



ADDIS ABABA UNIVERSITY
COLLEGE OF BUSINESS AND ECONOMICS
MASTERS OF BUSINESS ADMINISTRATION

A Study of Customer Satisfaction and the Mediating Role Service Quality in the
Relation Between Customer Orientation and Customer Satisfaction, A Case of
Ethiotelecom's Indoor Mobile Network Coverage in the City of Addis Ababa

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GSE/2398/09

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ADDIS ABABA UNIVERSITY
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We, the undersigned, certify that have read and with this recommendation for the acceptance of Addis Ababa University, a thesis prepared by Samuel Deribew, entitled: A Study of Customer Satisfaction and the Mediating Role Service Quality in the Relation Between Customer Orientation and Customer Satisfaction, A Case of Ethiotelcom's Indoor Mobile Network Coverage in the City of Addis Ababa,for the partial fulfillment of the requirements of for the award of a degree in Masters of Business Administration.

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I, the undersigned, declare that this thesis is my original work and has not been submitted or presented, in whole or in part, in any previous applications for a degree All the resources used for this thesis have been duly acknowledged.

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This is to certify that this thesis, titled “A Study of Customer Satisfaction and the Mediating Role Service Quality in the Relation Between Customer Orientation and Customer Satisfaction, A Case of Ethiotelcom’s Indoor Mobile Network Coverage in the City of Addis Ababa” is undertaken by Samuel Deribew, in partial fulfillment for the award of Masters of Business Administration from Addis Ababa University, College of Business and Economics, is original work, and not submitted before for any degree either at this university or any other university to the best of my knowledge.

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Abstract

This research paper aims to study the success of Ethio telecom's indoor mobile network coverage. The study mainly focuses on the indoor mobile network coverage of Ethio telecom. Ethio telecom deployed indoor mobile network coverage for 334 buildings in Addis Ababa. Indoor mobile network coverage is needed because providing coverage using conventional outdoor signal sources is difficult inside buildings due to several factors. The objective of the study is to identify the factors that affect the customer satisfaction of Ethio telecom's customers regarding the indoor mobile network coverage. The effects and relationships of customer orientation, service quality, and mobile network performances on customer satisfaction were studied. For this study, quantitative data from 204 respondents were analyzed. From the analysis of the study, it was found that customers are not satisfied with the indoor mobile network coverage. Service Quality, Customer orientation, and Mobile network were proven to have a positive and significant relationship with Customer Satisfaction. Another takeaway from the research is that service quality plays a mediating role in customer orientation and customer satisfaction. Additionally, the research has found that there is a significant variation in customer satisfaction, service quality, and mobile network performance based on the purpose of the building the indoor system is installed. This study recommends Ethio telecom to improve its mobile network service, to be more customer oriented, improve its service quality to satisfy its customers.

Keywords: Customer Satisfaction, Mobile Network Performance, Customer Orientation, Indoor Mobile Network

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ACRONYMS & ABBREVIATIONS

ACSI: American Customer Satisfaction Index

B.Location: Building Location

B.Purpose: Building Purpose

BTS: Base Transceiver Station

DAS: Distributed Antenna System

ETC: Ethiopian Telecommunication Corporation

M_CO: Mean of Customer Orientation

M_CS: Mean of Customer Satisfaction

M_NQ: Mean of Mobile Network Performance

M_SQ: Mean of Service Quality

PCE: Prior Customer Expectation

PQ: Perceived Quality

Wi-Fi: Trade mark phrase meaning IEEE 802.11

CHAPTER 1 - INTRODUCTION

This chapter gives background on Ethio telecom's indoor mobile network. It also covers the problem statement, research objectives, research questions, significance of the study, scope of study and the thesis organization.

1.1 Background of the study

The growth in the number of mobile network subscribers and the construction boom that followed the turn of the Ethiopian millennium has had a significant effect on mobile network coverage and quality in Addis Ababa. Despite Ethio telecom's telecom expansion project for Addis Ababa in 2015, the number of complaints about poor signal quality and reception continued to rise. Complaints about poor signal coverage and signal quality are primarily raised from hoteliers, commercial, and other mixed-use building owners.

Several factors can be attributed as causes for poor mobile network reception in buildings. Building materials (Reinforced concrete causes the highest signal attenuation, in addition, tempered glass, bricks all have an effect), partitions (materials used in buildings is not a set standard, partitions are made using a variety of materials such as magnesium boards, reinforced concrete, glass and more each having their own effect in received signal strength and quality), obstruction from nearby buildings, dead zones caused by large building density (or areas that are not covered with the standard BTS), and heavy traffic on BTS towers; (i.e. Multitude devices trying to use one BTS) are the main reasons behind poor mobile network coverage and quality. Basement floors, top floors in taller buildings (these are very likely to be affected by low signal quality and signal interference due to the reception from many surrounding BTS sites, and elevators usually don't have access to the outside signal source. Another important reason for low quality mobile network service in buildings is the number of customers. A large number of customers in the building translates to high network traffic which makes placing successful calls difficult due to degraded signal quality and dropped calls.

To solve the indoor mobile network problem there are four popular solutions. The first one is direct coverage by Macro Cell. This is normal outdoor coverage using the standard BTS, the outdoor BTS antenna will be adjusted to target the concern areas of a buildings. But providing indoor coverage using this solution is quite difficult, because of there would be

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serious signal loss in penetrating particularly in larger buildings. The second solution is direct coverage by Micro cell. It offers great flexibilities in terms of choosing internal or external antenna. Its advantages are simple installation and high traffic capacity but its drawback is limitation in coverage area. The third solution is using Repeater or RRU. Repeater is used in place requiring small capacity. RRU can split the BTS into several units, and the RF units are constructed to provide coverage for special areas. The last solution is indoor distribution system. This is a network of antennas dispersed throughout a building. It is used in combination with the third solution. Its disadvantages are, its performance strongly depend on the donor signal, and its deployment will take time. There are three main DAS systems based on the signal distribution technology used, Passive DAS, Active DAS and Hybrid DAS. To respond to the ever-growing complaints, Ethio telecom has deployed indoor mobile network coverage system to 334 buildings in Addis Ababa choosing the Passive DAS system. This project aimed to deliver a more reliable mobile network coverage to the buildings that had been suffering from poor mobile network coverage and quality. Regretfully the solution was unsuccessful, with customers still complaining about the lack of adequate signal coverage or poor signal quality in their buildings. Some even speculate that the indoor mobile network solution has made the situation worse. The feedback that Ethio telecom receives from building owners suggests, Ethio telecom is not able to satisfy its customers, the loudest complaints coming from hotelier buildings.

On the flip side, after the end of the last phase of the indoor mobile network coverage project, new and existing commercial buildings and hotels have requested the solution with comments that they would pay for it if necessary. Ethio telecom has informed the owners that the project has been finalized, and they would need to wait for the next phase to get the solution installed. Since the beginning of 2019, Ethio telecom has installed an indoor mobile network for only two buildings. These two buildings were new five-star hotels. Through constant lobby with the government, Ethio telecom permitted them to procure the system from the vendor who has been supplying and installing the indoor mobile network system.

1.2 Statement of the problem

Due to the reasons listed above a standard outdoor BTS cannot deliver adequate coverage and good signal quality in most areas inside commercial buildings and hotels. In 2013, Ethio telecom decided to invest in a project that could provide indoor mobile network coverage for 63 government, commercial, and hotel buildings in Addis Ababa. The project

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later expanded into an additional 278 buildings in Addis Ababa and 92 buildings in the different regional cities. The series of phases in this project aimed to equip the buildings with reliable indoor mobile network coverage and improved signal coverage with better signal quality.

IN its vision statement, Ethio telecom has stressed its desire to be a world-class telecom service provider. Building a reputable brand known for its customers' consideration is one of its mission statements. The other mission statement is providing high quality, affordable telecom products, and services that can ensure high customer satisfaction. With these two mission statements, Ethio telecom expressed its desire to be a customer-oriented company with a good quality of service. Ethio telecom also expressed its commitment to have high-level performances, customer service quality, organizational excellence, and continuous improvement of quality of services ("About Us," n.d.). But in reality:

- New buildings can't get the indoor mobile network coverage at this time, contradicting one of its core mission statements: "providing affordable telecom products that can ensure high customer satisfaction".
- Customers complain about poor mobile network performance inside buildings that have indoor mobile network coverage.
- Customers frequently voice their frustration with Ethio telecom's customer service. One of the feedbacks Ethio telecom receives is that there is a long wait for field technicians to come and inspect complaints and longer wait to have it fixed.
- Previous researches conducted on Ethio telecom has found that Ethio telecom has got a lot of improvements to do in terms of improving its service quality and mobile network performance.

Previous researches conducted on Ethio telecom mainly focused on service quality and its effect on customer satisfaction. Their focus was to identify the causes of poor service quality in major well-known business activities and infrastructure deployments of Ethio telecom, such as the mobile network in general and fixed line access. But their research also focused on relatively smaller towns of Ethiopia (Mamo G.S., 2018 & TADESSE T. D., 2015) except the study conducted by (Kuri, C.A., 2014) whose study focuses on the city of Hawassa. (Mamo GS., 2018) has studied the factors that affect customer satisfaction on service quality focusing on Ethio telecom in Dawro zone. His study concluded that Ethio telecom needs to work on its customer service and service quality for mobile network service.

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(Kuri, C.A., 2014) Conducted a research about the role of service quality in relation to customer satisfaction concentrating on the case of Ethio telecom presence in the Southern region, Hawassa city. His focus group was the fixed-line telephone customers. In his research, he has found that the perceived service quality was poor in all dimensions and indicating customers were not satisfied with the service of Ethio telecom. He recommended Ethio telecom make improvements in all aspects of service quality and points out a few recommendations on how to. (TADESSE T. D., 2015) focused his paper on the relationship between service quality and customer satisfaction on the cases of cellular phone users in Ambo town. He goes on to explain that the quality of service provided by the Ethio telecom is poor, and attributes the reasons as poor network coverage, slow mobile data speed, and poor signal quality. Due to the mentioned reasons Ethio telecom's customers were found to be dissatisfied. But emphasized that the staff of Ethio telecom were good at handling complaints and questions. He recommended Ethio telecom provide continuous training to its front officers and technical operators and deploy modern technologies in order to satisfy its customers.

This paper investigates whether the indoor mobile network coverage project has achieved its goal, weighing customers' perception of the mobile network performance and their satisfaction. The relationship between customer orientations with customer satisfaction is investigated. Customer orientation tells us how Ethio telecom has kept its word on being considerate of its customers. Additionally, the role of service quality in the relationship between customer orientation and customer satisfaction will be evaluated.

To the extent of my knowledge, there is no research conducted in Ethiopia investigating customer satisfaction regarding Ethio telecom's indoor mobile network coverage for buildings.

1.3 Research Questions

1. Is Ethio telecom's indoor mobile network project successful in satisfying its customers?
2. Are Ethio telecom's employees' customer-oriented or not?
3. Does the customer orientation of Ethio telecom employees affect the satisfaction of Ethio telecom's customers?
- 4- How does the mobile network performance inside commercial buildings and hotels affect Ethio telecom customers' satisfaction?
5. How good is the service quality of Ethio telecom within the context of the indoor mobile network coverage?

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6. Does service quality have any mediating role in the relationship between customer orientation and customer satisfaction?

1.4 Objective of the study

1.4.1 General Objective

The general objective of this study is to identify factors that affect customer satisfaction towards Ethio telecom's service for indoor mobile network service.

1.4.2 Specific Objectives

The specific objectives of this study are:

- To understand the relationship between Customer Orientation and Customer Satisfaction in Ethio telecom's indoor mobile network service.
- To study the relationship between Mobile Network Performance and Customer Satisfaction in Ethio telecom's indoor mobile network service.
- To study the relationship between Service Quality and Customer Satisfaction within the context of Ethio telecom's indoor mobile network coverage.
- To study if Service Quality has any mediating role in the relationship between Customer Orientation and Customer Satisfaction in the Ethio telecom's indoor mobile network coverage.

1.5 Significance of the study

Ethio telecom's has a responsibility to address the mobile network coverage issues since it is the state monopoly company tasked with the telecommunication service and telecommunication infrastructure development. Several studies have been conducted to gauge the satisfaction level of Ethio telecom customers (Mamo G.S., 2018, Tadesse T. D., 2015, & Kuri, C.A., 2014), although this studies focused on outdoor mobile network and fixed line access; and these studies have concluded that Ethio telecom scores low points in customer satisfaction measurement.

One area of focus in mobile network infrastructure is the indoor/inbuilding mobile network coverage. Ethio telecom deployed this infrastructure to provide improved signal strength, signal quality, and reduced call drops in buildings. The study's main aim is to investigate the success of the project using customer satisfaction as a measuring tool. The study also investigates mobile network performance from the customers' perspective. Traditionally Ethio telecom sends its engineers regularly to check the network performance parameters within

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buildings. But further investigation is necessary from the customers' point of view because customers have continuously complained that even if measured parameters show the metrics are up to acceptable standards, the quality of indoor networks is still weak.

Several factors must be considered in addition to providing excellent service quality to achieve customer satisfaction. This study will evaluate the impacts of mobile network performance and customer orientation of service employees on customer satisfaction. Previous studies had indicated that service quality as the main determinant of customer satisfaction. In comparison, this study will also explore the mediating role of service quality in the relationship between customer orientation and customer satisfaction.

This study will help Ethio telecom take a valuable note in its approach to solving the problem of indoor mobile network coverage. It will also show the problem areas that needs to be addressed and propose solutions. Ethio telecom has to collect as much data as possible regarding its customer satisfaction rate among various service areas to keep its customers loyal and improve its service. Ethio telecom's service monopoly is going to end next year, and its infrastructure development monopoly will also end in 2 years as the government plans of "liberalizing" the telecommunication sector states. It might not be able to compete with foreign companies with more considerable financial might unless it keeps its customers happy, connected, and provide no reason to switch to a new competitor.

This study is significant because it focuses on the indoor/inbuilding network coverage which is a section of Ethio telecom's services whose customer satisfaction rate has yet to be studied. Indoor/inbuilding mobile network coverage is a consequential section of Ethio telecom's services because it affects a large number of people at once and leaves an impression on the quality of services Ethio telecom offers. Buildings are also where a large number of works takes place through offices, meeting halls in hotels and several other means directly impacting the country's ability to conduct work effectively and hence affecting its economy.

1.6 Scope of the Study

As the title of the thesis suggests, the study explicitly focuses on the indoor aspect of the mobile network that Ethio telecom is providing. The study focuses on buildings located in Addis Ababa, because it is in this city that the mobile network issue is reaching a chronic level. And the other reason is that the indoor system is not widely deployed in regional cities. The main objective of the study is to evaluate the customer satisfaction and also understand the

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impacts of customer orientation, service quality and mobile network performance on customer satisfaction.

1.7 Operational Definitions

Here are definitions of important terms and concepts that are going to be used in this study.

Indoor Mobile Network Coverage: A mobile network coverage system, dedicated to cover all areas in buildings.

Mediation: A mediation analysis seeks to identify the relationship between the independent and dependent variable via inclusion of a third variable known as mediating variable.

Mobile Network Performance: It is a measure of efficiency of the mobile network service from customers' point of view.

Customer Orientation: A set of behavior displayed that puts customer's interest first, while not excluding the interest of other stakeholders (Deshpandé, et al. 1993).

Customer Satisfaction: It is the customer's good feeling, which arises as a result of his/her perception of proper service (Liang and Zhang, 2012).

Service Quality: An assessment how well a delivered service confirms to clients previous expectation.

1.8 Thesis Organization

The organization of this thesis is as follows.

- **Chapter One: Introduction**

The introduction chapter of the research includes background on Ethio telecom's indoor mobile network. It also covers the problem statement, research objectives, research questions, significance of the study, scope of study and the thesis organization.

- **Chapter Two: Literature Review**

- Chapter two covers a literature review covering historical background of Ethio telecom, a review on customer satisfaction, customer orientation, mobile network performance, and service quality. The materials used are published researches, books and websites. The

conceptual framework and the supporting hypothesis are included in this chapter too.

- **Chapter Three: Methodology**

- This chapter includes the methods that are used to measure the sample size, target population, data collection instrument, and data analysis techniques.

- **Chapter Four: Data Analysis and Discussion**

- In this chapter, the data gathered from the questionnaire is analyzed and discussed.

- **Chapter Five: Conclusion and Recommendation**

- Based on the discussion from chapter four, conclusion and recommendations are presented in this chapter, Areas of further study are also discussed here.

-

CHAPTER 2 -LITERATURE REVIEW

In this chapter, the background of Ethiotelcom, theories regarding customer satisfaction, and factors that affect customer satisfaction i.e.customer orientation, service quality, and mobile network performance are discussed. The conceptual framework representing the relationship between customer satisfaction and the hypothesis supporting it is presented next.

2.1 Background of Ethiotelcom

Telecommunication services were introduced in Ethiopia in 1894 in the reign of Minilik II. However, the Ethiopian pioneer of telephony was his cousin Ras Mekonnen who came back with a telephone apparatus in 1889 after visiting Italy and established a company in Ethiopia. Ras Mekonnen's company was restructured and placed under government control at the beginning of the twentieth century and later transferred to operate under the auspices of the Ministry of Post and Communications ("Ethiopian Telecommunication Corporation (ETC)," n.d.).

Telecommunications services were separated from the postal administration and structured under the Ministry of Transport and Communications ("Ethiopian Telecommunication Corporation (ETC)," n.d.).

The Dergue regime restructured the Ethiopian Telecommunication in October 1975 and rebranded it as Ethiopian Telecommunication Service. In February 1981, it was reorganized and named Ethiopian Telecommunication Authority.

It retained this name until November 1996. The Ethiopian Telecommunications Service and the Ethiopian Telecommunications Authority (ETA) were in charge of both the operation and regulation of telecommunications services in Ethiopia ("About Us," n.d.).

Through regulation number 10/1996 enacted by the council of ministers, the Ethiopian Telecommunication Authority was replaced by Ethiopian Telecommunications Corporation. Through this regulation, the Ethiopian Telecommunications Corporation absorbs all the rights and obligations of the Ethiopian Telecommunications Authority ("Ethiopian Telecommunication Corporation (ETC)," n.d.).

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In 2005, ETC installed a national fiber-optic backbone comprising 4 000 kilometers radiating out in six main directions from the capital to Dire Dawa, Djibouti, Dessie-Mekele, Bahir Dar-Nekemte, Jimma and Awassa. The fiber optics infrastructure laid a foundation for delivering current and future services, including digital radio, TV, the Internet, data, and other multimedia services. ETC transferred from narrowband to broadband in January 2005. This enables ETC to increase the service capacity, reliability, quality, speed and size of data transfer.

As a continuation of the 2005/06 – 2009/10 five-year plan and after concentrating its efforts on education, health, and agriculture, the Ethiopian government has decided to focus on improving telecommunication services, considering them as a critical lever in the development of Ethiopia. Ethiotelcom is born, on 29th November 2010, from this ambition of supporting the steady growth of our country, within the Growth and Transformation Plan (GTP), with ambitious objectives for the year 2015. The Ethiopian government has decided to transform the telecommunication infrastructure and services into world-class standards, considering them to be a key lever in Ethiopia's development ("About Us," n.d.). Thus, Ethiotelcom is born from this ambition to bring about a paradigm shift in the telecom sector's event to support the steady growth of our country ("About Us," n.d.).

2.2 Customer Satisfaction

Customer satisfaction is a measure of how the products and services provided by a company meet or exceed customer expectations (Fornell, 1992). Customer Satisfaction can also be defined as an overall evaluation based on the total purchase and consumption experience with the good or service over time (Fornell, Johnson, Anderson, Cha & Bryant 1996).

Customer satisfaction is a barometer that predicts future customer behavior (Hill, Roche & Allen 2007). Customer satisfaction is the customer's good feeling, which arises as a result of her/his perception of proper product performance or serves with his expectations (Liang and Zhang, 2012). Organizations focus on customer satisfaction because it's one of the ways to retain an existing customer.

(Fornell, Johnson, Anderson, Cha & Bryant, 1996.) Introduced the American Customer Satisfaction Index (ACSI), to evaluate the performance of organizations. They developed this index to capture customer's evaluation and their experience.

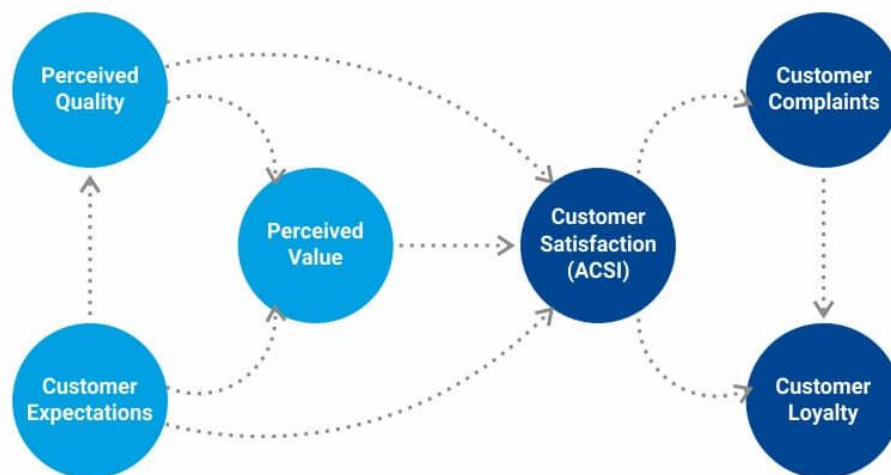


Figure 2-1 Causes and Effects of Customer satisfaction

Source: <https://www.questionpro.com/american-customer-satisfaction-index-acsi.html>

Before there exists an evaluation into the ACSI (Customer Satisfaction), there are three initial factors to be considered, perceived quality, customer expectations, and perceived value. Perceived quality refers to the customer's recent evaluation of his/her experience of the company's product/service in the recent past. Perceived Value factors the effect of cost relative to product/service gained. The last antecedent is customer expectation, which represents what the organization is offering to the customers and its customer's previous experience with other companies for a similar product/service.

The consequences of customer satisfaction are customer complaints and customer loyalty. When customers are dissatisfied, they'll voice their complaints or exit. An increase in customer satisfaction will decrease customer complaints while increasing customer loyalty (Fornell et al., 1996). Considering the great cost of adding a new customer by various means, an organization should keep its loyal customers in order to be more competitive and decrease its expenses. If customers have complaints about the company's products or services, the management should devise a strategy that allows proper handling to address the objections raised and make these customers a loyal customer. A company/organization needs to outperform its competitors by producing quality products or offering quality service to protect its market share or increase its dominance (Tsoukatos & Rand, 2006).

2.3 Factors Preceding Customer Satisfaction (Antecedents)

Antecedents are factors that affect and precede customer satisfaction. The antecedents that are going to be covered in this sections are Service Quality, Customer Orientation and Mobile Network Performance.

2.3.1 Service Quality

Companies with higher perceived quality have more market share and a higher return on investment than companies with low perceived quality. From this, we can conclude that the quality of goods and services offered by an organization with perceived high quality can do well compared with its competitors (Ghobadian et al., 1994).

Service Quality is regarded as one of the factors determining how competitive a company is and a differentiating factor from its competitors. High service quality implies long term profitability combined with other factors. Service Quality affects the customer's repurchase intentions on both new and existing customers (Ghobadian et.al., 1994). There are several reasons why organizations have to create a positive experience for their customers. According to some research papers, the cost of adding a new customer compared to keeping the existing ones is expensive. People are also getting impatient with incompetent service quality, and their expectation of good customer service is on the rise (Ghobadian et.al., 1994).

To attain a service quality, one should focus on

1. Market and customer: Service quality issues can arise in organizations that haven't emphasized identifying and acting on the needs and expectations of the customers.
2. Empowerment of Frontline Staff: Giving more authority or mandates to frontline staff. Allowing frontline staff to make important decisions based on the customers' needs allows the organization to provide a quality service.
3. Well Trained and Motivated Staff: Front line staff who isn't adequately trained for their jobs will find it difficult to perform their duties effectively.
4. A clear Service Quality Definition: In the absence of a clear vision and definition, employees are likely to have their own interpretation of "service quality." Lack of common vision will inevitably increase the variability experienced by the customer within each stage of the service delivery. Inconsistency and variability of treatment is likely to have an adverse impact on the perception of "quality" (Ghobadian et al., 1994)

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Service Quality is the measure of the extent to which the delivered service meets the customer's expectations.

Perceived Quality = Prior Customer Expectations + Actual Process Quality + Actual Outcome Quality
(Equation 2.1)

Since the customer is present in the service delivery, the perception of quality is also influenced by process quality other than the prior expectation and the quality of the outcome.

From the expression above, there are three quality outcomes.

1. Satisfactory quality is when the expectation is exactly met with the products and services offered ($PCE=PQ$).
2. Ideal quality is when perceived quality is greater than Prior Customer Expectations ($PQ>PCE$)
3. Unacceptable quality is when previous customer experience is greater than perceived quality ($PQ < PCE$) (Ghobadian et al., 1994)

(Parasuraman, et al., 1985) conducted an in-depth interview of managers and a set of focus group interviews of customers to gain insight about certain topics.

- What do the managers of service firms perceive to be the key attributes of service quality and the problems and tasks involved in providing high-quality service?
- What do consumers perceive to be the key attributes of quality in services?
- Do discrepancies exist between the perception of consumers and service marketers?
- Can consumer and marketer perceptions be combined in a general model that explains service quality from the customer's standpoint?

They have conducted these interviews since they couldn't get enough literature to provide a sound conceptual foundation for investigating service quality; previous literature mainly focuses on product quality.

From interviews with executives (Parasuraman et al., 1985) observed that there exists a set of key discrepancies or gaps exist regarding the executive perceptions of service quality and the task associated with service delivery to consumers.

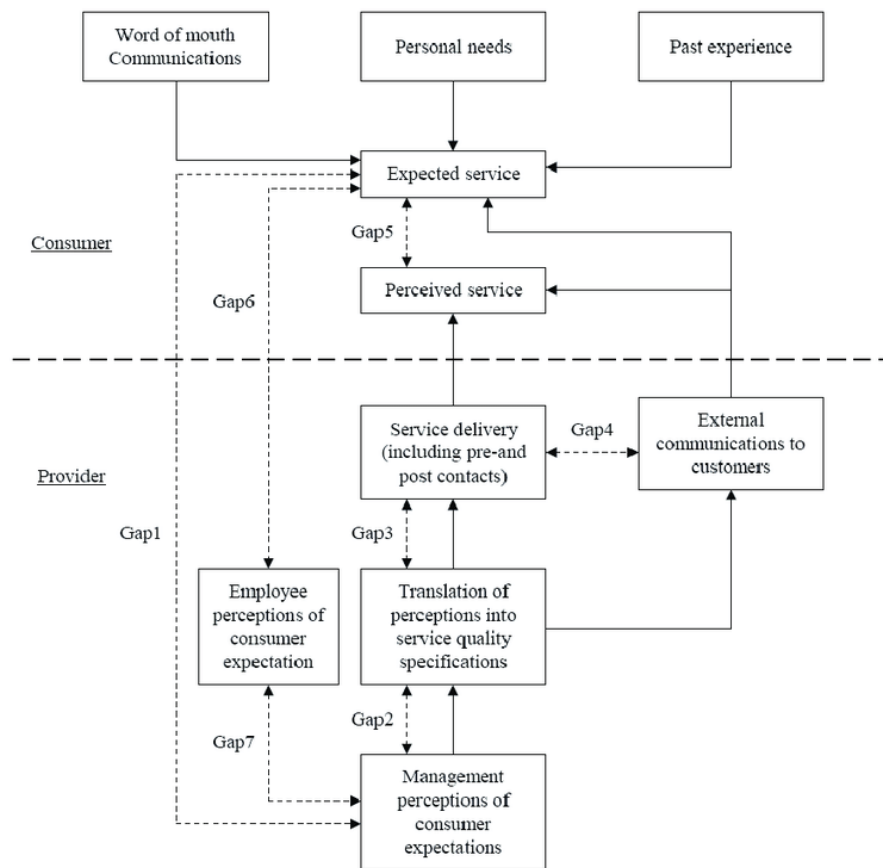


Figure 2-2 A conceptual model of service quality.

Source: (Parasuraman et al., 1985)

(Parasuraman et al., 1985) identified the following gaps after conducting in depth interviews with managers and focus group interviews with customers.

1. The gap between consumer expectation and management perceptions of those expectations will have an impact on the consumer's evaluation of service quality.
2. The gap between management perceptions of consumer expectations and the firm's service quality specifications will affect service quality from the consumer's viewpoint.
 - Several factors may constitute as a cause for this such as, resource constraints, market conditions etc.
3. The gap between service quality specifications and actual service delivery will affect service quality from the consumer's standpoint.

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4. The gap between actual service delivery and external communications about the service will affect service quality from a consumer's standpoint.
 - External communication can affect both consumer expectations and perceptions of the delivered service.
5. The quality that a consumer perceives in a service is a function of the magnitude and direction of the gap between expected service and perceived service.
 - The judgments of high and low service quality depend on how consumers perceive the actual service performance in the context of what they have expected.
6. Service quality as perceived by a consumer depends on the size and direction of the fifth proposal (GAP5)

$$\text{i.e. GAP5} = f(\text{GAP1, GAP2, GAP3, GAP4})$$

Parasuraman, et al., 1985) found that consumers used similar criteria in evaluating service quality from their focus group study. And these criteria seem to be grouped into ten key categories. The categories were:

Table 2-1 Key Categories of Service Quality

Responsiveness	Reliability
Competence	Credibility
Access	Security
Courtesy	Understanding/ knowing the customer
Communication	Tangible

Source: (Parasuraman, et.al. 1985)

These dimensions and their descriptions used as the basic service-quality dimensions which were derived for the SERVQUAL scale. After evaluating the overlapping categories, the SERVQUAL dimensions are listed below with their definitions.

- Tangibles: Physical facilities, equipment, and appearance of personnel
- Reliability: Ability to perform the promised service dependably and accurately
- Responsiveness: Willingness to help customers and provide prompt service

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- Assurance: Knowledge and courtesy of employees and their ability to inspire trust and confidence.
- Empathy: caring, individualized attention the firm provides its customers.

(Johnston, 1995) in his study classified determinants of service quality into a category of determinants that are mainly satisfiers and others that are predominantly dissatisfiers. And he summarized that

1. Some determinants of quality predominate over the others.
2. The source of dissatisfactions is not necessarily the opposite of the source of satisfaction.
3. Reliability is predominantly a source of dissatisfaction not satisfaction.
4. Responsiveness is a crucial determinant of quality, as it is a key component in providing satisfaction and the lack of it is a major source of dissatisfaction.
5. The intangible aspects of the staff-customer interface have significant effects, both negative and positive, on service quality.

2.3.2 Customer Orientation

(Singh & Koshy, 2008) defined salesperson's customer orientation as "the set of behavior displayed by salespersons in all customer-related activities that pertain to gathering and disseminating information to customers, understanding their expressed and latent needs, and continuously fulfilling these needs by delivering superior quality products and services through sustained long term relationship with customers, to profitably create value for customers and keep them satisfied."

(Deshpandé, et al. 1993) define customer orientation as "the set of beliefs that puts the customer's interest first, while not excluding those of all other stakeholders such as owners, managers, and employees, in order to develop a long-term profitable enterprise." This definition puts the assertion that providing a service that the customer wants should not interfere with the interest of the company and everyone who has stakes on it. Continuing on their explanation of customer orientation (Deshpandé et al.) asserts that any information about the current and prospective customer is inadequate without considering the set of values and beliefs of the company. Having a set of values and beliefs about customer orientation enables the company to put customer focus and make it appear throughout the organization.

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(Parasuraman, A., 1987), provides an insight into the benefit of customer-oriented organizational culture, stating that "A customer-oriented organizational culture is a prerequisite for service firms to excel in the increasingly competitive market place." The article also argues that a customer-oriented corporate culture by itself can't guarantee good performance in the market place.

(Appiah- Adu & Singh, 1998) explains the origin of customer orientation, pointing to the point where it can be traced to the development of the marketing concept, which is basically a business philosophy or policy statement which holds that the ultimate goal of an organization is to fulfill customer needs for the purpose of maximizing business profits.

An employee can only behave in a fully customer-oriented sense if all dimensions exist: technical skills, social skills; motivation; and decision-making authority (Yusoff & Baharun 2007).

Business strategies are said to be focused on customer orientation, including providing a quality product and service, providing customer service employees that have the capacity to resolve the customers' complaints and queries as soon as possible no matter how complex some issues might be (Sunit Vij, 2015). Front line employees such as salespeople, call center staff, and customer service representatives are all should be involved in a customer orientation training since they are the ones interacting with the customers and are responsible for their needs.

Companies are giving huge attention to customer orientation based on the belief that customer orientated companies can beat their competitors by forecasting the developing needs of customers and providing services and products that are deemed to excel the customer demand and expectation (Brady & Cronin, 2001). That is, being customer-oriented allows firms to acquire and assimilate the information necessary to design and execute marketing strategies that result in more favorable customer outcomes. (Brady & Cronin, 2001).

The word customer orientation can be found in the strategy statements of organizations. Insufficient understanding of customer orientation leads to problems or only surface-level changes, which in turn implies an incorrect understanding of the needs of the customers. Customer orientation is an important factor in companies' business profitability and a necessary precursor to competitive advantages. Market orientation, the marketing concept, and customer-first are associated and defined with the concept of customer orientation. The main aim of customer orientation is to make customers the main aim of the company's strategic focus

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(Nwankwo, 1995). Nwankwo added, in today's competitive market, managers should design and deliver sustainable customer orientation programs if they are to survive. Putting customers at the heart of an organization's product-market definition is the first rule of effective customer-orientation management.

A customer-specific definition requires organizations to have clear ideas about the needs of customers and customers themselves. There should be effective customer education systems, feedback systems that allow communication between customers and the organization, and genuine concern for market pluralism (Nwankwo, 1995).

Nwankwo also suggested that managers need to create a framework for a customer-oriented service with four dimensions, including definition, sensitivity, measurement, and implementation. Nwankwo created this framework to help managers to conduct a clearly focused self-examination of their strategies and to determine what customer orientation goals and objectives to pursue (Nwankwo, 1995).

The evaluation of a company regarding how customer-oriented it should be, is done by the customers themselves. From their study (Deshpandé et al., 1993) has found that the company's' customer orientation, as reported by customers, is related positively to business performance, and the customers' perception is more important than the company's own perception.

Robert Saxe and Barton A. Weitz developed the SOCO scale in 1982 to measure the customer orientation of salespeople. Defined Customer-Oriented Selling is expressed: as the degree in which the frontline officers are willing to help customers in order to solve the customer's (prospects) issue. And a highly customer-oriented salesperson/ front officer engages with the customer to satisfy the customer's long-term needs and guarantee future satisfaction and usually refrains from actions that only guarantee short term satisfaction (Saxe & Weitz, 1982). The customer orientation of salespeople is mostly dependent on the extent to which customers use the salesperson as a source of information and their cooperation in seeking out their desire and their trust in the salespeople.

On the basis of literature review and interviews, they have developed the characteristics of a customer-oriented selling process,

1. An initiation to help customers make a good decision
2. Helping customers assess their needs.

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3. Offering products that will satisfy customers' needs.
4. Describing products (and services) adequately.
5. Avoiding deceptive or manipulative tactics
6. Avoiding the use of high pressure selling.

The SOCO scale is used as a way to measure the customer orientation of salespeople, from either a salesperson or a customer perspective, and some studies used a modified version of the SOCO scale to suit their own study area, these scales are considered as variants of the original scale (Thomas et al.,2015).

2.3.3 Mobile Network Performance

Accessibility, retainability, and integrity are three of the performance indicators for mobile network performance that should be kept in check. Accessibility refers to the ability of the user to obtain service within an acceptable time frame and conditions. It can be simply translated as when a user is able to make a call, and the call setup time is within the acceptable time range. Retainability refers to the ability of the user to keep using the service once it has been accessed, and again under the appropriate conditions. The last performance indicator is integrity, which refers to the degree to which the system is maintained without many disturbances once it has been accessed (Ascom, 2013).

The main target of telecommunication companies when deploying infrastructure is to provide coverage for as many customers possible and keeping the quality of service in both data and voice service up to a defined standard. It is up to the service provider to manipulate the perception of its customers and to decide and define its service and performance regarding critical attributes of cellular service (Eljaam, B. 2005). If a telecommunication service provider wants to satisfy its customer regarding the network performance, it has to look at and improve those parameters that indicates the cellular network coverage, the network quality, call drop rate, and other metrics.

There are currently four major network types in operation across the world (2G, 3G, 4G/LTE, and 5G). The main measurable parameters that concern users are signal quality and signal strength. Basic network parameters for 2G, 3G and 4G will be discussed below. 5G will not be discussed because it hasn't been commercially deployed in abundance.

2G network parameters

RxLevel: The receiving level in terms of dBm refers to the signal strength that the mobile is receiving from the nearest cell tower (BTS). It ranges from -30dBm to -110dBm, -30dBm being the strongest full bar while -110dBm being the worst signal level with total disconnection. **RxQual** refers to voice quality and ranges from 0 to 7. [0-4] is the acceptable level of quality, when the signal quality gets closer to 7, then the user will experience dropped call, longer call setup time and low-quality phone conversation. **Traffic channel assignment success rate** refers to the rate that the TCHs assigned by the BTS controller is successfully seized. TCH Assignment success rate is one of the accessibility performance indicators, which indicated the rate of the user device successfully acquiring TCHs to make calls (Huawei, 2008).

3G network Parameters

RSCP (Received Signal Code Power) refers to the power measured by a user device on a particular physical communication channel and indicates signal strength in the 3G network. RSCP values ranges between [-30dBm to -124dBm]. **Ec/Io** is the ratio of the received energy per chip and the interference level and given in dB. Its value ranges from [0dBm to -20 dBm]. [0dBm to -6 dBm] gives excellent signal strength with maximum data speed while [-11dBm to -20 dBm] poor signal quality with diminished performance in terms of both voice and data service.

4G network parameters

RSRP (Reference Signal Received Power) refers to the power of the LTE reference signals spread over the full bandwidth and narrowband, which literally means signal strength of the LTE. RSRP greater than -80dBm is generally considered excellent while below -100dBm bad signal plagued with disconnection. **RSRQ (Reference signal Received Quality)** indicates the quality of the received reference signal. RSRQ greater than -10dB generally considered excellent signal while below -20dB refers disconnection ("Mobile Signal Strength", n.d.).

JD Power and Associates conducted a study in 2003 on seven customers reported problem areas impacting overall carrier performance, including dropped/disconnected calls, static/interference, voice distortion, no connection on the first try, echoes, no immediate voice mail notification, and no immediate text message notification. From their study, they have stressed the importance of providing clear and uninterrupted calls to customers, and it has been the main focus area of service providers. Their recent studies conducted in 2019 and 2020, have

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found that investments in telecom infrastructures, especially in LTE and future 5G allows service providers to deliver a good service to their customers with a noticeable improvement in rural areas. Comparing the studies conducted by JD Power and Associates from the years 2003 and 2019, one can observe that the customer complaint areas have included issues related to data connection and unassisted customer care.

(Eljaam, B. 2005) reviewed prior studies conducted to identify the drivers of customer satisfaction in the telecom service. Service price, good geographic coverage in the user's surroundings, network quality/reliability, and customer service were identified as the main drivers. Good geographic coverage directly translates to investment in infrastructure deployment, and smart deployment of this infrastructure to avoid signal blockage and interruptions. From the user side of cellular network, network quality is based mainly on three factors; access reliability, completeness of coverage, and audio quality. These are measurable parameters, and telecom companies always track these parameters together with survey interviews to gauge the level of customer satisfaction. (Eljaam, B. 2005) proposes four dimensions to measure customer satisfaction.

- System availability is the ability to access the network whenever needed. Availability is dependent on a load of requests from the customer (the system being overwhelmed from the number of connection requests) and outages in the area, which can be power or other modular failures that cause loss of signal in that particular coverage area.
- Coverage, which is the area that is being served with that particular infrastructure.
- Call drops usually occur because of signal congestion or system error, which causes the call to be discontinued.
- Signal Quality

The above four dimensions are dependent on the type of network chosen by the customer. 2G networks, in general, can cover larger areas and has a better penetration power, which is associated with their operating frequency. In most cases, to provide 2G network coverage, cellular network operators use 900MHz to cover more rural areas while 1800 for more densely populated urban areas. Although it is not widely deployed yet, the 5G network provides faster network speed, which can deliver a download speed as fast as 20Gbps in theory,

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practically it delivers a minimum of 100Mbps, a lower latency rate as low as one millisecond and more simultaneous connections.

Heavy cellular traffic is one of the causes of bad signal connection. If there are more people served with the same cell phone tower (BTS), making a call will be difficult because there is a chance that the tower is already full of traffic. And even if one can make a call, the quality of that call is below average in most cases.

A more recent study conducted by (Finley, B. et al., 2017) focused on mobile user satisfaction and identified the drivers for customer satisfaction. Their primary goal was to study the relationship between customer satisfaction with network quality and real network performance. Most studies only explore only the relationship between customer satisfaction and network quality, but without using a measuring tool to measure the signal coverage and other network data to verify the response of the customers that were surveyed. And they have also studied the non-network predictors (device type & device quality) of user satisfaction with network speed and availability. From the study (Finley, B et al., 2017), have found that network availability, minimum download goodput, number of frequently measured locations, network operator, and device type are significant factors. This study also made note that customer satisfaction related to the speed of mobile connection is, in part, impacted if the customer noticed a discrepancy between the data reading from a measuring tool and the advertised/marketed speed for that particular service. Some customers may not use measurement tools to check the speed of their mobile connection but relay on their user experience. For this particular reason, (Finley, B et al. 2017) recommends further research to study the two ways of understanding the speed of customers' mobile connection.

2.4 Related Research

(Rahman, M. H., 2014) identified service innovativeness, service reliability, service competitiveness, & service consistency as factors affecting customer satisfaction in the mobile telecommunication industry in Bangladesh. At the time of his study, there were six mobile service providers in Bangladesh. And he recommended service providers to establish a strong network signal to promote value-added service. The study also revealed that customers have an insignificant perception of their demand being fulfilled by the operators.

Operators provided value-added service has an insignificant influence on making them satisfied; fair price, customized service, and convenience in use can promote value-added service in promoting customer satisfaction.

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(Jibril, Muhammad, 2011) studied customer satisfaction in the mobile telecommunication industry in Nigeria, focusing on one of the main telecom service providers in the country. In his study, he has found that more than half of the customers for the service provider (Etisalat) are satisfied. (Jibril M., 2011) hypothesized that customer satisfaction is affected by the service provider's service quality, billing, validity period customer care, and support. He has also linked customer satisfaction with demographic variables such as age, gender, location, employment, age, and a combination of these on his hypothesis. Jibril M. has found that Nigerians were satisfied with the service of Etisalat but cautioned that their satisfaction results from incompetence among its competitors or customers were new to the customer satisfaction measurement, or maybe customers were not able to explain their perception about the service provider. Regarding the demographic influences, the older generation was more satisfied with the service than the younger ones; males were more satisfied with regard to the female population, employed people are less satisfied than the unemployed ones. But the overall result showed him that the demographic factors have a weak influence on customer satisfaction. People with lower incomes are more satisfied with the service than the higher-income people. Quality of network proved to be the major factor when looking at the mobile telecommunication industry standard, and its influence on customer satisfaction was found to be huge.

(Nurysh, et al., 2019) studied factors affecting customer satisfaction in the mobile telecommunications industry in Malaysia. Their study proposes that customer satisfaction is influenced by service quality, perceived value, and attractiveness of alternatives. They have tested the moderating effect between service quality, perceived value, and customer satisfaction. There is a strong positive relationship between service quality and customer satisfaction, and the same had been found to be true for the case of perceived value. The moderator found that the interaction of both variables with the attractiveness of alternatives has no effect on improving or enhancing customer satisfaction. But the authors have explained that their finding of the insignificant effect of the attractiveness of alternatives by correlating it to the demographic group who participated with their research and the culture associated with that age group. As most Malaysian youths prefer using the Wi-Fi network for most of their communication need, including voice calls, they are very reluctant to care about their carrier provider and look for alternatives.

(Popli & Manish, 2013) studies the determinant of customer satisfaction focusing on the Indian telecom industry. They hypothesized and tested the relationship between customer

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satisfaction and customer services, pricing of the telecom service provider, sales promotion, coverage of cellular companies, and signal strength of cellular companies. From their study, Popli & Manish concluded that:

- The two factors that have a great impact on the services of cellular companies, and also the major driver for customer satisfaction are fairness in prices and coverage area.
- Customers are more dissatisfied with the level of fairness in price, and in rural areas, customers complain about coverage of cellular service.
- The satisfaction of customers dependent on the demographic categories in which the customers hailed from, i.e., on the basis of their age, gender, profession, status, etc.

(Tilahun, Meron, 2017) studied the relationship between service quality and customer satisfaction of Ethiotelcom's call center. Her study revealed that all the service quality dimensions have a positive and significant relationship with customer satisfaction. Customers were found to be more satisfied with the assurance dimension of service quality.

2.5 Indoor Mobile Network Experience of Other Countries

Nigeria

Due to poor landline connectivity, there is a heavy reliance on mobile communication systems, placing a huge demand for GSM services. The mobile operators operating in Nigeria are hardly able to satisfy this high demand. Consequently, many areas suffer from weak or no signal reception. This has resulted in a progressive decline in the quality of service experienced by users. Also, the Nigerian terrain comprises hills, valleys, plateaus, and a few high-rise structures that can block out signals and cause weak signal reception. The use of cellular boosters in Nigeria is a growing trend that is not only beneficial to the users but can help maximize profit by operators. The NCC recently put out a warning on boosters deployed indiscriminately by users, stressing that users can only deploy boosters in conjunction with licensed network operators. A lot of these boosters are currently imported and on sale in the Nigerian Market (Onwuka, Liz & Okwori, 2018).

United States

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In 2013, the FCC passed a regulation mandating that all cell phone signal boosters be certified with improved designed to avoid interference with carrier networks. According to this new regulation

1. All cell phone signal boosters must be sold in kits
2. All cellphone signal boosters must be labeled and registered with carrier network for consent.
3. All consumer cell phone signal boosters are allowed a maximum gain of +65db
4. All in-building cell phone signal boosters cannot be retrofitted for vehicle use.[1]

Using this regulation, more than 90 carriers around the world have provided a blanket consent to all boosters with this certification standards. In Africa, Nigeria, South Africa, Lesotho, and Some Northern African Countries allows private individuals to install the indoor signal booster privately from a verified vendor ("Why cell phone signal", 2018).

India

("Retailers must stop." 2019) Signal boosters (Repeaters) must be registered with the carrier provider in which the booster spectrum works. The cellular operators' association of India explains that these signal boosters and repeaters cause interference with existing airwaves and impact the overall network quality.

United Kingdom

(Real Wireless, 2013) gives an insight in the ways the UK is addressing the in building mobile network problem. Traditional consumer repeaters or signal boosters are available in the market with the permission of the operator. Operators deploy repeaters in large buildings, in combination with a DAS System. Femtocells are available for the consumer to buy and deploy. They are connected with the house's broadband network and power system, similar to the Wi-Fi access point. They can be deployed commercially by operators also. For larger areas, picocells are also an option.

DAS systems are deployed for larger infrastructures connected to the traditional booster or dedicated high capacity base station. Real Wireless, in its study for the Ofcom (Office of communications, UK), has found a few concerns/issues and proposes solutions.

Concerns:

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- Full integrations of small cell solutions into existing operator networks. Seamless handover of networks, i.e., when the customer is using a network from one source and continues communication, even the customer is moving to the outdoor area.
- Ensuring the security standards are carefully met in consumer accessible small cells.
- Multi operator support is expensive.
- Many in building solutions are still reasonably immature and limited in their availability.

Recommendations:

- Guide customers to identify the type of solution they need based on their situation.
- Considering making low power shared access licensed spectrum available for indoor deployments to help accelerate the deployment of in-building solutions.
- Considering monitoring and reporting in-building coverage levels across operators as part of their market reports.
- Assisting in the formation of best practice guidelines for the implementation of security standards in UK in-building solutions.

2.6 Conceptual Framework Diagram

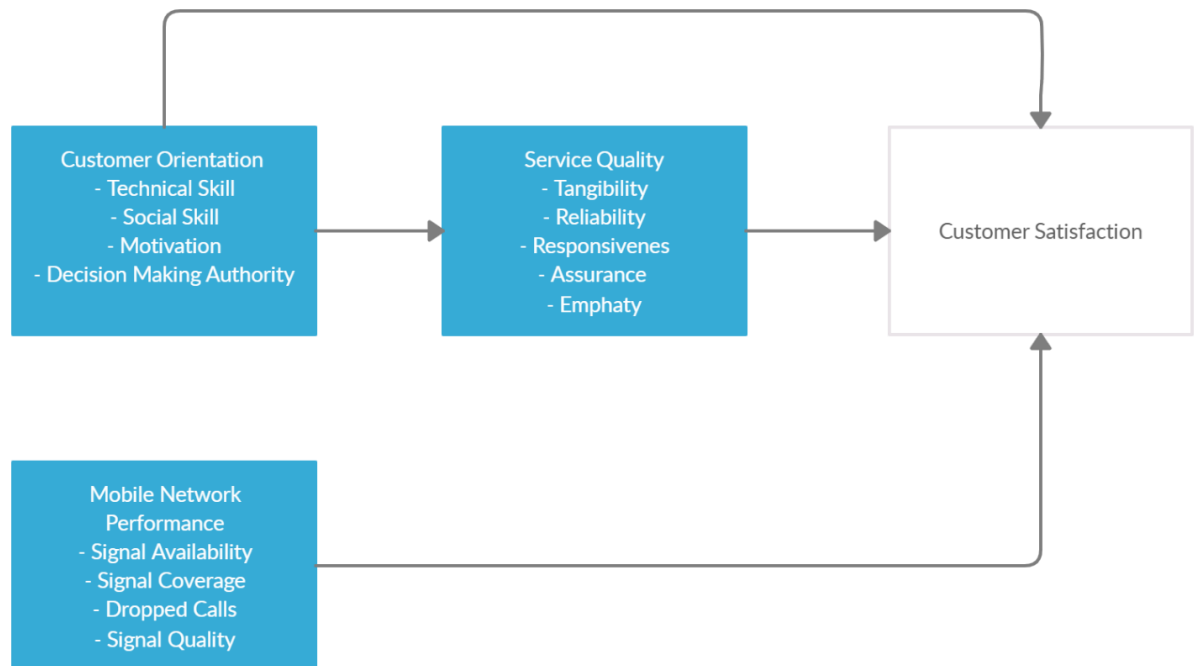


Figure 2-3 A conceptual framework diagrams.

Source: Author

2.7 Hypothesis of the Study

H1: Customers are not satisfied with the indoor mobile network service of Ethio telecom.

According to (Anderson and Srinivasan 2003), satisfied customers stay longer with a firm, make more purchases, and tend to contribute to word of mouth branding. Currently, loyalty is not a big concern for Ethio telecom because it has a current market monopoly. Still, it should start focusing on satisfying customers and try to make its customers loyal, considering the government's intention to allow more competitor service providers to operate in Ethiopia.

Customer satisfaction is the result of the overall experience of the customer. It is the customer's good feeling which arises as a result of positive perception about product/service received (Liang & Zhang, 2012). Perceived Quality, Perceived Value, and customer expectation are important factors in determining customer satisfaction (Fornell, Johnson, Anderson, Cha & Bryant 1996). For the customer to have a good Perceived Quality, the system flow for the product/service delivery should be designed carefully. Some researchers have

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shown that the flow of events and experience in a service delivery process affects customer satisfaction. (Verhoef, Antonides, and de Hoog 2004).

A service delivery process often concerns a sequence of related events occurring at different points in time. The value of the experience (Perceived Value) is factored by the experience from these events. The average performance of the service and the deviation from the averages are important in shaping a customers' service evaluation (Verhoef et al., 2004). The customer service element is a key determinant of customer behavior and intentions after the service (Parasuraman, Zeithaml, and Malhotra 2005).

Customers expect Ethio telecom to provide a good and reliable network since it is the only responsible company in the country tasked with telecom service. Customers also expect Ethio telecom to provide adequate service that can at least match services provided by neighboring countries. Ethio telecom has also been advertising its success in mobile network coverage expansion and upgrades, making customers expect improvement in the service and coverage. But at the same time, Ethio telecom receives many customer complaints, and people are waiting for the government to open up the market for other competitors and switch their subscription. The eagerness of the people and the government's desire to open up the market indicates Ethio telecom has not been successful in satisfying its customers.

H2. Service quality has a positive influence on customer satisfaction.

SERVQUAL model, which helps to describe the service quality provided by a company, has five dimensions. Among them is reliability, a company's ability to provide the promised services and products as advertised & expected by its customers (Parasuraman et al. 1985). The ability of the service providers to help customers and to respond to customer request represents another dimension of service quality. Perceived quality is customers' recent evaluation of their last interaction with the product or service offered by the company (Fornell et al., 1996) and also dependent on the actual process quality and actual outcome quality (Ghobadin et al. 1996). (Fornell, et al., 1996) describes perceived quality as one of the causes of customer satisfaction. A service that creates a good perceived quality on its customers makes its customer satisfied.

H3. The customer orientation of service employees has a positive relationship with customer satisfaction

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Several researchers have found that customer-oriented companies can increase customer satisfaction and value by providing high-quality products and services. Customer orientation influences customers' perceived service quality. The primary concern for customer orientation is to create value for the customer. Organizations need to understand what the customer wants and develop a product/service that the customer values much (Lee et al., 2010). Because of the intangible nature of service and their high level of interaction, customer orientation can be expected to play a huge role in companies' success. A service provider with a clearly defined customer-oriented business strategy can create a good perception of service quality to its customers (Irfan, P.S., 2015). (Kim, 2009) concluded his research about the customer's responses to customer orientation of service employees, front line employees with a high degree of service orientation influence customers' perception of service quality. Customer-oriented behavior is the ability of the service provider to help its customers, which leads to more customer satisfaction and customer retention (loyalty) (Araújo et al., 2013).

H4- Mobile network performance and customer satisfaction have a positive relationship.

The ability to make and receive calls is the core function of a telecom service provider. Failing to meet the customers' demand for a quality service means poor mobile network performance resulting in a low customer satisfaction index score. Poor network performance triggers customers to reevaluate their perception of the service provider. Customers' mobile network experience and their evaluation drives the overall customer satisfaction with the service provider (Radosavljevik, Van Der Putten, & Larsen, 2011).

H5. Customer orientation and service quality have a positive relationship.

Service providers should understand what customers perceive a high-quality service after their engagement, and they should design their products and/or service delivery process accordingly. (Parasuraman, et al., 1995) identified a gap between what customers expect and what management thinks the customers expect will impact the customer's evaluation of the service quality. Additionally, the service quality that a customer perceives is a function of the magnitude and direction of the gap between expected service and perceived service. But a customer-oriented organization can minimize these gaps since its primary focus is to deliver products or services that are in line with customer expectations while keeping the organization's stakeholders' interest (Deshpandé et al. 1993). If a company identifies its customers'

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expectations and needs, the customers' perceived service quality will be positive. This can only be achieved if the company is strongly customer-oriented and puts their interest first.

H6. Service Quality has a mediating role in the relationship between Customer orientation and Customer Satisfaction.

From Hypothesis 3 that states, the customer orientation of service employees have a positive relationship with customer satisfaction and Hypothesis 5 that states customer orientation, and we can hypothesize that service quality has a mediating role between customer orientation and customer satisfaction.

CHAPTER 3 – METHODOLOGY

This chapter includes topics such as research design, sources of data, data sampling techniques, sample size, data collection instrument, data collection procedure, limitations of the study, ethical consideration, and methods of data analysis are discussed.

3.1 Research Design

This chapter aims to explain the type of research conducted, the number of samples taken, the target population of the study, variables of the study, and the analysis techniques used to answer the questions raised in the first chapter.

Customer satisfaction within Ethio telecom had been studied and published in several pieces of research within different contexts and functional departments. This study aimed to investigate if the customers of Ethio telecom are satisfied with the indoor mobile network coverage project and test if customer orientation, network quality, and service quality affect customer satisfaction.

The research design is to collect quantitative data, observe patterns, and understand the relationship between the dependent and independent variables. Quantitative analysis helps the researchers describe situations, establish relationships between variables, and sometimes explain the causal relationship between variables.

3.2 Source of Data

The data used for this study is a primary source data collected through a structured questionnaire. The questionnaire was administered both online and face-to-face. The online tool that was used for the study was Survey Monkey.

Secondary sources of data are used to identify buildings with indoor mobile network coverage, the type of coverage, and other related information. Secondary sources of data were collected from the company that has conducted the indoor mobile network implementation.

3.3 Target population of the study

The target population for this study were Ethio telecom customers that had a prior knowledge about the indoor mobile network coverage project. Usually, building owners,

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building administrator officials, ICT managers, members from building's general service department have prior knowledge and experience in indoor mobile network coverage.

3.4 Sampling Technique

The study followed Non-probability Sampling Techniques particularly purposive sampling and random sampling. Buildings for the survey were mostly selected randomly only based on the owners, management, or customers' willingness to cooperate and the buildings' convenience. A few sites were selected deliberately based on the assumption that their owners' contribution is vital for the study, particularly hotels and government buildings. Purposive or judgmental sampling is a strategy in which particular settings, persons, or events are selected deliberately to provide relevant information that cannot be obtained from other choices (Taherdoost H., 2016).

3.5 Sample Size

To calculate the sample size,

$$n = \frac{p(100-p)z^2}{E^2} \quad (\text{Equation 3.1})$$

Where,

n is the required sample size,

P is the percentage occurrence of a state or a condition. (Taherdoost H., 2016)
Suggested to use 50% as an estimate of P.

E is the maximum percentage error required. E is the margin of error (the level of precision) or the researcher's risk. Ordinarily, the recommendation is to use a 5% or 10% margin of error.

Z is the value corresponding to the level of confidence required.

Then True sample is calculated as

$$\frac{(\text{Sample Size} * \text{Total Population})}{(\text{Sample Size} + \text{Total Population} - 1)} \quad (\text{Equation 3.2})$$

From the above two formulas, and a total number of buildings that have indoor coverage in Addis Ababa are 334 (i.e., 63 on the first phase and 271 in the second phase)

Taking Z value as 1.96, confidence 95%, and e 5%,

$$n = \frac{p(100 - p)z^2}{E^2}$$

$$n = \frac{0.5(1 - 0.5)1.96^2}{0.05^2}$$

$$n = \frac{(0.5 * 0.5)3.8416}{0.05^2}$$

$$\underline{n = 384.16}$$

Then the total sample required is calculated as,

$$Sample = \frac{(Sample\ Size * Total\ Population)}{(Sample\ Size + Total\ Population - 1)}$$

$$Sample = \frac{(384.16 * 334)}{(384.16 + 334 - 1)}$$

$$Sample = \frac{(128,309.44)}{(717.16)} = 178.9 \simeq 179$$

The initial idea was to collect data from 179 buildings and taking one sample from each building. But visiting each 179 buildings and collecting data from each was found to be very difficult. Therefore the margin of error had to be increased to 10% to decrease the number of buildings to be sampled in the study. .

$$n = \frac{0.5(1-0.5)1.96^2}{0.1^2} \quad \text{From Equation 3.1}$$

$$n = \frac{(0.5*0.5)3.8416}{0.1^2} = 96.04$$

Then using equation 3.2,

$$Sample = \frac{(96.04 * 334)}{(96.04 + 334 - 1)}$$

$$Sample = 74.76 \simeq 75$$

The above sample size gave us the minimum sample size that has to be collected. Using this sample was collected from 100 buildings and 247 individual respondents. **But data from 204 respondents representing 84 buildings were used**, because 43 responses were discarded because they did not properly complete the survey.

3.6 Data Collection Instrument

The primary data for this study was collected through a self-administered structured questionnaire. The questionnaire was structured to capture customers' opinions about their evaluation of the mobile network performance of the indoor mobile network project, whether Ethio telecom employees are customer-oriented or not, and whether Ethio telecom is providing excellent service quality and the overall satisfaction.

The questionnaire used has five parts.

Part one is structured to collect demographic data and the purpose of buildings. Demographic data includes respondents Gender, Age, Educational Background. Respondents were asked to fill the building's position and use the building on the questionnaire to check for variations in respondents' opinions concerning mobile network performance and customer satisfaction, in the same area,

Part two: aimed to collect data on customers' opinions about mobile network performance. The questionnaire is taken from a paper written by Eljaam, B, in 2015. The instrument's reliability is presented as Cronbach's Alpha with a value of 0.7138, which indicates it is a reliable instrument.

Part three: aimed to collect data on Customer orientation of Ethio telecom employees, from the customers' perspective. The instrument used was taken from a research paper written by Hennig-Thurau that was published in 2004- The tool measures customer orientation of service employees across four customer orientation dimensions; Technical Skills, social skills, motivation, and decision-making authority. The reliability of the customer orientation of service employees was excellent, with alpha values of 0.91 and higher for the four COSE dimensions. A confirmatory factor analysis gave support for the postulated four-dimensional structure of COSE.

Part four: aimed to collect data on the service quality that Ethio telecom is offering. The instrument used to measure the service quality of the indoor mobile network of Ethio telecom was adopted from a research paper titled service quality and customer satisfaction in a telecommunication service provider written by (Loke, S. et al. 2011) and checked for reliability. The alpha values ranged between 0.832 to 0.929, which is an acceptable level for reliability measure.

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Part five: aimed to gauge the satisfaction of Ethio telecom's customers.

For parts 2-5, a five-point Likert scale was used (1= Strongly Disagree, 2= Disagree, 3=Neither (neither agree, nor disagree), 4= Agree, and 5= Strongly Agree) for the respondents to select.

3.7 Data Collection Procedure

After the buildings to be surveyed were identified from the list of sites acquired from the company who is responsible for the indoor mobile network coverage project, the questionnaire was distributed and administered in face-to-face contact and online. For conveniences' sake, the questionnaire was available on survey monkey, and the link was sent to targeted people via telegram app and email. Unfortunately, people were reluctant and not easily cooperative to fill the survey online. Only 57 respondents filled out the survey using the online platform. Then the answers were coded into the SPSS.

3.8 Limitations of the research

Reaching all 178 buildings to conduct the study was especially challenging. To do research covering 178 buildings requires financial assistance and a lot more time. Additionally, due to the risk of Covid-19 transmission, the places that were visited were limited. Some hotels that were selected deliberately for this study either became quarantine centers for people who recently entered the country or closed altogether. Due to the reasons mentioned above, only 100 different buildings were selected with multiple respondents in each building. Due to these factors, from ten sub-cities in Addis Ababa, only eight are represented in the study, with only three sub-cities are adequately covered if we compare the number of buildings with the indoor mobile network coverage.

People were afraid to fill out the questionnaires, although they were assured that it would only be used for educational purposes. Taking into account that Ethio telecom is a government entity, some people were afraid to express their negative opinion; which their frustration is understandable.

3.8 Ethical Considerations

Name of the respondents and names buildings were not included in the study deliberately to make the respondents feel safe and to make sure the respondents stay anonymous. Only volunteers were asked to fill out the questionnaire, and people were not asked more than twice if they have failed to send the survey back. The introduction part of the clearly

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states, the intent, and the purpose of the questionnaire highlighting the responses will only be used for academic purposes.

3.9 Methods of Data Analysis

3.9.1 *Pearson's Correlation Coefficient*

Pearson's correlation coefficient is the test statistics that measures the statistical relationship, or association, between two continuous variables. It is known as the best method of measuring the association between variables of interest because it is based on the method of covariance. It gives information about the magnitude of the association, or correlation, as well as the direction of the relationship ("Pearson's correlation coefficient," n.d.). Coefficient values can range between -1 (indicating negative relationship) and +1 (indicating positive relationship). The coefficient would be zero if there exists no association between the variables. If the coefficient value lies between ± 0.5 and ± 1 , then it can be said there exists a high degree of correlation between the variables, if the coefficient value lies between ± 0.3 and ± 0.49 then there exists a moderate correlation, otherwise low correlation.

3.9.2 *Kruskal-Wallis H Test*

The Kruskal-Wallis test is a rank-based non-parametric test that can be used to determine if there are statistically significant differences between two or more groups of an independent variable on a continuous or ordinal dependent variable. It is considered the non-parametric alternative to the one-way ANOVA. It is an extension of the Mann-Whitney U test to allow the comparison of more than two independent groups ("Kruskal-Wallis H", n.d.). The Kruskal-Wallis test is a non-parametric test, which means that it does not assume that the data come from a distribution that can be entirely described by two parameters, mean and standard deviation (the way a normal distribution can). Like most non-parametric tests, you perform it on ranked data, so you convert the measurement observations to their ranks in the overall data set: the smallest value gets a rank of 1, the next lowest receives a rank of 2, and so on (McDonald, J.H. 2014-).

3.9.3 *Linear Regression*

Linear regression is used when predicting the value of a variable based on the value of another variable. The variable we want to predict is called the dependent variable or the outcome variable. ("Linear regression analysis," n.d.). It is a commonly used type of predictive analysis that tells if a set of predictor variables do a good job in predicting an outcome or

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dependent variable (Statistics solutions, n.d.). The coefficient of determination (R^2) used to measure how much of the variation in dependent variable can be explained by the variation in independent variables. (R^2) always increases if more independent variables are added on the relationship. (R^2) value ranges between 0 to 1; 0, indicates that the outcome cannot be predicted by the set of independent variables while 1 indicates that changes in the dependent variables can be predicted without error (Kenton, W. 2019.).

3.9.4 Process Macro

The process macro is a plug in for SPSS. It is developed by Andrew Hayes. It computes regression analysis involving mediators, moderators and covariates.

CHAPTER 4 - DATA ANALYSIS & DISCUSSION

This chapter focuses on analyzing data collected from the survey, translation of data, and answering the research questions. The main focus of this paper was to study if customers are satisfied with the indoor mobile network coverage. The analysis of the collected data will shed light on the factors affecting customer satisfaction of Ethio telecom's customers. The initial hypothesis that was developed from the conceptual framework will be evaluated.

4.1 Descriptive Statistics

Two hundred eighty questionnaires were distributed for targeted respondents, but only 247 were returned. From the returned 247 surveys, 43 (1 from the online platform and 42 printed) were discarded because they were incomplete. Therefore, the analysis of the paper involves data collected from only 204 respondents.

Table 4-1 Number of males and females participated in the study

	Frequency	Percent
Male	144	70.6
Female	60	29.4
Total	204	100.0

Source: Survey data, 2020.

The gender distribution of the respondents reflected in Table 4-1. 70.6% of the respondents were male, and the remaining 29.4% of the respondents were female. Male representation in this study is more prevalent, but it was not intentional and wouldn't affect the study's outcome.

Table 4-2 Age group of the respondent population

18-25	33	16.2
26-35	110	53.9
36-45	48	23.5
46-55	10	4.9
56-65	2	1.0
>65	1	.5
Total	204	100.0

Source: Survey data, 2020.

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The majority of the respondents belonged to the age group between (26-35) years, taking 53.9% from the overall respondent population. While 48 people belonged in the age group between 36-45 years representing 23.5% of the respondent population. There were 33 people from the age group between 18-25, 10 people from the age group between 46-55, 2 people from the age group between 56-65 and one people from the age group 65+ years, and each contributing 16.2%, 4.9%, 1%, and 0.5% respectively.

Table 4-3 Educational background of the respondent population

	Frequency	Percent
PhD	1	.5
Masters	22	10.8
BA/BSC	133	65.2
Diploma	34	16.7
Certificate	9	4.4
other	5	2.5
Total	204	100.0

Source: Survey data, 2020.

Table 4-3 shows the educational background of the respondents. 65.2% of the respondents (i.e., 133 people) were BA/BSC holders, 16.7% were diploma holders, 10.8% of the respondents had master's degree, 4.4% had a certificate, 0.5% had a Ph.D., and 5 people (2.5%) had other pieces of training not specifically listed on the questionnaire. These numbers imply that the respondents were able to understand and fill the survey properly.

Table 4-4 Types of buildings classified based on their purpose

	Frequency	Percent
Commercial Building	122	59.8
Government Building	36	17.6
Hotel	46	22.5
Total	204	100.0

Source: Survey data, 2020.

According to the buildings' purposes, the study classified buildings in three broad categories (i.e., Commercial buildings, government-owned buildings, and Hotels). 59.8% of the survey was completed by people working (owning) in commercial buildings. The broad category of commercial buildings includes mixed-use buildings and office buildings. 17.6% of the respondents say they are working in a government-owned building. People working in hotels account for 22.5% of the total respondent population.

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Table 4-5 Location of the buildings (Subcity)

	Frequency	Percent
Bole	85	41.7
Kirkos	60	29.4
Lideta	2	1.0
Addis Ketema	9	4.4
Gulelle	4	2.0
Yeka	3	1.5
Nifas Silk	13	6.4
Arada	28	13.7
Total	204	100.0

Source: Survey data, 2020.

41.7% of the data were collected from people working in buildings located in Bole sub-city. 29.4% of the survey was completed by people who were working on buildings located in Kirkos sub-city. 13.7% of people say they work in buildings situated in Arada sub-city. 15.2% of the respondents work in buildings located in 5 different subcities (Lideta 1%, Addis Ketema 4.4%, Gulelle 2.0%, Yeka 1.5%, and Nifas Silk Lafto Subcity 6.4%).

4.2 Customers Satisfaction Analysis of Ethiotelcom's Indoor Mobile Network Coverage

The main objective of this study was to know whether Ethiotelcom's customers are satisfied with the indoor mobile network coverage or not. The questionnaire asked respondents to rank their response from strongly agree to disagree for a positively worded statements about customer satisfaction strongly.

Table 4-6 Customer Satisfaction Statistics

M_CS		
N	Valid	204
	Missing	0
Mean		2.5600
Median		2.5000
Std. Deviation		.88035
Variance		.775

Source: Survey data, 2020.

The mean value 2.5600 represents the overall feedback of customers concerning their satisfaction with Ethiotelcom's indoor mobile network coverage.

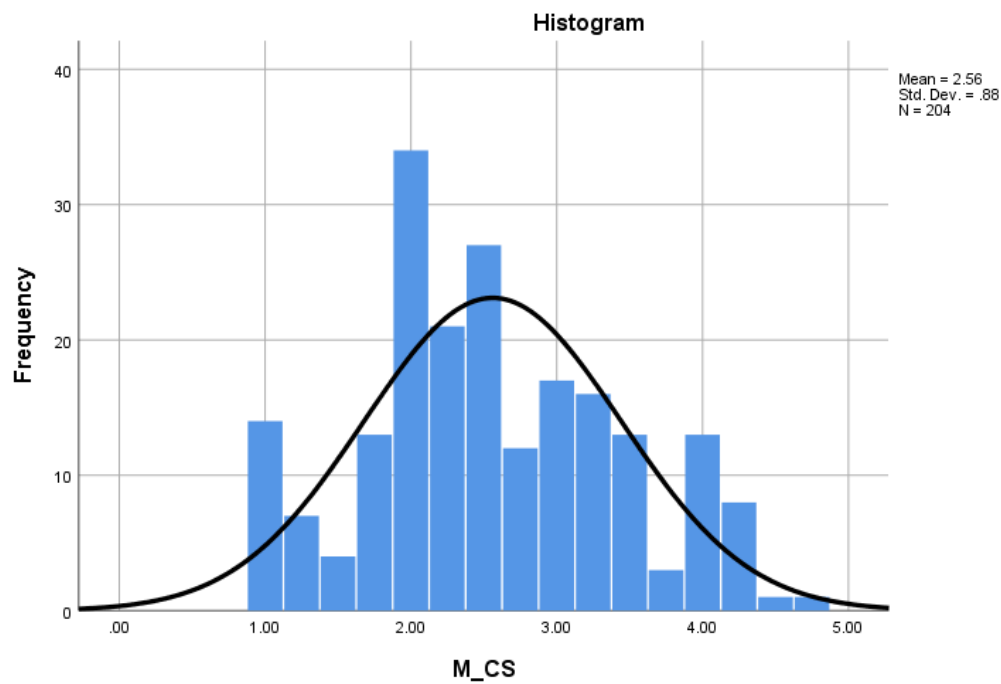


Figure 4-1 Histogram diagram (M_CS Vs. Frequency)

Source: Survey data, 2020.

Table 4-7 Customer Satisfaction Mean Vs. Frequency

		M_CS		
		Frequency	Percent	Cumulative Percent
Valid	1.00	14	6.9	6.9
	1.25	7	3.4	10.3
	1.50	4	2.0	12.3
	1.75	13	6.4	18.6
	2.00	34	16.7	35.3
	2.25	21	10.3	45.6
	2.50	27	13.2	58.8
	2.75	12	5.9	64.7
	3.00	17	8.3	73.0
	3.25	16	7.8	80.9
	3.50	13	6.4	87.3
	3.75	3	1.5	88.7
	4.00	13	6.4	95.1
	4.25	8	3.9	99.0
	4.50	1	.5	99.5
	4.75	1	.5	100.0
Total		204	100.0	

Source: Survey data, 2020.

The mean value of customer's ranks for the four questions concerning customer satisfaction was computed. Table 4-7 shows the frequency occurrences of each mean value. The data from Table 4-7 and Figure 4-1 give a clear picture of where the respondents' opinions rest and their attitude. 70% of the respondents evaluate their satisfaction with Ethio telecom's indoor mobile network to be within the range between [1,3], (i.e., most responses are inside the range (Strongly disagree, Neither). The overall mean for customer satisfaction is 2.56, as shown in Table 4-6, which can be translated as customers are not satisfied with Ethio telecom's indoor mobile network coverage project.

4.2.1 Customer Satisfaction Across Building Purpose

To check if there is a variation in the satisfaction level of customers based on the purpose of the building, the Kruskal-Wallis Test is used.

Table 4-8 Hypothesis Test: Customer Satisfaction Vs. Building Purpose

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of M_CS is the same across categories of B.Purpose.	Independent-Samples Kruskal-Wallis Test	.001	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .050.

Source: Survey data, 2020.

Running non-parametric independent-samples Kruskal-Wallis Test for the two samples (i.e., customer satisfaction and building purposes), the null hypothesis that states the distribution of the mean of customer satisfaction is the same across categories of building purposes was rejected because the asymptotic Sig is below the significance level 0.05.

Therefore, we can conclude there is statistically significant differences in customer satisfaction among different types of buildings purposes.

Table 4-9 Customer Satisfaction Mean Rank Based on Building Purpose

		N	Mean Rank
M_CS	Commercial Building	122	89.95
	Government Building	36	114.74
	Hotel	46	126.22
Total		204	

Source: Survey data, 2020.

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Table 4-9 shows the mean rank of customer satisfaction and the building purpose for comparison. Commercial buildings scored the lowest mean rank 89.95, followed by government buildings 114.74 then hotel buildings with customer satisfaction mean rank 126.22.

Table 4-10 Pairwise Comparisons of Building Purpose

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig. ^a
Commercial Building-Government Building	-24.789	11.138	-2.226	.026	.078
Commercial Building-Hotel	-36.271	10.160	-3.570	.000	.001
Government Building-Hotel	-11.481	13.067	-.879	.380	1.000

Each row tests the null hypothesis that Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

a. The Bonferroni correction for multiple tests has adjusted significance values.

Source: Survey data, 2020.

The significant number is $p < 0.01$, less than 0.5; for this reason, the null hypothesis was rejected. There is a 7.21% difference in customer satisfaction across the building types. Between commercial and government buildings, there is a significant 0.26 customer satisfaction difference. There is a 3.27% difference in customer satisfaction across commercial and government building types. Between commercial and hotel buildings, there is a significant customer satisfaction difference. There is a 7.47% difference in the level of customer satisfaction across commercial and hotel building types. But between government and hotel buildings, there is no statistically significant customer satisfaction difference since (Sig) p is greater than 0.05.

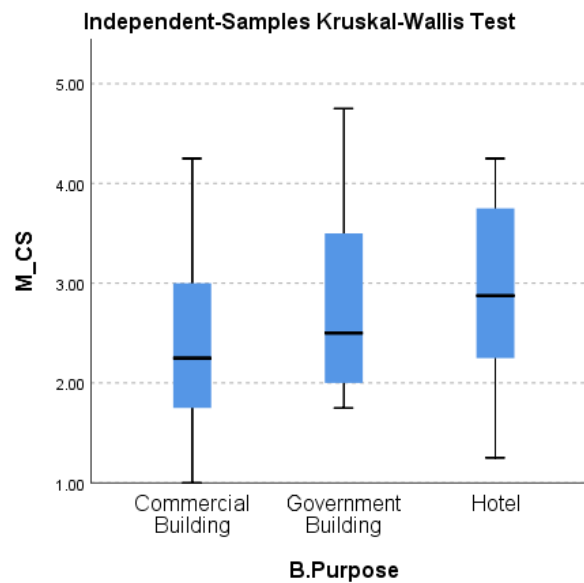


Figure 4-2 Building Purpose Against Mean of Customer Satisfaction

Source: Survey data, 2020.

4.2.2 Customer Satisfaction Across Building Location

To check if there is a difference in customer satisfaction based on the buildings' locations, the Kruskal-Wallis test was used. Although Subcities are more extensive, the study used them to describe places of building instead of Ethio telecom's Zonal divisions for two reasons. Ethio telecom divided the city into six zones (North Addis Ababa Zone, Central Addis Ababa Zone, South Addis Ababa Zone, East Addis Ababa Zone, Central Addis Ababa Zone & South Western Addis Ababa Zone). But these areas cover larger areas than the subcities, and the interpretation might be vague as most people don't know in which zone their building belongs to.

Table 4-11 Hypothesis Test: Customer Satisfaction Vs. Building Location (Subcity)

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of M_CS is the same across categories of B.Location.	Independent-Samples Kruskal-Wallis Test	.133	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .050.

Source: Survey data, 2020.

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Table 4-11 shows the asymptomatic significant number is 0.133, which is higher than 0.05. Therefore the null hypothesis that states, "the distribution of M_CS are the same across categories of building location" is retained.

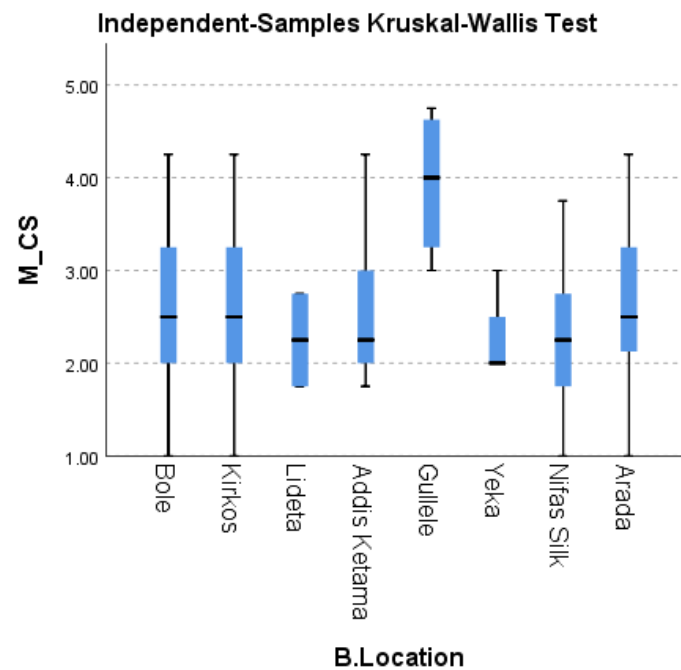


Figure 4-3 Building Location Against Mean of Customer Satisfaction

Source: Survey data, 2020.

Table 4-12 Hypothesis Test: Customer Satisfaction Vs. Building Location (Subcity)

	B.Location	N	Mean Rank
M_CS	Bole	85	95.72
	Kirkos	60	108.35
	Lideta	2	79.25
	Addis Ketama	9	103.39
	Gullele	4	180.00
	Yeka	3	84.00
	Nifas Silk	13	84.54
	Arada	28	111.18
Total		204	

Source: Survey data, 2020.

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Figure 4-3 shows the building location plotted against the mean of customer satisfaction. Table 4-12 also provides an insight into how customer satisfaction mean rank is different across different subcities.

4.3 Customers Orientation Analysis of Ethio telecom's Indoor Mobile Network Coverage

Respondents were asked if they think Ethio telecom employees are customer-oriented or not. Their summarized response in the following tables below.

Table 4-13 Customer Orientation means Vs. Frequency

Valid		Fre	Per						
		que	cent	2.58	16	7.8	3.75	1	.5
		ncy		2.67	9	4-4	3.83	8	3.9
	1.25	2	1.0	2.75	9	4-4	3.92	5	2.5
	1.33	1	.5	2.83	7	3.4	4.00	5	2.5
	1.50	1	.5	2.92	2	1.0	4.08	1	.5
	1.83	1	.5	3.00	7	3.4	4.17	4	2.0
	1.92	2	1.0	3.08	7	3.4	4.25	1	.5
	2.00	4	2.0	3.17	4	2.0	4.33	1	.5
	2.08	6	2.9	3.25	8	3.9	4.42	1	.5
	2.17	5	2.5	3.33	13	6.4	4.50	1	.5
	2.25	12	5.9	3.42	13	6.4	4.67	1	.5
	2.33	8	3.9	3.50	7	3.4	4.75	1	.5
	2.42	6	2.9	3.58	9	4.4	Total	204	100
	2.50	5	2.5	3.67	10	4.9	l		.0

Source: Survey data, 2020.

Table 4-14 Customer Orientation Statistics

M_CO	
N	Valid 204
	Missing 0
Mean	3.0139
Median	3.0000
Mode	2.58
Std. Deviation	.68220
Variance	.465

Source: Survey data, 2020.

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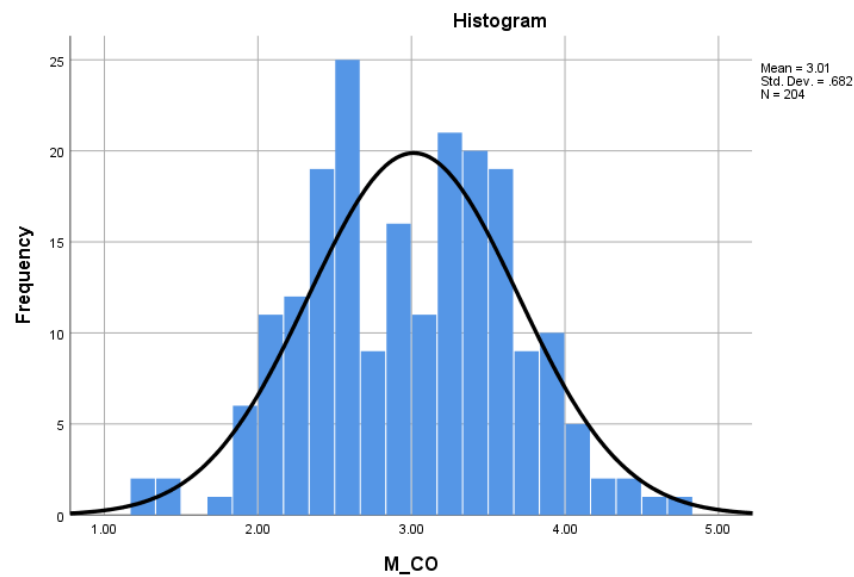


Figure 4-4 Histogram diagram (M_CO Vs Frequency)

Source: Survey data, 2020.

Table 4-13 shows us the mean of each respondents' evaluation of Ethiotelcom employees. Table 4-14 shows us the overall mean of the customer orientation of Ethiotelcom's employees, which is 3.0139. 3.0139 translates that people cannot say for sure that Ethiotelcom employees, whether customer-oriented or not. All four dimensions of customer orientation were analyzed to ensure that the mean for each aspect of customer orientation is near the overall measure of customer orientation.

Table 4-15 Technical Skills

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
M_TS	204	1.00	5.00	3.2876	.79205
Valid N (listwise)	204				

Source: Survey data, 2020.

Table 4-16 Social Skills

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
M_SS	204	1.00	5.00	3.0392	.88445
Valid N (listwise)	204				

Source: Survey data, 2020.

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Table 4-17 Motivation

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
M_MOT	204	1.00	5.00	2.9575	.83855
Valid N (listwise)	204				

Source: Survey data, 2020.

Table 4-18 Decision Making Authority

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
M_DMA	204	1.00	5.00	2.7712	.75154
Valid N (listwise)	204				

Source: Survey data, 2020.

All the four dimensions of customer orientation were evaluated to find a difference from the overall mean value. But all have relatively the same mean score except decision-making authority, which has a lower score. From the analysis above, one cannot say with confidence Ethio telecom employees are either customer-oriented or not. But as the detailed descriptive statistics shows the mean for decision making authority and motivation are below the neutral mark, and the other two dimensions also are barely above the neutral mark. Ethio telecom should work on to improve in aspects related to customer orientation.

4.4 Mobile Network Performance

Customers were asked to answer four questions concerning mobile network parameters. These questions gather feedback concerning mobile network availability inside buildings, mobile network coverage throughout a building, voice call quality inside a building, and call drop inside a building. The summary of respondents' feedback is discussed below.

Table 4-19 Mobile Network Performance Statistics

M_NQ	
N	Valid 204
	Missing 0
Mean	2.8272
Median	2.7500
Mode	2.00
Std. Deviation	.91470
Variance	.837

Source: Survey data, 2020.

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Table 4-19 shows that the mean response for customers' feedback about mobile network performance. The mean value of 2.8272 indicates that people don't think that Ethio telecom's indoor mobile network has good network performance.

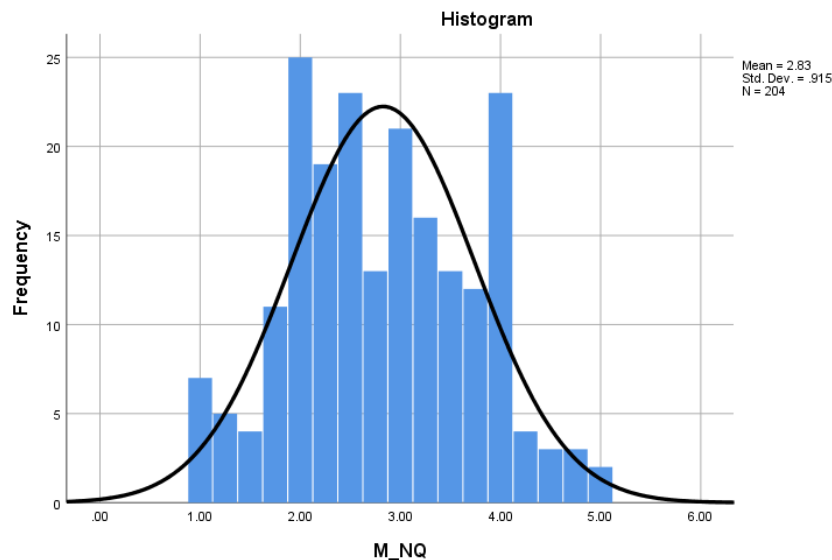


Figure 4-5 Histogram diagram (M_NQ Vs. Frequency)

Source: Survey data, 2020.

The histogram illustrated in Figure 4-5 shows most responses were below the neutral line. 62.7% of the answers has a mean value of either three or below three.

Table 4-20 Mobile Network Performance In terms of Signal Availability

	Frequency	Percent
Strongly Disagree	19	9.3
Disagree	79	38.7
Neither	25	12.3
Agree	69	33.8
Strongly Agree	12	5.9
Total	204	100.0

Source: Survey data, 2020.

Table 4-20 shows that 9.3% of the respondents strongly disagreed with the statement “Ethio telecom's indoor mobile network is available every time you are in the building (N.Q.1).”, 38.7% of the respondents disagreed, 12.3% of the respondents could not say for sure that they either agree or disagree with the statement, while 33.8% agreed. Only 5.9% of the respondents said they could strongly agree with the statement. The majority of respondents disagreed.

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Table 4-21 Mobile Network Performance In terms of Signal Coverage

		Frequency	Percent
Valid	Strongly Disagree	26	12.7
	Disagree	102	50.0
	Neither	23	11.3
	Agree	43	21.1
	Strongly Agree	10	4.9
Total		204	100.0

Source: Survey data, 2020.

50% of the respondents disagreed when asked if the indoor mobile network coverage system covers all areas of their building (N.Q.2). 12.7% strongly disagreed, 21.1% agreed, and 11.3% responded they could not say, but only 4.9% strongly agreed.

Table 4-22 Mobile Network Performance In terms of call drops

		Frequency	Percent
Valid	Strongly Disagree	18	8.8
	Disagree	58	28.4
	Neither	33	16.2
	Agree	73	35.8
	Strongly Agree	22	10.8
Total		204	100.0

Source: Survey data, 2020.

Respondents were asked to describe their opinion about the statement that claims, "The number of dropped calls in the building are negligible (N.Q.3)". 35.8% of the respondents said they agree with the statement, 28.4% said they disagreed, 16.2% responded they can't say they agree or disagree with the statement, 10.8% of the respondent said they strongly agreed while the remaining 8.8% of the respondents said they strongly disagreed with that statement.

Table 4-23 Mobile Network Performance In terms of Signal Quality

		Frequency	Percent
Valid	Strongly Disagree	27	13.2
	Disagree	77	37.7
	Neither	28	13.7
	Agree	62	30.4
	Strongly Agree	10	4.9
Total		204	100.0

Source: Survey data, 2020.

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The last question the respondents were asked was whether the quality of the phone calls that they are making inside buildings is acceptable. The majority of the respondents, i.e., 37.7% disagreed, 30.4% said they agree, 13.7% said they could not agree or disagree, and 13.2% said they strongly disagreed with the statement. Only 4.9% of the overall respondents said they could strongly agree with this statement.

4.4.1 Mobile Network Performance Vs. Building Location

The relationship between mobile network performance and building location has been investigated using the Kruskal-Wallis test.

Table 4-24 Hypothesis test: Mobile Network Performance Vs. Building Location

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of M_NQ is the same across categories of B.Location.	Independent-Samples Kruskal-Wallis Test	.019	Reject the null hypothesis.
Asymptotic significances are displayed. The significance level is .050.				

Source: Survey data, 2020.

Table 4-24 shows that the null hypothesis states the distribution of M_NQ (Mean of Mobile network performance) is the same across categories of building location. Since the null hypothesis's significance is 0.019, which is below 0.05, it is rejected.

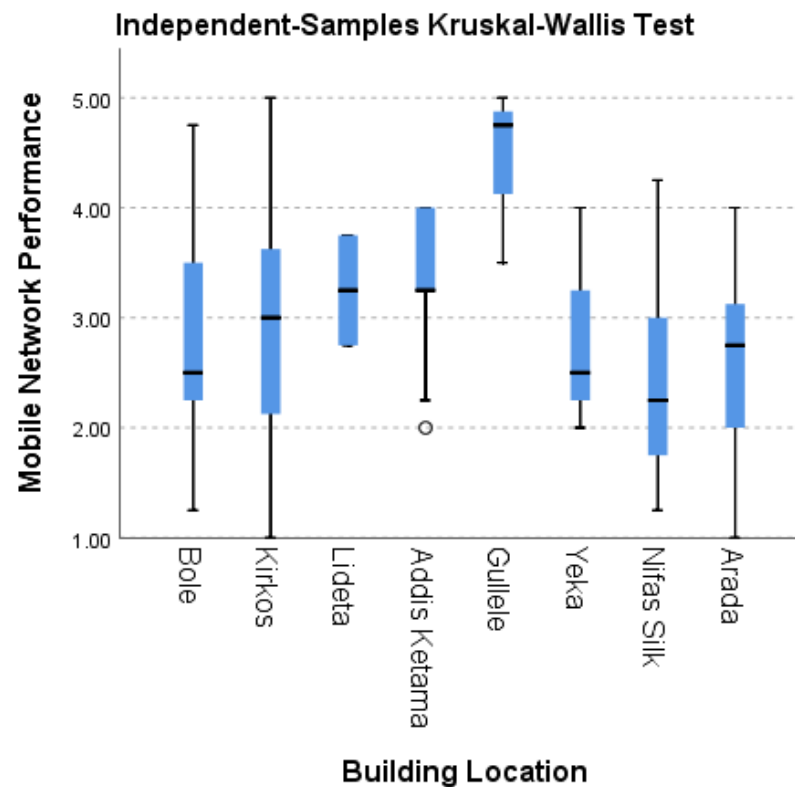


Figure 4-6 Building Location Vs. Mobile Network Performance

Source: Survey data, 2020.

Figure 4-6 clearly shows mobile network performance varies based on building location. The graph shows that some subcities have relatively similar mobile network performance in buildings, but some sub-cities have a significant difference. The pairwise comparison below explains it.

Table 4-25 Pairwise Comparison of Mobile Network Performance Across Subcities

Sample 1-Sample 2	Sig.
Nifas Silk-Arada	.405
Nifas Silk-Bole	.143
Nifas Silk-Yeka	.472
Nifas Silk-Kirkos	.079
Nifas Silk-Lideta	.194
Nifas Silk-Addis Ketama	.013
Nifas Silk-Gullele	.001
Arada-Bole	.471

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Arada-Yeka	.766
Arada-Kirkos	.262
Arada-Lideta	.334
Arada-Addis Ketama	.039
Arada-Gullele	.002
Bole-Yeka	.968
Bole-Kirkos	.553
Bole-Lideta	.442
Bole-Addis Ketama	.070
Bole-Gullele	.003
Yeka-Kirkos	.897
Yeka-Lideta	.565
Yeka-Addis Ketama	.359
Yeka-Gullele	.051
Kirkos-Lideta	.532
Kirkos-Addis Ketama	.134
Kirkos-Gullele	.006
Lideta-Addis Ketama	.913
Lideta-Gullele	.264
Addis Ketama-Gullele	.142

Each row tests the null hypothesis that Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

Source: Survey data, 2020.

Pairwise comparisons among subcities whose asymptotic significance value < 0.05 indicates there is variation in mobile network performance based on buildings' locations. For subcities with pairwise comparison asymptotic significance value ≥ 0.05 can be explained as their mean response regarding mobile network performance is similar to other subcities listed in the comparison. For example, there exists a significant difference in mobile network performance between Bole Subcity and Gullele Subcity. In contrast, there is no significant difference in mobile network performance between Bole sub-city and Lideta Subcity.

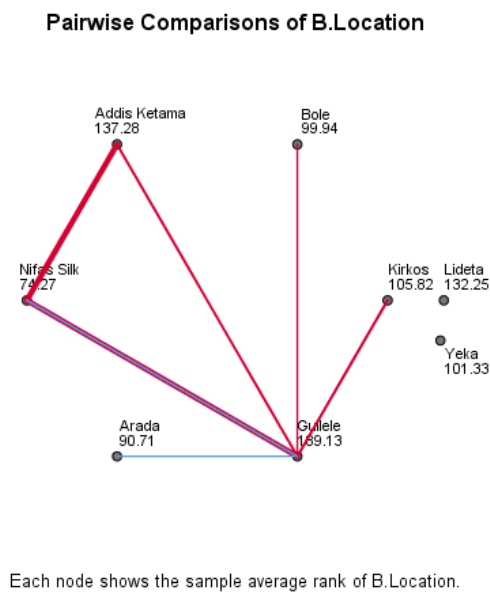


Figure 4-7 Pairwise Comparison B.Location Vs. Mobile Network Performance

Source: Survey data, 2020.

4.4.2 Mobile Network Performance Vs. Building Purpose

The relationship between mobile network performance and building location has been investigated using the Kruskal-Wallis test.

Table 4-26 Hypothesis test: Mobile Network Performance Vs. Building Purpose

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of M_NQ is the same across categories of B.Purpose.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .050.

Source: Survey data, 2020.

The test revealed that the null hypothesis stated, "the distribution of M_NQ (i.e., Mean of Mobile Network Performance) is the same across categories of B.Purpose (i.e., Building Purpose) should be rejected because the significance level of $p < 0.001$. Therefore, one can confidently say that there exists a variation in mobile network performance across different buildings with different purposes.

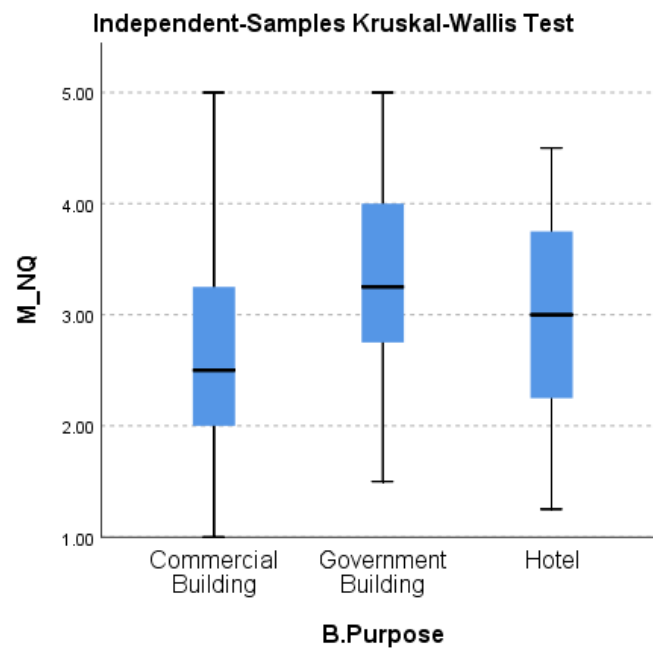


Figure 4-8 Building Purpose Vs. Mobile Network Performance

Source: Survey data, 2020.

There is a difference in the mean response of mobile network performance concerning building purposes. Mainly the difference between commercial buildings and the other two is visible.

Table 4-27 Pairwise Comparison: Mobile Network Performance Vs. B.Purpose

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig. ^a
Commercial Building-Hotel	-25.771	10.173	-2.533	.011	.034
Commercial Building-Government Building	-44.058	11.152	-3.951	.000	.000
Hotel-Government Building	18.287	13.084	1.398	.162	.487

Each row tests the null hypothesis that Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

a. The Bonferroni correction for multiple tests has adjusted significance values.

Source: Survey data, 2020.

The pairwise comparison table shows a significant difference in mobile network performance across commercial buildings and hotel buildings and between commercial buildings and government buildings. But in Hotels and government buildings, there is no statistically significant difference exists.

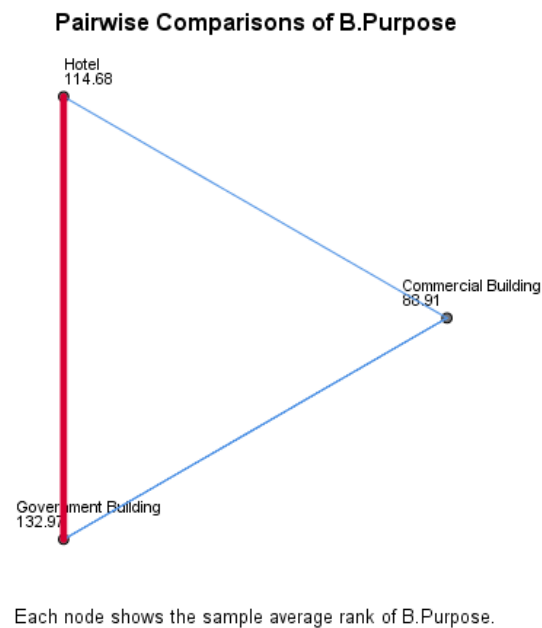


Figure 4-9 Pairwise Comparison of B.Purpose Vs. Mobile Network Performance

Source: Survey data, 2020.

Pairwise comparisons of building purposes regarding respondents' views on mobile network performance will be more apparent once understanding the above diagram. The average mean rank of mobile network performance for respondents belonging to hotel buildings is 114.68. For respondents in a government building, it is 132.97, but for respondents in commercial buildings, it is 88.91, which is a steep low number.

4.5 Service Quality of Ethio telecom's Indoor Mobile Network Coverage

Service quality is hypothesized to have a mediating effect on the relationship between customer orientation and customer satisfaction. This hypothesis will be tested and verified later in this chapter. But now, let's observe how Ethio telecom's indoor mobile network coverage is performing in terms of its Service quality.

Table 4-28 Descriptive Statistics_ Service Quality

M_SQ		
N	Valid	204
	Missing	0
Mean		3.0167
Median		3.0500

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Mode	3.80
Sum	615.40

Source: Survey data, 2020.

Table 4-28 shows the basic statics computed for service quality. As the table shows, the mean of the service quality is 3.0167 implies the service quality is neither good nor bad.

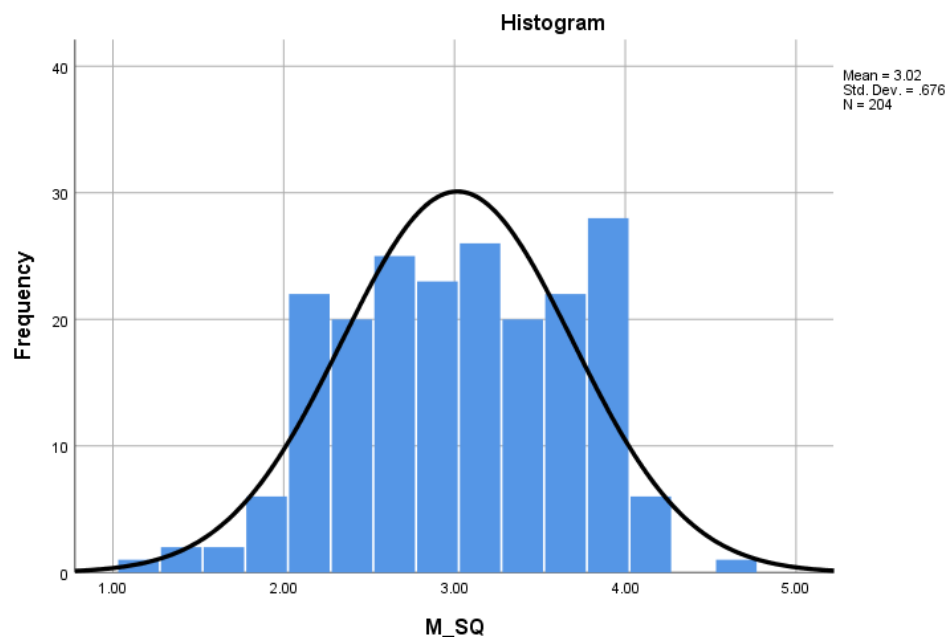


Figure 4-10 Histogram Diagram_ Service Quality Vs. Frequency

Source: Survey data, 2020.

Figure 4-10 illustrates the respondent's evaluation of service quality and the frequency of it. As we can see from the diagram 50% of the respondents chose to say either they don't feel they are receiving a good service quality or they can't say for sure.

4.5.1 Service Quality Across Building Purpose

Kruskal-Wallis Test was used to check if there is a variation in the service quality concerning the purpose of the building.

Table 4-29 Hypothesis Test: Service Quality Vs. Building Purpose

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of M_SQ is the same across categories of B.Purpose.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .050.

Source: Survey data, 2020.

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Running non-parametric independent-samples Kruskal-Wallis Test for the two parameters (i.e., service quality and building purpose), the null hypothesis was rejected, stating the distribution of service quality the same across categories of building purposes. Because the asymptotic Sig is below the significance level 0.05. Therefore, it's possible to say with certainty that service quality differs based on the purpose of the building.

Table 4-30 Service Quality Mean Rank Based on Building Purpose

	B.Purpose	N	Mean Rank
M_SQ	Commercial Building	122	88.22
	Government Building	36	118.61
	Hotel	46	127.76
	Total	204	

Source: Survey data, 2020.

Table 4-30 shows the mean rank of service quality across the three purposes of buildings listed in the study. Commercial buildings score the lowest mean rank, followed by government and hotel buildings. The difference between the mean ranks between commercial buildings and the other two should be noted.

Table 4-31 Pairwise Comparisons of Building Purpose

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig. ^a
Commercial Building-Government Building	-30.390	11.193	-2.715	.007	.020
Commercial Building-Hotel	-39.540	10.211	-3.872	.000	.000
Government Building-Hotel	-9.150	13.132	-.697	.486	1.000

Each row tests the null hypothesis that Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

a. The Bonferroni correction for multiple tests has adjusted significance values.

Source: Survey data, 2020.

Table 4-31 illustrates the pairwise comparison of service quality across different building purposes. But service quality in hotels and government buildings has no statistically

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meaningful difference. The asymptotic significance value is greater than 0.05.

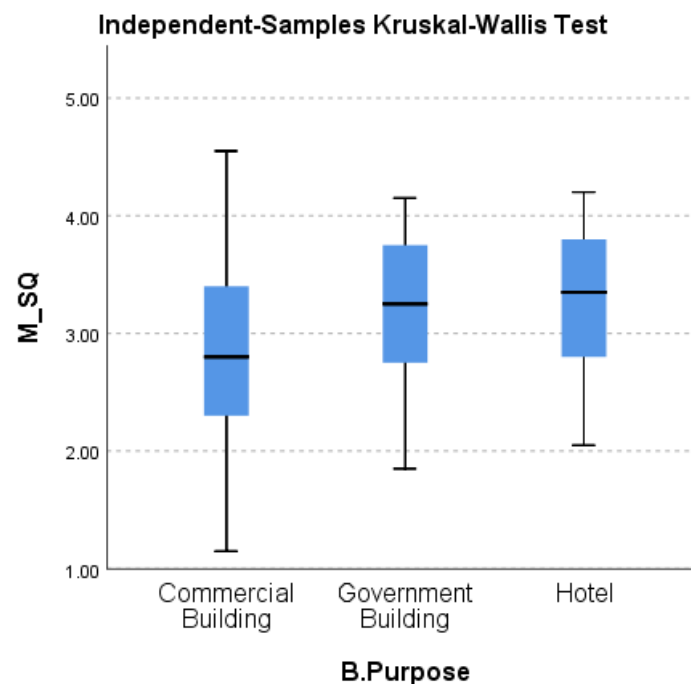


Figure 4-11 Building Purpose Against Mean of Service Quality.

Source: Survey data, 2020.

4.5.2 Service Quality Across Building Location

To check if there is a difference in service quality based on locations of the buildings, the Kruskal-Wallis Test was used.

Table 4-32 Hypothesis Test: Service Quality Vs. Building Location (Subcity)

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of M_SQ is the same across categories of B.Location.	Independent-Samples Kruskal-Wallis Test	.201	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .050.

Source: Survey data, 2020.

Table 4-32 shows the significant number is 0.201, which is higher than 0.05. Therefore the null hypothesis that states, "the distribution of M_SQ are the same across categories of building location" is retained. There is no statistically significant relationship attributed to the variation in service quality based on building location.

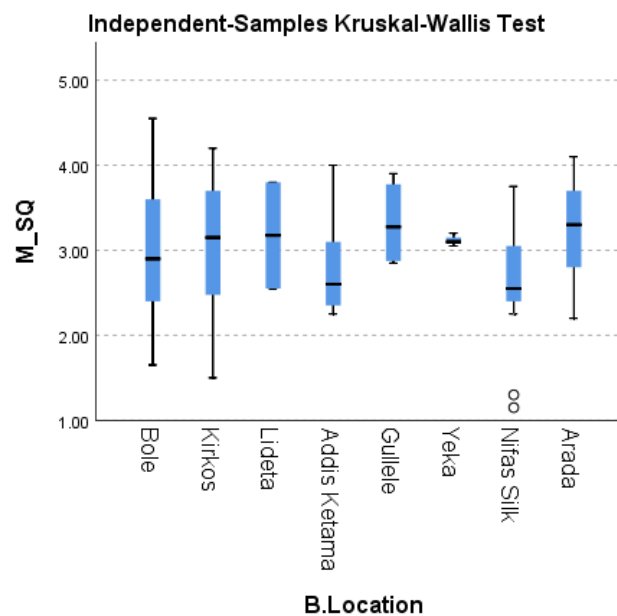


Figure 4-12 Building Location Against Mean of Service Quality

Source: Survey data, 2020.

Table 4-33 Hypothesis Test: Service Quality Vs. Building Location (Subcity)

	B.Location	N	Mean Rank
M_S Q	Bole	85	97.59
	Kirkos	60	107.80
	Lideta	2	115.00
	Addis Ketama	9	81.44
	Gullele	4	130.00
	Yeka	3	111.50
	Nifas Silk	13	71.27
	Arada	28	121.52
Total		204	

Source: Survey data, 2020.

Table 4-33 shows how service quality across each sub-city represented in the study. Addis Ketama and Nifas Silk sub-city have the lowest service quality mean rank.

4.6 Customer Orientation Vs. Customer Satisfaction

To understand the relationship that exists between customer satisfaction and customers' perception of Ethio telecom employee's customer orientation, first, their linearity should be checked using the scatter plot. The scatter plot graph shown below depicts their relationship.

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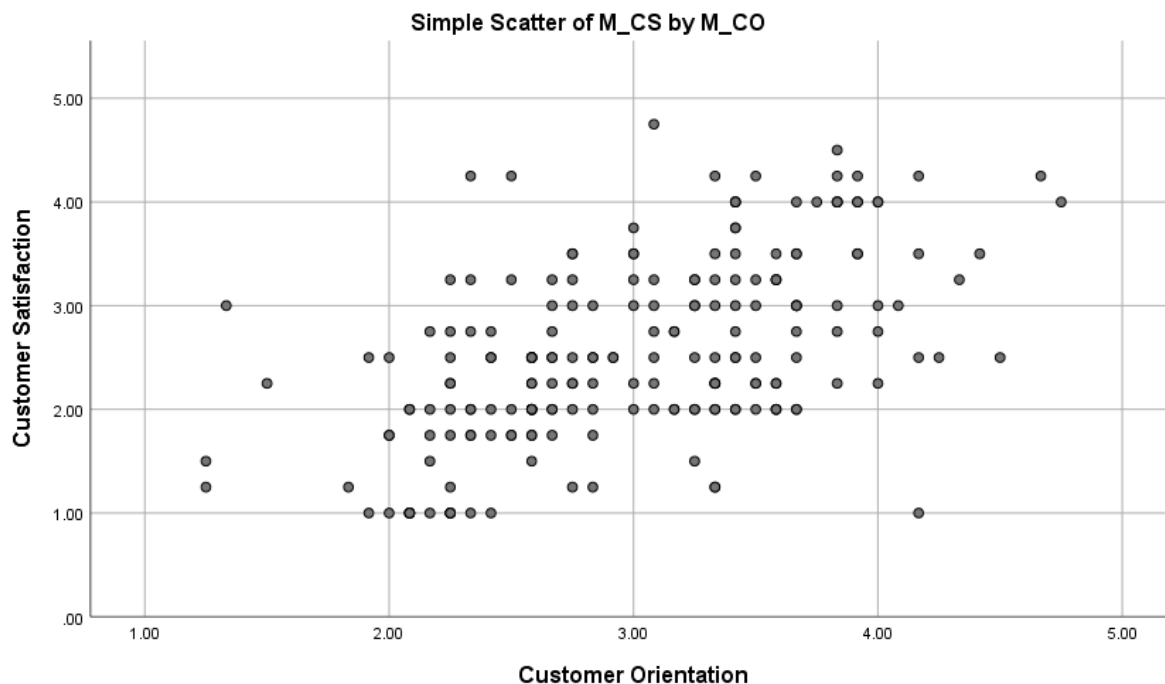


Figure 4-13 Customer Orientation Vs. Customer Satisfaction Scatter Plot

The scatter plot shown in Figure 4-13 shows linearity between the two variables, although the graph has some residual points. Then a Pearson correlation was run to check the relationship between customer orientation and customer satisfaction.

Table 4-34 Correlation Between Customer Orientation and Customer Satisfaction

Correlations			
		M_CO	M_CS
M_CO	Pearson Correlation	1	.540**
	Sig. (2-tailed)		.000
	N	204	204
M_CS	Pearson Correlation	.540**	1
	Sig. (2-tailed)	.000	
	N	204	204

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

Source: Survey data, 2020.

Results of the Spearman correlation indicated that there is a statistically significant and moderately strong positive association between customer orientation and customer satisfaction with a correlation coefficient r , 0.540 and significance, $p < 0.001$.

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4.7 Mobile Network Performance Vs. Customer Satisfaction

First, the linearity between mobile network performance and customer satisfaction had to be checked. Customer satisfaction is the dependent variable, so it's plotted against Y-axis while the independent variable mobile network performance is plotted against the X-axis. Although the scatter diagrams on Figure 4-14 shows the nodes are dispersed, it can give us the impression that the variables have a positive linear relationship.

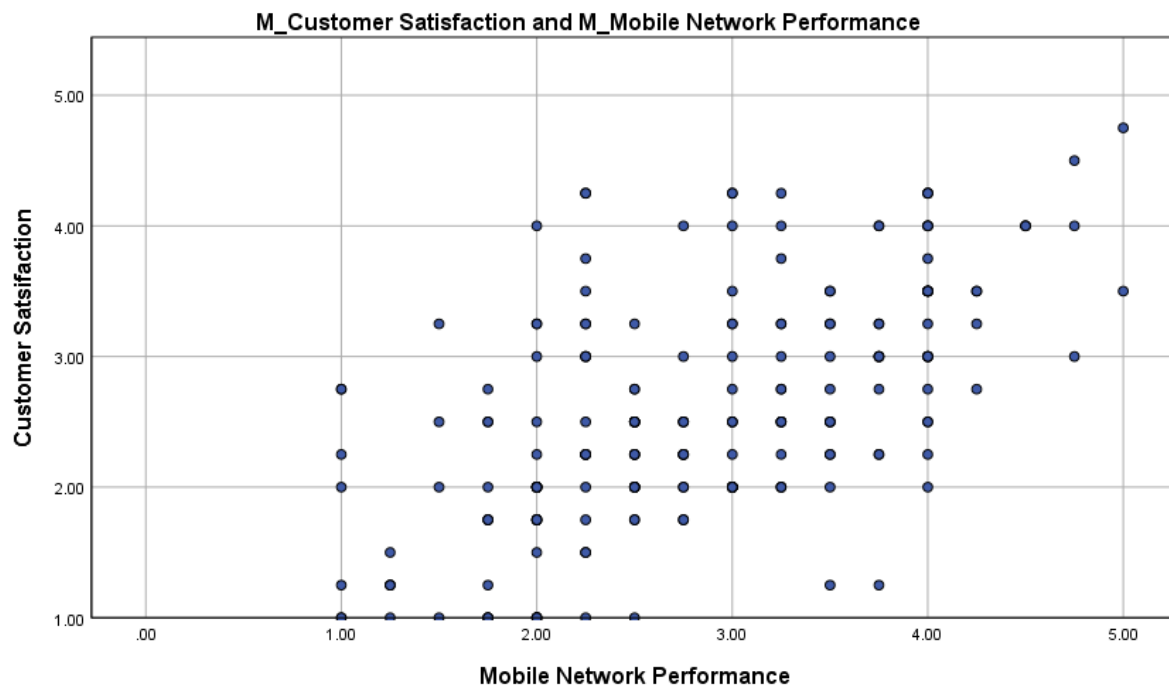


Figure 4-14 Mobile Network Performance Vs. Customer Satisfaction Scatter Plot

Source: Survey data, 2020.

Table 4-35 Correlation: Mobile Network Performance and Customer Satisfaction

Correlations			
		M_CS	M_NQ
M_CS	Pearson Correlation	1	.597**
	Sig. (2-tailed)		.000
	N	204	204
M_NQ	Pearson Correlation	.597**	1
	Sig. (2-tailed)	.000	
	N	204	204

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

M_NQ – Mean of Mobile Network Performance

M_CS – Mean of Customer Satisfaction

Results of the Pearson correlation indicated that there is a significant, moderately strong positive association between mobile network performance and customer satisfaction, $r=0.597$ and, $p < 0.001$.

4.8 Customer Orientation Vs. Service Quality

The scatter diagram in Fig 4-15 shows the linear relationship between customer orientation and service quality. The scatter diagram shows an increase in service quality with respect to the increase in customer orientation.

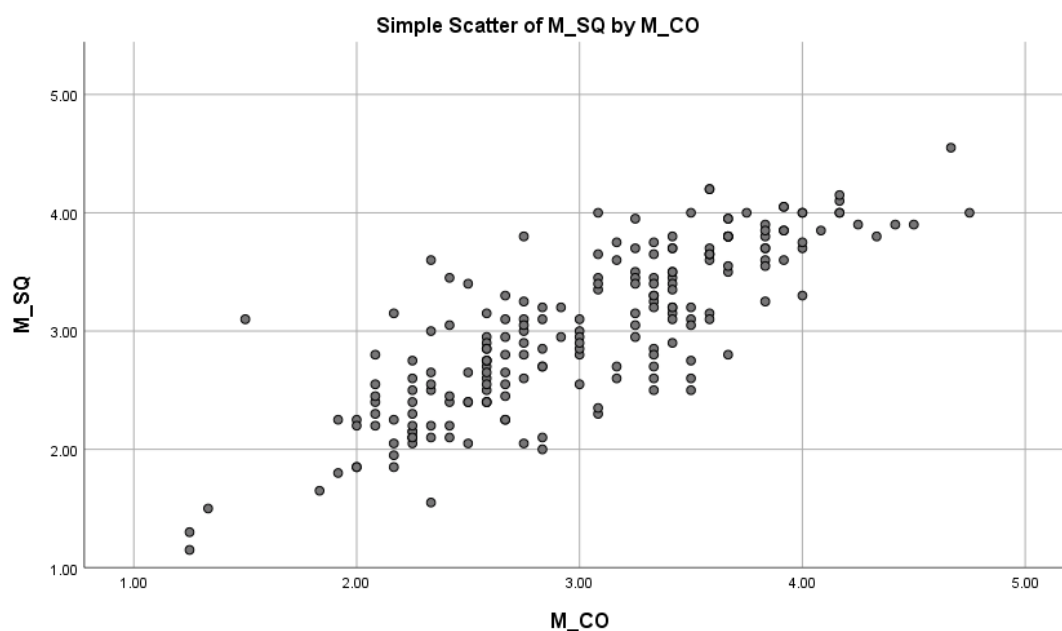


Figure 4-15 Customer Orientation Vs. Service Quality Scatter Plot

Source: Survey data, 2020.

Table 4-36 Correlation Between Customer Orientation and Service Quality

Correlations			
		M_CO	M_SQ
M_CO	Pearson Correlation	1	.820**
	Sig. (2-tailed)		.000
	N	204	204
M_SQ	Pearson Correlation	.820**	1

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Sig. (2-tailed)	.000	
N	204	204

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

Source: Survey data, 2020.

Results from the Pearson Correlation analysis indicated that there exists a statistically significant, positive and strong association between customer orientation with correlation coefficient $r = 0.820$ and significance $p < 0.001$.

4.9 Service Quality Vs. Customer Satisfaction

The scatter diagram shown below has some points where it looks linearity has not been kept. Still, when we consider the effects of smaller sample size, we can cautiously say we can observe a linear relationship between the two.



Figure 4-16 Service Quality Vs. Customer Satisfaction Scatter Plot

Source: Survey data, 2020.

Table 4-37 Correlation Between Service Quality and Customer Satisfaction

Correlations			
		M_SQ	M_CS
M_SQ	Pearson Correlation	1	.577**
	Sig. (2-tailed)		.000

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	N	204	204
M_CS	Pearson Correlation	.577**	1
	Sig. (2-tailed)	.000	
	N	204	204

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

Source: Survey data, 2020.

Results of the Pearson correlation indicated that there is a statistically significant, moderately strong positive association between service quality and customer satisfaction, with correlation coefficient $r = 0.577$ and significance $p < 0.001$.

4.10 Mediating Role of Service Quality

Our conceptual framework indicated that service quality has a mediating role in customer satisfaction and customer orientation.

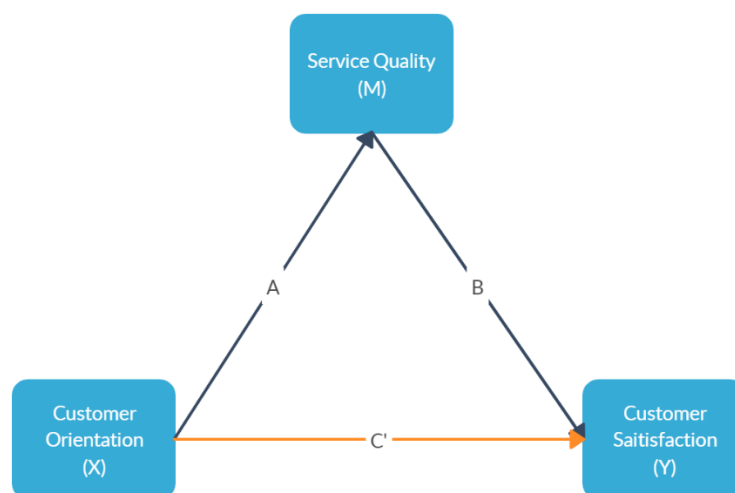


Figure 4-17 Mediating model diagram

To test the mediating role of service quality, a Process Macro for SPSS developed by Andrew Hayes' was used. First, the macro runs and tested the effect of customer orientation on service quality.

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Table 4-38 Process Macro Output_CO→SQ

Model : 4								
Y : M_CS								
X : M_CO								
M : M_SQ								
Sample								
Size: 204								

OUTCOME VARIABLE:								
M_SQ								
Model Summary								
R	R-sq	MSE	F	df1	df2	p		
.8203	.6730	.1501	415.6665	1.0000	202.0000	.0000		
Model								
	coeff	se	t	p	LLCI	ULCI		
constant	.5672	.1232	4.6051	.0000	.3243	.8101		
M_CO	.8127	.0399	20.3879	.0000	.7341	.8913		

Source: Survey data, 2020.

The path from customer orientation to service quality (a) is positive and statically significant. i.e. (b= 0.8127, s.e.= 0.0399, $p < 0.001$).

Table 4-39 Process Macro Output_CO→CS, SQ→CS,

OUTCOME VARIABLE:								
M_CS								
Model Summary								
R	R-sq	MSE	F	df1	df2	p		
.5886	.3464	.5116	53.2703	2.0000	201.0000	.0000		
Model								
	coeff	se	t	p	LLCI	ULCI		
constant	.1572	.2390	.6577	.5115	-.3141	.6285		
M_CO	.2641	.1287	2.0528	.0414	.0104	.5179		
M_SQ	.5326	.1299	4.1009	.0001	.2765	.7887		

Source: Survey data, 2020.

The direct effect from customer orientation to customer satisfaction (path C') is positive and significant (b= 0.2641, s.e.= 0.1287, $p = 0.0414$), which indicates that if customers feel

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Ethiotelecom employees are more customer-oriented, then their satisfaction with their service will increase. The direct effect of service quality on customer satisfaction (path B) is also positive and significant (i.e., $b=0.5326$, $s.e.=0.1299$, $p=0.0001$), indicating that if customers feel Ethiotelecom is increasing its service quality, then customers' satisfaction will increase.

Table 4-40 The indirect effect of X on Y (the effect through M).

Partially standardized indirect effect(s) of X on Y:				
	Effect	BootSE	BootLLCI	BootULCI
M SQ	.4917	.1104	.2874	.7195

Source: Survey data, 2020.

The indirect effect is tested using a non-parametric bootstrapping. The Null hypothesis states that if Zero(nil) falls between the lower and upper bound of the confidence interval, then the indirect effect of X is 0. Otherwise, the null hypothesis will be rejected, and the indirect effect will be added to the direct effect to find the total effect. In our case 0 doesn't fall between the upper and lower bounds of confidence. Here the indirect effect is calculated as ($A*B=0.8127*0.5326=0.4329$). But one cannot say, variable M (Service Quality) completely mediates the relationship between Customer Orientation and Customer Satisfaction since there exists a direct relation between the two variables. Therefore, the partially standardized indirect effect of X on Y 0.4917 should be taken and added with the direct effect of the total effect to find the overall effect $0.4917+0.2641=0.6964$.

4.11 Analysis of Linear Regression

Before the analysis of regression, a test of linear regression model assumptions must be executed.

Normality: To make a valid reference from the regression, the regression's residuals should follow a normal distribution. Residuals are error terms, representing the difference between the observed value of the dependent variable and the predicted value.

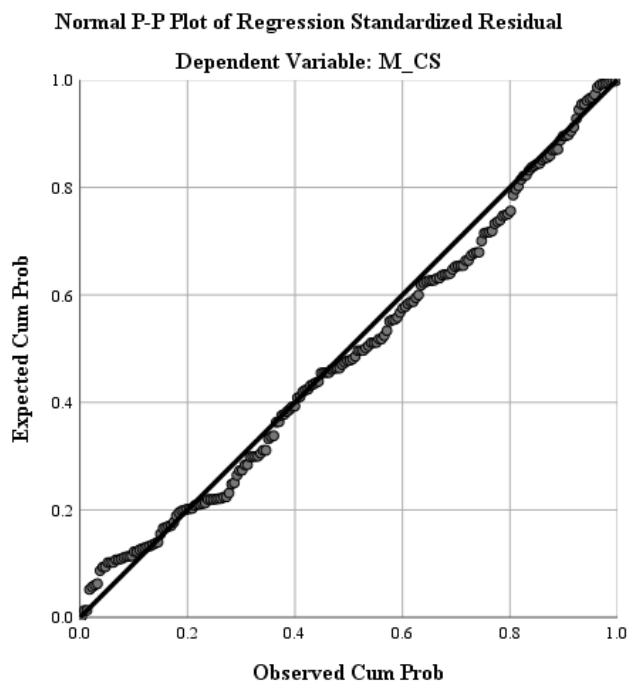


Figure 4-18 Normal P-P Residual Plot

Source: Survey data, 2020.

From the above figure it can be observed that the residual plot follows the normal line. It can be concluded that the residuals are normally distributed and consistent with the normality assumption.

Homoscedasticity: Refers to equal distribution of residuals across the X and Y axis of the scatter plot.

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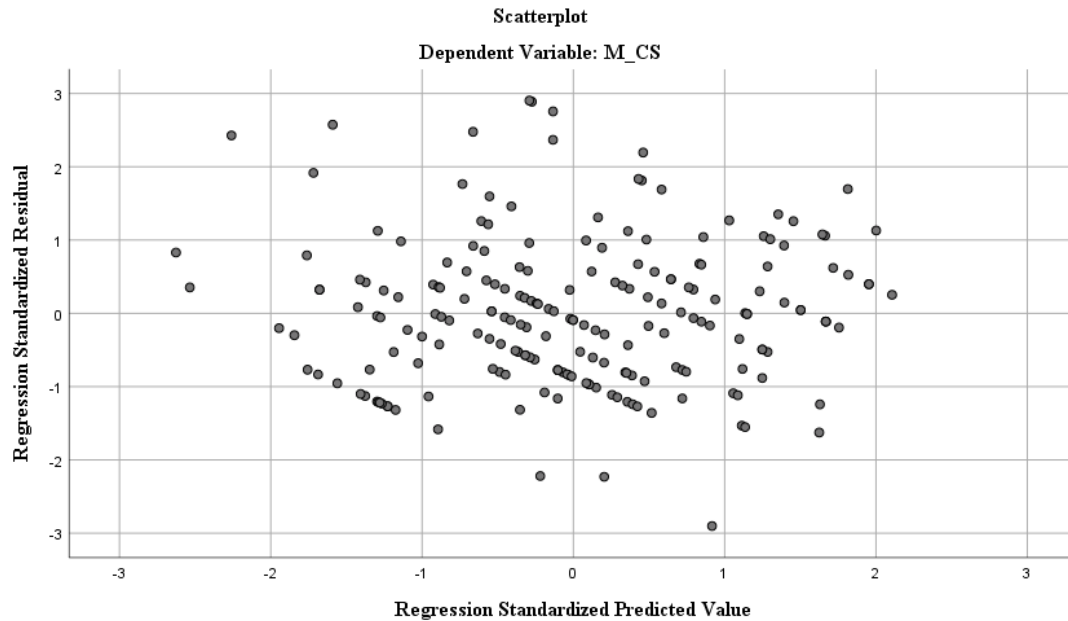


Figure 4-19 Scatter Plot showing homoscedasticity

Source: Survey data, 2020.

The above figure shows even distribution of residuals above and below X-axis and almost even distribution of residuals to the right and left of the Y-axis. Therefore, it can be concluded that the data fulfils the homoscedasticity assumption.

Multicollinearity: occurs when the predictor variables are highly correlated with each other. In other words, high inter-association between predictor variables. It should be avoided. It can be checked by referring to the variance inflation factor (VIF) values, on coefficient table. The VIF values should be below 10.00, with a best-case scenario if $VIF < 5.00$. Collinearity tolerance should also be above 0.1 or 0.2 to avoid multicollinearity.

Table 4-41 Regression Coefficient

		Coefficients ^a					Collinearity Statistics	
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.		
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.150	.219		-.683	.495		
	M_NQ	.393	.056	.408	6.985	.000	.769	1.301
	M_CO	.159	.117	.123	1.364	.174	.322	3.109
	M_SQ	.371	.119	.285	3.118	.002	.315	3.178

a. Dependent Variable: M_CS

Source: Survey data, 2020.

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From Table 4-41, it can be observed that the VIF values for the three independent variables are below 5, and the collinearity statistics values are all greater than 0.2, Therefore, multicollinearity isn't observed among the independent variables.

Table 4-41 Regression Model Summary

Model Summary^b					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.689 ^a	.475	.467	.64288	1.946

a. Predictors: (Constant), M_SQ, M_NQ, M_CO

b. Dependent Variable: M_CS

Source: Survey data, 2020.

Table 4-42 shows the multiple linear regression model summary and the overall fit statistics. The adjusted R^2 of the model is 0.467 and $R^2=0.475$. Which can be interpreted as the linear regression explains 47.5% of the variance in the data. The Durbin-Watson test that measures autocorrelation in residuals from regression analysis is 1.946 which is in the range between 1.5 and 2.5. This indicates there is no first order linear auto correlation in the linear regression data.

Table 4-42 ANOVA

ANOVA^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	74.667	3	24.889	60.220	.000 ^b
	Residual	82.660	200	.413		
	Total	157.327	203			

a. Dependent Variable: M_CS

b. Predictors: (Constant), M_SQ, M_NQ, M_CO

Source: Survey data, 2020.

The p value in the ANOVA table is very small, less than 0.05. This indicates the independent variables reliably predict the dependent variable, and both set of variables has a statistically significant relationship.

From table 4-41 it can be observed that customer orientation doesn't have a statistically significant individual contribution in predicting the outcome of customer satisfaction ($\beta=0.123$, $p>0.174$). For every one unit of change in mobile network performance, a 0.393-unit change in customers' satisfaction is predicted, while holding the changes in mobile network performance and customer orientation constant. For every one-unit change in service quality, it can be predicted a change of 0.371 unit in customer satisfaction.

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$$\text{Customer Satisfaction (Predicted)} = 0.393M_NQ + 0.371M_SQ$$

4.12 Discussion

This study's primary focus is to evaluate if Ethio telecom is successful in satisfying its customers in the context of Indoor mobile network coverage and in assessing factors contributing to customer satisfaction.

Many factors can be attributed to influence customer satisfaction in the telecommunication business. But in this study, only three variables were studied; customer orientation of service employees, mobile network performance, and service quality were selected and analyzed their contribution.

Customer orientation is one of the factors studied in this research. Our research hypothesized that customer orientation of service employees has a positive influence on customer satisfaction. From the analysis of our data that evaluates customers' opinions about Ethio telecom employee's customer orientation, it is observed that the mean and median values are 3.0. The histogram graph shows the customer response looks evenly distributed between the two extremes, and so did the frequency Vs. Customer orientation evaluation table illustrated in table 4-13. Based on this, it can be cautiously concluded that the majority opinion regarding the customer orientation of Ethio telecom employees revolves around the neutral barrier. 52.4% of the respondent's evaluation of customer orientation has a mean value that ranges between 2.5 and 3.5. The remaining 47.6% of respondent's assessment is dispersed outside the range of [2.5,3.5].

From the result, it is challenging to say Ethio telecom employees are customer-oriented or not. Still, it is sure to say Ethio telecom has a long way to go in terms of making its employees more customer-oriented. Special attention has to be given to the decision-making authority dimension of customer orientation since it has the lowest mean value score. Ethio telecom has to do its business to satisfy its customer, and also its employees have to focus on their customer needs.

It is hypothesized that there is a positive relationship between customer orientation and customer satisfaction. So, from our analysis, the correlation coefficient is 0.540. This indicates a positive and moderately strong correlation between customer orientation and customer satisfaction; therefore, the hypothesis (H3) is accepted. The study also analyzed what will be

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the change in customer satisfaction when there is a change in customer orientation index. The result from our study showed as there is no statically significant change will be observed.

(Hawa, H.N.S., 2015) in their study titled “The effect of customer orientation on customer satisfaction and examining the mediating effect of service quality”, (Mehmood, S. 2011) in his study titled “The Influence of customer orientation on customer relationship in telecom services” and (Marzie, T., Hormoz, M., & Feridon, A., 2013) titled “The survey of relationship between customer orientation and customer satisfaction using CUSTOR scale in Yas Novin Parse chain stores in Golestan province” all have found that there is a statistically significant contribution of customer orientation in predicting the position of customer satisfaction. From their conclusions and referring other literatures, unless a more detailed analysis involving large group of samples conducted, it is better to not to nullify the contribution of customer orientation towards customer satisfaction.

The other factor in study that was analyzed was mobile network performance. Only 17.3% of the total respondents’ response ranges between a mean scale of four and five for questions regarding the indoor mobile network performance. The opinion from the respondents indicates that Ethio telecom has a big task in providing a robust and reliable mobile network in buildings.

It was hypothesized that mobile network performance and customer satisfaction has a positive relationship. So, from the analysis, the correlation coefficient is 0.597. The correlation coefficient indicates there is a positive and moderately strong relationship between network performance and customer satisfaction; therefore, the hypothesis (H4) is accepted.

Previous research conducted by (Mamo G.S., 2018) titled “Assessment of the factors that affect customer satisfaction on service quality”, and focused on Dawro Zone, in the SNNPR. His research has found that Mobile network performance and customer satisfaction has a positive relationship. The customers of Ethio telecom were not satisfied with Ethio telecom and the mobile network performance was found to be poor. (Saha, Islam, & Haque, 2016) have also reached similar conclusion, the higher the mobile network performance, the greater will be customers’ satisfaction.

The study has analyzed if mobile network performance varies based on building purpose. The result from our research shows there is a significant variation of 8.9 percent in mobile network performance across different building purposes. There is also a difference in

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contrast between hotels & commercial centers, even in between government and commercial buildings. Still, for hotels and government building types, there is no significant variation. The study also found the least satisfied with Ethio telecom indoor network performance are people from commercial buildings followed by government users, and last is hotel building users.

Acceptable performance variation, expectation, coverage area requirement, and other factors can be generalized within requirements based on building purpose. Commercial centers usually have fewer concrete partitions and are without a ceiling. Hotels on contrast have many partitions reducing the coverage radius of the antenna. Additionally, most hotels require the antennas to be installed inside ceilings, which makes the antennas to cover fewer radius. But the presence of access doors for the ceilings in most hotels has enabled Ethio telecom to install more antenna and provide more coverage without damaging the hotel's aesthetics. In commercial buildings, antenna installation and coverage design usually follow the corridors. Commercial building owners are concerned about the look of their buildings because Ethio telecom used PVC trunking 60*40mm for buildings that doesn't have ceilings. Because of this they usually force the installation team to put the antennas in a fewer place. This makes it difficult for the indoor antennas to cover more area. Additionally, partition designs corridors change occurs in commercial centers, particularly in office buildings. This results removal of the indoor mobile antenna, making the indoor system not to function properly. The quality of service that Ethio telecom provides for hotel, government and commercial buildings also differs. Usually, priority is given to governmental and hotel buildings.

Variations in mobile network performance based on building location was investigated in the study. The analysis found that there is a significant variation of mobile network performance across building locations. The significant variation was observed between Nifas Silk and Addis Ketema, Nifas Silk and Gulelle, Arada and Addis Ketema, Arada and Gulelle, Bole, and Gulelle, and Kirkos and Gulelle subcities. The lowest rank of mobile network performance Nifas Silk followed by Arada, Bole, and Yeka Subcities.

Ideally, there shouldn't be a significant disparity in mobile network performance, based on building location. Because Ethio telecom deployed the same technology for every building. The repeater for the indoor mobile network uses the outdoor mobile network as a donor (i.e. from nearby BTS towers). The outdoor mobile network's performance can vary depending upon the traffic, performance and condition of the BTS and the distance between the building and the nearest BTS tower. The indoor mobile network system only can amplify the outdoor

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signal strength; it can't improve signal quality. If the outdoor cellular network is heavily congested, then the indoor system cannot help customers make calls with an acceptable standard. Because of these reasons, the indoor mobile network can vary from place to place.

The analysis on the independent impact of mobile network performance showed it has a positive statistically significant impact on customer satisfaction.

The other independent variable analyzed in the study was service quality. From our analysis, we found the mean and median values is 3.0167 and 3.05. The Service Quality Vs. The frequency plot in Figure 4-10 shows even distribution of customer responses around the neutral line. This indicates that customer opinion is divided between agreeing and disagreeing with the goodness of the service quality. 48.5% of the responders described the service quality they are getting from Ethio telecom to be in between (1,3). Even though the majority's response was on the other side, it still shows that Ethio telecom faces a lot of work in delivering better service quality service for all.

Variations in service quality with respect to the purpose of the building was investigated in the study. The result revealed that the distribution of service quality rank is different across different categories of building purposes. Commercial buildings reported the lowest service quality followed by government and then hotel buildings. It's obvious that government offices and hotels receive the highest priority in customer service. That's Ethio telecom has assigned dedicated customer service officers for each hotel and large government buildings and offices. Some commercial buildings also have one, but only a few. If there are issues that need to be solved, the highest priority is always given to the hotels. Complaints letters from hotels are usually endorsed by their government customers (government offices organize general meetings, training, and other events in these hotels). Commercial buildings are third in the pecking order of priority.

The variation of service quality based on building location was analyzed, the analysis found that there is no significant variation of service quality across building location.

The study has analyzed the relationship between service quality and customer satisfaction, and from our result, it shows that there exists a positive, moderately strong ($r = 0.575$, $p < 0.001$) relationship between the two. The regression coefficient 0.371 also supports it. A positive increase in service quality indicates positive growth in customer satisfaction. (Ojo, O., 2010) in its study about the relationship between service quality and customer

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satisfaction in the Nigerian telecommunication industry have also found a similar result. He has found that there is a positive relationship between customer satisfaction and service quality.

It is hypothesized that service quality and customer orientation have a positive relationship. So, from our analysis, the correlation coefficient is 0.820 and the regression coefficient is 0.8127. The result from our study indicates there is a positive and strong relationship between customer orientation and service quality; therefore, the hypothesis (H5) is accepted. This implies that if Ethio telecom improves its delivery of service with speed and quality, its customer orientation will improve.

In this study, the mediating role of service quality in customer orientation and service quality was investigated. From using Process macro, it is observed that service quality indeed has a partial mediating role between the two variables. The mediation is partial because the test revealed there exists a direct relationship between customer orientation and service quality.

As it is stated at the beginning of this section, the main aim of this research is to study the customer satisfaction of Ethio telecom's indoor mobile network. From the descriptive analysis of the data that evaluates customers' opinions about their satisfaction regarding the indoor mobile network coverage, the mean and median of the responses are 2.5666, 2.555. From these numbers, the histogram diagram depicted in Figure 4-1 & 70% of the response has a mean value ranging between [1,3]. It can be said that customers are not satisfied with the service of Ethio telecom's indoor mobile network coverage. This verifies our first hypothesis that states customers are not happy with the indoor mobile network coverage. Previous researches that has taken interest in finding customers' satisfaction has found customers are not satisfied in services provided in Ethio telecom. (Mamo GS., 2018), has found that mobile network customers of Ethio telecom in Dawro Zone. (TADESSE T. D., 2015), has also found that customers in Ambo Town are not satisfied with Ethio telecom, additionally he also found that the majority of the customers are willing to switch to another competitor if there exists an alternative.

The variation of customer satisfaction across building purposes was studied. The result shows that there is a difference in customer satisfaction, depending on the categories of building. Customers in commercial buildings have the lowest customer satisfaction, followed by government and then hotel buildings. Customer satisfaction variation based on the location of the buildings located was tested. As illustrated in Table 4-11, the null hypothesis was

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retained, i.e., the distribution of customer satisfaction is the same across categories of building location.

The independent variables' overall impacts on the dependent variable (i.e., customer satisfaction) were tested. From the result summary, it can be observed that from any change in customer satisfaction, 46.7% of it can be explained by customer orientation, mobile network performance, and service quality (independent variables).

CHAPTER 5 - CONCLUSION AND RECOMMENDATION

This chapter is the last chapter, where the conclusion and recommendations of the study will be discussed. Implications and future areas of research will be addressed in the final section.

5.1 Conclusion

Ethiotelecom is the only telecommunication company with a license to provide telecommunication service in Ethiopia. Providing customers with a reliable mobile network is among its main responsibilities. To do so, Ethiotelecom had been investing in mobile network upgrade infrastructures to boost both indoor and outdoor mobile network coverage and service. This paper investigated the success of Ethiotelecom's indoor mobile network coverage with respect to customer satisfaction.

From the analysis of the survey data, one can answer the research questions as,

- Ethiotelecom's indoor mobile network coverage project is not successful in satisfying its customers.
- It's difficult to say Ethiotelecom employees are customer oriented, from the analysis of the data, but as previous researches also suggested, Ethiotelecom should be more customer oriented.
- The mobile network performance inside buildings is below the acceptable level.
- Ethiotelecom's service quality is also below the acceptable level.
- Service quality has a mediating role in the relationship between customer satisfaction and customer orientation.

The effects of building location and building purpose were discussed in the study—all four variables, both dependent and independent, varied with respect to building purpose. Only mobile network performance varies based on building location.

Positive changes in the indexes of Customer Orientation, Service Quality and Mobile Network results a positive change in the index of Customer Satisfaction. Previous studies in

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Ethiotelecom's other business activities has been suggesting Ethiotelecom to make an improvement with regards to service quality and be more customer orientated.

Ethiotelecom will soon have competitor companies operating in Ethiopia. Therefore, Ethiotelecom should continuously improve its service quality and mobile network performance to make its customers stay loyal. Because once customers switched service providers, it will be more costly to bring them back. (Tadesse, 2015) in his research has found that Ethiotelecom's customers are willing to switch service provider if they get a chance.

Investing in improving the indoor mobile network service should be a critical focus point for Ethiotelecom. The number of buildings covered in project might be smaller, but the number of customers in these buildings is quite significant. And these customers usually spend their working times indoors, i.e. in their office, shops, and hotels.

5.2 Recommendations

Based on the data analysis, findings, and conclusion of the study, Ethiotelecom should note the following points.

- Ethiotelecom employees should be more customer-oriented. Ethiotelecom should provide the necessary training to its technical and customer service officers on customer relationships, should empower its professional and customer service officers to be flexible according to the customers' requirements.
- Ethiotelecom should improve its service quality for the indoor mobile network coverage.
- Ethiotelecom should improve the reliability and coverage of indoor mobile network coverage. Ethiotelecom should study if the low performance of mobile networks inside buildings is the consequence of the type of indoor technology used or poor outdoor mobile network quality.
- The current generic deployment of the indoor solution should also be studied. The technology that Ethiotelecom has been installing is Passive Distributed Antenna System. Different buildings require different indoor mobile network capacity depending on their size and purpose, and hence they require different technology. Deploying the same solution for a G+5 office building and airport terminal is not ideal. (For indoor mobile network coverage types refer annex).
- It can be observed from the study customer satisfaction, mobile network performance and service quality differ based on building purpose. All three variables have a

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significantly low score in commercial buildings. Ethio telecom should investigate why this kind of disparity exists when all are using the same technology.

- Develop tools to regularly survey and monitor customer satisfaction among customers and measure other performance indicators.
- Dedicate a specialized office with the necessary resources for indoor mobile network coverage so that customer service employees can proactively interact with the customers and prompt technical support.
- The indoor mobile network system is currently deployed for only commercial buildings, hotels and government offices. Ethio telecom should also focus on providing this coverage for residential buildings, parks, and remote outdoor places on demand.
- To cope up with the demand for this system, Ethio telecom should outsource this business area to authorized vendors. Currently Ethio telecom uses this strategy to deliver broadband internet to its customers. In the cases of United States and India, vendors and retailers should register the indoor repeaters with the service providers. Companies are authorized to conduct the deployment of the indoor systems, although there is a limit in the maximum gain of the repeater that can be installed independently. Ethio telecom should allow, authorized companies to install smaller repeaters directly without its consent. For larger buildings, Ethio telecom should allow authorized vendors to provide different and better solutions other than the passive DAS and consult only on its deployment & donor issues. If Ethio telecom don't provide the solution, people will use contraband and unauthorized repeaters. It is widely seen in most African countries. Contraband and unauthorized repeaters will cause problems to Ethio telecom, their main issue is due to their low quality they will cause signal (uplink) interference on the donor site. Heavy interference on the donor site will cause the BTS to fail, resulting the area near that building to lose outside mobile network coverage. Installation of the indoor system should also be conducted by a technical expert. All connections and the donor antenna position should be carefully considered. Otherwise, it will be another cause for uplink interferences on the donor site.

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5.3 Areas for Further Study

I recommend future research to be conducted in the following topics.

- Detailed technical analysis should be conducted to identify the reasons behind inadequate indoor mobile network coverage.
- A research must be conducted to investigate the feasibility of building owners sharing the financial burden of indoor mobile network deployment with Ethio telecom. Sharing the financial burden may allow Ethio telecom to provide other types of indoor mobile network coverage that uses different technology based on building size and purpose.
- Another area that requires a feasibility study and research it Ethio telecom's customer service and maintenance service for the indoor mobile network. An investigation must be conducted if outsourcing to a third party or dedicating a special task force is worthy, to increase customer satisfaction and reduce the burden on field technicians.

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APPENDICES

APPENDIX A - Questionnaire

Addis Ababa University

College of Business and Economics

Masters of Business Administration Program

Introduction

The title of the study is the mediating role of service quality on the relationship between customer orientation and customer satisfaction, and the effect of network quality on customer satisfaction, A particular case in the Ethio telecom's Indoor mobile network coverage Project. The general objective of the study is to identify the factors affecting customer satisfaction in Ethio telecom's mobile network coverage project. The findings from this research would serve as a source of information for future similar projects that are going to be implemented by Ethio telecom, particularly for future indoor mobile network coverage projects.

This questionnaire will be used for the research that I'm conducting in the pursuit of the MBA from Addis Ababa University, College of Business and Economics. As you are a supposed benefactor from the indoor mobile network coverage project by the Ethio telecom, your input is extremely valuable in gauging the satisfaction level of customers, and identifying the key issues within the indoor mobile network project. Your response can also be used to address other customer related issues in other Ethio telecom's business activities.

At last, I'd like to address issues regarding confidentiality. Your name, site name and your response will be strictly protected, and used only for this study.

Please note that this study solely focused on the indoor mobile network coverage at your building.

I. Instructions:

- Don't write your name.
- Please tick to indicate your answer.

II. Personal Information

- Gender: Male ☐ Female ☐
- Age: 18-25 ☐ 26-35 ☐ 36-45 ☐ 46-55 ☐ 56-65 ☐ 66+ ☐
- Education Level: PhD ☐ Masters ☐ BA/BSC ☐ Diploma ☐ Certificate ☐ other

III. Building's Location (Subcity)_____

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IV. Purpose of the Building_____

Part 1. Network Quality

Questions	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree
1. Ethiotelcom's indoor mobile network is available every time you are in the building.					
2.The indoor mobile network system covers all areas within your building.					
3.The number of dropped calls in the building are negligible.					
4- The quality of the calls within the building is up to an acceptable level.					

Part 2. Customer Orientation

Questions	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree
1. The employees of Ethiotelcom have a high level of knowledge.					
2. The employees are experts in their job.					
3. The employees of Ethiotelcom are highly competent.					
4- The employees of Ethiotelcom have extensive social skills					
5. The employees of Ethiotelcom are able to consider their customers' perspective					
6. The employees of Ethiotelcom know how to treat a customer well.					
7. The employees of Ethiotelcom show strong commitment to their job					
8. The employees of Ethiotelcom do their best to fulfill their customers' needs					
9. The employees of Ethiotelcom are always highly motivated					
10. The employees of Ethiotelcom are allowed to decide autonomously in customer matters					
11. The employees of Ethiotelcom have appropriate room for maneuver in solving customer problems.					
12. In the case of customer requests, Ethiotelcom's employees do not need to ask their superior for permission.					

Part 3. Service Quality

Questions	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree
1. Customer service counter is well equipped with up-to date facilities					
2. Design of the equipment and its installation is visually appealing.					
3. Staff are well dressed and appear neat					
4- Material and information associated with the service are visually appealing at the customer counter					
5. When Ethio telecom promises to do something by a certain time, services are delivered as promised.					
6. When I face problems, Ethio telecom's staff is sympathetic and reassuring.					
7. Ethio telecom staff are dependable					
8. Ethio telecom staff keeps the transaction records accurately					
9. Ethio telecom's staff are always willing to help the customers.					
10. Ethio telecom's staff does not appear to be too busy in responding customer requests.					
11. Ethio telecom's staff tells the customer exactly when services will be performed.					
12. I receive prompt service from Ethio telecom staff.					
13. Customer service staff seems to have received adequate supports from Ethio telecom to do their job well.					
14- I can trust Ethio telecom's staff.					
15. I feel safe when conducting business with Ethio telecom's staff.					
16. The customer service staff is polite.					
17. Ethio telecom's staff gives me individual attention.					
18. Ethio telecom staff knows what I actually want.					

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19.I have interest in the services provided by Ethio telecom.					
20. Ethio telecom operates according to the business hours that are convenient to most of the customers.					

Part 4- Customer Satisfaction

Questions	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree
1. I am fully satisfied with Ethio telecom's indoor mobile network coverage.					
2. Ethio telecom always fulfills my expectations.					
3. Ethio telecom has never disappointed me so far in the service of indoor mobile network coverage.					
4- My experiences with Ethio telecom are excellent.					

Thank You!

Samuel Deribew.

(2020)

አዲስ አበባ ዩኒቨርሲቲ

የንግድ እና ኢኮኖሚክስ ኮሌጅ

የቢዝነስ አስተዳደር ፕሮግራም ማስተርስ

መግቢያ

የዚህ ጥናት ርዕስ በኢትዮ ቴሌኮም የህንጻ ውስጥ የሞባይል ኔትወርክ ሽፋን ፕሮጀክት ላይ የአገልግሎት ጥራት በደንበኛው የስራ መመሪያ እና በደንበኛው እርካታ ግኑኝነት ላይ ስላለው ተጽእኖ እንዲሁም የሞባይል ኔትወርክ ብቃት/ጥራት በደንበኛው እርካታ ላይ ያለው ተጽእኖ የሚል ሲሆን አጠቃላይ አላማውም በኢትዮ ቴሌኮም የህንጻ ውስጥ የሞባይል ኔትወርክ ሽፋን ፕሮጀክት ላይ በደንበኛው እርካታ ላይ ያለው ተጽእኖ የሚያደርሱ ምክንያቶችን መለየት ነው። ከዚህ ጥናት የሚገኘው መረጃ ወደፊት ኢትዮ ቴሌኮም ሊሠሯቸው ላሰባቸው ፕሮጀክቶች ቀድመው መታሠብ ያላበቸውን ነገሮች ለማወቅ እንደ መረጃ ምንጭ ይጠቅማል።

ይህ ጥናት እኔ ከአዲስ አበባ ዩኒቨርሲቲ የንግድ እና ኢኮኖሚክስ ኮሌጅ የኤም ቢ ኤ (MBA) ዲግሪ ለማግኘት የማደርገው ጥረት አካል ነው። እርስዎ ኢትዮ ቴሌኮም በሠራው የሕንጻ ውስጥ የሞባይል ኔትወርክ ሽፋን ፕሮጀክት ቀጥታ ተጠቃሚ እንደመሆንዎ መጠን ለማደርገው ጥናት እርስዎ የሚሰጡኝ መረጃ ትልቅ ጥቅም አለው። በተለይም በፕሮጀክቱ ላይ የተጠቃሚዎችን የእርካታ መጠን ለማጥናት ይረዳኛል። የእርስዎ መልስ ሌሎችም ከደንበኛ ጋር የተያያዙ ኢትዮ ቴሌኮም ላይ ያሉትን ችግሮች ለመፍታት ያገለግላል።

በመጨረሻም ይህ መጠየቅ ሚሥጥራዊነቱ የተጠበቀ ነው። በመጠየቁ ላይ የሚሰጡኝ መረጃ ለዚህ ጥናት ብቻ የሚውል ነው።

እርስዎ ስም፣ የህንጻው ስም፣ እንዲሁም የእርሶዎ መልስ በጥብቅ ሚስጢር የሚያዙ ናቸው።

ማስታወሻ፡- ይህ ጥናት የሚያተኩረው በኢትዮ ቴሌኮም ህንጻ ውስጥ የሞባይል ኔትወርክ ሽፋን አገልግሎት ላይ ብቻ ነው።

V. መመሪያዎች

- እባክዎትን ስሞትን አይጻፉ።
- መልስዎትን ለማመልከት " / " ይጠቀሙ።

VI. ግላዊ መረጃ

❖ ፆታ፡ ወንድ ☐ ሴት ☐

❖ እድሜ ፡ 18-25 ☐ 26-35 ☐ 36-45 ☐ 46-55 ☐ 56-65 ☐ 66+ ☐

❖ የትምህርት ደረጃ፡ ፒኤችዲ ☐ ማስተርስ ☐ ድግሪ ☐ ዲፕሎማ ☐ ሰርተፍኬት ☐ የተለየ ☐

የህንጻው መገኛ ክፍለ ከተማ ፡ _____

የህንጻው አገልግሎት አይነት ፡ _____

ክፍል አንድ ፡ የሞባይል ኔትወርክ ብቃት/ጥራት

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ጥያቄ	እጅግ በጣም እስማማለሁ	እስማማለሁ	ገለልተኛ	አልስማማም	እጅግ በጣም አልስማማም
1/ እርስዎ ሕንፃው ውስጥ በሚሆኑበት ሰአት ሁሌም የኔትዎርክ ሽፋን አለ።					
2/ የህንፃው ውስጥ የሞባይል ኔትዎርክ በሁሉም ቦታ ላይ ይገኛል።					
3/ በስልክ ንግግር ላይ እያሉ የኔትዎርክ መቆራረጥ ሁኔታ በጣም አልፎ አልፎ ነው የሚያጋጥሞት።					
4/ በህንፃው ውስጥ የሚከናወኑ የስልክ ጥሪዎች በሙሉ ደረጃቸውን በጠበቀ እና ጥራት ባለው መልኩ ነው የሚስተናገዱት።					

ክፍል ሁለት፡ ስለ ሰራተኛው የስራ መመሪያ

ጥያቄ	እጅግ በጣም እስማማለሁ	እስማማለሁ	ገለልተኛ	አልስማማም	እጅግ በጣም አልስማማም
1/ የኢትዮ ቴሌኮም ሰራተኞች ለሚሰሩት ስራ ከፍተኛ እውቀት አላቸው።					
2/ የኢትዮ ቴሌኮም ሰራተኞች ለስራቸው ከፍተኛ ልምድ አላቸው።					
3/ የኢትዮ ቴሌኮም ሰራተኞች በስራቸው ብቁ ናቸው።					
4/ የኢትዮ ቴሌኮም ሰራተኞች ጥልቅ በሆነ ሁኔታ ከሰው ጋር ይግባባሉ።					
5/ የኢትዮ ቴሌኮም ሰራተኞች ከደንበኛው ወገን በመሆን የደንበኞችን ችግር ለማየት ይሞክራሉ።					
6/ የኢትዮ ቴሌኮም ሰራተኞች ደንበኞችን እንዴት ማስተናገድ እንዳለባቸው ያውቃሉ።					
7/ የኢትዮ ቴሌኮም ሰራተኞች ለስራቸው ያላቸውን ቁርጠኝነት ያሳያሉ።					
8/ የኢትዮ ቴሌኮም ሰራተኞች የደንበኞችን ፍላጎት ለማርካት የተቻላቸውን ያህል ይጥራሉ።					
9/ የኢትዮ ቴሌኮም ሰራተኞች ከፍተኛ የሆነ የስራ ተነሳሽነት አላቸው።					
10/ የኢትዮ ቴሌኮም ሰራተኞች ከደንበኛው ጋር የተያያዙ ጉዳዮችን በራሳቸው መወሰን ይችላሉ።					

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11/ የኢትዮ ቴሌኮም ሰራተኞች በተወሰነ መልኩ እንደ ደንበኞቹ ፍላጎት አገልግሎት አሰጣጣቸውን ማስተካከል ይችላሉ።					
12/ ደንበኛው የኢትዮ ቴሌኮም ሰራተኞችን በሚፈልጉበት ጊዜ ሰራተኞቹ ሁሉም የአለቃቸውን ፍቃድ አይጠይቁም።					

ክፍል ሶስት ፡ ስለ የሞባይል ኔትወርክ ብቃት/ጥራት

ጥያቄ	እጅግ በጣም እስማማለሁ	እስማማለሁ	ገለልተኛ	አልስማማም	እጅግ በጣም አልስማማም
1/ የደንበኛው አገልግሎት መስጫ አካባቢው የተሟላ እና ዘመናዊ ነው።					
2/ የአቃው ዲዛይን አገጣጠሙ ሲታይ ለዐይን የሚማርክ ነው።					
3/ የኢትዮ ቴሌኮም ሰራተኞች በደንብ የሚሉብሱ እና ፅዱኝ ናቸው።					
4/ ስለዕቃው እና ስለአገልግሎቱ መረጃ የሚሰጡ ጽህፎች ሲታዩ እይታን የሚሰጡ ናቸው።					
5/ ኢትዮ ቴሌኮም ቃል በሚገባው እና በወሰነው ቀን ቀጠሮ መሰረት አገልግሎቱን ያደርሳል።					
6/ ችግር በሚያጋጥመን ጊዜ የኢትዮ ቴሌኮም ሰራተኞች ችግሩን በፍጥነት ለመፍታት ጥረት ያደርጋሉ።					
7/ በኢትዮ ቴሌኮም ሰራተኞች ሙሉ እምነት አለኝ።					
8/ የኢትዮ ቴሌኮም ሰራተኞች ሁሉንም ድንበኞችን ለመርዳት ዝግጁ ናቸው።					
9/ የኢትዮ ቴሌኮም ሰራተኞች የደንበኞችን ችግር ለመፍታት ቀጠሮ አያበዙም።					
10/ የኢትዮ ቴሌኮም ሰራተኞች ለደንበኞች ችግሮች መቻላቸው እንደሚፈቱ በግልጽ ያሳውቃሉ።					
11. የኢትዮ ቴሌኮም ሰራተኞች አገልግሎቱን መቼ እንደሚከናወኑ ለደንበኛው በትክክል ይናገራሉ?					
12/ ከኢትዮ ቴሌኮም ፈጣን ምላሽ ሁሉም አገኛለሁ።					
13/ የደንበኛው አገልግሎት ክፍል ሰራተኞች ስራቸውን በበቂ ሁኔታ እንዲሰሩ ከድርጅታቸው በቂ ድጋፍ ያገኛሉ።					
14/ የኢትዮ ቴሌኮም ሰራተኞችን ማመን እችላለሁ።					
15/ የኢትዮ ቴሌኮም ሰራተኞች ጋር ለስራ በምንገናኝበት ጊዜ የደህንነት ስሜት ይሰማኛል።					
16/ የኢትዮ ቴሌኮም የደንበኛው አገልግሎት ሰራተኞች ትሁት ናቸው።					
17/ የኢትዮ ቴሌኮም ሰራተኞች በቂ ትኩረት ይሰጡኛል።					

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18/ የኢትዮ ቴሌኮም ስራተኞች ምን እንደምረጥ በደንብ ያውቃሉ፡፡					
19/ ኢትዮ ቴሌኮም ለሚሰጣቸው አገልግሎት ሙሉ ፍላጎት አለኝ፡፡					
20/ የኢትዮ ቴሌኮም የስራ ሰዓት ለደንበኞች በአብዛኛው የተመቹ ናቸው፡፡					

ክፍል አራት፡ የደንበኛው እርካታ

ጥያቄ	እጅግ በጣም እስማማለሁ	እስማማለሁ	ገለልተኛ	አልስማማም	እጅግ በጣም አልስማማም
1/ በኢትዮ ቴሌኮም የህንፃ ውስጥ ሞባይል ኔትዎርክ ሽፋን አገልግሎት በደንብ እረክቻለሁ፡፡					
2/ ኢትዮ ቴሌኮም ሁሌም የምጠብቀውን ያሟላል፡፡					
3/ በኢትዮ ቴሌኮም የህንፃ ውስጥ ሞባይል ኔትዎርክ አገልግሎት ዘራያ ስራ አሳዝነውኝ አያውቁም፡፡					
4/ በኢትዮ ቴሌኮም የህንፃ ውስጥ ሞባይል ኔትዎርክ አገልግሎት እጅግ በጣም ጥሩ ነው፡፡					

አመሰግናለሁ!
 ሳሙኤል ደርበው
 2012 ዓ.ም

APPENDIX B- Introduction to Indoor Mobile Network Coverage: Basics

Serving a building using the outside BTS is proving to be challenging because there are several factors that contribute to the reduction(attenuation) of cellular signal. Among the factors,

- The materials which the building is constructed from (Reinforced concrete causes the highest signal attenuation, tempered glass, bricks, etc.)
- The type of partition within the building (partitions can be made using magnesium board, reinforced concrete, glass, etc.),
- The height of the building (Whether or not it has a basement; if it has a basement the outside signal cannot reach the basement floors, the building's own height; i.e. if the building's height is taller than the nearest best serving BTS, there is a severe loss of received signal strength from within the building.)
- The number of customers at the building. (If there are many customers inside the building it will be difficult to make a call and receive a call without an issue using the degraded signal strength)
- The type of Elevator used. (If the elevator's wall is made from glass or not, if they are not, usually the lift shaft is built using steel reinforced concrete.

Due to the above-mentioned factors and other reasons providing an inbuilding mobile network coverage is the best option to serve customers within a building.

Distributed Antenna System (DAS)

A DAS is a network of antennas that sends and receive signals to and from cellular devices. DAS has two components, A signal source and a distribution system

- Signal Source: an input to the DAS network. The source can be from a direct connection to the BTS, using off-air methods (Using a donor antenna) or a small cell. Here in Ethiopia we only use the off-air method using a Yagi-donor antenna.
 - Off-Air: Uses a donor antenna to receive and send cellular signal from/to BTS. There are different types of donor antennas depending on the level of the outside signal strength (Logarithmic, omni). The donor antenna will be connected to the signal repeater before it is connected to the DAS system.

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TABLE 1. ADVANTAGES AND DISADVANTAGES OF OFF-AIR SIGNAL SOURCE

Advantages	Disadvantages
Easily deployable	Performance strongly depend on the outside signal (donor)
Low cost	The level of congestion on the donor BTS severely also affects performance

- BTS: The connection between the telecom service providers' BTS and the core network typically required a fiber connection. This system is usually being deployed in airport terminals and large stadiums.

Advantages	Disadvantages
High performance	Expensive
Can cover a large area	Long deployment time
	Space, power and cooling

TABLE 2. ADVANTAGES AND DISADVANTAGES OF BTS SIGNAL SOURCE

A variety of solutions are available for the indoor mobile network coverage system. The Passive DAS, Active DAS or a Hybrid DAS. The three main things that we have to look for when we choose the type of solution that we want are the *Capacity*, *Coverage area* and the *Signal source*.

Signal Source

The signal source determines the capacity and the coverage area of the DAS System. The signal source's performance and the type technique chosen to receive the signal heavily affects the type of solution¹.

Coverage Area

¹ <https://www.waveform.com/pages/das-distributed-antenna-systems>
Distributed Antenna Systems (DAS): The Definitive Guide- 18 Dec 2019

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The coverage area dictates the type of DAS system to be used. For buildings below 500,000²ft passive DAS is the appropriate solution. For area between 500,000²ft-1,000,000²ft hybrid DAS, and for areas greater than 1,000,000²ft active DAS is preferable.

Capacity

Capacity is heavily influenced by coverage area and the type of wiring used for the DAS, it can be fiber optic cable (From signal source to the amplifier unit), ethernet cable or typical RF coaxial cable.

Signal Distribution Technologies

There are three main types of signal distribution technology: Passive, Active and Hybrid.

Passive DAS

A passive DAS uses RF component such as coaxial feeder cables, splitters, couplers to distribute and divide the signal. There is a loss of signal strength because of the insertion loss of these passive devices therefore the design must be executed with absolute precision. The DAS system that Ethiotelcom has been implementing is a passive DAS which is perfect choice for most of the buildings in the city. But if the building is very large using the passive DAS is not advisable because whenever the antenna gets further away from the signal repeater or amplifier there will be a significant loss (That is mainly because of the insertion loss of the couplers, splitters and also the cable length).

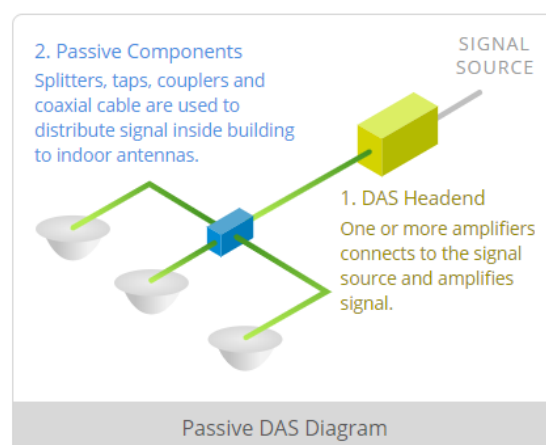


Figure 1. Passive DAS Diagram (Img Src, <https://www.waveform.com/pages/das-distributed-antenna-systems>)

Active DAS

An active DAS converts the analog radio frequency transmission from the signal source to a digital signal for distribution, then the DAS transmits the digital signal over fiber optic or ethernet cables to remote radio units RRUs that convert the signal back to an analog signal.

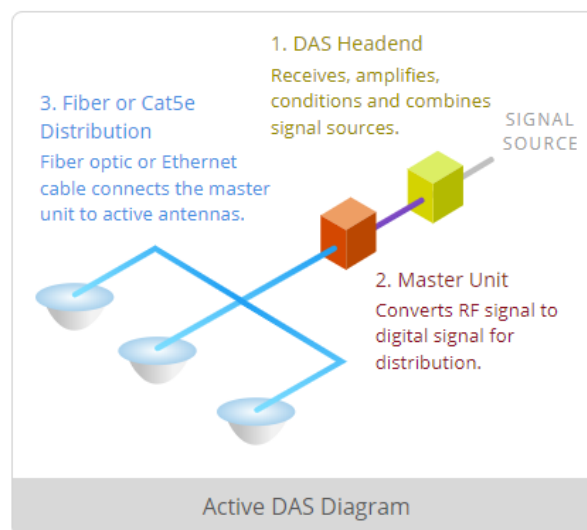


Figure 2. Active DAS Diagram (Img Src, <https://www.waveform.com/pages/das-distributed-antenna-systems>)

Hybrid DAS

Hybrid DAS combines characteristics of passive and active systems, the RRUs are separate from the antennas, allowing them to use both fiberoptic cable and coaxial cable. This system costs less than an active DAS because it employs a smaller number of RRUs but it is still more expensive than passive DAS.

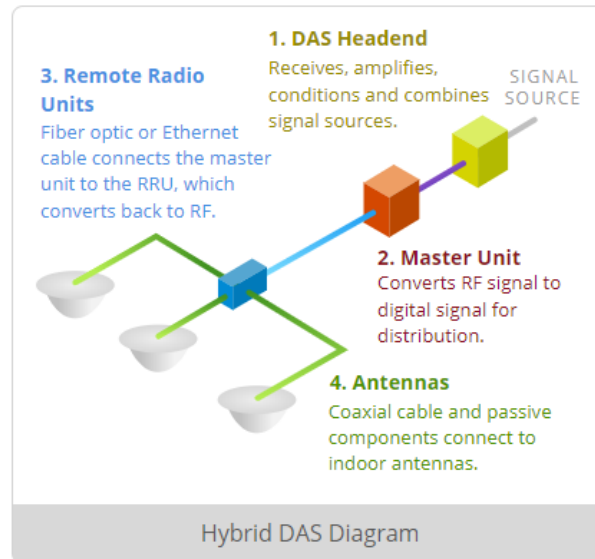


Figure 3. Hybrid DAS Diagram (Img Src. <https://www.waveform.com/pages/das-distributed-antenna-systems>)

Site Survey & Design:

There are a few things that must be considered when designing for the indoor mobile network coverage system.

1. The building's distance from the nearest BTS is one of the considerations that must be taken into account before designing the indoor system. The cellular repeater receives the signal from the nearest BTS using the donor antenna, if the RxLevel is below -60dB then it will be difficult to get maximum output from the repeater because its output is dependent on the input signal and its gain i.e. The one Ethiotelecom is using is around 90dB.
2. The type of partition used inside the building, if there is no partition in a given floor the number of omni antenna installed will decrease.
3. The purpose of the building itself also another factor to consider when conducting a site survey because it affects the installation techniques and the antenna density in the building. If the building is a hotel and it doesn't have sufficient access points to install the antennas and connect the cables then one will be forced to do the design for the parts that he is able to. This is because in hotels using a C-channel (PVC Trunking) to pass a cable and install antenna is strictly forbidden since it downgrades the aesthetic of the hotel. Note: most of the installations in Addis Ababa are done using the trunking.

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Site Selection

Initial site survey was conducted by Ethio telecom and the vendor for the project. Experts from the two offices covered almost all buildings in Addis Ababa for initial survey and drive test. The drive test enabled the experts to determine which building needs the indoor mobile network coverage project and assess the access for the installation. If the building needs the indoor mobile network coverage system, then they will contact the building's management/owner and explain the idea of the project and ask for their opinion on whether they'll accept the project or not. If they agreed then the vendor sends his engineers to conduct a detailed site survey. Through time when building owners and hoteliers get the information about the project from their peers, they have begun to request the Ethio telecom to install the system for them.

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APPENDIX C- Buildings with indoor mobile network coverage

#	Site Name	#	Site Name
1	AAU- Administrator Building	33	Ihlas Business Center
2	AAU- Registrar Building	34	Cheshir Service Ethiopia
3	Aberus Building	35	Bekele Eshetu Tower
4	Adams Pavillon Building	36	EthioCeramic Building
5	ADM Business Plc	37	Omedad Building
6	Alem NO.1 Building	38	Hibrework Building
7	Alem NO.2 Building	39	Betesahlitemihret Building
8	Awash International Bank SC HQ	40	Minister of Mine_New Building
9	Bahir Building	41	Minister of Mine_Old Building
10	Beer Garden	42	FDRE Minister of Justice Office Bole Branch
11	Bethlehem Plaza	43	Mekane Yesus Building
12	Bole Ambassador hotel (BLOCK C)	44	Yekatit Hospital
13	Bole Jupiter Hotel	45	Mahiber kidusan Building
14	Bole Rock	46	MOFED Building
15	Capital Hotel	47	A.A City Administration office of Youth & Sport
16	Debredamo Hotel	48	AAWSA 6killo
17	Deleopol hotel	49	United Insurance
18	Dembel City center	50	Robel Plaza
19	Dembel shopping mall	51	Sintayehu Belay Building
20	DH Geda Tower	52	Maficity mall
21	Diamond hotel	53	Tommy Tower
22	Edna Mall	54	Mega Building
23	EEPCO	55	Black Lion Hospital (main building)
24	Eliana Shopping Center	56	Tirar Hotel
25	Ellily Hotel	57	Alem Gebeyehu Bldg
26	Empire Addis International Hotel	58	Millinium Hall
27	Ethio telecom new technical office	59	Palas Commercial
28	Ethiopian Airlines Cargo	60	Nifas Selk Commercial Bank
29	Ethiopia Airline Control Twoer-1	61	Ethiopian Women's Federation Building
30	Ethiopia Airline training Center	62	Great city Hotel and Tourism
31	Ethiopia CIVIL Aviation Authority(Airport)	63	Cheleleq Alsam Tower 1
32	Ethiopia Insurance building	64	Dagim Millennium Hotel
65	Ethiopian Airlines Head Office(white house)	97	Oromia National Regional Office of the President
66	Federal Ethics &Anti-Corruption building	98	OWWCE
67	Federal police station	99	Park Plaza
68	Friendship Shopping Mall	100	Addis Fana Building
69	Friendship hotel	101	Electric World
70	Getu Commercial Center	102	Dagmawi Menelik referral Hospital
71	Gollagul Tower	103	Mintiwab bldg

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72	Harmoney hotel	104	Tk Building-1
73	Helzer INN tower	105	Tk Building-2
74	Intercontinental Addis Ababa Hotel	106	Panorama Hotel
75	Jupiter hotel	107	Addis Ababa City Administration Education Bureau
76	KZ hotel	108	emperial hotel (METEK)
77	Lucky Building	109	AB Zone business Center
78	Marriott hotel	110	Ethiopian Investment Agency
79	Medehanealm Building	111	Ministre of Water Resource
80	Mezegagha	112	Senait Negash Bldg
81	Ministry of Industry	113	Radio Fana and Walta
82	NANE Building	114	rewina building
83	National gril control center	115	Authority for Research & Consercvation of Cultural Heritage
84	Nega City Mall	116	Ethiopian Broadcast Authority
85	ODA Tower	117	Addis Ketema Subcity HQ
86	SA building	118	Akaki-Kality Subcity HQ
87	Sheger house	119	Bole Subcity HQ
88	Snap Building	120	Gulelle Subcity HQ
89	Sugar Corp	121	Gulf Aziz
90	Yiha City Center	122	Tikur Anbessa Hospital New Building
91	Zefmash Tower/Shoa Hyper Mart	123	Ethiopian Press Enterprise
92	Zeweditu hospital	124	Ministry of Education (old Bldg)
93	Holy city center	125	The Confederation of Ethiopian Trade Unions
94	Metebaber bldg	126	Traffic Police
95	Mulugeta zelek bldg	127	Arada Bldg
96	Afarnisis int. hotel-Old Building	128	Menged transport and Ethiopian Development Research Institute
129	Afarnisis int.hotel-New Building	160	Ethiopian Revenue and Customs Authority megenagna Block A
130	Minarol bldg	161	Ethiopian Revenue and Customs Authority megenagna Block B
131	Belle-vue Hotel and Spa	162	Ethiopian Revenue and Customs Authority megenagna Block C
132	Grand Yordanos Hotel	163	Ethiopian Revenue and Customs Authority megenagna Block D
133	Enat Tower	164	Ethiopian Road Authority_New Building
134	FDRE Justice Minister	165	Ethiopian Road Authority_Old Building
135	Construction & Business Bank	166	Tegbare TVET College
136	Wabe shebele Hotel	167	Beza Bldg
137	Electric Power	168	INDUSTRY MINISTER BLDG
138	Sajdah Business Center	169	JAMBO
139	Dama House	170	lideta commercial bank
140	Medina Tower	171	Ministry of Education New Bldg
141	Down Town bldg	172	Ministry of Urban Development&Construction Bldg
142	San Trading	173	F.D.R.E.Ministry of Justice Yeka Justuce Office Bldg
143	Ambasel bldg	174	Ethiopian Mapping Agency Block 1
144	DASHEN BANK LIDETA	175	Ethiopian Mapping Agency Block 2

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145	ETMAS BUILDING	176	Federal Prisons Administration
146	Kenenisa Hotel	177	Kiyamid Bldg (behayind of suger copration (owner,s bldg2)
147	Mekonen Bitew	178	WEGAGEN BANK SC
148	Momona Hotel	179	FBE_Eshetu Chole Building
149	Soliana	180	AAU School of Natural science & PGS_4Killo
150	Sileshi Sihin	181	Dashen Bank Head Office
151	Doba bldg	182	AAU, School of Commerce
152	Master internation hotel	183	Kokeb Bldg1
153	OSAC Business plc	184	Kokeb Bldg2
154	Sofiay Mall	185	The Oromia National Regional State Office of The President
155	Hulualem Business Center	186	Ministry of Transport and Post Office
156	Turkana bldg	187	Government Housing Agency Block 988
157	Global insurance bldg	188	Addis Ababa Water And Sanitation Authority
158	Jesus is lord bldg	189	KAFDM PLAZA
159	Tefera Haile Commercial Center	190	EBC (Ethiopia Broad Cast Coporation)
190	Mati Bldg	223	Ethiopian Commodity Exchange Authority
191	Safeway super market	224	SHEGER HOUSE
192	AA justice office	225	Dashin Bank lideta_2
193	Boran real estate	226	Mercato Lideta Flintston Shops Bldg
194	Wengelawit Bldg	227	Abegaz Tower
195	Kelifa Business center	228	Azzeman Hotel
196	sami bldg	229	SA Business center
197	Emmad Furnished	230	Solomon Bldg 2
198	Leul Taz Bulding	231	Hansen Bldg
199	Dir Building	232	Haile Bldg 2
200	Aragaw Kefyalaw Building	233	UNECA
201	Semen Hotel	234	commercial Bank of Ethiopia around merkato
202	Yobek commercial center	235	Golden Tulip
203	Balker Tower	236	Derartu Tulu Tower
204	BEAKEA BULDING	237	Keremela Business Center
205	Ayma International Hotel	238	Tesfachen Bldg
206	RETINA BUILDING	239	Ethio Ceramics PLC Bolae
207	GARD MALL	240	Tesfa Business Center
208	Tantos Tower	241	Seid Yassin Addis Ababa
209	New York Hotel(huangchao chinese hotel)	242	Food,medcens and health care administration and control authourity of ethiopia
210	INSA 2	243	Saro Maria Hotel
211	Mulugeta Commercial Center	244	Huajian Business Group
212	Dreamlinear Hotel	245	CBE Abunepetrose branch
213	Abenem Business Center	246	Homage hotel
214	Glory Building	247	Selam city mall
215	Dire dawa bldg	248	Habsha Brewery Bldg
216	Sidamo Tera Bldg	249	Tracon Tower
217	NEW DAY BUILDING	250	military bldg block A
218	Somale Tera Build	251	military bldg block B

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219	Afewerk Building	252	TAF OIL PLC
220	Arrarat Hotel 1	253	AIRLINE TERMINAL 1
221	Mesfin Building	254	AUGH Bldg
222	Meaza Desalgn Building	255	Oromiya development and Assocetion bldg
256	GetFam Hotel	289	flight Ops.New and Old Bldg
257	Getahun Commercial Center	290	EAL New catering warehouse
258	Abdulaemid Mohamed (SHENZA Bldg)	291	Africa insurance Blding Bole branch
259	Soramba Hotel	292	Ministry of Defense
260	Minisry of Agriculture Blocks A and B	293	Yober Hotel
261	Minisry of Agriculture Blocks C	294	Gidey Tsegaye Building.
262	Nigist Saba Hotel	295	Afia shopping center
263	Nexus Hotel	296	Super Double General Trading
264	Arrarat Hotel 2	297	Sapphire Addiss Hotel
265	Bahru Abreha Blg	298	Bati Complex
266	Beto real state	299	HOTEL MAGNOLIA AND CONFRENCE
267	Bole Sky Gate Hotel	300	ETHIO CERAMICS kazanchis
268	Abyssinia Building	301	SUR Constraction Bldg Head office
269	Muller Real Estate	302	Andinet kimem & Kimemakimem
270	Dink Sira Complex	303	ATA Commercial Center
271	Alu Addis Bldg	304	Huajian factory AA
272	Washington Hotel	305	Admas Commercial Center
273	Piassa Commercial Center	306	Kurtu Business Center
274	Ethiopian human right commission	307	Ossac Building Kazanchis
275	Country Tower	308	Sidra International Hotel
276	Rim Seven Bldg	309	WAGGA
277	Lex Plaza	310	Africa Commercial Center
278	H&M Building	311	Agian B
279	Darulie Business Center	312	Bahiran Mall
280	Husen Agraw Bldg	313	Dir Tera S.C. Bldg
281	Rebecca Bldg	314	Ethioceramics HO-Piassa
282	Biftu Adugna Building	315	Government Communication affairs office
283	Lafto Mall	316	Zergaw Building
284	J.H Simex Hotel	317	Blrhane Adere Africa Mall
285	AHADU COMPLEX	318	Morning Star Mall
286	MEKLIT REAL STATE	319	KelifaSahabit Bldg
287	HAILE BLDG	320	Haikan International Hotel
288	PALM BLDG	321	Samuel Deressa Building
322	Tamegaz Bldg	331	INSA
323	Wolde Building	332	Paulos Hospital
324	Yacob Bldg	333	Raddison BLU
325	KKARE BLDG		
326	Ethiopia MGT Institute		
327	Glorys Building		
328	Zershta Building		

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329	Naod Building
330	Atitegeb General Trading