



# **Role of Acquiring Turnkey System for Project Success of Telecom Expansion Program: The Case of Ethio telecom**

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**Advisor:  
Abraraw Chane (PhD)**

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

**Addis Ababa University  
College of Business and Economics  
School of Commerce**

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## STATEMENT OF DECLARATION

I, Yiheyis Takele, declare that this project work entitled “**Role of Acquiring Turnkey System for Project Success of Telecom Expansion Program: The Case of Ethio telecom**” is my original work and has not been presented for any previous degree in any other University. And all the sources of materials used for the thesis have been duly acknowledged.

Yiheyis Takele Dagne

Name (Candidate)

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Signature

\_\_\_\_\_

Date

This is to certify that the above declaration made by the candidate is correct to the best of my knowledge.

Abraraw Chane (PhD)

Advisor

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Signature

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Date

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## **Abstract**

*Telecom services have advanced from times to time and now, nothing seems possible without telecom services. Satisfying the ever increasing customer demand is challenging and hard to fulfill the need. Ethio telecom is the only telecom operator in Ethiopia and responsible to deliver all type of telecom services nationwide. Accordingly, Ethio telecom has launched Telecom Expansion Program to deploy state of the art technology and to expand existing infrastructure at large. The program encompasses different technical domain projects and executed using turnkey project approach. The purpose of this study is to explore the role of Turnkey procurement system on project performance of telecom expansion program of Ethio telecom from schedule, budget and quality perspective. According to the result of this study, lack of exhaustive project planning, execution, and internal and External factors has triggered project schedule delay and budget variation significantly. The main findings reveal that there is a relationship between turnkey procurement system and project performance. The target population for the study was taken all the 49 Telecom Expansion Program participants who were involved in the program. The study was a descriptive research type and used questionnaires and interviews to collect the required data. The data were analyzed using Statistical Package for Social Sciences (SPSS) version 26. The findings of the study are of great importance for future projects in the company and fill the gap of empirical evidence in Ethio telecom. The study suggested that: before project commenced detail and exhaustive planning should be done and factors that affect project performance should be scrutinized. The study recommends that further research should be carried out to establish the role of turnkey procurement system on other project performance indicators such as stakeholder satisfaction, Knowledge transfer and Return on Investment (ROI).*

**Key words:** Turnkey procurement, Project performance, Ethio telecom

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## **Acronyms and Abbreviations**

2G: Second Generation wireless telephone technology

3G: Third Generation mobile communications

4G: Fourth Generation mobile communications

DB: Design – Build

DBB: Design – Bid – Build

EPC: Engineering, Procurement and construction

FBB: Fixed Broad Band

FLNGN: Fixed Line New Generation Network

GTP: Growth and Transformation Plan

IP: Internet Protocol

IT: Information Technology

KPI: Key Performance Indicator

LTE: Long Term Evolution

MBH: Microwave Backhaul

OF: Optical Fiber

OTN: Optical Transport Network

PMI: Project Management Institute

RAN: Radio Access Network

ROI: Return on Investment

SD: Standard Deviation

TEP: Telecom Expansion Program

TPA: Traditional Procurement Approach

## CHAPTER 1: INTRODUCTION

In this section background of the study, background of the organization, statement of the problem, the research question, research objectives, significance of the study, scope and limitation of the study discussed.

### 1.1. Background of the study

The turnkey system has been used for a long time when the project has a high level of complexity and there is a well-defined scope on behalf of the owner (Ghadamsi,2016;). In recent years it has been used indiscriminately in contractual processes of IT projects regardless of size, complexity and scope. Turnkey system integrates design and construction part and offers better performance in time and cost and results in lesser defects (Adnan & Rosman ,2018). Turnkey project has become a common practice in telecommunication industry (Ahola et al. 2018).

Successful projects are those which are delivered on time, within approved budget and to the required quality (Atkinson, 1999). The inability to complete projects on time and within budget continues to be a prolonged problem worldwide (Mahgoub,2019).

Turnkey project is a project delivery method in which the design and construction services are done by a single consortium known as the design–builder (Adnan & Rosman, 2018). The turnkey project usually involves the development and design, the production, and the delivery and installation of the project (Syeduzzaman et al. 2018). In a turnkey project, the supplier takes on complete responsibility for the adherence to delivery dates, the scope, and the cost of the entire project delivery. It meaningfully shortened project delivery time by overlapping design phase and construction phase of a project (Ghavamifar,2009).

However, turnkey project provides a better performance in time, budget and quality; telecom expansion program of Ethio telecom delayed from the planned date and incurred additional budget to complete the project (TEP closure report 2016). Hence the objective of this study is to explore the impact of turnkey system on project performance of telecom expansion program of Ethio telecom from schedule, budget and quality angle.

This study is important as it provides significant inputs for the future telecom expansion projects by identifying factors which causes schedule slippage and budget overrun and recommend possible ways to mitigate those sources of schedule and budget overrun.

The study also serves as an input for future researches focusing on turnkey procurement system and its impact on other project success measurements.

## **1.2. Background of the Organization**

Ethiotelecom, is a state owned telecommunication service provider in Ethiopia, to carry out a mission of providing telecom services for all citizens equitably. Ethiotelecom is sole operator in the country who deliver variety of telecommunication services all over the nation: Fixed voice, Fixed broad band (FBB), mobile services (2G,3G,4G /LTE), data services and, internet services to its customer (Adam, 2012).

The increasing customer demand and advancement of communication technology has driven Ethiotelecom to expand and deploy new state of the art telecom infrastructure all over the nation. In line with this Ethiotelecom has launched the first Telecom Expansion Program (TEP) which was part of The Federal Democratic Republic of Ethiopia (FDRE) Growth and Transformation Plan I (GTPI) TEP charter (2013).

The program mainly targeted to solve the coverage, capacity and quality challenges of service provisioning in the nation. The planned out lay of the program was to be covered by vendor financing strategy with a turnkey project basis. The overall project was planned to be completed within two years TEP charter (2013).

TEP's main objectives were:

- To expand mobile network capacity from 20 million to 56 million subscribers
- To cover 85% of the geographical area of the country via 2G mobile signal
- To provide 6M+ capacity wireless Broadband service
- Expand and improve Backbone transmission network capacity and reliability by deploying new optical fiber cable and installing 40Gx40λ capacity fully meshed optical transmission network (OTN).
- Develop sustainable and reliable power system for each network elements
- Swap old legacy network equipment

### **1.3. Statement of the problem**

Telecommunication services have advanced from time to time and now, nothing seems possible without telecom services. However, with all the efforts telecom service providers are striving for; it is not found to be easy to provide required service types and quality to the ever growing demand of consumers. In order to satisfy customer demand and achieve company objectives, Ethio telecom was undertaking different telecom expansion projects. In line with this, Ethio telecom has established a Program Management Office led by program director to accomplish telecom expansion projects on turnkey basis with different vendors/contractors TEP charter (2013).

Turnkey projects can be defined to be those wherein a contractor is contacted to design, manufacture, transport, install, and start up a facility for an owner.

Turnkey projects also can be defined as a project delivery method during which a single organization prepares the design and carry out construction of a project. This kind of project can substantially shorten project times. Yet, if the schedule is not being managed properly, delay is very common in this procurement system (Yau & Yang 2012).

Adnan & Rosman (2018) stated that turnkey project is an alternative to the traditional design and built system as this type of project may occur when the owner requires external expertise and so allows the entity to turn over the keys at the end of the project. Turnkey projects shift responsibility from the customer to the contractor (Cova et al. 2002). One key advantage of turnkey project is the opportunity to integrate the design and construction components.

The Telecom Expansion Program (TEP) has faced scope change, schedule change and budget variances that affected the overall performance of the project. There was a delay in project closing date due to scope and requirement change after contract signature (TEP closure report 2016). Usually in turnkey projects, scope changes are minimal and the basic nature of turnkey project is fixed price and limited project time (Kostecka & Deaconu, 2016).

The project delay has affected the goals and objectives of the company in delivering quality of service, satisfying customer demands and achieving the government plan in the industry.

As the expansion project was carried on turnkey basis it should be completed within planned time, fixed price and up on specified scope.

There are a number of studies available worldwide which shows the effect of turnkey system on project performance respected with time, price, and scope constraints but no specific empirical study found on the topic in Ethio telecom. Hence, this study has attempted to show the role of turnkey procurement system on project performance of Ethio telecom and fill the gap of empirical evidence in Ethio telecom. Moreover, it also revealed the effect of project planning and scoping on performance of telecom expansion projects in Ethio telecom.

According to Ethio telecom internal audit report (2016), some of telecom expansion projects did not meet project performance requirement as they did not conform to scope, time and budgetary requirements. Some of the projects has incurred additional budgets and were not completed on time and some changed their initial scope which in turn affected the project implementation plan (PIP). Project delayed and unable to close projects on intended time (TEP closure report 2016).

We concluded that turnkey procurement had an effect on project performance of telecom expansion projects. The main purpose of this study was to relate the impact of turnkey procurement system on schedule, budget and quality performance of telecom expansion project in Ethiopia which was part of the Ethiopian Growth and Transformation Plan (GTP I) targets in telecommunication sector.

#### **1.4. Research questions**

The study sought to explore the following research questions:

1. What is the impact of turnkey procurement system on schedule performance of Telecom Expansion Project in Ethio telecom?
2. What is the impact of turnkey procurement system on budget performance of Telecom Expansion Project in Ethio telecom?
3. What is the impact of turnkey procurement system on quality performance of Telecom Expansion Projects in Ethio telecom?

## **1.5. Research objectives**

### **1.5.1. Main Objectives**

The main objective of the study was to explore the impact of turnkey procurement system on project performance of Telecom Expansion Project in Ethio telecom.

### **1.5.2. Specific Objectives**

The specific objectives of the study were:

1. To establish the impact of turnkey procurement system on schedule performance of Telecom Expansion Project in Ethio telecom.
2. To establish the impact of turnkey procurement system on cost performance of Telecom Expansion Project in Ethio telecom.
3. To establish the impact of turnkey procurement system on quality performance of Telecom Expansion Project in Ethio telecom.

## **1.6. Scope of the study**

This study sought to establish the impact of turnkey project on project performance of telecom expansion program in Ethio telecom. Under Telecom Expansion Program (TEP) there were two domain of projects, Network domain and IS domain projects TEP charter (2013). This study has focused only on Network domain projects named, wireless project, backbone transmission project fixed access network project and IP core network project. The study targeted program director, program managers, Project managers, network functional managers and coordinators who participated in the expansion project from inception to closing in Addis Ababa. There are several practices and challenges that influence the performance of turnkey projects in developing countries. Thus, the main focus of this study was to relate the impact of turnkey procurement system on project performance in telecom expansion program in Ethio telecom.

## **1.7. Limitation of the study**

To the best of my knowledge there is no prior study focuses on turnkey project practices and impacts on project performance in telecom sector in Ethiopia that can help strengthening the study findings. In addition, most of project management office team members returned to their functional offices and are working in a tight schedule and routine

operational activities, this made data collection difficult and lengthen data collection period. To mitigate this limitation, the researcher kindly convinced the respondents to fill and return the questionnaires. Since the project was closed in the year 2015 G.C, and vendors and subcontractors were returned to their country, it is not possible to get their view about the overall project performance.

### **1.8. Organization of the Study**

This project work is organized in five chapters, Chapter one provides background of the study, the problem statement, the study objectives, the research questions, significance of the study, scope of the study and limitations of study. Chapter two focuses on review of related literature on turnkey projects, which covers both theoretical and empirical literature and conceptual framework presented. Chapter three covers the research approach and methodology to achieve the research objective of the study. The Analysis of findings and discussion part are included in chapter four. The last chapter provides conclusions and recommendations based on the research findings.

## **CHAPTER 2: LITERATURE REVIEW**

### **2.1. Introduction**

This chapter presents and explores the study of theoretical literature reviews related with turnkey project, project performance and impact of turnkey projects on project performance. There are various elements that determine project success, but this study focuses on the three critical parameters of project performance i.e. time, cost and quality.

### **2.2. Theoretical Review**

Telecommunication technology has advanced rapidly over the past century and become an essential part of the world we live in today. The global telecommunications marketplace has changed dramatically, with users now having an expectation of connectivity regardless of their location to carry on their business seamlessly (Cheng et al. 2003).

Today telecom industry changes radically due to globalization, changes in market structure, technological development and regulatory practices (Curwen & Whalley 2004; IBM 2010; Ernst & Young 2010). The telecom industry is described by extreme competition and industry players are revising their positions and participation in the value network (Bain & Company 2010; ITU 2012).

Consequently, voice and data service demand in Ethiopia also increasing rapidly. And as the demand for telecom service and capacity continues to grow all over the nation, huge network expansion and upgrading needed in each network domain.

The ever increasing needs and wants of telecom services were the driving forces to Ethio telecom to expand and upgrade its network and deploy state-of-the-art technology in all network domains to fulfil customer needs (TEP closure report 2016). Mobile or wireless network(2G,3G,4G), wired or fixed access network (voice, FBB, data), Backbone transmission network (backbone fiber and OTN) were projects carried on during telecom expansion program TEP charter (2013).

There are different project contracting options available and followed by different companies. Among those options and commonly used ones are Design – Bid – Build (DBB), Design – Build (DB) and Engineering, Procurement and construction (EPC)/

Turnkey (Nitin, 2010). Each option has its own advantage and disadvantage regarding schedule, cost, scope, risk, roles and responsibilities.

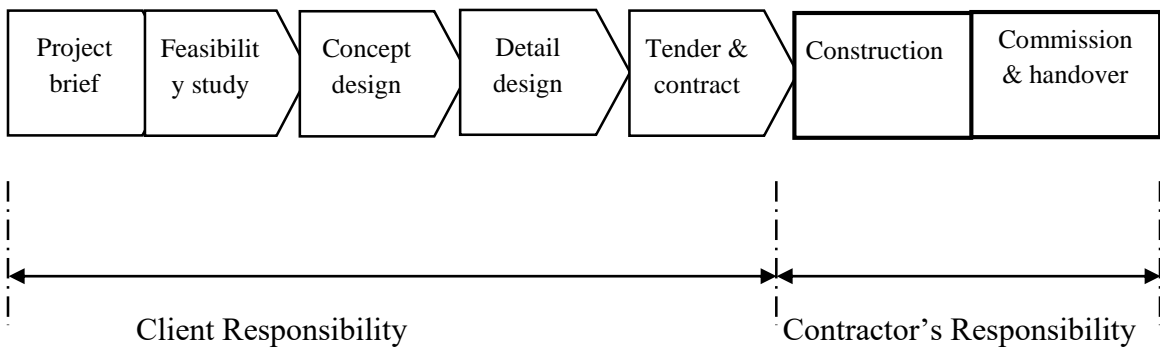
According to Joseph (1997), the methods of contracting can be divided into two broad categories: design-bid-build, which separates the design and construction activities, and design-build, or turnkey, which integrate the design and construction part.

### 2.3. Design – Bid – Build (Traditional contracting)

This method splits the design part and the construction part in to two. It is a project delivery method in which the client/owner contracts the design part and construction part autonomously to distinct entities (Ghavamifar, 2009). Under this system the complete design has to be prepared by the designers before tender and construction activities take place (Abdul Rashid et al. 2006). It is sometimes called sequential or multiple responsibilities contracting system. This method consists of three successive phases; design phase, bidding phase and construction phase.

In this method of contracting the client’s architect or engineer is responsible for the design part and contractors are primarily responsible for construction only (Ghadamsi & Braimah,2012). Occasionally client may outsource some design work to external design specialists, but this can raise difficult questions of design responsibility. In DBB method, the client produces a detailed requirement and design of the project’s output which will be awarded to the contractor through bid under competitive tendering (Okunlola et al. 2011).

**Fig 2.1** Traditional Procurement system process

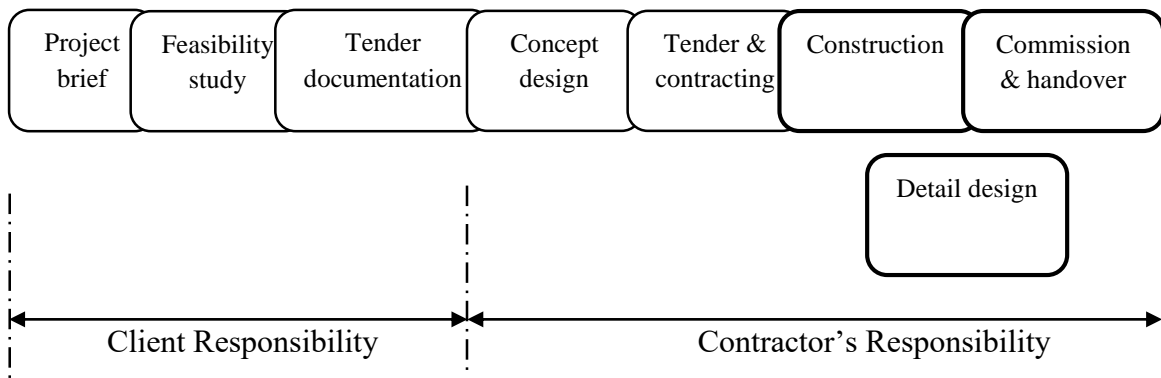


Source: (Abdul Rashid,2006)

## 2.4. Design – Build

This method, integrates the responsibilities of design and construction of the project (Ashworth, 2001). It is a project delivery method in which the design and construction services are done by a single consortium known as the design–builder (Abdul Rashid et al. 2006). It is also called single responsibility procurement system whereby the client will only need to deal with a single organization for both the designing and constructing of the project (Seng & Yusof 2006). Hence, the contractor will be responsible both for the design and construction teams. The method depends on a single point of responsibility contract and minimizes the client/owner risk (Ghadamsi,2016). It enables to reduce delivery time by overlapping design phase and construction phase of a project.

**Fig 2.2** Design and Build Procurement system process



Source: (Abdul Rashid, 2006)

Ethiotelecom uses different project contracting approach based on project type, project scope, volume of work, implementation difficulties and technology advancements. As telecom expansion projects scope were wide-ranging, expansion and upgrading work was all over the country and also communication and IP technologies are hi-tech and dynamically changing, it was difficult to use Design – Bid – Build/traditional contracting methodology. Hence Ethiotelecom followed turnkey contracting approach to realize telecom expansion projects.

## **2.5. Turnkey contract**

Turnkey contracts are contracts in which purchaser, on completion, turns a key in the door and everything is working to full operating standards (Syeduzzaman et al. 2018). Consequently, turnkey contractors have responsibility for the project's design, construction and commissioning phases (Abdul Rashid et al. 2006).

The basic notion in a turnkey contract is that the contractor will deliver the works to the client ready for use at the agreed price and by a fixed date (Global Negotiator ,2019).

Under this strategy customer usually prepares a statement of requirement, technical specifications and a scope document which becomes the strict responsibility of the contractor to deliver. In turnkey contract, the client's jobs are limited to those of inspection, payment and make sure that the works meet their performance guarantees hence the client does not require to keep an engineer in the traditional sense during construction phase (Nitin 2010; Okunlola et al. 2011).

Turnkey project is a type of construction contract where all the target projects of this study are employed in. Turnkey contract has so many constraints and risks that distinguish it from other project contract types (Wood & Ellis, 2003). Thus it is prudent to consider what impacts it will have on project performance from the three main project management constraints point of view, time, cost and scope.

Turnkey project is also a project in which contractor finalizes the entire project on behalf of customer; the contractor hands over the keys to the buyer at completion (Syeduzzaman et al. 2018). Nowadays many Ethio telecom expansion and new build projects are turnkey based projects (Ethio telecom annual report 2019).

The turnkey contract typically includes the entire process of design, construction, commissioning and operation of facilities. In some situations, the contract includes the maintenance of facilities by the contractor for a term lasting beyond the retention period (Greenwood, 1988). The extended maintenance period helps to client operation and maintenance personnel to acquire the required knowledge through experience sharing and on job training (OJT) to operate the system.

In a turnkey project the role of the client is severely limited and the ability of the client to make any changes other than a formal contract variation is almost non-existent (Merna & Smith ,1990 as cited in Kostecka & Deaconu ,2019). The contractor has much greater multidisciplinary responsibilities and has to coordinate along the supply chain and across a series of project phase interfaces. According to (Kostecka & Deaconu ,2019) The project manager's responsibility in a turnkey project is to evaluate and monitor the contract's activities which are necessary to keep the project on track.

In turnkey project, the client prepares a project proposal, requirement and project scope document which is often handed over to the contractor and is expected to produce the project in accordance with the standards set by the company with which they are contracted (Ofosu & Owusu 2013; Kostecka & Deaconu ,2019). The basic concept is that, in a turnkey contract, the contractor shall ensure that the works are ready for use at the agreed price and by a fixed date.

In a turnkey project, the supplier/contractor takes full responsibility for the delivery dates, the scope and the cost of the entire delivery to the customer (PMI, 2018). The customer thus is not affect by any risks inside the project and the result of the project is covered by a single agreement (Mohammed Zakaria Ghareet al. 2011). Turnkey projects are typically very complex, comprise development and design, the production and supply and putting of the project in place.

The main difference b/n traditional contract and turnkey contract type is that: In turnkey contract once the contractor receives detail requirement, specification and scope document from customer it is contractor's sole responsibility to design, forecast possible risks, determine contract price, construct, and handover the project to the client (Mohammed Zakaria Ghareet al. 2011). In addition, project monitoring and evaluation, project follow-up and communication methodology should be established at the commencement of the project.

As per (Cova et al. 2002) contractors' responsibilities in a turnkey project may include the conclusion of the component, responsibility for developing innovative and productive practices, and responsibility to make sure that the project is successfully delivered to the

client according to the time, cost, and scope objectives set, and also fits the customer's own processes and ultimately, creates value for the customer.

Turnkey projects involve delivery of an entire system and therefore the construction organization is usually involved in the early specification phase of the project, project negotiations, project set up, forming strong financial and relational positions within the business environment, and passing over the completed system to the customer (Cova et al. 2002).

Furthermore, turnkey projects also require a combination of Financing, Design, Construction, Manufacturing, Installation, finished system operation, Training of the buyer's staffs to operate the system, Warranty period and Guarantee of the whole system (Brady et al. 2005).

## **2.6. Risk in turnkey projects**

There are different types of risk factors in turnkey projects which affect time, quality and cost of the projects (Wood & Ellis, 2003).

### **2.6.1. Internal Risk Factors**

The following are common internal risks in turnkey projects: client interference; disagreement on job allocation, incompetence of design team appointed by contractor, incompetence of nominated sub-contractors, unreasonable demands and variation by clients after the work is completed; insolvency of the client after the handover of the projects; poor project relationship between parties involved; pressure to perform because of short construction period (Adnan & Rosman ,2018).

### **2.6.2. External Risk Factors**

Security problems; communication barriers among the parties involved; force majeure; social disorder and cultural problem are some of the external risk factor result in time, quality and cost overrun.

According to Dey (2009), one of the most important tasks for the construction industry is risk management as it affects the project outcomes. Proper risk management procedure avoids the occurrence of possible events that may threaten the project. Understanding the nature and cause of project risks and knowing how to handle them is very crucial for

projects to be successful (Sivagami and Sarath, 2018). In addition, risk management is important in ensuring that projects are often completed successfully. A project is considered successful when it is completed within budget, ahead of schedule, and satisfies the pre-defined objectives set by the client/ owner. And achieving those goals usually means that the project team was ready counteract, minimize, or eliminate risk (Adibi, 2007).

Turnkey projects must implement the process of protecting all force majeure risks and conduct detailed feasibility studies before beginning the project. All involved parties in the project must have alternatives or actions that must be taken in order to minimize risks. According to Peng (2012), proper risk avoidance will have a better control to the overall outcome of the project.

Based on different writings turnkey projects have an advantage over traditional method with respect to time, cost and quality successes.

## **2.7. Effect of turnkey procurement system on project performance**

After having considered the concept and the working process and procedure of turnkey project procurement systems, let us look into the broad effect of the system on project performance. This study mainly focuses on the three critical project performance parameters – time, cost and quality.

- **Time:** As turnkey procurement system integrates the design and construction part; it is called “build-it-fast” project delivery system. The system allows the design and construction process run almost in parallel and simultaneously to each other, thus reducing the overall project development period significantly. As a single responsible for both the design and construction, the contractor is able to control the construction time and also the time and the design of the project, thus minimizing the total contract duration. In this type of procurement system, the contractor has been selected based on its experience, knowledge and competency in construction, as such by giving it the design responsibility, the contractor very often able to reduce construction time (Abdul Rashid et al, 2006).
- **Cost:** Though the turnkey contract cost is fixed at the tender stage and is subject to design changes, it is often higher than the traditional form of contracting. Since cost estimations are prepared without a detailed breakdown during tender, has made the

contractors to increase the price to allow for many uncertainties. The reason for this is that once accepted, the tender price will be the final contract sum. The price is subject to change when there are variations required or instructed by the client. The substantial cost saving in this type of procurement system is made through the reduction of overall project development period

- **Quality:** The contractor can use his knowledge and experience to develop a much more compacted and coherent work program, as well as a more efficient design and project control program, by combining design and construction. Simultaneously, it allows the contractor to be creative in order to improve the construction process and techniques, resulting in higher quality work and processes.

## **2.8. Project Performance**

Before a project begins, the goals for the project need to be determined and need to understand how project sponsors and key stakeholders will determine if the project is successful or not. Traditionally, a project is considered to have achieved a high level of performance if it is accomplished on time, within budget, good quality level and provides high level client satisfaction (Ghadamsi & Braimah,2012). According to Bryde and Brown (2004) the traditional distinction between good and poor project performance focused on satisfying cost, time and product quality related criteria.

Project success can be measured in many ways including if it was completed on time, on or under budget, improved customer service and a combination of these or other factors. From project management view, it is all about fulfilling or exceeding stakeholders' needs and anticipations from a project.

A collection of quantifiable metrics used to gauge and compare project success in terms of achieving both strategic and organizational goals are known as project performance indicators. Key Performance Indicators (KPIs) are the most relevant indicators (KPI). Key performance metrics are important in deciding whether a project's activities are successful or not. Key performance indicators means factors by reference to which project progress, performance or position can be measured effectively. Without KPIs, determining the success of projects and project activities is an assumption, with no way to quantify goal

attainment. Project performance should be measured with respect to specified schedule, approved budget, quality, and stakeholder satisfaction (Berssaneti & Carvalho, 2015).

A performance measure is a metric which is used for quantifying the effectiveness and efficiency of action (Cruz et al.2020). A project performance measurement generally involves identifying a balanced set of measures, measuring what matters to stakeholders and users. KPIs are metrics used by organizations to track the success and guide their progress toward specific strategic objectives. KPIs are measurable and controllable. Kerzner (2017) stated that a KPI's most crucial characteristic is that it is actionable.

The most common project performance KPIs are: Cost, schedule and quality.

### **2.8.1 Cost Performance**

The overall cost that a project incurs from inception to completion is an overall project cost. One of the key aspect concerns cost predictability is that whether the final overall cost is in line with the initial cost estimate (Swan and Khalfan,2007). How much the actual budget differs from the projected budget. Costs must be monitored and managed during the project lifecycle to ensure that the project is completed within planned budget. Organizations may reduce financial risk and likely lower their cost of capital by accurately predicting cost efficiency. According to Sunindijo (2015), Cost performance are often affected because of poor project planning, poor cost estimates, and inefficient cost control mechanisms that causes budget revision.

### **2.8.2 Schedule performance**

Schedule performance is defined as meeting the duration baseline in the initial planning process of the project. Time overruns occurs when there is an extension of time beyond planned completion dates traceable to the major stakeholders (Kaming et al. 1997). Project duration is basically the time needed from start to completion of the project. Since time is a very important issue for many clients, project duration is often of prime interest. Keeping deadlines is one of the criteria for success on projects. If a project goes beyond estimated time, it also often exceeds the budget. Successful projects naturally create budget and schedule milestones so costs and timelines can be monitored against project

implementation plan(PIP) during the project lifespan. Scheduling is one of the key factor that influences project performance.

### **2.8.3 Quality performance**

Quality is about satisfying the aesthetic, functional, and legal requirements of the project and project results. It is a critical dimension of project performance. Quality is related to how the final product and its function fulfil the specification (Chan & Chan 2004, Collins & Baccarini, 2004). If a completed project fulfils the stated specification, quality is accomplished. Quality is commonly related to customer satisfaction, which is described as a comparison between the customer's before purchase anticipations and their after purchase perception. Hence, it comprises customer's feeling about whether the output provided as a satisfying or dissatisfying experience (Forsythe,2007).

**Number of Errors:** How often things need to be rework and redo during the project, which causes budget and schedule revisions. It's good to segment projects into phases so as to evaluate project quality while there's still time to make adjustments before you get to the end. A quality review of final project deliverables and project management practices is also important for many organizations.

### **2.8.4 Project Success**

A project is commonly recognized as successful when it is completed on time, within budget, and as per the specifications (Atkinson, 1999). Many factors impact the degree of project success. Project success referred as meeting or exceeding stakeholder needs and expectation by balancing competing demands among:

- Scope, time, costs, quality.
- Stakeholders with different needs and expectations.
- Identified requirements (needs) and unidentified requirements (expectations).

According to Müller & Kam (2012), The two components of project successes are:

1. Project success factors (independent variables), are the elements of a project which, when influenced, increase the likelihood of success; such as stakeholder, risk and quality management.

2. Project success criteria (dependent variables), are the measures used to judge on the success or failure of a project, which includes cost, scope and time.

Traditionally project success measured by time, budget, and requirements criteria. Despite the very fact that this manner of measuring project success is currently subject to widespread criticism, these criteria remains often used in publications on project success in IT projects (Royal Academy of Engineering, 2004).

Budget limits, setting time and defining the requirements always take place at the early planning stage of the project, when ambiguity is at maximum (Pinto,2007). According to Chandra (2009), a project is said to be successful when it meets the timeline, within the budget and fulfill the requirements established by customer.

## **2.9. Schedule overrun**

As per Alkhatami (1997) cited by Mukuka (2015), schedule overruns defined as additional time required to complete a given construction project beyond its original planned duration, whether compensated for or not. Schedule overrun occur when the project is not completed as planned and took more time to complete. It is basically a project slipping over its planned schedule and is considered as common problem in construction projects worldwide. Project schedule set during planning phase and it is done based on assumption of activities duration which might cause scheduling flaws. Schedule overruns are often very negative since they hamper the client to start using the final product as planned (Assaf and Al-Hejji, 2006)

### **2.9.1. Causes of schedule overrun**

There are many causes of delay related to owner involvement, contractor performance, and the early planning and design of the project. Important causes are financial problems, changes in the design and scope, inadequate planning, and resource shortages, delay in making decisions and approvals by owner, difficulties in obtaining work permit, and coordination and communication problems (Assaf & Al-Hejji, 2006). According to Chan & Kumaraswamy (1997), the five primary schedule delay factors are: poor risk management and supervision, unpredicted site conditions, delay in decision making, client-initiated changes, and work variations. Planning tight schedules for a complex turnkey projects also one of the reason for Schedule overrun.

### **2.9.2. Effects of schedule overrun**

Schedule Overrun create customer dissatisfaction due to delay of project deliverable. It also extends return on investment period to customer by extending product deliverable time which generate revenue for the customer.

### **2.10. Cost overrun**

Cost overrun is the amount of project cost spent to complete the project exceeds the amount of planned project cost. It is a difference between the project closing cost and planned project cost (Shanmugapriya & Subramanian, 2013). Cost overrun is an instance in which the provision of contracted item or service require more financial resources than originally agreed contract between client and contractor.

#### **2.10.1. Causes of cost overrun**

The main factors influencing cost overrun are inaccurate material estimation, material cost increase due to inflation and degree of complexity (Assaf & Al-Hejji, 2006). According to Fageha & Aibinu (2013), poor project planning and inadequate scope definition can lead to expensive changes, project delays, rework, cost overruns, schedule overruns, and project failure. Wrong cost estimation during planning phase could be one of the reason for cost overrun. In turnkey telecom and IT projects due to its rapid technology advancement and complexity cost overrun is a common problem.

#### **2.10.2. Effects of Cost overrun**

Cost overruns have a direct effect on project performance. Specially in turnkey projects where project cost is fixed during contract signature it is difficult to get approval from the client side for the additional or extra cost required to complete the project. Hence the project might be delayed until the extra budget approved. A cost overrun increases investment cost. If the return does not increase accordingly, it reduces the targeted return on investment(ROI) which affects customer satisfaction. One of the strategy to reduce cost overrun is by deploying projects in turnkey basis. However, during planning phase detail analysis should be done to avoid scope change, forecast cause of risks, prepare detail work break down structure, allocate appropriate time for each endeavors.

## **2.11. Empirical Review**

Several studies have been carried out on performance of turnkey projects (DB). The empirical review of some studies related to the purpose of this study is discussed in this section.

A research on Performance of design-build(turnkey) projects in terms of cost, quality and time: views of clients, architects and contractors in Singapore was carried out by Ling & Leong (2002). The aim of the study was to determine the performance of DB(Turnkey) projects from the Singapore clients', architects' and contractors' points of views, and to compare these views. In particular, performance was discussed based on projects' time, cost and quality performance. Questionnaires were distributed to 100 architects, 100 clients and 155 contractors in Singapore. Data was obtained from respondents, 26 percent of contractors, 15 percent of architects and 15 percent clients in Singapore which was considered to be adequate for a study of this nature. The researchers calculated mean ratings and used Student's t-test for evaluation.

According to a study made by Ling and Leong (2002), contractors and clients felt that DB projects perform well in terms of quality. Moreover, DB projects deliver more consistent aesthetic quality than traditionally procured buildings, and score marginally higher in terms of aesthetic quality than traditionally procured buildings, and score marginally higher in terms of aesthetic quality.

As Ling and Leong (2002) stated, time performance results show that the usage of DB reduces overall project development time and physical construction time. The related reasons for the reduced time to complete the project are: contractors' early involvement allows them to incorporate buildability, contractors' knowledge of lead times of key items, high degree of consultation, co-operation and good information flow ensures that design discrepancies are resolved faster. Concerning cost performance, Ling and Leong (2002) findings shows that costs of DB projects may be lower. This is because turnkey contractors would have conducted value engineering to make their offers more competitive and can propose design solutions that reduce cost without reducing quality. In addition, contractors would use standardized components. Clients and architects felt that the cost of DB projects may be lower because contractors pursue cheaper design solutions all the time— as expected, contractors deny this.

There was also research conducted by Ibiyemi et al. (2009) on comparative analysis of design & build and traditional procurement methods in Lagos, Nigeria. The research objectives were to do a comparative analysis of the D&B and the Traditional Procurement Approach (TPA). The objectives also included analysis of the relative advantages and disadvantages of the D&B on the basis of time, complexity, cost of project, legal mechanisms, and financial and liability risk transfer. Questionnaire was distributed to 40 randomly selected respondents in Nigerian construction companies based in Lagos and about 65% to 82% response rates were completed and obtained from the respondents. Data was collected from senior managers, managing directors, construction directors, and chief engineers with an average of 20 years' construction industry experience in Lagos.

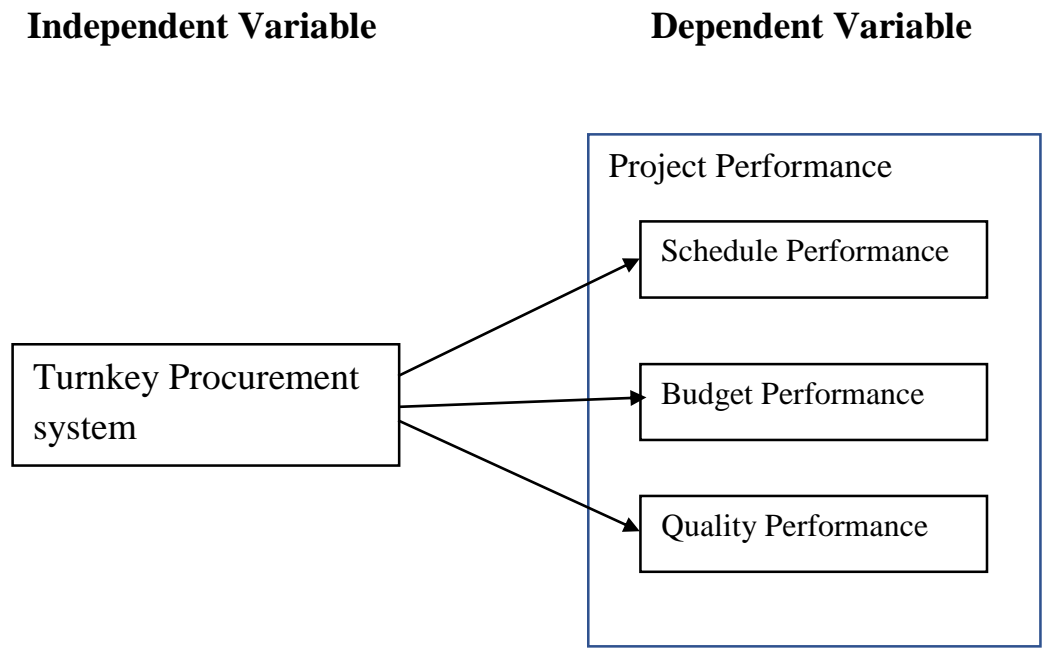
According to a study made by Ibiyemi et al. (2009), 94 percent of the respondent claimed that the use of DB for project procurement lessen overall project time compared to TPA contracts. Remarkably, up to 27% claimed that 20% time saved when they use D&B compared to TPA. Regarding cost, 75% of the respondents believed that up to 20% saving could be achieved when using D&B system. Ibiyemi et al. (2009) also argue that D&B procurement is considered much better than the traditional system in terms of comprehensiveness, conciseness, clients' trust and acceptability. In conclusion, Ibiyemi et al. (2009) survey result shows that D&B system reduced overall cost, minimize completion time and provides better quality performance.

## **2.12. Conceptual Framework**

Conceptual framework defines the relevant variables for the study and maps out how they might relate to each other. The conceptual framework in this study used to relate turnkey procurement system with project performance of telecom expansion project executed on turnkey basis. This study considered selected variable based on their impact and importance on telecom expansion project performance.

To test a cause-and-effect relationship, we identified two variables: the independent variable and the dependent variable. The independent variable in this study is turnkey procurement system and the dependent variable is project performance.

**Fig 2.2** Conceptual framework of turnkey procurement system influence on project performance



## **CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY**

### **3.1. Introduction**

This chapter addresses the research methodology that is used for collecting and analyzing the data in the study. It describes the research design, population, sample size and sampling techniques, instruments for data collection and procedures and data analysis method to meet the research objective.

### **3.2. Research Approach**

There are three types of research approaches: qualitative, quantitative and mixed methods (Mbhiza,2017). Qualitative research requires capturing and analyzing non-numerical data to grasp concepts, opinions, or attitudes. It can also be used to gather in-depth information about a problem (Saunders et al. 2009) which was used to analyze data collected by interviews in this study. Quantitative research is an approach for testing objective theories by examining the relationship among variables. Objective measures and statistical, mathematical, or numerical interpretation of data obtained by closed-ended questionnaires were emphasized through quantitative methods (Saunders et al. 2009). In this study a mixed research approach was used to take advantage of both qualitative and quantitative techniques. According to Lund (2012), Mixed methods research is more capable to answer certain complex research questions than qualitative or quantitative research in isolation.

### **3.3. Research Design**

As per Kumar (2005) cited in Bello (2018), research design is a procedural plan that is adopted by the researcher to answer questions validly, objectively, and economically. It could also be defined as a detail plan of how a research to be completed. The research design used in this study is a descriptive type. Descriptive research intended to accurately and systematically describe a population, situation or phenomenon that is being studied (McCombes,2019). Descriptive research is aimed at ascertaining, describing and focuses on answering the 'who', 'what', 'when', 'where' and 'how' questions and is suitable for explanation of phenomena as they naturally occur (McCombes,2019). Accordingly, in this study it helps to understand and ascertain turnkey procurement system effect on project performance.

### 3.4. Target Population

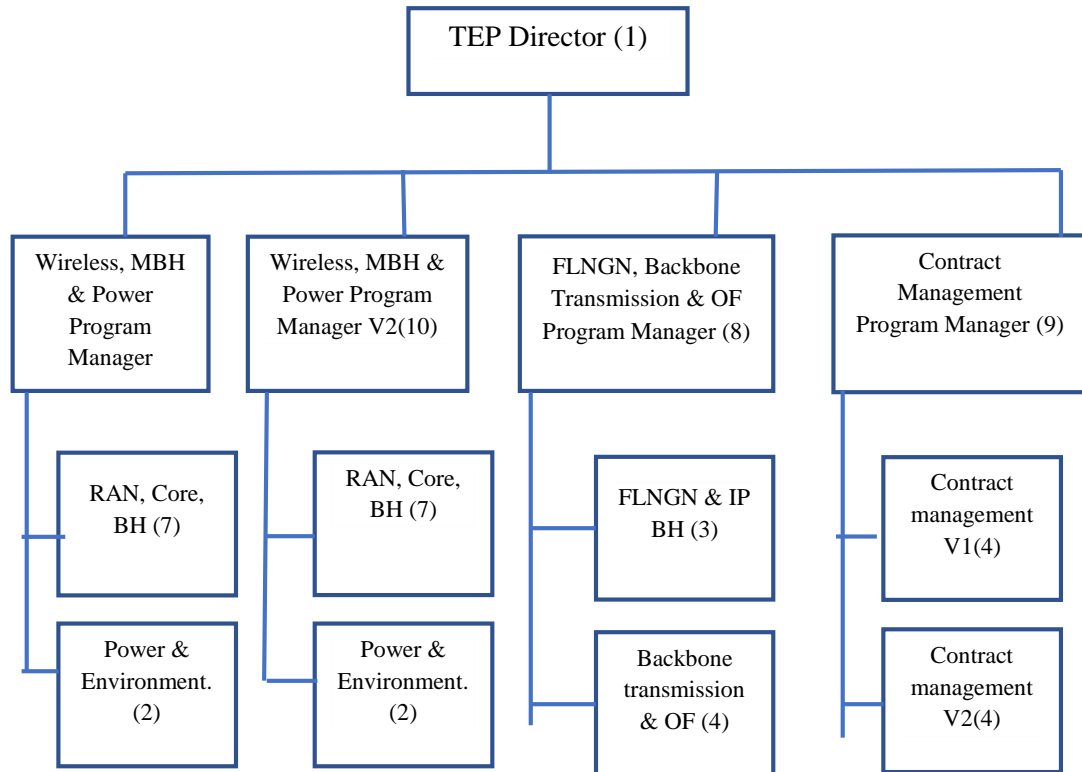
The target population for this study were TEP office staffs and functional office technical domain managers who participated in telecom expansion program at different hierarchies from inception to closing of the program. Program director, Program managers, project managers, coordinators, functional office technical domain managers of different project units in Addis Ababa were considered. Project performers were chosen as target population because of their involvement and contribution in project activities as per project organizational charter and most of the strategic issues and performance measures were handled by them.

The below table shows target population for the study.

**Table 3-1** Target population

SN	Target population	Population size
1	Program Director	1
2	Program Managers	4
3	Project Managers	9
4	Coordinators	23
5	Functional Managers	12
<b>Total (N)</b>		<b>49</b>

**Fig 3-1** TEP structure:



source TEP-Charter, 2013

### 3.5. Sample size

The population size (N), for telecom expansion program network domain projects were 49, Given that N is less than 200, the entire population have been sampled using the census technique (Israel,2009). A complete list of all items in the population is defined as census technique. Hence, the sample size of this study were all the 49 staffs who participated in the expansion program from inception to closing. A census technique has the benefit of getting information from each and every individual in the population of the program.

### 3.6. Source of Data and collection methods

For achieving the purpose of this study both primary and secondary data sources were used. The Primary data source were information retrieved directly from Telecom Expansion Projects participants using questionnaire and interview whereas the secondary data sources were contract document, TEP governing charter, project progress reports, technical reports, project closing report, related research papers, journals, literatures, articles and web sites.

Questionnaire and interview were used as a primary data collection instrument (Cohen, 2013). The questionnaire consists close-ended and open-ended questions to collect respondents' perceptions in turnkey projects and its impact on project performance of telecom expansion projects. Interview and document analysis triangulated the information gathered by questionnaire.

### **3.7. Data analysis methods**

In this study, quantitative and qualitative methods were used in order to answer the research questions. Using both methods is important, to provide better understanding and answers of the research questions and research problems formulated from the research topic. SPSS (Statistical Package for Social Sciences) version 26 software has been used for quantitative data analysis. Given the descriptive nature of this study, collected data were analyzed using the mean and standard deviation technique and charts and graphs were also used to rate and view the respondent's answers. The data from interviews were analyzed using qualitative method.

### **3.8. Validity and reliability**

Validity and reliability are the two most essential and basic characteristics in the evaluation of any measurement tool for a good research. Validity clarifies how well the collected data covers the actual area of investigation (Ghauri & Gronhaug, 2005). Validity is about finding out if the data collected is relevant to the problem being investigated.

Reliability concerns the degree to which a measurement of a phenomenon gives stable and consist result (Carmines & Zeller, 1979). Reliability is also concerned with repeatability.

In order to verify the content validity, related literatures have been reviewed and subject matter managers and experts were consulted (Taherdoost, 2016).

For this research the questionnaire items reliability was checked using SPSS V.26 software. Cronbach's alpha value is used to measure the internal consistency that can be achieved in the SPSS by conducting the reliability test. For all the questions, the reliability test was carried out and the value of overall Cronbach's Alpha found is 0.851. According to Silverman (2004) a coefficient of 0.7 and above is considered good and appropriate for

conducting data analysis on the data collected from the questionnaire. Reliability value of each variable shown in the table 3.2 below.

**Table 3.2** Reliability Result.

No.	Variables	Cronbach's Alpha	No. of Items
1	Turnkey project Characteristics	0.751	10
2	Schedule Performance of TEP	0.855	13
3	Impact of Schedule performance	0.888	6
4	Budget Performance of TEP	0.844	7
5	Quality Performance TEP	0.868	6

### **3.9. Ethical consideration**

In any kind of research study ethical issues should be addressed during, and after the research had been conducted. This research has taken into consideration ethical issues on collecting and use of data, analysis in responsible manner. Participants has been informed the purpose of the research and the possible outcomes that they are taking part in research. In general, the participants were provided with necessary information that could influence their decision to participate in the research. Participants volunteers and took part without being forced. Research data were protected and kept the confidentiality of the respondents.

## **CHAPTER 4: DATA ANALYSIS AND DISCUSSION OF RESULTS**

### **4.1. Introduction**

The objective of this research, as indicated in the previous chapter, is to study the effect of turnkey system for project success of telecom expansion program. That is to find out the turnkey system impact on schedule, budget and quality performance.

This chapter presents analysis and discussion of the findings of the study. The analysis was aided by the use of Statistic Package for Social Science version 26 software. The questionnaire was developed using a Likert - type scale; when 1 reflects strong disagreement, 2 disagree, 3 Neutral, 4 agree and 5 strongly agree. The scores provided by the respondents to each factor were entered and the answers from the questionnaires were then described using descriptive statistics. SPSS statistics version 26 was used to analyze the collected data. Furthermore, the result obtained from the interview and related documentation available in Ethio telecom was also reviewed in relation to the literature. The outcome and interpretation of the data obtained summarized as follows:

### **4.2. Response Rate**

In the study primary data collection tools, questionnaire and interview were used. The study targeted 49 respondents who participated in Telecom Expansion Program from commencement to closing. Accordingly, questionnaires were distributed to 49 respondents. Out of the 49 distributed questionnaires to the respondents, 45 questionnaires representing 91.8 % of the total questionnaires distributed were properly filled and returned, while 4 questionnaires (8.9%) were not returned. According to Mugenda and Mugenda (2003), response rate above 70% is considered very good for further analysis.

Five interviewees, 1 Program Manager, 2 project managers and 2 coordinators were interviewed on the basis of an interview guide line.

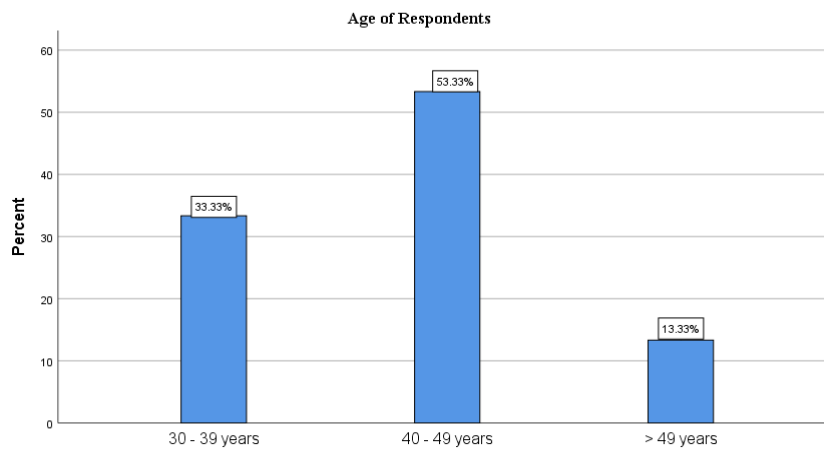
**Table 4-1: Demographic characteristics of the respondents:**

Description		Frequency	Percent	Valid Percent	Cumulative Percent
<b>Age in Years</b>	30 - 39 years	15	33.3	33.3	33.3
	40 - 49 years	24	53.3	53.3	86.7
	> 50 years	6	13.3	13.3	100.0
	<b>Total</b>	45	100.0	100.0	
<b>Gender</b>	Male	42	93.3	93.3	93.3
	Female	3	6.7	6.7	100.0
	<b>Total</b>	45	100.0	100.0	
<b>Educational Level</b>	Certificate/Diploma	2	4.4	4.4	4.4
	BA/BSc	22	48.9	48.9	53.3
	MA/MSc	21	46.7	46.7	100.0
	<b>Total</b>	45	100.0	100.0	
<b>Work Experience [years]</b>	6 - 10 years	1	2.2	2.2	2.2
	11 - 15 years	10	22.2	22.2	24.4
	> 15 years	34	75.6	75.6	100.0
	<b>Total</b>	45	100.0	100.0	
<b>Position in TEP</b>	Program Director	1	2.2	2.2	2.2
	Program Manager	3	6.7	6.7	8.9
	Project Manager	8	17.8	17.8	26.7
	Project Coordinator	21	46.7	46.7	73.3
	Functional Manager	12	26.7	26.7	100
	<b>Total</b>	45	100	100	

Source: Survey data (2021)

From the survey result, majority were male, out of the 45 respondents 42 respondents (93.3%) were male and 3 respondents (6.7%) were female. Which indicates that female participation in TEP was insignificant. The age distribution of the respondents was that 15 participants (33.3%) were between 30-39 years old, 24 participants 53.3% were between 40-49 years old and 6 participants (13.3%) were above 50 years old. Thus, from these results it can be concluded that the respondents were old enough to have the necessary knowledge and information about Telecom Expansion Program (TEP). Ages and the findings are shown on figure 4.1.

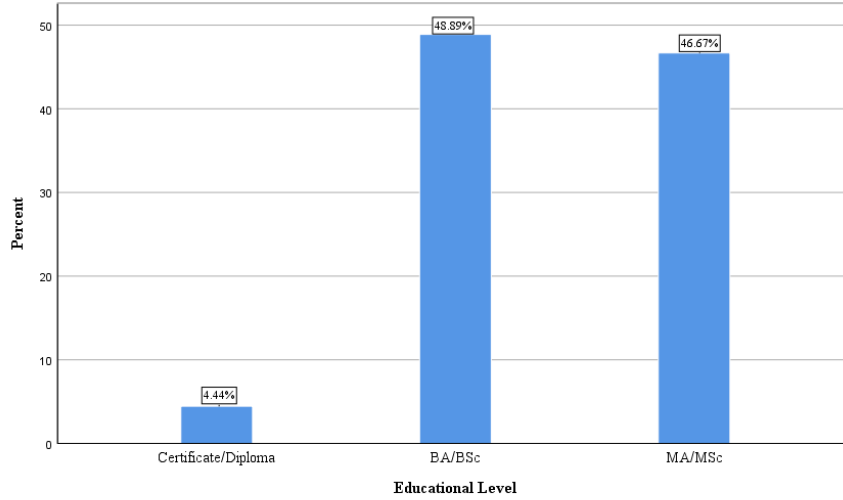
**Figure 4.1** Age of the Respondents



Source: Survey Data (2021)

Regarding the level of education of the respondents, 22 respondents (48.9%) had first degree, 21 respondents (46.7%) have master's degree and the rest 2 respondents (4.4%) had certificate or diploma. This is an indication that the majority of the respondents (95.6 %) in this study had a university degree as their highest level of education and therefore had the knowledge to evaluate the impact of turnkey procurement system on TEP performance.

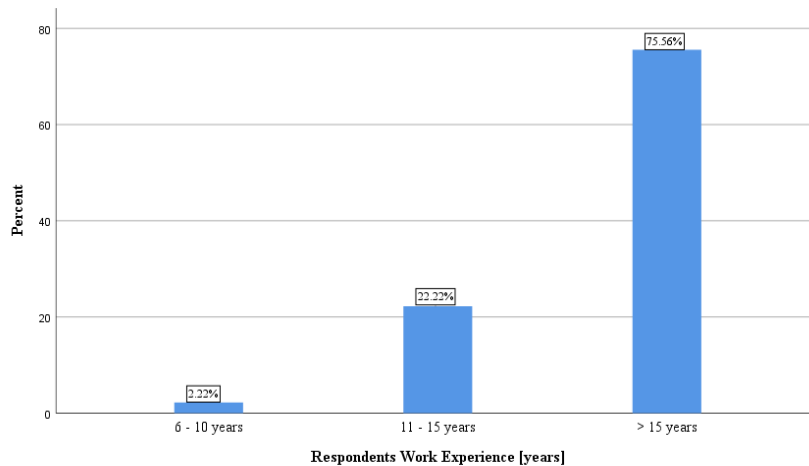
**Figure 4.2 Education Level of Respondents**



Source: Survey Data (2021)

From the study findings, 34 respondents (75.6 %) had more than 15 years of experience; 10 out of 45 respondents (22.2%) had 11 to 15 years of experience. Only frequency 1, covering 2.2% of all respondents, had less than 6 to 10 years of experience. Therefore, as almost all of the respondents which covers 97.8% of the respondents had more than three years' of experience in telecom projects by the company, they had a clear understanding that to what extent turnkey procurement influence TEP performance.

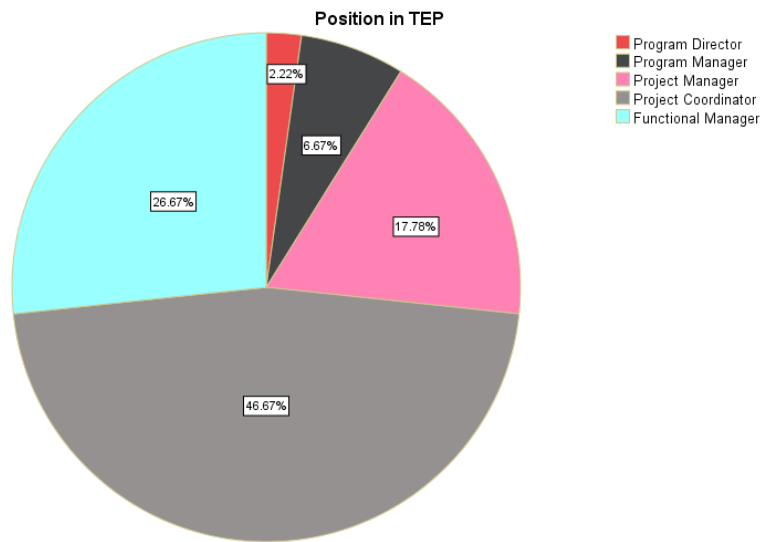
**Figure 4.3 Respondents work Experience**



Source: Survey Data (2021)

The respondents were from various positions in TEP. 1 project director (2.2 %), 3 Program Managers (6.7%), 8 Project Managers (17.8%), 21 Project coordinators (46.7%) and the remaining with a frequency of 12 (26.7%) of respondents who responded in the data collection instrument were Functional Managers who engaged in TEP endeavors from commencement to closing and project handover. This indicates that almost all the respondents were in a position that enables them to give adequate response regarding impact of turnkey system on performance of TEP. Respondents were drawn from various position in which they work in as shown on figure 4.4

**Figure 4.4** Respondents Position in TEP



Source: Survey Data (2021)

### 4.3. Questions related to Turnkey project characteristics

Part two of the questionnaire was designed in order to get a response for the general knowledge of turnkey project. This section consists of ten questions that try to understand respondents' reflection and knowledge about turnkey project characteristic, project performance and impact of turnkey project on project scope, schedule and budget performance, turnkey project risks and client and contractor responsibilities with respect to telecom expansion program. The following statements were presented to respondents to what extent they agreed with the statements on turnkey projects, where 1=strongly

disagree, 2= disagree 3= Neutral, 4= Agree, 5= strongly agree. The findings are presented on Table 4.2 below.

**Table 4.2** Turnkey projects

Questions	Number of Respondents	Mean	Std. Deviation
Turnkey project deployment approach is helpful for deploying complex and hi-tech projects.	45	4.42	.753
In turnkey project the client/owner risk is minimal.	45	3.89	.832
In turnkey project the contractor risk is very high	45	3.82	.960
In Turnkey project risk is transferred from the client to the contractor.	45	4.11	.647
In turnkey project contract price is higher than the traditional contract price due to risk transfer.	45	4.00	.798
Contractor is responsible both for the design and construction activities.	45	4.18	.806
Client responsibility in turnkey project is defining project scope , prepare requirement and project follow-up.	45	4.27	.837
Client project manager responsibility in turnkey project is limited to facilitating, organizing, monitoring and follow-up.	45	3.82	1.134
Management support is highly required in turnkey project to complete projects within scope and on time.	45	4.60	.539
Turnkey project enables to complete projects within short period of time.	45	4.11	.885
Turnkey projects are completed within a fixed budget.	45	3.44	1.013
Average		4.06	0.84

Source: Survey Data (2021)

Turnkey project characteristic, benefit, client and contractor responsibility, risk status, impact on schedule and budget. From the finding, respondents agreed with mean score of 4.06 which indicates that respondents had a good understanding about turnkey project model described in literature review about turnkey project model.

From the result, respondents agreed with mean score of 4.6 and 4.42 that management support is highly required to accomplish turnkey projects within scope and time and also turnkey projects are helpful to deploy hi-tech projects respectively.

The finding shows that with mean score of 4.27 and 4.18 that in telecom expansion turnkey project, client was responsible to define project scope, prepare requirement and perform project follow-up and contractors were responsible both for the design and construction endeavors which coincides with the characteristics of turnkey project model described in literature review.

Regarding risk, respondents agreed with mean score of 3.89 and 3.82 that in telecom expansion turnkey project ethiotelecom’s risk was minimal and contractors risk was very high. The result also agreed with turnkey projects features explained in literature review.

The respondent also agreed with mean score of 4.11 and 3.44 that turnkey project shorten project completion time and completed within a fixed budget. But the result found from schedule and budget performance of telecom expansion projects contradict with this result.

#### **4.4. Schedule Performance of Telecom Expansion Program**

The following statements were presented to the respondents to establish the extent to which they agreed with the statements on Telecom Expansion Program schedule performance.

**Table 4.3** Schedule Performance of Telecom Expansion Program

Questions	Number of Respondents	Mean	Std. Deviation
Projects are completed as per PIP (Project Implementation plan).	45	2.71	1.121
There was a delay in telecom expansion projects from the predefined timeline.	45	3.44	.943
Communication barrier between Ethio telecom and contractor impacts project schedule.	45	3.40	.939
There was project schedule slip due to client/ Ethio telecom working processes and procedures.	45	3.36	.933
Project commencement date enforces project schedule variation.	45	3.62	.834
Work culture difference between Ethio telecom and contractor affects project schedule.	45	3.60	1.031

TEP Projects have delayed due to internal and external risks.	45	3.98	.839
Shortage of skilled subcontractor affects project schedule.	45	3.98	.812
There was schedule delay because of Client/Ethiotelecom over interference.	45	2.71	.757
There was schedule delay because of poor project management and follow-up.	45	3.00	1.243
Government regulation and policies affect project schedule.	45	3.20	.944
Project scope change affect project schedule.	45	3.80	1.198
Project schedule affected by requirement change .	45	3.67	1.022
Poor project implementation plan(PIP) affects project schedule.	45	3.69	1.276
Average		3.44	0.99

Source: Survey Data (2021)

Respondents were asked fourteen questions regarding schedule performance of telecom expansion program in Ethiotelecom, which is one of the project performance KPI. The respondents agreed and replied that telecom expansion program delayed from predefined schedule due to different reasons as stated in table 4.3 above, with an average mean score of 3.44 and standard deviation of 0.99.

As it can be seen in the above table internal and external risk factors and shortage of skilled subcontractors were the main factors for project schedule delay with an equivalent mean score of 3.98. Interviews with program manager, project managers, and coordinators, as well as document reviews, revealed that the telecom expansion program had been delayed due to internal and external risks. Internal risks listed by interviewees included Ethiotelecom working processes and procedures, delays in get pass approval at Ethiotelecom premises, and lengthy warehouse material management process. External risks included security issues in the southern and eastern parts of the country, land acquisition issues for outdoor sites, and the inability to obtain commercial power on time.

Telecom expansion program delay also triggered by project scope change, requirement change and delay of project commencement date with mean score of 3.80,3.67 and 3.62 respectively. The interview and document analysis finding support that telecom expansion

projects were delayed due to scope and requirement changes. Program manager and project managers described that to get better performance in capacity and coverage of wireless services some scope and requirement change were made and those changes caused project schedule delay on wireless project.

Work culture difference and communication barrier between Ethio telecom and contractor were reasons for telecom expansion program delay with mean score of 3.6 and 3.4. In addition to the above mentioned reasons Ethio telecom working processes and procedures and government regulation and policies also affected project schedule with mean score of 3.36 and 3.2 respectively. Though most of the above mentioned factors triggered schedule delay, client/Ethio telecom over interference did not affect the schedule much.

#### **4.5. Impacts of project schedule delay/slip in Telecom Expansion Projects**

The following statements were addressed to the respondents in order to determine the degree to which they agreed with the statements on the impact of project schedule delay/slip on Telecom Expansion Projects. The findings are presented in Table 4.4.

**Table 4.4** Impacts of project schedule delay/slip on Telecom Expansion Projects

Questions	Number of Respondents	Mean	Std. Deviation
Project schedule delay do not affect or alter project budget.	45	2.04	1.107
Project schedule delay causes cost overrun / price escalation and additional budget.	45	3.96	.976
Project schedule delay incurs additional operational cost	45	3.96	.852
Intended service delivery time prolonged and expected revenue not generated on time.	45	4.22	.876
Contractor exposed for extra cost and liquidation damage.	45	4.27	.688
Project completion delay has affected operational and business activities .	45	4.11	.885
Both internal and external stakeholders are not satisfied.	45	3.22	1.259
Average		3.68	0.95

Source: Survey Data (2021)

The above Table 4.4 shows the Impacts of project schedule delay in Telecom Expansion Projects. According to the result, the respondents agreed that project schedule delay highly affects telecom expansion program with an average mean score value of 3.68 and standard deviation 0.95.

From the findings, due to schedule delay mainly contractor exposed for liquidation damage, client lost anticipated revenue as service deliver time was prolonged and operational and business activities were also affected with mean score of 4.27,4.22 and 4.11 respectively and a corresponding standard deviation of 0.688,0.876 and 0. 885.Project schedule delay caused project cost overrun and incurred additional operational cost with and equivalent mean score of 3.96 and standard deviation of 0.97 and 0.852 respectively. Consequently, with a mean score of 3.22 and standard deviation of 1.26 both internal and external stakeholders were not satisfied.

#### **4.6. Budget performance in Telecom Expansion Projects**

The following statements were addressed to the respondents in order to assess the degree to which they agreed with the statements on budget performance of Telecom Expansion Projects. The results are presented in table 4.5.

**Table 4.5** Budget performance in Telecom Expansion Projects

	Number of Respondents	Mean	Std. Deviation
Telecom expansion Projects are completed within approved budget.	45	2.98	1.057
There was budget change due to requirement change.	45	3.62	.912
Lack of detail project feasibility study causes budget change.	45	3.47	.991
There was budget change because of Planning change.	45	3.62	.886
There was budget change due to project scope change.	45	3.76	.857
Project implementation delay causes budget change.	45	3.56	.943
There was poor project monitoring and follow-up which results in extra budget requirement and cost overrun.	45	2.82	1.093
Internal and external risk factors causes budget change.	45	3.58	.812
Average		3.43	0.94

Source: Survey Data (2021)

The above Table 4.5 shows the results of mean score for Telecom Expansion Projects budget performance and causes of budget change. Respondents agreed with an average mean score of 3.43 and standard deviation 0.94 that there was a budget change in telecom expansion program. The main reason for budget change in telecom expansion project was project scope change with mean score of 3.76 and standard deviation 0.857.

The other factor which was rated second as cause of budget change at telecom expansion project were planning and requirement change with mean score of 3.62. Internal and external risk factors and implementation delay were the third and fourth factors that cause budget change in the telecom expansion project with mean score of 3.58 and 3.56, respectively. Lack of detail project feasibility study also triggered budget change in the telecom expansion project with mean score of 3.47. Respondents rated that poor project monitoring and follow up causes lesser impact on budget change with mean score of 2.82 and standard deviation 1.

The response obtained from interview and result of available document analysis indicated that there was a budget change because of scope and requirement changes. As per the interviewee, scope change was made to improve the capacity and coverage of wireless service.

#### **4.7. Quality performance in Telecom Expansion Project**

The following statements were presented to the respondents to determine the extent to which they agreed with the statements on Quality performance in Telecom Expansion Project. The findings are presented on table 4.6.

**Table 4.6** Quality performance in Telecom Expansion Project

Questions	Number of Respondents	Mean	Std. Deviation
Telecom expansion Projects are completed as per the Specifications.	45	3.64	.857
The final project outcome fulfil intended objectives as per the required quality.	45	3.78	.795
Stakeholders satisfied by the project outcome	45	3.84	.638

Telecom expansion projects closed properly and handed over to functional offices.	45	3.53	.919
Project final deliverables increase customer satisfaction	45	4.07	.654
Standard operating procedure documents (SOPs) developed.	45	3.36	.883
Average		3.7	0.79

Source: Survey Data (2021)

Table 4.6 shows that the mean score for Telecom Expansion Project Quality performance ranged from 3.36 to 4.07 with the standard deviation (SD) from 0.64 to 0.92, which indicates that the performance of Telecom Expansion Project Quality was above average and that the individual responses did not deviate much from the mean.

The respondents agreed that telecom expansion projects were completed as per the specifications with mean of 3.64 and SD 0.85. They also agreed that final project outcome fulfilled expected objectives with mean of 3.78 and SD 0.79, according to the required quality with mean of 3.78 and SD 0.795 and with stakeholders satisfied by the project outcome resulting mean of 3.84 and SD 0.638.

Telecom expansion projects were properly closed and handed over to functional offices, resulting mean of 3.53 and SD 0.9. Final deliverables of the project improve customer satisfaction and standard operating procedure document developed with mean of 4.07 and 3.36 respectively and corresponding standard deviations of 0.654 and 0.883.

The interview findings also reinforced and agreed with the questionnaire result that telecom expansion project was completed with the required quality and fulfil the desired specifications. Moreover, all the interviewee replied that the targeted objective was achieved with high quality and enhanced performance.

#### **4.8. TEP Performance**

To estimate the extent to which the respondents agreed with the performance of telecom expansion program, an analysis was done and the findings are presented on Table 4.8.

From the findings, 66.7% of the respondents agreed, that TEP performance was very good; 11.1% accepted that the performance was excellent and while the remaining 22.2 %

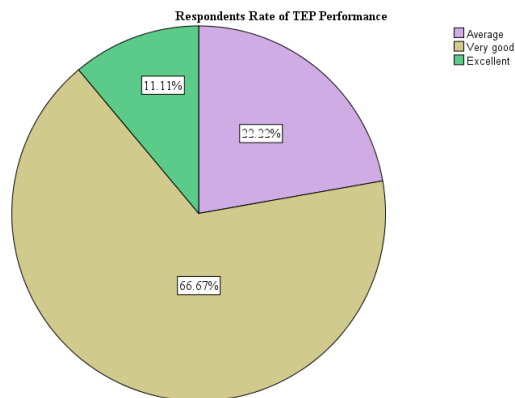
indicated that TEP performance was average. Hence, it can be concluded that TEP performance was very good.

**Table 4.7** Telecom Expansion Program Performance.

Respondents Rate of TEP Performance					
Description		Frequency	Percent	Valid Percent	Cumulative Percent
Respondents Rate of TEP performance	Average	10	22.2	22.2	22.2
	Very good	30	66.7	66.7	88.9
	Excellent	5	11.1	11.1	100.0
	Total	45	100.0	100.0	

Source: Survey Data (2021)

**Figure 4.5** Respondents Rate of TEP Performance



Source: Survey Data (2021)

#### 4.9. Impact of Turnkey project

The study sought to get respondents view whether turnkey project had impact on Telecom Expansion Program performance at Ethio telecom or not. Respondents response presented on Table 4.8 below.

**Table 4.8** Impact of Turnkey Project on TEP Performance.

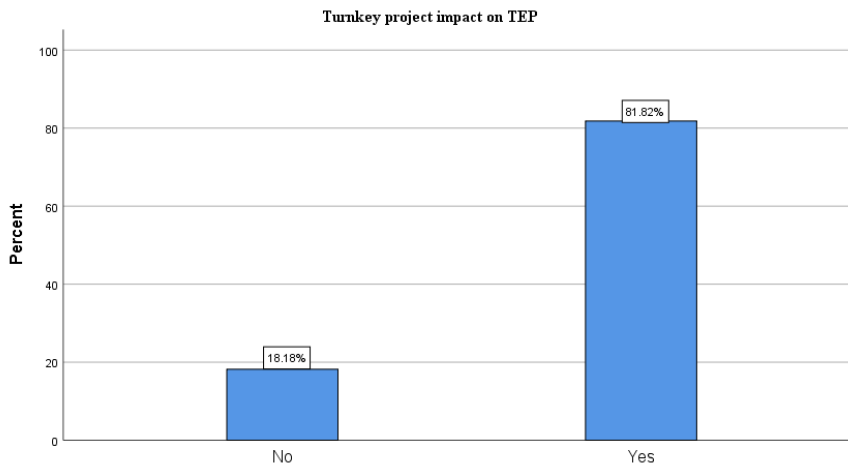
Impact of Turnkey project on TEP Performance					
Description		Frequency	Percent	Valid Percent	Cumulative Percent
Respondents Rate	No	8	17.8	18.2	18.2
	Yes	36	80.0	81.8	100.0
	Total	44	97.8	100.0	
Missing	System	1	2.2		
Total		45	100.0		

Source: Survey Data (2021)

The result indicated that majority of the respondents,35(81.8%) agreed that turnkey project has impact on telecom expansion program performance, while 18.2 indicated that turnkey project did not have impact on telecom expansion program performance in Ethiotelecom. It can be concluded that turnkey project had impact on TEP performance.

The interviewee response about impact of turnkey project on schedule, budget and quality performance was that turnkey procurement is very useful to complete projects within time, with fixed price and desired quality. Furthermore, turnkey procurement system is very helpful for advanced projects.

**Figure 4.6** Turnkey project impact on TEP Performance



Source: Survey Data (2021)

## **CHAPTER 5: CONCLUSION AND RECOMMENDATION**

### **5.1. Introduction**

The main aim of this study was to discover the impact of the turnkey project on the project performance of Telecom Expansion Program in Ethio telecom. The specific objectives of the study were to disclose the effect of the turnkey project on the schedule performance, budget performance and quality performance of Ethio telecom telecom expansion projects. The researcher used both primary and secondary data sources of data to collect the study related information which was used to create and balance reliability of the study. Questionnaires and interview guides were therefore formulated in accordance with the research goals and respondents were selected using census process, where all members of the population are studied. The research results have been analyzed, discussed, and interpreted. Therefore, in this chapter, the researcher summarizes the key findings, conclusions and also recommendation for future turnkey project execution in the company.

### **5.2. Summary of findings**

This section of the study summarizes the major findings obtained from the analysis of data collected through questionnaire, interview and document analysis such as contract document, TEP governing charter, project progress and closure reports, and company working manuals.

Telecom expansion program was done on turnkey basis and the program encompassed 5 lots (wireless, backbone transmission and optical fiber, fixed network and IS system). This study focused on project performance of the network domain which consist of wireless, backbone transmission, optical fiber and power supply projects. The response of the respondents varied based on their domain project performance.

Each projects' specification and scope were prepared in advance by Ethio telecom. Accordingly, as per the turnkey project practice, vendors prepared design document which comply ethio telecom's requirement and submitted for evaluation and discussion to Ethio telecom. Once both technical and commercial evaluation had been completed and agreed on the design document, projects were started with clear goals, objectives and strategies to achieve program scope. For each project, PIP settled and budget allocated

(TEP charter and Closure report). Based on the analysis, the below findings were recognized.

From both the questionnaires and interview results, it was found that turnkey projects are beneficial for the deployment of hi-tech projects. Due to technology advancement and frequent technology and features improvement executing projects on turnkey basis by manufacturers or vendors is preferred since they are acquainted with the new products and features. Ethio telecom as a client defined project scope, set objective and prepared specifications. Contractors performed the design, construction, commissioning and test activities which was in-line with the characteristics of turnkey project model. During project execution phase, Ethio telecom main responsibility was project facilitation, organization and follow-up hence once the project has been commenced ethio telecom's risk was minimal. Whereas since both design and construction works were contractor's responsibility, contractors were highly exposed for unforeseen risk which exposed them for liquidated damage as per the contract agreement. The finding also showed that the contract price was fixed for the agreed scope and requirement in the contract. Price changes due to design and construction flaw was covered by contractor, that is the reason turnkey project price is higher than traditional project contracting type. In general, the finding shows that turnkey project practice in Ethio telecom expansion project resembled with turnkey project characteristic described in the literature review.

The study finding shows that telecom expansion projects schedule delayed with an average mean of 3.44. From respondents answer and Ethio telecom project closure report it is found that some projects completed before PIP, some completed within PIP and few delayed far from the PIP. As reported in the project closure report and confirmed through interview, the reason for completing projects before and within PIP was that contractors prepared effective work breakdown structure and performed non-dependent activities in parallel to shorten project completion time.

According to the result from questionnaires, interviews and project closure report few projects were delayed both by contractor and Ethio telecom problems. The study result shows that most of the delays were caused by Ethio telecom. To mention the main causes of project delay from Ethio telecom side were that internal and external risk factors, scope

and requirement changes, delay on project commencement date, working processes and procedures, work cultural and lengthy technical evaluation were source of potential delay. On the contractor side, lack of eligible subcontractors, poor PIP and lack of sense of urgency were reported as causes of project delay only in few projects.

External factors which caused project delay were government regulation, land acquisition, power accusation and in some areas security problem were the reasons. As per the result finding, in telecom expansion turnkey projects contractors were responsible for any schedule delay triggered by them and which exposed them for extra cost, hence they were vigilant in schedule planning and schedule management which avoided schedule delay caused by them. The study result indicates that they were not the primary source of delay. Furthermore, the result of the correlation coefficient showed that there is a weak positive relationship between turnkey project and schedule performance.

The result of the analysis for budget Performance of telecom expansion projects shows that there was a budget change with an average mean of 3.44. Similar to schedule change the primary cause of budget change was project scope change, requirement change, internal and external risk and planning change. However as per the interview result and project closure report the scope and planning change were done on some projects by Ethio telecom to excel project deliverables, increase coverage area and network capacity.

Since the principal contract price was set as per contract agreement for the initially specified project scope and requirement, budget change due to scope and requirement change was not responsibility of the contractor. As per the outcome of the questionnaire, interview and project closure report, budget adjustment were made on some of the expansion projects where scope and requirement change were made.

The result of the analysis for quality Performance of telecom expansion projects shows a mean score of 3.44. which shows that the telecom expansion projects quality performance was above average. Projects were completed as per the specification, and intended objectives. Moreover, the target capacity and coverage achieved which was one of the quality performance criteria from telecom expansion perspective. As per the final closure report, questionnaire and interview result projects were properly closed, operation and maintenance document prepared and handed over to functional offices for operation and

follow-up. One of the criteria for quality performance measurement was stakeholder satisfaction. The questionnaire result shows a mean score of 3.84 which shows stakeholder satisfaction were above average and also the interview result confirmed that both Ethio telecom and contractors were satisfied from the overall project achievement. As per the study findings, turnkey project had a moderated relationship with quality performance of telecom expansion projects. TEP brought positive impact on providing quality of service, improving image of the company and increase company revenue (Ethio telecom annual report 2016).

### **5.3. Conclusion**

The result obtained from questionnaire, interview and secondary resources indicate that telecom expansion projects deployed on turnkey basis from three international contractors namely Huawei, ZTE and Ericsson. The researcher found that in Ethio telecom there is a good knowledge about turnkey procurement system characteristics and its benefit. From this study it is observed that telecom expansion projects completion performance varies from project to project and contractor to contractor. Some projects completed before PIP, some completed within PIP and few projects completed with a significant delay. The overall TEP delay as per TEP closure report was 6 months' period and the primary causes of schedule delay were scope change, requirement change and internal and external factors. Though few telecom expansion projects delayed because of additional scope and requirement change, most of the projects were completed within and before schedule. Hence turnkey procurement system helped to lessen project completion time. The findings of this study on turnkey procurement system schedule performance has been supported by the study of Ghavamifar (2009) who stated that turnkey project delivery time shortened by overlapping design and construction phase of a project.

Regarding budget performance, in some projects there was a budget change due to scope and requirement changes. According to the study results, project scope and requirements were changed after the contract was signed and project execution began, resulting in additional budget. Considering the original scope and requirement, there was no budget overrun and the price was fixed. The findings of this study on price have been supported

by the study of Global Negotiator (2019) who stated that turnkey projects delivered with a fixed price unless additional works are incorporated.

This study finding also indicate that turnkey procurement system has a positive impact on quality performance of telecom expansion projects. As per the study result TEP completed with good quality performance and as per the required specification and fulfilled intended objective and also both client and contractors were satisfied. The only quality performance issue observed from interview and project closure report were with one of the contractor, Ericsson. The contractor project management were relatively weak and lacks sense of urgency about the project. Hence the contractor did not fulfil project objective on time and disagreement were created between Ethio telecom and Ericsson. Consequently, based on the result of this study and considering the volume of the project, it has been concluded that telecom expansion program exhibited good project performance with respect to budget, schedule and quality. As a result of the findings of this study, and in light of the projects' size, it has been concluded that the telecom expansion program performed well in terms of budget, schedule, and quality. However, at the start of the project, there was a gap in preparing the whole requirement and project scope.

#### **5.4. Recommendation**

Based on the research findings, the following recommendations are provided for future telecom turnkey projects implementation.

- Ethio telecom has a well-established working processes and procedures to perform its day to day project activities. But the processes and procedures are not customized with the need of turnkey procurement model. This study recommends that Ethio telecom working processes such as warehouse management, material requisition procedure and get pass permission request and approval procedure, should be customized and modified according to turnkey procurement system requirement and project urgency.
- One of the reason identified which affected telecom expansion schedule performance was external factors. such as, Land acquisition, Power acquisition and right of way problems. Hence this study recommends that for future projects at planning stage and before any project implementation commenced such type of

issues should be identified and managed properly. The study also suggests that during project timetable preparation external risks like security, weather condition, geographical location difficulties should be considered.

- This study identified that the main reason for schedule delay and budget variation was planning change, scope change and requirement change once construction was started. This shows that there was a gap in planning and scoping the project. Hence, this study recommends that in the future before any project started end to end analysis should be conducted, detail requirement should be prepared and practicable project scope should be defined.
- This study also recommends that strict project monitoring and follow-up should be conducted starting from the very beginning of the project, which enables to recognize any schedule slip from the PIP and take corrective action.

### **Suggestion for future research**

This study only examined the impact of turnkey procurement system on schedule, budget and time performance of telecom expansion projects, the study recommends that further research should be carried out to determine the impact of the turnkey procurement system on other project performance indicators such as stakeholder satisfaction, Knowledge transfer and Return on Investment (ROI).

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**Appendix A**  
**Questionnaires**

**Addis Ababa University, College of Business and Economics**

**School of Commerce**

**Master of Project Management**

**Dear Sir/Madam,**

The purpose of this questionnaire is to obtain required data for the specified study on “The impact of Turnkey Project on Project Performance in Ethiotelecom”. Turnkey contracts are contracts where purchaser, on completion, turns a key in the door and everything is working to full operating standards. In turnkey projects contractors are fully responsible for the design, construction, commissioning and test phases of a project. Telecom Expansion Program (TEPI) was a mega project deployed to modernize and expand telecom infrastructure across Ethiopia from the year 2014 G.C to 2016 G.C under a turnkey approach.

The study is purely for academic purpose as a partial fulfillment of MA Degree in Project Management. All data included in this questionnaire will be strictly confidential and will be kept completely anonymous. For this survey to be helpful and accurate, please answer each question as honestly as possible.

Thank you in advance for taking your time to complete the questionnaire.

**With Regards**

Yiheyis Takele

Mobile: 0911225942

E-mail: yihetake@gmail.com

## Part One: Demographic Information

Kindly respond to the following questions by putting “X” in the answer box that corresponds to your response.

1. Gender:

Male  Female

2. Age:

Below 30yrs.  30-39yrs.  40-49 yrs.  Above 50yrs.

3. Educational Level:

Certificate/Diploma  BA/BSc  MA/MSc  PHD

4. Work Experience [years]: 0 – 5  6 – 10  10 – 15  Above 15

5. Position in TEP:

Program Director  Program Manager  Project manager

Project coordinator  Functional Manager

## Part Two: Questions related to Turnkey project

This part of the questionnaires’ is to understand respondent reflection about turnkey project, project performance and impact of turnkey project on project scope, schedule and budget performance with respect to telecom expansion program.

Based on your experience and participation in telecom expansion program in Ethio telecom, please respond to what extent you do agree with the following statements.

No.	Item description	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Turnkey project deployment approach is helpful for deploying complex and hi-tech projects.					
2	In turnkey project the client/owner risk is minimal.					

3	In turnkey project the contractor risk is very high.					
4	In Turnkey project risk is transferred from the client to the contractor.					
5	In turnkey project contract price is higher than the traditional contract price due to risk transfer.					
6	Contractor is responsible both for the design and construction activities.					
7	Client responsibility in turnkey project is defining project scope , prepare requirement and project follow-up.					
8	Client project manager responsibility in turnkey project is limited to facilitating, organizing, monitoring and follow-up.					
9	Management support is highly required in turnkey project to complete projects within scope and on time.					
10	Turnkey project enables to complete projects within short period of time .					
11	Turnkey projects are completed within a fixed budget					

**Questions related to telecom expansion project performance.**

**Part Three: Schedule Performance of Telecom Expansion Program**

Please indicate your level of agreement with the following statements relating to schedule performance of Telecom Expansion Program

No.	Item description	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Projects are completed as per PIP (Project Implementation plan).					
2	There was a delay in telecom expansion projects from the predefined timeline.					
3	Communication barrier between Ethio telecom and contractor impacts project schedule.					

4	There was project schedule slip due to client/ Ethiotelcom working processes and procedures.					
5	Project commencement date enforces project schedule variation.					
6	Work culture difference between Ethiotelcom and contractor affects project schedule.					
7	TEP Projects have delayed due to internal and external risks.					
8	Shortage of skilled subcontractor affects project schedule.					
9	There was schedule delay because of Client/ Ethiotelcom over interference .					
10	There was schedule delay because of poor project management and follow-up					
11	Government regulation and policies affect project schedule					
12	Project scope change affect project schedule.					
13	Project schedule affected by requirement change					
14	Poor project implementation plan(PIP) affects project schedule					

#### **Part Four: Impacts of project schedule delay/slip in Telecom Expansion Projects**

Please indicate your level of agreement with the following statements relating to impacts of project schedule delay in Telecom Expansion Projects

No.	Item description	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Project schedule delay do not affect or alter project budget.					
2	Project schedule delay causes cost overrun / price escalation and additional budget.					
3	Project schedule delay incurs additional operational cost.					

4	Intended service delivery time prolonged and expected revenue not generated on time.					
5	Contractor exposed for extra cost and liquidation damage.					
6	Project completion delay has affected operational and business activities .					
7	Both internal and external stakeholders are <b>not</b> satisfied.					

8. What other points do you want to mention on project timeline performance of telecom expansion projects?

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### **Part Five: Budget performance of Telecom Expansion Program**

Please indicate your level of agreement with the following statements relating to budget performance of Telecom Expansion Program

No.	Item description	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Telecom expansion Projects are completed within approved budget.					
2	There was budget change due to requirement change.					
3	Lack of detail project feasibility study causes budget change.					
4	There was budget change because of Planning change.					
5	There was budget change due to project scope change.					
6	Project implementation delay causes budget change.					
7	There was poor project monitoring and follow-up which results in extra budget requirement and cost overrun.					
8	Internal and external risk factors causes budget change.					

**Part Six: Quality performance in Telecom Expansion Program**

Indicate your level of agreement with the following statements relating to quality performance of Telecom Expansion Program

1No.	Item description	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Telecom expansion Projects are completed as per the Specifications.					
2	The final project outcome fulfil intended objectives as per the required quality.					
3	Stakeholders satisfied by the project outcome.					
4	Telecom expansion projects closed properly and handed over to functional offices.					
5	Project final deliverables increase customer satisfaction.					
6	Standard operating procedure documents (SOPs) developed.					

**Part Seven: Overall Project Performance of Telecom Expansion Program in Ethio telecom**

How would you rate the performance of Telecom Expansion Program?

Excellent       Very Good       Average       Below average

6. In your opinion does turnkey project have impact on the performance of telecom expansion projects in Ethio telecom?

Yes [ ]      No [ ]

## **Interview**

Dear Respondents the objective of this interview is to collect data regarding the impact of turnkey project on the performance of telecom expansion projects. Data collected from the interview and the result of the survey will be used strictly for an academic purpose and will be kept confidential. Thank you in advance for taking your time to answer the interview.

### **Interview guide**

1. What type of project contracting type Ethio telecom used in TEP?
2. Do you think telecom expansion projects initiation and planning phase done exhaustively?
3. Do Ethio telecom prepared detail roles and responsibilities and communicated to all stakeholders in advance?
4. Do project scope was clearly defined and communicated to all stakeholders at the beginning of the project?
5. Were internal and external risks are identified and considered at the project planning phase and risk mitigation plan developed?
6. Was the project impacted by unexpected risks?
  - If yes, what was the impact on project performance (cost, schedule and quality)?
7. Did the telecom expansions projects complete as per the planned schedule?
  - If no, what was the reasons?
8. Was there any design change during project execution?
9. Was there a project cost overrun?
  - If yes, what was the reason?
10. Do company working tools, policies and procedures affect project schedule?
11. Was there a scope change once project execution started?
  - If yes? what was the impact on budget and schedule performance?
12. Did the final outcome of the project fulfil intended objectives and as per the required quality?
13. What are the Impacts of turnkey project on project schedule, budget and quality performance in general, and in particular Ethio telecom TEP?

## Appendix B

### Reliability

#### Scale: Turnkey Project

##### Case Processing Summary

		N	%
Cases	Valid	45	100.0
	Excluded <sup>a</sup>	0	.0
	Total	45	100.0

a. Listwise deletion based on all variables in the procedure.

##### Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.751	.756	10

### Reliability

#### Scale: schedule Performance

##### Case Processing Summary

		N	%
Cases	Valid	45	100.0
	Excluded <sup>a</sup>	0	.0
	Total	45	100.0

a. Listwise deletion based on all variables in the procedure.

### Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.855	.851	13

### Reliability

#### Scale: Impact of schedule delay

#### Case Processing Summary

		N	%
Cases	Valid	45	100.0
	Excluded <sup>a</sup>	0	.0
	Total	45	100.0

a. Listwise deletion based on all variables in the procedure.

### Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.888	.899	6

## Reliability

### Scale: Budget Performance

#### Case Processing Summary

		N	%
Cases	Valid	45	100.0
	Excluded <sup>a</sup>	0	.0
	Total	45	100.0

a. Listwise deletion based on all variables in the procedure.

#### Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.844	.851	7

## Reliability

### Scale: Quality Performance

#### Case Processing Summary

		N	%
Cases	Valid	45	100.0
	Excluded <sup>a</sup>	0	.0
	Total	45	100.0

a. Listwise deletion based on all variables in the procedure.

### Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.868	.876	6