pallant, 2005).

Coefficients			
Model		Collinearity Statistics	
		Tolerance	VIF
1	Activity resource estimation	.260	3.844
	Develop schedule	.158	6.334
	Control schedule	.258	3.880
	Plan schedule management	.252	3.971
	Activity sequencing	.219	4.570
a. Dependent Variable: Activity duration estimate			

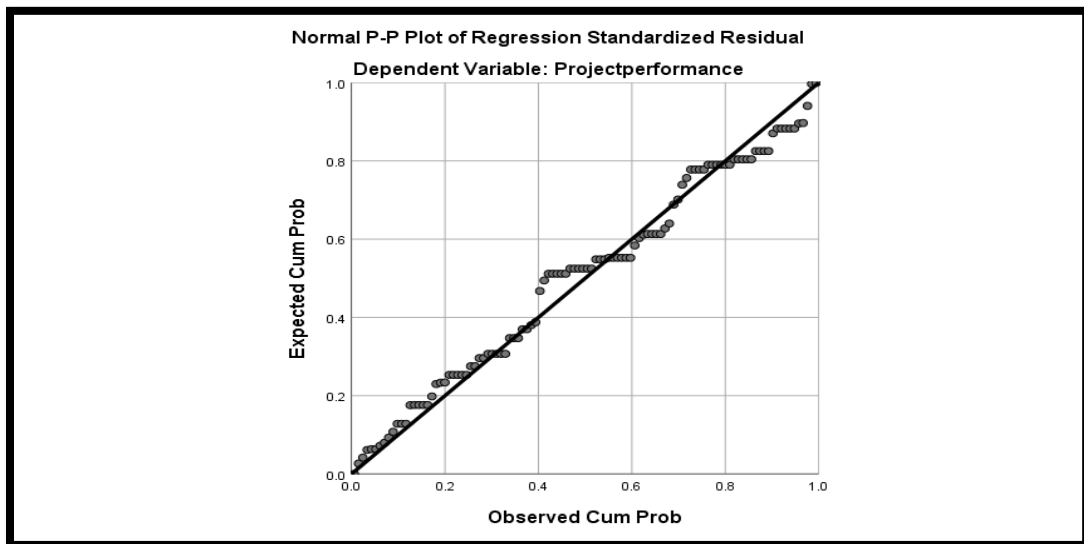
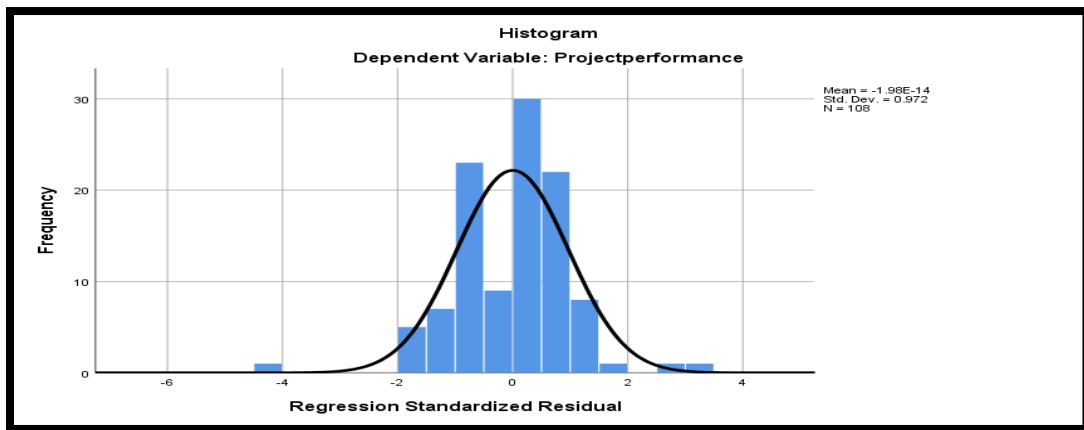
Source: Own survey 2022

Table 4.11: Multicollinearity results of independent variables

According to Table 4.11, all values of tolerance are above 0.1 and all values of variance inflation factor (VIF) are below 10. Therefore; it can be concluded that there is no multicollinearity among independent variables in this dataset.

4.4.2.3 Normality

A very significant assumption in regression is that the dependent variable is normally distributed. Normality is used to expound a symmetrical, bell-shaped curve, which has the highest frequency of scores around in the middle combined with smaller frequencies towards the extremes (Pallant,2005).



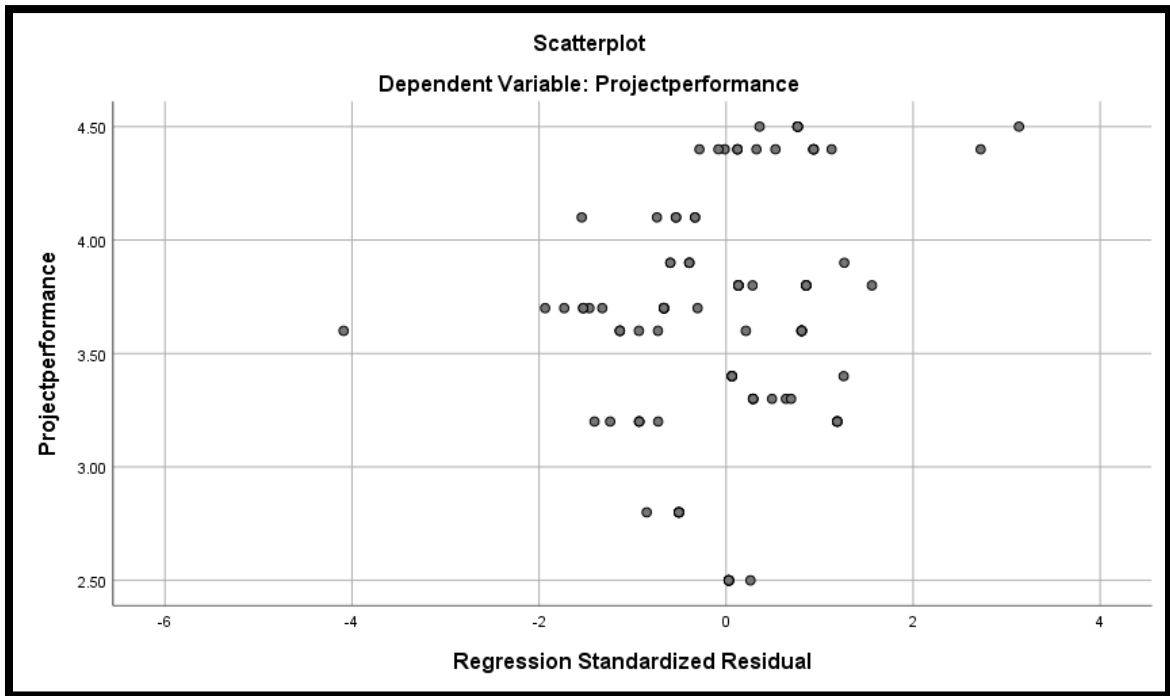
Source: Own survey 2022

Figure 4. 1: Histogram and P-P plot

The regressions in this research have project performance as the dependent variable and the visualized histogram indicates that data used in the study is normally distributed and hence the assumption of normality is fulfilled.

4.4.2.4 Homoscedasticity and linearity

Since regression models should be assumed to have a constant variance of residuals (homoscedasticity), one has to check if this assumption is met. Homoscedasticity and linearity is checked by assessing the Residual Scatterplot. The variance of the residuals was checked from the scatterplots which is a scatterplot of standardized residuals versus standardized predicted values showing no sign of funneling (Tabacknick & Fidell, 1996).



Source: Own survey 2022

Figure 4.2 1 : Scatterplot of Dependent Variable

Figure: 4.2 shows a random displacement of scores that take on a rectangular shape and most scores are concentrated around the center, with no systematic pattern showing the assumption of homoscedasticity and linearity is met (Tabacknick & Fidell, 1996). In conclusion, it can be said that the assumptions of normality, linearity, homoscedasticity, and the independence of residuals are met.

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.897 ^a	.784	.751	.11742	.784	347.625	6	101	.000

a. Predictors: (Constant), Practices of controlling schedule, Practices Schedule Management Plan, Practices of activity definition, Practices of activity sequencing, Practices of activity resources estimation, Practices of activity duration estimation, Practices of schedule development

Source: Own survey 2022

Table 4.12 Linear Regression - Model Summary

Table 4.12 provides the data required to perform the multiple regression analysis. The R value represents the simple correlation and is 0.897, which indicates a high degree of correlation. The R² value is called coefficient of determination indicates how much of the total variation in the dependent variable (project performance), can be explained by the independent variable (Project scheduling management). In this case (R²= 0.784), the independent variables explain 78.4% of the variability of dependent variable which is very large.

4.4.3 Statistical relationship between scheduling management practices and project performance

According to ANOVA test on Table 4.13, the p-value (.000^b) is less than 0.05(.000^b <0.05) which indicates project scheduling management practice has a significant effect on project performance. This result indicates the researcher to statistically check the null hypothesis for rejection.

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	28.757	6	4.793	347.625	.000 ^b
	Residual	1.393	102	.014		
	Total	30.150	108			

a. Dependent Variable: Project performance

b. Predictors: (Constant), Practices of controlling schedule, Practices Schedule Management Plan, Practices of activity definition, Practices of activity sequencing, Practices of activity resources estimation, Practices of activity duration estimation, Practices of schedule development

Table 4.13 Results for ANOVA with Project Performance as Dependent Variable and time management practice as independent variable

4.4.3.1 Effect of project scheduling management practice on project performance

The regression analysis, as described by Cooper and Schindler (2014), is a method for creating the statistical relationship between the independent and dependent variables. This relationship is established by the model:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon \dots \dots \dots \text{Eqn 4.1}$$

Where: Y= Project performance,

Xn= Project scheduling management practice

ε =The residual amount

β_0 =Constant

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.906	.130		1.585	.000
	Plan schedule management	.167	.052	.148	3.234	.002
	Activity definition	.271	.051	.244	5.013	.000
	Activity Sequencing	.087	.066	.079	1.333	.005
	Activity resource estimation	.372	.062	.253	6.035	.000
	Activity duration estimation	.815	.102	.683	7.982	.000
	Schedule development	.695	.098	.484	7.066	.000
	Control schedule	.447	.059	.379	7.539	.000

a. Dependent Variable: project performance

Source: Own research 2022

Table 4.14: Regression Coefficients

From Table 4.14, project scheduling management and project performance is related by the model equation as follows.

$$Y=0.906+0.167X_1+0.271X_2+0.087X_3+0.372X_4+0.815X_5+0.695X_6+0.447X_7+\varepsilon\dots \text{Eqn 4.2}$$

The statistical relationship between the independent and dependent variables in equation 4.2 is interpreted as follows: taking all factors into account at zero, the project performance will have a value of 0.906 and a unit increase in degree of plan schedule management, activity sequencing, activity resource estimation, activity duration estimation, schedule development and control schedule would lead to an increase by 0.167, 0.087, 0.372, 0.815, 0.695 and 0.447 respectively in project performance.

4.4.4 Research hypothesis summary

Table 4.15 illustrates all values of coefficients are positive and all p-values are less than 0.05. Therefore, the null hypothesis is rejected. This research proofed that project scheduling management practice has significant positive effect on project performance.

Effect of project scheduling management practice on project performance (Hypothesis test)	Outcome
Plan schedule management	$\beta =0.569, P=0.031$
Defining activities	$\beta =0.532, P=0.001$
Sequencing activities	$\beta =0.445, P=0.013$
Estimating activity resource	$\beta =0.370, P=0.000$
Estimating activity duration	$\beta =0.252, P=0.001$
Developing schedule	$\beta =0.261, P=0.000$
Controlling a schedule	$\beta =0.403, P=0.000$

Source: own research, 2022

Table 4.15 Summary of the overall outcome of the research hypotheses

5 Chapter Five: Summary, Conclusion and Recommendation

This chapter focused on summarizing the research findings which are discovered during the study of project time management practice on project performance in the case of bottle overhaul in-house capability development project and sets out conclusion and recommendation drawn from the research finding.

5.1 5.1 Summary

The population of this study comprehends a total 108 staffs. Out of the 108 respondents 96(88.9%) of them are male and the rest 12(11.1 %) are female. This implies there are more male employees than female on the project assignments.30(27.8%), 54(50%) and 24(22.2%) of the respondents were in the age range of 25-30, 31-36 and 37-42 respectively. This implies all of the respondents are in a productive age.32(29.6%) of the respondents are the project engineers,4(3.7%) of the respondents are project team leaders,20(18.5%) of the respondents are project supply chain management officers,22(20.4%) are Mechanics on machine installation,19(17.6%) are procurement officers and the remaining 11(10.2%) are facility planners. Concerning educational status of the respondents, 84(77.8%) of the respondents have Bachelor degree and 13(12.0%) of the respondents have Master degree and the remaining 11(10.2%) have college diploma. This demonstrates that most of the respondents were educated up to Bachelor degree. Moreover; 36(33.3%), 36(33.3%), 30(27.8%), 6(5.6%) of the respondents have 1-3,4-6,7-10,11-14 years of experience on project management.

5.2 Time management practice summary

While reviewing the effect of project scheduling management practice on project performance, the researcher found out the following results.

5.2.1 Plan schedule management practice

Regarding the effect of plan schedule management practice on project performance, the average mean (M=3.40) falls on moderate cutoff point interval (between 2.34 - 3.66, section 4.3). The major components of plan schedule management practice which affects the project performance are: to what extent meetings are used as tools and techniques(M=3.24), the degree of using analytical techniques(M=3.36), the practice of assessing enterprise environmental

factors before preparing plan schedule management (M=3.39), to what extent expert judgment tools and techniques is used to prepare plan schedule management (M=3.4).

5.2.2 Activity definition practice

Regarding the effect of activity definition practice on project performance, the average mean (M=3.51) falls on moderate cutoff point interval (between 2.34 - 3.66, section 4.3). The major components of activity definition practice which affects the project performance are: the practice of using schedule management plan to prepare milestone list(M=2.84), the content of WBS dictionary, which contains a detailed description of work and technical documentation for each WBS element(M=3.18),the practice of considering organizational process assets to prepare plan schedule management(M=3.2), the content of work breakdown structure, which defines each deliverable and the decomposition of the deliverable into work packages(M=3.25), the content of scope statement, which includes the products scope description of the project deliverables and defines the product user acceptance criteria(3.27), the practice of using project charter to prepare plan schedule management(3.4).

5.2.3 Activity sequencing practice

Regarding the effect of activity sequencing practice on project performance, the average mean (M=3.63) falls on moderate cutoff point interval (between 2.34 - 3.66, section 4.3). The major components of activity sequencing practice which affects the project performance are: the practice of using an activity list to prepare project documents updates(M=2.96), the practice of identifying and using a milestone list to prepare project documents updates(M=3.04), to what extent dependency determination is applied(M=3.48), The practice of considering organizational process assets to prepare project schedule network diagram (3.59).

5.2.4 Activity resource estimation practice

Regarding the effect of estimating activity resources on project performance, the average mean (M=3.29) falls on moderate cutoff point interval (between 2.34 - 3.66, section 4.3). The major components of activity resource estimation practices which affects the project performance are: the practice of using resource calendars to prepare activity resource estimation(M=2.26)

the degree of enterprise environmental factors assessment to activity resource estimation(M=2.47), The practice of using activity cost estimates to prepare activity resource estimation (M=2.46), the practice of considering organizational process assets(M=2.84), to what extent project management software is used(M=3.05).

5.2.5 Activity duration estimates practice

Regarding the effect of activity duration estimate on project performance, the average mean (M=3.50) falls on moderate cutoff point interval (between 2.34 - 3.66, section 4.3). The major components of activity duration estimation practices which affects the project performance are: the practice of applying reserve analysis(M=2.79), the practice of using activity resource requirements to prepare activity resource estimation(M=3.06), the practice of applying expert judgment(M=3.2), the practice of using project resource breakdown structure to prepare activity resource estimation(M=3.26), the practice of considering organizational process assets to prepare activity duration estimates(M=3.34), the practice of using activity list to prepare project document updates(M=3.39),the degree of enterprise environmental factors assessment to prepare activity duration estimates(M=3.48).

5.2.6 developing schedule Practices

Regarding the effect of developing a schedule on project performance, the average mean (M=3.40) falls on moderate cutoff point interval (between 2.34 - 3.66, section 4.3). The major components of activity duration estimation practices which affects the project performance are: the practice of the critical chain method(M=11), the practice of applying schedule compression(M=2.25), The practice of applying modeling techniques(M=2.41), the practice of applying leads and lags(M=2.60), the practice of using activity resource requirements to prepare project management plan updates (2.87), the practice of using risk register to prepare activity resource estimation (M=2.72), the practice of using activity list to prepare project schedule(M=3.08).

5.2.7 Control Schedule Practices

Regarding the effect of schedule control on project performance, the average mean ($M=3.14$) falls on moderate cutoff point interval (between 2.34 - 3.66, section 4.3). The major components of control schedule practices which affects the project performance are: The practice of using resource optimization techniques($M=2.87$), the practice of using schedule data to prepare project document updates($M=2.88$), the practice of considering organizational process assets to prepare organizational process assets updates($M=2.91$), the practice of using project schedule to prepare schedule forecasts($M=2.94$), the practice of using scheduling tool (3.12).

5.3 Project performance summary

The average mean of this project performance is 3.47. Moreover; while rating the project performance in terms of time, cost and quality, the average mean obtained is 3.21, 3.25 and 4.42 respectively. According to the cutoff point interval, this project is considered as moderate on its overall performance. The performance of this project is mainly affected in terms of time and cost wise which has a mean value of 3.21 and 3.25 respectively. However; it is ranked as high performance in terms of quality perspective($M=4.42$). This result clearly shows that the project performance is affected in terms of time and cost. It clearly indicates that there is a room and opportunity for improvement. The correlation coefficient and regression analysis between project scheduling management practice and project performance shows project scheduling management practices and project performance have high level of positive association and linear relationship.

5.4 Conclusion

The study concludes that project scheduling management practices are always significant aspect of a project and has a crucial effect on project performance. Based on the finding result of the study on bottle overhaul in-house capability development project, the below conclusions are set forth.

- The degree of using analytical techniques and extent of expert judgment tools and techniques used to prepare plan schedule management highly affected the project performance during activity definition.

- The practice of using a schedule management plan to prepare a milestone list, the content of WBS dictionary, which contains a detailed description of work and technical documentation for each WBS element, the practice of considering organizational process assets to prepare plan schedule management, the content of work breakdown structure, which defines each deliverable and the decomposition of the deliverable into work packages had influenced the project performance during activity sequencing stage.
- The practice of using an activity list to prepare project documents updates, the practice of identifying and using a milestone list to prepare project documents updates, to what extent dependency determination is applied extremely impacted the project performance during activity resource estimation.
- The practice of applying reserve analysis, the practice of using activity resource requirements to prepare activity resource estimation, the practice of applying expert judgment, the practice of using project resource breakdown structure to prepare activity resource estimation were the major factor that affected the project performance during activity duration estimation.
- The following time management practices greatly affected the project performance during schedule development: the practice of the critical chain method, the practice of applying schedule compression, the practice of applying modeling techniques, the practice of applying leads and lags, the practice of using activity resource requirements to prepare project management plan updates, the practice of using risk register to prepare activity resource estimation, the practice of using activity list to prepare project schedule
- The following time management practices greatly affected the project performance during schedule development. The practice of critical chain method, the practice of applying schedule compression, the practice of applying modeling techniques, the practice of applying leads and lags, the practice of using risk register to prepare activity resource estimation and the practice of using activity resource requirements to prepare project management plan updates.
- The practice of using resource optimization techniques, the practice of using schedule data to prepare project document updates, the practice of considering organizational

process assets to prepare organizational process assets updates, the practice of using project schedule to prepare schedule forecasts, the practice of using scheduling tool badly affect the project performance during schedule control.

5.5 Recommendation

Based on the research the conclusion, the researcher recommends ET-MRO capability development project department to contemplate the following to enhance project performance.

- It is highly recommended to use project management software. Planning and estimation, cost and schedule control, management of budget, resource allocation, collaboration and communication can easily be maintained using this tool (Joydeep,2015).
- Since the project performance is affected cost and time wise, training provision is highly recommended to the staffs.
- The practice of using modeling techniques, schedule compression, leads and lags are highly recommended
- Utilization of expert judgment tools and risk register are advised to be used at each stage of a project.

5.6 Suggestions for further Studies

Project performance is affected by deferent factors and project time management practice might not be the only contributing factor for this project to get delayed. This research only covers the effect of time management practice on project performance of bottle Overhaul capability development project. The future research should exert an effort to enlighten the effect of the remaining factors on project performance on Ethiopian airlines projects or other sectors. The researcher also recommends the future researcher to deal with the effect of project management components like skills, processes and tools (Westland,2006), project methodology techniques and project monitoring and control on project performance.

References

- Allen, D (2001). *Getting things done: The Art of Stress-Free Productivity*. New York: Viking.
- Alumbugbu, P. O., Abdulazeez, A., Saidu, I., Ola-awo, W. A., & Tsado, A. J. (2015). *Evaluation of perception of stakeholders on key performance indicators for U.B.E building projects*. Journal of Multidisciplinary Engineering Science and Technology.
- Joshi, A., Kale, S., Chandel, S. and Pal, D. (2015). *Likert Scale: Explored and Explained*. British Journal of Applied Science & Technology.
- Barkema, H.G., Chen, X.-P., George, G., Luo, Y. and Tsui, A.S. (2015). *West Meets East: New Concepts and Theories*. Academy of Management Journal.
- Baker S. L. (2004). *Critical Path Method (CPM)*. University of South Carolina, Dept. of Health Services Policy and Management Courses and Curricula, HSPM J716, 2004.
- Beleiu, I., Crisan, E., & Nistor, R. (2016). *Main factors influencing project success*. Babes-Bolyai University, Romania.
- Benedict Amade, Chimezie Henry Achaka, Emmanuel Chinenye Ubani (2013). *Effectiveness of Scheduling Techniques in the Success of Mechanical Construction Projects*. Department of Project Management Technology, P.M.B. 1526, Federal University of Technology, Owerri, Nigeria.
- Bonett, D.G. and Wright, T.A. (2000). *Sample size requirements for estimating pearson, kendall and spearman correlations*. Psychometrika.
- Cert IV Project Management (2012): *Activity Duration Estimating (Tools and Techniques)*. Line Management Institute of Training.
- Chang, A. and Nguyen, L.T. (2011). *The mediating effects of time structure on the relationships between time management behaviour, job satisfaction, and psychological well-being*. Australian Journal of Psychology.
- Constantin, C. (2006). *Sisteme informatice de marketing : analiza și prelucrarea datelor de marketing . aplicații în SPSS*. Brașov: Infomarket.
- Cooper, D.R. and Schindler, P.S. (2014). *Business research methods. 12th ed*. New York.
- Drucker, P. (2017). *The effective executive: the definitive guide to getting the right things done*. New York.
- D. Suresh, A. Sivakumar(2019).*Impact of Schedule Management Plan on Project Management Effectiveness*. International Journal of Engineering and Advanced Technology (IJEAT).

- Falqi, I. (2004). *Delays in project completion: a comparative study of construction delay factors in Saudi Arabia and the United Kingdom*. Unpublished MSc. Thesis, School of the Built Environment, HeriotWatt University.
- Federal Aviation Administration Aviation Safety Civil Aerospace Medical Institute, (2021). *Oxygen Equipment use in general aviation operations*. Oklahoma City.
- Gonzalez, V., Alarcon, L.F. and Mundaca, F. (2008). *Investigating the relationship between planning reliability and project performance*. Production Planning & Control.
- Hazar , H. H. (2014). *Time Management tools and techniques for project management*. Socioeconomic Research Bulletin.
- Hoseini, E. (2015). *Project Time Planning in Norwegian Construction Industry-An Empirical Study Master's thesis*. NTNU.
- Hyvari, I. (2006). *Project management effectiveness in project-oriented business organizations*. International Journal of Project Management.
- Wikipedia Contributors (2019). *Ethiopian Airlines*. [online] Wikipedia. Available at: https://en.wikipedia.org/wiki/Ethiopian_Airlines.
- W1 (n.d.). *Base Maintenance*. [online] MRO. Available at: <https://corporate.ethiopianairlines.com/mro/base-maintenance> [Accessed 9 Jun. 2022].
- James S. Penny packer, (2005). *Measures of Project Management Performance and Value: Center for business practices*.
- Joydeep Kundu,(2015). *Project management -an overview: Global Institute of Science and Technology, India*
- Julie P. (2005). *SPSS Survival Manual: A step by step guide to data analysis using SPSS for Windows (Version 12)*. Australia, Allen & Unwin.
- Kombo, D. K., & Tromp, D. L. (2006). *Proposal and Thesis Writing: An Introduction*. Nairobi: Pauline Publications Africa.
- Melanie Mortensen (2013). *The top five Network Migration Implementation Risks Telecom Project Managers Should Focus On*. Available at: <http://www.redonis.com>.

- Meredith, J.R., Shafer, S.M. and Mantel, S.J. (2017). *Project management in practice*. Hoboken, Nj: Wiley.
- Mohamed Ahmed Zaid (2015), *Correlation and Regression Analysis: organization of Islamic cooperation statistical economic and social research and training center for Islamic countries*. Turkey
- Mohsen Tavakol, Reg Dennick (2011). *Making sense of Cronbach's alpha: International Journal of Medical Education*.
- Mugenda, O.M and Mugenda, A.G. (2003). *Qualitative and Quantitative approaches: Research Methods*. Africa Centre for Technology Studies (ACTS) Press. Nairobi, Kenya.
- Nonis, S. A., Fenner, G. H. and Sager, J. K. (2011). 'Revisiting the relationship between time management and job performance'. World Journal of Management,
- Pallant, J. (2005). *SPSS Survival Manual: A step by step guide to data analysis using SPSS for Windows (Version 12)*. Crows Nest, NSW: Allen & Unwin.
- Parmenter, D. (2020). *Key performance indicators: developing, implementing, and using winning KPIs*. Hoboken, New Jersey: John Wiley & Sons, Inc.
- Project Management Institute(PMI) (2013). *A guide to the project management body of knowledge: PMBOK guide*. 5th ed. Newtown Square, Pennsylvania: Project Management Institute.
- The Use of Project Time Management Processes and the Schedule Performance of Construction Projects in Mexico. *Journal of Construction Engineering*.
- Oburu, A. O. (2020). *Effective project time management*. International Academic Journal of Information Sciences and Project Management.
- Osawe, C. O. (2017). 'Time management: an imperative factor to effective service delivery in the Nigeria public service'. International Journal of Development and Management Review.
- Safework Mulugeta (2019). *The relationship between project time management practices and project success*. Addis Ababa
- Tabachnick, B. G. & Fidell, L. S. (1996). *Using Multivariate Statistics*. New York, NY: HarperCollins.
- Tatjana Samsonowa (2014). *Industrial research performance management: key performance indicators in the ICT industry*. Heidelberg: Physica.

- Saunders, M, Lewis, P & Thornhill, A. (2015). *Research Methods for Business Students*. Edingburgh. Pearson
- Aboramadan, M. and Borgonovi, E. (2015)). *Performance Measurement and Management in Non- Governmental Organizations*. IOSR Journal of Business and Management.
- Obilor, E.I & Amadi E.C (2018). *Test for significance of Pearson's correlation coefficient*.
- Smith, M. (2002). *Assessing The Effectiveness Of Project Management Practices In Project-Driven Organisations*. Available at:
https://cdn.ymaws.com/www.projectmanagement.org.za/resource/resmgr/conference_proceedings_2002/01.pdf.
- Solís-Carcaño, R.G., Corona-Suárez, G.A. and García-Ibarra, A.J. (2015). *The Use of Project Time Management Processes and the Schedule Performance of Construction Projects in Mexico*. Journal of Construction Engineering.
- Wachamba E. (2009). *Determinants of Effective Monitoring and Evaluation Systems in Non – Governmental Organizations*. Nairobi, Kenya.
- Westland, J., (2006). *The project management life cycle*. London: Kogan.
- Zwikael, O., Pathak, R.D., Singh, G. and Ahmed, S. (2014). *The moderating effect of risk on the relationship between planning and success*. International Journal of Project Management.

APPENDICES

APPENDIX I: INTRODUCTION LETTER

Natanim Kassu

Addis Ababa, May-2022

RE: Request to fill out questionnaires

Dear Respondent,

Greetings!

I am a student at the Addis Ababa University School of Commerce pursuing a Master of Arts degree in Project Management currently conducting a research on the effect of project time management practices on project performance. You have been selected as one of the respondents to assist in providing the requested data and information for this project. I kindly request you to spare few minutes and answer questions. The information gathered will strictly be used only for the purpose of this study. Your identity will be kept confidential, and name shall not be recorded. Please kindly respond to all the questions honestly and truthfully.

Thank you in Advance!!

Natanim Kassu 0940283929

APPENDIX II: QUESTIONNAIRE

A. Bio-Data: Tick (X) where appropriate.

1 Gender: Male Female

2 Age: 18-24yrs 25-30yrs 31-36yrs 37-41yrs >43yrs

B. Basic Information

3. Highest level of Education you achieved?

College Diploma Bachelor’s Degree Master’s Degree

4. What is your role in the organization?

Project Engineer Team Leader Manager

5. Years of project management experience: _____

Plan schedule management practice questioners	Very Poor	Poor	Neither	Good	Very Good
The practice of using project management plan to prepare schedule management plan in your company					
The practice of formulating project charter to prepare plan schedule management					
The practice of assessing enterprise environmental factors before preparing plan schedule management					
The practice of considering organizational process assets to prepare plan schedule management					
To what extent expert judgment tools and techniques is used to prepare plan schedule management					
The degree of using analytical techniques					
To what extent meetings are used as tools and techniques					

Activity sequencing practice questioners	Very Poor	Poor	Neither	Good	Very Good
The practice of using schedule management plan to prepare project schedule network diagram					
The practice of using activity list to prepare project documents updates					
The practice of using activity attributes to rearrange the sequence of the activities					
The practice of identifying and using milestone list to prepare project documents updates					
The practice of using project scope statement to prepare project documents updates					
The practice of applying dependency determination analysis for preparing project schedule network diagram					
The degree of enterprise environmental factors assessment to prepare project schedule network diagram					
The practice of considering organizational process assets to prepare project schedule network diagram					
The practice of applying precedence diagram method (PDM)					
To what extent dependency determination is applied					
The practice of using leads and lags					
Activity resource estimation practice questioners	Very Poor	Poor	Neither	Good	Very Good
The practice of using schedule management plan to prepare activity resource requirements					
The practice of using activity list to prepare resource break down structure					
The practice of using activity attributes to prepare project document updates					
The practice of using resource calendars to prepare activity resource estimation					
The practice of using risk register to prepare activity resource estimation					
The practice of using activity cost estimates to prepare activity resource estimation					

The practice of considering organizational process assets					
The degree of enterprise environmental factors assessment to activity resource estimation					
To what extent expert judgment is used					
The degree of using alternative analysis					
To what extent published estimating data are used					
The degree of using bottom-up estimating					
To what extent project management software is used					
Activity duration estimates practice questioners	Very Poor	Poor	Neither	Good	Very Good
The practice of using schedule management plan to prepare activity duration estimates					
The practice of using activity list to prepare project document updates					
The practice of using activity attributes to prepare activity duration estimates					
The practice of using activity resource requirements to prepare activity resource estimation					
The practice of using resource calendars to prepare activity resource estimation					
The practice of using project scope statement to prepare activity resource estimation					
The practice of using project resource breakdown structure to prepare activity resource estimation					
The practice of considering organizational process assets to prepare activity duration estimates					
The degree of enterprise environmental factors assessment to prepare activity duration estimates					
The practice of applying expert judgment					
The practice of applying analogous estimating					
The practice of applying parametric estimating					

The practice of applying three-point estimating					
The practice of applying group decision making Techniques					
The practice of applying reserve analysis					
Questioners on developing schedule Practices	Very Poor	Poor	Neither	Good	Very Good
The practice of using schedule management plan to prepare schedule baseline					
The practice of using activity list to prepare project schedule					
The practice of using activity attributes to prepare schedule data					
The practice of using Project Schedule Network Diagrams to prepare project calendars					
The practice of using risk register to prepare activity resource estimation					
The practice of using activity resource requirements to prepare project management plan updates					
The practice of using activity resource requirements to prepare project management plan updates					
The practice of using resource calendars to prepare project document updates					
The practice of using duration estimate to prepare project schedule					
The practice of using project scope statement to prepare project schedule					
The practice of using risk register to prepare project schedule					
The practice of using resource breakdown structure to prepare project schedule					
The practice of considering project staff assignments					
The practice of considering organizational process assets					
The degree of enterprise environmental factors assessment to develop schedule					
The practice of applying schedule network analysis					
The practice of applying critical path method					
The practice of critical chain method					
The practice of applying resource optimization Techniques					
The practice of applying modeling					

techniques					
The practice of applying leads and lags					
The practice of applying schedule compression					
Questioners on Control Schedule Practices	Very Poor	Poor	Neither	Good	Very Good
The practice of using project management plan to prepare work performance information					
The practice of using project schedule to prepare schedule forecasts					
The practice of using work performance data to accommodate change requests					
The practice of using project calendars to prepare project management plan updates					
The practice of using schedule data to prepare project document updates					
The practice of considering organizational process assets to prepare organizational process assets updates					
The practice of using performance reviews					
The practice of using project management software					
The practice of using resource optimization Techniques					
The practice of using modeling techniques					
The practice of applying leads and lags					
The practice of applying schedule compression					
The practice of using scheduling tool					
Questioners on Project performance	Very Poor	Poor	Neither	Good	Very Good
I. How are we doing time wise? The use of schedule Analysis & Forecasting					
How is on time Completion of projects?.(A head or behind schedule completion is used to evaluate Performance Schedule Variance)					

How efficiently are we using time?.(Efficient utilization of time is used to evaluate Schedule Performance Index (SPI))					
II. How are we doing cost-wise? The use of Cost Analysis & Forecasting					
How is budget utilization of projects?.(under or over our budget utilization is used to evaluate Cost Variance (CV))					
How efficiently are we using our resources? (Effective resource utilization is used to evaluate Cost Performance Index (CPI))					
How efficiently must we use our remaining resources? This is used to analyze Evaluation To-Complete Performance Index (TCPI)					
The practice of what project likely to cost? .This is used to study Estimate at Completion (EAC)					
The practice of forecasting the project be under or over budget? .This is used to examine To Evaluate Variance at Completion (VAC)					
The practice of what will the remaining work cost?. This is used to examine Estimate to Complete (ETC)					
III. How are we doing on quality?					
Level of quality non-conformance report after the project is completed?					
Number of accidents happened due to quality?					