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Performance Evaluation of Anbessa City Bus Based on Quality of Service: The Case of Bethel to Merkato Route

By

Muktar Husein

June, 2021

Addis Ababa, Ethiopia

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Performance Evaluation of Anbessa City Bus Based on Quality of Service: The Case of Bethel to Merkato Route

A Thesis Submitted to School of Graduate Studies of Addis Ababa University, Ethiopian Institute of Architecture, Building Construction and City Development (EiABC), in Partial Fulfillment for the Degree of Master of Science in Urban Planning.

By

Muktar Husein

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Addis Ababa, Ethiopia

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By Muktar Husein

June, 2021

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Declaration

I, the undersigned, declare that this thesis is my own and original work and has not been presented for a degree in any other university, and that all sources of material used for the thesis have been duly acknowledged, following the scientific guidelines of the Institute.

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The thesis can be submitted for examination with my approval as an Institute's advisor.

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Advisor Signature Date

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Abstract

Public transportation in Addis Ababa has been dominated by city bus services provided by the few bus enterprises, taxis operated by private sectors and Light Rail Transit. Walking is also major mode of transport for a significant number of city residences. Despite the role of LRT, buses and mini-bus taxis as the major public transport system, the overall urban mobility in Addis has been characterized as chaotic, unreliable, unsafe, unaffordable and inefficient for a fast-expanding city. Public transportation has influential role in the quality of life individually and the productivity of entire regions in every society through generating inter or intra regions or city connections during urbanization. Cities with poor public transport are characterized by suppressed social and economic advantages. However, providing a reliable, efficient and quality transportation service to the people is a challenging operation to the service provider. Since its establishment, Anbessa City Enterprise has passed through many ups and downs to improve and expand its transportation service in general. It has got major improvement so far. Yet, the enterprise could not be able to address the required quality and the ever-increasing transportation demand in and around the city of Addis Ababa. Hence, the Anbessa city bus service operation requires a continuous performance assessment for efficient and proper utilization of buses to serve the current and future customers' demand. As a result, any intervention in this regard cannot be fruitful unless the current level of performance and the gap in quality of service is identified scientifically. The objective of this research is therefore to evaluate performance of Anbessa city bus based on quality of service specifically along the Bethel-Merkato route. To evaluate performance of Anbessa bus along this route, indicators regarding quality of service were identified from different literatures and discussed under literature review section of the research. Identified quality-of-service indicators are service availability, service frequency, trip time, service reliability, comfort, safety and security, cleanliness, fare, information and customer care. Two methods were developed to analyze the study. The first method was customer satisfaction index (CSI), this method analyzed overall customer satisfaction rate of the service by calculating quality-of-service indicators importance rates and satisfaction rates of 351 respondents. The second method was Common Values for the Performance Indicators; this method analyzed expected level of service quality to be delivered from the view point of different expected average performance levels. Based on the analysis the first method results identified, the service is about 53.2% successful in satisfying its customers, which indicates low result in satisfying its users. The second result also showed that, quality of service along this route is below average in some attributes and average in the rest. Further studies are needed to develop standard performance evaluation indicators at city and level and evaluation of Anbessa bus performance from service provider's perspective.

Key Words: *Performance, indicators, Indexes, customer satisfaction, importance rates, satisfaction rate*

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Acronyms

AACTA	Addis Ababa City Transport Authority
ACBE	Anbessa City Bus Enterprise
BRT	Bus rapid Transits
CSA	Central Statistical Agency
CSI	Customer Satisfaction Index
GIS	Geographic Information System
HOV	High Occupancy Vehicles
ITS	Intelligent transportation Service
LRT	Light Rail Transit
MetEC	Metals and Engineering Corporation
PM	preventive Maintenance
UN HABITAT	United Nation Habitat

Chapter one: Introduction

1.1. BACKGROUND OF THE STUDY

Public Transportation provides people with mobility and access to employment, community resources, medical care, and recreational opportunities in communities. It benefits both low-income residents and high-income residents economically and environmentally.

Public transport systems are about the flows of people in and out of areas in the urban system. Yet transit is not just about getting people from point A to point B. It is increasingly being recognized as an opportunity to limit our impacts on the environment, better adapt to changing demographics, reduce our overall costs of living and build healthier communities. Successfully planned, investment in transit also has the possible to be the initiation for an extensive range of initiatives intended at solidification of communities and increasing economic attractiveness (Fenta, 2014).

Mass transport facilitates the mobility of the society in any city with less cost and efficient time in the developed world. It provides a public transportation with the flexibility to serve the people with unlimited range of locations from city centers to suburbs. It services the public at a cheaper operating cost, with less amount of fuel, least accident rate and environmentally friendly as compared to private cars, small and collective taxicabs. (Berhan, 2013)

Public transportation in Addis Ababa has been dominated by city bus services provided by the few bus enterprises, taxis operated by private sectors and LRT. Walking is also major mode of transport for a significant number of city residences. Despite the role of LRT, buses and mini-bus taxis as the major public transport system, the overall urban mobility in Addis has been characterized as chaotic, unreliable, unsafe, unaffordable and inefficient for a fast-expanding city (Fenta, 2014).

With a motive to provide public transport service in Addis Ababa, the first public bus which is Anbessa city bus was started after the end of the Italian invasion. Since then, it is providing services to high number of residents in Addis Ababa, and large numbers of its users are the residents with low income or those who cannot afford to use other modes of transportation (AACTA, 2019).

Based on Addis Ababa City Transport Authority's (AACTA, 2019) public transport distribution report, the public bus in the city of Addis Ababa includes Anbessa city bus, Sheger city bus and Alliance city bus. In addition to buses, presently LRT is one of the dominant public transit services in Addis Ababa. The service was started operation in 2016 with 41 trains and transports 120,000 passengers per day in both North-South and East-West direction (AACTA, 2019).

Currently, though the Anbessa city bus have a large coverage in and around the city of Addis Ababa, it faces a lot of challenges in their performance, which is characterized by overloading, old buses, lack of reliability, frequency, longer trip time, and safety and comfort of its customers. Moreover, in terms of service satisfaction of their customers, it unfortunately leaves much to be desired and remains long way to go.

Generally, the above listed Anbessa city bus problems in Addis Ababa limited their users to low-income residents of the city. Also, it reduces availability of different options for all dwellers of the city, which reduces modal choice of public buses (Iles, 2005).

The study route coves a distance of 10.5 kms with four (4) Anbessa buses functioning along the route. Bethel is characterized predominantly by residential and mixed land uses with commercials along the main streets and service activities. Merkato is the biggest open market in Africa where, according to some studies, every week several million dollars' worth transactions take place. It is estimated that Merkato hosts more than 13,000 people who are engaged in 7,100 business entities, and attracts over 200,000 people every day (Megento, 2018).

1.2. PROBLEM STATEMENT

In addition to Anbessa city bus, Sheger and Alliance public buses have been introduced to the Addis Ababa's transit system as a supplementary solution to the challenges Addis Ababa public transport is facing. However, still, the public buses could not be able to address challenges in their performance and the ever-increasing transportation demand in and around the city of Addis Ababa.

In this regard, Anbessa city bus sets a good example. Since its establishment, the enterprise has passed through many ups and downs to improve and expand its transportation service in general. It has got major improvement so far. Hence, the Anbessa city bus service operation needs a continuous performance evaluation for efficient and proper utilization of buses to please the present and upcoming clients' demand.

1.3. OBJECTIVES OF THE STUDY

1.3.1. GENERAL OBJECTIVE

The general objective of this study is to evaluate performance of Anbessa city bus based on quality of service, by taking the case of Bethel-Merkato route.

1.3.2. SPECIFIC OBJECTIVES

- To identify performance indicators of public buses based on quality of service.
- To assess Anbessa city bus quality of service performance based on performance indicators.
- To identify possible measures of improvement of public buses performance in terms of quality of service.

1.4. RESEARCH QUESTIONS

- What are available performance indicators to measure public buses quality of service?
- What is the current performance level with respect to the quality of Anbessa city bus in Bethel-Merkato route?
- What are suitable responses toward bettering public bus performance in terms of quality of service particularly for Bethel-Merkato route?

1.5. SIGNIFICANCE OF THE STUDY

The study on Anbessa city bus performance based on quality of service, the case of Bethel-Merkato route helps us to know the real performance of the service in terms of service quality on the specified route. Additionally, the study will help us understand diversities of indicators to measure quality of service and what needs to be done to resolve detected weaknesses and recommend suitable measurements.

Evaluating performance of the service quality will help in evaluating the system's overall performance, understanding expectations of the system in relation to community objectives, assessing management performance and diagnosing problems in relation to service, its status with competing transit types and providing a management control system for monitoring and improving its services (Dhingra, 2011).

Additionally, it will help the stakeholders such as bus enterprises, transport agency, public transit agency, policy makers and general public to give solution in terms of efficient use of available

buses and the proper way forward regarding enterprise profit and community demand. Generally, the study will be the base for understanding the current performance status of Anbessa city bus in terms of service quality in Bethel-Merkato route. Moreover, it can serve as a source of data and indicative of possible methods of performance analysis.

1.6. SCOPE OF THE STUDY

Spatially the study was carried out in Addis Ababa specifically on Bethel-Merkato route. It focuses on the issues related to overall quality of service performance of Anbessa city bus on specified route. The study evaluated various indicators regarding evaluation of performance of Anbessa city bus on its service quality. Methodologically the study used different methods and approaches based on assessment criteria and indicators.

1.7. STRUCTURE OF THE DOCUMENT

The study has five chapters. The first chapter is an introduction that presents the research background, statement of the problem, objectives, research questions, significance, scope and limitation of the study. The second chapter is literature review section; while the third chapter provided methodology and materials that includes a description of the study area, study approach, the specific methods, sampling techniques, source of data and material used. The fourth chapter describes the main results and discussion part of the study based on collected data and evidences. Finally, the fifth chapter presents the main conclusions and recommendations.

Chapter Two: Literature Review

2.1. INTRODUCTION

More than half of world population lives in cities. The world currently has more urban areas than a decade or two decades ago. Cities are economic centers crowded with jobs and opportunities, and thus fascinate people from various non-urban lives in becoming urbanites. The growing population in cities rises the demand for basic services with urban space, which is inadequate (Kodukula, 2018).

According to United Nations it's estimated that, by 2050 over 68% of the world's population will be urban dwellers. This growth is triggered by both an increase in population and by population migrating to urban areas (United Nations, 2018). This means that there will be more demand for urban space and for the provision of services to the growing population. The infrastructure provided now in cities will decide its social, environmental and economic characteristics of the future.

Ongoing rapid growth of the cities, low per capita income, and low automobile ownership in most million plus cities in the Sub-Saharan African cities means that the population will remain to trust heavily on public transport to meet their daily mobility requirements. This necessity is expected to grow strongly for the predictable future and provision of efficient and effective public transport operations are serious to sustainable economic and social development. Whereas investment in new transport infrastructure is obligatory to help happen mobility requirements it will not be sufficient on its own, even in those rare conditions where it can be prolonged to match the growth in travel demand. More effective use of standing infrastructure and equipment is both necessary and cost effective for the conceivable future (Kumar, et al., n.d.).

Quality of service influences customer satisfaction, passenger demand, investment decisions and revenue. However, to deliver an appropriate quality of service, and hence to make the service attractive to passengers, operators and authorities must ensure that the quality delivered meets the needs and expectations of both existing and potential users. To achieve this, a clear understanding of travel behavior and consumer needs and expectations is required, together with an accurate quantification of the strengths and weaknesses of the service. Therefore, it is essential to measure the quality of the service provided so that improvements aimed at enhancing user satisfaction and increasing market share can be most effectively targeted (ANDERSON, et al., 2013).

To be useful and suitable, the public transport service needs to be available to take passengers where they want to go at the time they wish to travel. This is facilitated by access and egress via appropriately placed and available (occurring) boarding and alighting points, and a network, timetable and operating hours fitting with activities which give rise to travel demand. Theoretically, a suitable service must also be reliable, punctual, and provide an appropriate level of comfort (ANDERSON, et al., 2013).

If service is available for a given trip, a customer may choose transit if its comfort and convenience are competitive with other available modes. Customer satisfaction is important to transit customers, welfare-to-work clients and other special population groups, employers, the community, transit agencies, and transit employees (Ryus & Ferreira, 2003).

Transit customers who have a pleasant experience while using transit will likely continue to use transit. Choice customers with easily available alternatives are likely to have higher expectations of satisfaction. Even so-called “captive” or “transit-dependent” riders will explore other travel options if their transit experience is sufficiently negative. Building ridership and market share are key objectives of most transit agencies and can be influenced by improving customer satisfaction. Transit may improve captive customers’ overall quality of life if it removes an actual or perceived barrier for them (Ryus & Ferreira, 2003).

Buses are the primary mode of public transit in most developing countries, including Ethiopia. Due to rapid urbanization, the travel demand in metropolitan cities is high, and the travel market has become increasingly active. However, the demand of public buses has been related to low-income Addis Ababa residents due to economic disparities and its less competitive service performance relative to other motorized modes. Therefore, good measurement of public transport performance and service quality is required to valuate and ensure more optimal policy decisions and management actions in order to maximize level of service and later demand.

2.1.1. ADDIS ABABA

Addis Ababa, with an area of 540 km^2 is divided into 11 sub-cities. The city is the country’s political and economic center. Evidently, the City of Addis Ababa population is growing continuously with an annual growth rate of 2.1% (CSA;Orc Macro, 2012). The city also lodges many international Aid and Development organization and embassies. Hosting 30 percent of the urban population of Ethiopia, Addis Ababa is one of the fastest growing cities on the continent (UN-HABITAT, 2008). Based on CSA (2007) report, the city’s population is estimated to be 3 million and 5 million after 10 years. Its population has nearly doubled every decade. In 1984 the population was 1, 412,

575, in 1994 it was 2,112, 737, and it is currently thought to be 4 million. UN-HABITAT estimates that this number will continue to rise, reaching 12 million in 2024 (UN-HABITAT, 2008).

Addis Ababa is exhibiting high social, economic, structural and change with more than 70% of recorded vehicles in the country are found in Addis Ababa. The expansion of the city, increasing population size coupled with the economic development has required respective transport service supply for the increasing mobility needs of the People (Ministry of Transport, 2013).

The spatial expansion of the city, fueled by expanding industries and other economic enterprises, more and more people are migrating to the capital in search of jobs and other economic opportunities. This spatial expansion is further exacerbated by massive urban renewal projects initiated by both the Federal and city government. As stated by (Kassahun & Bishu, 2017). Since the 2005 urban policy, the city was busy clearing the city's major slum areas in the inner city. As a result, 80% of inner-city dwellers that used to live in public houses were relocated and compensated with condominium houses that were built in satellite cities, which are found in the outskirts of Addis. Relocated inner city residents to the newly built-up areas, were forced to commute long distances to and from the city center where their work and social life was concentrated. As the city expands with the emergence of satellite cities, it has created a huge public transport demand.

2.1.1.1. Anbessa City Bus in Addis Ababa

The city of Addis Ababa is mainly served by Anbessa city bus, minibuses, collective and private taxicabs which account for 6:94%, 34:23% and 6:28% of the modal share respectively. Moreover, in the city, walking accounts for 43:76% (pedestrian), 8:65% the trip is made by private cars and the rest are company provided transport service. (Berhan, 2013)

In Addis Ababa, Anbessa city bus has a long history in providing transportation service. It was established at the end of the Italian invasion in 1943 by collecting vehicles and garage equipment from the invader to serve passengers in Addis Ababa. It was named public transport and was guided by auxiliary staff of the remaining Italian and other foreigners. In December 1954, it was organized into a share company by getting legal personality vested in it by the Ethiopian government. At that time, it had 10 buses to serve the people in Addis Ababa in only four routes. After two years, the numbers of buses were increased to 30 and were able to operate in 14 routes. Again, the company transferred its ownership to a public transport service in the year 1966; and in the year 1973, bought 50 city buses to strengthen its services. (Berhan, 2013)

Similarly, during the year 1996 to 2003 the enterprise bought 466 DAF model city buses. As of the year 2011 the enterprise operates 98 routes with an average daily dispatch of 321 buses with three large depot, four bus terminals, 16 checkpoints and 1; 400 bus stops throughout the city. (Berhan, 2013)

As of 2014 the enterprise runs 112 routes, with the fleet size or 730 busses, including the 500 Bishoftu buses, which are assembled locally by Metals & Engineering Corporation (MetEC). The enterprise dispatches the buses from Legahar, Merkato, Piazza and Megenagna stations. There are about 1,640 check points, where passengers get the services. It also has four service centers at Yekka, Shegole, Makanisa and Akaki, where there are workshops, gas stations, stores and offices. The enterprise has 7,747 staff in different professions. The fare for the trip covered between 6 km to 12.4 km is 0.50 birr. A long distances trip ranging between 9 and 13 km is 0.75 birr, while 13 to 15km distance trips‟ fare is one birr. It also charges 10 birrs for 47km to 50 km. Anbessa gives bus transport service for the city of Addis Ababa and the surrounding areas from 6:15 a.m. up to 10:00 p.m. These buses cover a collective distance of 54,000 km daily and provide their services to 1.5 million people. The city has also tried to introduce other buses, namely Alliance bus, Sheger bus and Higer mid-bus. (Fenta, 2014).

2.2. PERFORMANCE MEASUREMENTS

Performance measurement can be defined as a process of quantifying efficiency and effectiveness of an action. Performance measurement system can be defined as a set of metrics used to quantify both the efficiency and effectiveness of actions (Djordjevic & Krmac, 2016).

A performance measure can be considered as a quantitative or qualitative characterization of performance. Each of these measures has certain indicators that are used to signify transit performance for each particular measure (Eboli & Mazzulla, 2012).

Performance in general terms refers to any evaluation or comparison measure. Each of performance measures has certain indicators that are used to signify transit performance for each particular measure. A performance indicator is more specifically a performance measure used to document progress toward a performance goal, and to monitor performance (Eboli & Mazzulla, 2012).

2.2.1. PUBLIC TRANSIT PERFORMANCE MEASUREMENTS

As stated by Eboli & Mazzulla (2012) the measurement of transit performance represents a very useful tool for ensuring continuous increase of the quality of the delivered transit services, and for allocating resources among competing transit agencies.

Transit service quality can be evaluated by subjective measures based on passengers' perceptions, and objective measures represented by disaggregate performance measures expressed as numerical values, which must be compared with fixed standards or past performances (Eboli & Mazzulla, 2012).

Performance measurement can be used for multiple purposes: to evaluate overall performance of transit systems, to provide management control system for monitoring and refining transit services, to assess management performance potentials of the transit system in relation to public objectives, to assess management performance and detecting difficulties, to allocate resources between competing transit properties, and to facilitate accountability required by different stakeholders (Eboli & Mazzulla, 2012).

There is a diversity of performance measures developed for describing different features of the transit services. These transit performance measures are based on point of views of passenger, agency, and community. Passenger's viewpoint reflects the passenger's perception of the service. The community's viewpoint measures transit's role in meeting broad community objectives, which measures the impact of a transit service on different aspects of a community, such as employment, property values, or economic growth. Additionally, this point of view also measures how transit contributes to community mobility and transit's effect on the environment. The agency viewpoint reflects transit performance from the perspective of the transit agency as a business (Eboli & Mazzulla, 2012).

2.2.2. QUALITY PERFORMANCE

Service quality is defined as a comparison between customer expectation and perception of service. Service quality gives the measure of how well the service level delivered to the commuter's as per their expectation (Raoniar, et al., 2015).

The service quality that a consumer perceives is a function of the magnitude and direction of the existing gap between the expected service and the perceived one. The magnitude and direction of this gap depend on the nature of the gaps associated with the design, marketing and the service delivery (Seco & Gonçalves, 2007).

2.3. PERFORMANCE INDICATORS

According to Dhingra (2011) a performance indicator is more specifically a performance measure used to document progress toward a performance goal, and to monitor performance. Hence performance indicators are specific measurable outcomes used to evaluate progress towards established goals and objectives.

The performance indicators can be computed directly or can result from the ratio between two or three variables, and can be quantitative or qualitative. They can represent the impact at individual choices, at the community level, or on the accomplishment of national goals. They can also be more focused on comparing the system's effectiveness regarding other services or on evaluating its efficiency (Seco & Gonçalves, 2007).

The aspects usually describing transit services can be distinguished into characteristics that more properly describe the service (e.g. frequency of runs), and characteristics depending more on customer tastes and less easily measurable (e.g. comfort) (Eboli & Mazzulla, n.d.).

Estimation of service quality in terms of user perception is purely based on psychological behavior of the commuters (Raoniar, et al., 2015). It is necessary to understand the key parameters upon which transit performance depends, as these factors affect the user perception and creates a perception of the transit system in the user's mind.

Based on various studies regarding quality determinants in public transportation the aspects mainly characterizing bus services are: Service availability, service frequency, service reliability, comfort, trip time, cleanliness, safety and security, fare, information and customer care.

2.3.1. SERVICE AVAILABILITY

The attributes belonging to this category of service aspects are represented by characteristics of the route of the bus line in terms of path and coverage, number of bus stops, distance between bus stops and location of the bus stops. The stop spacing, or the distance between adjoining service stops of a path are important factors to balance the trade-off between rider convenience (stops with easy walking distances) and speed. Therefore, a transit stop must be located within walking distance, and the pedestrian environment in the area should not discourage walking.

2.3.2. SERVICE FREQUENCY

Service frequency/Regularity is the number of hourly departures, or the time between successive transport units. It is an important factor in one's decision to use transit; in fact, the more frequent

the service, the shorter the waiting time when a bus or train is missed, and the greater the flexibility that customers have in selecting travel times (Transportation Research Board, 2003). Also, in Eboli (2011) service frequency resulted to be the attribute with the highest weight on the overall transit service quality.

2.3.3. TRIP TIME

Commercial speed/Trip time, although directly related, the trip time is of easier perception by customers, which is all time spent on trip, including stopped time (Seco & Gonçalves, 2007). Travel time is a key factor when choosing a mode of transport. For work or school journeys, time importance is much higher (VABUOLYTĖ & UŠPALYTĖ-VITKŪNIENĖ, 2018).

Generally, people want their trip without change of the vehicles during their journey, unless the change is perceived as easy and fast (VABUOLYTĖ & UŠPALYTĖ-VITKŪNIENĖ, 2018). When the there is no pressure to be on time, like for leisure journeys, the value attached to time is lower.

2.3.4. SERVICE RELIABILITY

Reliability/Punctuality, as pointed by all transit performance studies as the most important factor regarding to customers. Only reliable/punctual services can allow the citizens daily trips' organization and stimulate the use/dependence on public transports. Turnquist M (1980) define transit service reliability as "the ability of the transit system to adhere to schedule or maintain regular headways and a consistent travel time".

Unreliable service results in additional travel and waiting time for passengers. As a consequence, service unreliability can lead to loss of passengers, while improvements in reliability can lead to attraction of more passengers (El-Geneidy, 2007).

Headway regularity can be defined as the evenness of intervals between transit vehicles. An indicator (expressed in %) is calculated as the ration of the average difference between the actual and the scheduled headway to the scheduled headway (Transportation Research Board, 2003). As reported in Nakanishi (1997) a transit vehicle was considered "regular" if it is within ±50% of the scheduled interval (for intervals of 10 minutes or less) or within ±5 minutes of the scheduled interval (for intervals greater than 10 minutes).

Running time adherence can be defined, analogously to the headway regularity, as the average difference between the actual and the scheduled running times compared to the scheduled running time. Also, this indicator is measured in percent.

2.3.5. COMFORT

Comfort during the journey is important for transit users, both the physical comfort regarding vehicles and comfort regarding ambient conditions on board or at stops. Comfort on board means having soft and clean seats, comfortable temperature, not many people on board, smoothness of the bus ride, low levels of noise and vibrations, not nasty odours. These many factors are differently evaluated across different groups of users (Eboli & Mazzulla, n.d.).

Comfort at bus stops can be considered as a function of the passenger amenities provided at the stops. Amenities include shelters, benches, vending machines, trash receptacles, lighting, phone booths, and so on. The effects of particular amenities on transit passengers are not well known. Some researchers have argued that the term “amenities” implies something extra and not necessarily required (Transportation Research Board, 2003).

Iseki (2008), found that stop and station-area amenities were ranked as the least important by the users; however, these elements provided at bus stops or stations enhance also convenience and security.

The indicator most frequently used for evaluating comfort during the journey is linked to the degree of crowding on bus. Tyrinopoulos (2008) estimates the load of the vehicles as the number of passengers on board divided by the capacity of the vehicles. The maximum vehicles load, the mean vehicles load and the lines percentage where the load exceeds were calculated. The calculation of the maximum load is based on the sum of the passengers on board the vehicles of all the journeys examined per line segment separately.

Eboli (2011), proposed a methodology for evaluating the availability of furniture at bus stop based on a score assigned to each line stop on the basis of the various available amenities (e.g. shelter or benches, or both, et cetera). The indicator varies from a minimum value of 0 to a maximum value of 10; the minimum value was assigned to the stops without any kind of furniture; the maximum value to the stops with all the furniture identified in a previous step.

2.3.6. CLEANLINESS

The indicators regarding cleanliness refer to the physical condition of vehicles and facilities, and specifically the cleanliness of the bus interior and exterior, having buses and shelters clean of graffiti, cleanliness of seating and windows, and so on. Clean buses tend to promote a good public image and help to attract and maintain ridership (Transportation Research Board, 1995).

2.3.7. SAFETY AND SECURITY

Safety, despite an unclear perception by passengers on their daily trips it has a psychological effect and the perception of the operators' concern with passenger's safety increases their confidence on the service and on the operator's commitment in delivering a good service (Eboli & Mazzulla, n.d.).

The aspect linked to safety indicates the degree of safety from crime or accidents and the feeling of security resulting from psychological factors; therefore, this aspect refers not only to safety from crimes while riding or at bus stops and from accidents, but also to safety related to the behavior of other persons and to the bus operation. Generally, the term "safety" is used to indicate the possibility of being involved in a road accident, while the term "security" refers to the possibility of becoming the victim of a crime.

Security, more perceivable to passengers and with greater impact on their evaluation then safety, generally refers to the feeling of security inside the vehicle, during the trip and at bus stops and terminals. It can be evaluated attending to the number of crimes against passengers, staff or public transport property, or by the operator's efforts to assure security, like the presence of Police Officers on board or specified safety devices like security cameras, intercom systems or emergency alarms.

2.3.8. FARE

The service aspect regarding fare includes characteristics of the monetary cost of the journey by bus, like the cost of a one-way ride, the cost of a transfer, the availability of discounted fares (e.g. for students), the availability of volume discounts (e.g. for monthly passes), the cost of parking at bus stops (Eboli & Mazzulla, n.d.).

Standard values equivalent to the average cost of the tickets for different typologies of service adopted by transit agencies operating in similar territorial contexts characterized by high standards of transit service quality.

2.3.9. INFORMATION

Another service aspect affecting transit service quality is linked to the availability of information pertinent to the planning and execution of a journey. Passengers need to know how to use transit service, where the access is located, where to get off in the proximity of their destination, whether any transfers are required, and when transit services are scheduled to depart and arrive. Without

this information, potential passengers will not be able to use transit service (Transportation Research Board, 2003).

Ideally, passenger information should be available at every stage of the rider's transit trip. Pre-trip information helps the rider to plan routes and connections. Pre-trip information needs consist of the location of the nearest bus stop, routes that travel to the desired destination and transfer locations, fare, time of departure, and approximate duration of the trip. In-transit information assists the rider at each decision point during the trip. In -transit information needs consist of the identification of the correct bus to board at the departure point; identification of bus stops for transfers or disembarking on the bus; how to transfer to another route at transfer points; cost, time limits, and restrictions; identification of the correct bus to board; area geography (i.e., location of the final destination in relation to the bus stop); return trip information at the destination (e.g., departure times and changes in route numbers). Supportive/confirming information repeats and reinforces data and decisions; it should be provided at any point during the trip when the rider may want to be reassured that he/she is progressing correctly and not getting lost (Eboli & Mazzulla, n.d.).

In Eboli (2011) an indicator of the attribute "availability of schedule/maps on bus, and announcements" was calculated as the ratio of the number of vehicles with functioning information device on board to the total number of vehicles sampled in a certain time period. In addition, an indicator of the attribute "availability of schedule/maps at bus stops" was evaluated on the basis of a score assigned to each stop of a line, from a minimum value of 0 to a maximum value of 10. The minimum value was assigned to the stops without any kind of information device at the stop; the maximum value to the stops with schedule and maps.

2.3.10. CUSTOMER CARE

Customer care includes those elements needed to make easier and more pleasant the journey, like courtesy and knowledge of drivers, courtesy and helpfulness of ticket agents, personnel appearance, together with elements linked to the easiness of purchasing tickets or paying fare, presence and condition of the ticket issuing and validation machines, and effectiveness of the ticket selling network (Eboli & Mazzulla, n.d.).

In Eboli (2011) personnel appearance was evaluated by means of trained checkers who verified if personnel use the uniform. An indicator was proposed as the ratio of the number of uniformed staff to the total staff number. Personnel helpfulness was evaluated by means of a mystery rider who verified the behavior of the personnel and assigned a score to each personnel unit, according

to a scale from 0 to 10. In the same research work the authors propose an indicator for evaluating the ease of purchasing the ticket by taking into account the only opportunity of purchasing the tickets on bus by a manual operator or automatic ticket machines. This indicator was calculated as the ratio of the number of vehicles with functioning automatic ticket machines to the total number of vehicles sampled in the period of data gathering.

2.4. INDICATORS EVALUATION INDEXES

The variety of performance indicators pointed out in international references, reveals that there still doesn't exist a consensus for a uniform and universal methodology for urban public transport systems' quality evaluation (Seco & Gonçalves, 2007).

2.4.1. COMMON VALUES FOR THE PERFORMANCE INDICATORS

Measures overall performance of transit on study route based on different quality of service indicators. It majorly evaluates expected performance quality of service delivery from the view point of different expected average performance levels.

1. Service Frequency index: It can be calculated by the equation:

$$F = \frac{Nd}{\mathrm{T}}$$

where F is the frequency (PT units/h), Nd is the number of public transport units' departures during a T period of time (in hours). The inverse of frequency gives the average time between departures or the regularity of the public transport units.

2. Trip time index: it can be calculated by the equation:

$$Vc = \frac{L}{T}$$

where V_c is the commercial speed (km/h), L is the route length (km) and T is total travel time from origin to destination (in hours).

3. Service Reliability Index: It can be computed by the following equation:

$$P = \frac{\sum PT \pm 5min}{\sum PT}$$

where P is the punctuality em %, ∑PT±5min. is the number of public transports that arrive between 0 and 5 minutes either before (worst case) or after the scheduled time, and ∑TP are all the public transport arriving.

4. Comfort Index: Bus occupancy can be a proxy to evaluate the trip comfort, calculated as:

$$O = \frac{p}{S}$$

where O is the occupancy rate (%), P is the total number of passengers present at a given time or part of the network, and S is the number of seats available.

5. Safety and Security Index: it can be expressed by the total number of accidents (Acc) involving humans and property per 100 000 vehicles-kilometers per run or the number of accidents involving passengers per million of passengers carried. Can be calculated as:

$$Sf = \frac{Acc}{100{,}000\ (vehicle - km)}$$

Or

$$Sf = \frac{Acc}{1000{,}000\ (passengers)}$$

One security indicator can be crime rate on the system and can be calculated as:

$$CR = \frac{Nc}{100{,}000\ trips}$$

where C_R is the annual crime rate and N_C is the number of annual reported crimes all over the system.

Generally, overall performance of public transit quality of service can be evaluated as indicated on the table below.

Table 1: Common values for the performance indicators

Indicators		
Punctuality/ Reliability	High Frequency	Low Frequency
	90% - ±5min	80% - ±5min
Frequency/Regularity	Peak hour	Off-peak hour

	4 - 12 Vehicles/h	0.5 – 4 Vehicles/h	
Trip cost	Variable		
Speed/Trip time	Minimum	Average	Maximum
	6 km/h	15 km/h	25 km/h

Source: (Seco & Gonçalves, 2007)

2.4.2. CUSTOMER SATISFACTION INDEXES

Customer satisfaction represents a measure of transit performance according to customer wishes. Therefore, the measure of customer satisfaction provides a service quality measure. Customers express their points of view about the services by providing judgments on some service aspects by means of ad hoc experimental sample surveys, known in the literature as "customer satisfaction surveys." (Mazzulla, 2009).

A more direct measure for service quality evaluation is provided by an overall index, often called "Customer Satisfaction Index" (CSI) (Hill N., 2003). CSI represents a measure of service quality on the basis of the user/consumer perceptions on service aspects expressed in terms of importance rates, compared with user/consumer expectations expressed in terms of satisfaction rates (Mazzulla, 2009).

The indicator can be calculated on the basis of user judgments expressed by a numerical scale; this kind of scale has some advantages compared to the scales with points described by means of words (e.g., Likert and verbal scale) because it allows quantitative techniques of analysis to be applied. To measure customer satisfaction, different numerical values can be used, generally from 1 to 3, from 1 to 5, from 1 to 7, from 1 to 9, etc. The adopted scale can also have an even number of levels, for example, the traditional numeric scholastic scale composed of points from 1 to 10 (Mazzulla, 2009).

According to Mazzulla (2009) Customer satisfaction index (CSI), which can be calculated by means of the satisfaction rates expressed by users, weighted on the basis of the importance rates, according to the following formula:

$$CSI = \sum_{k=1}^{N} (Sk * Wk)$$

Where Sk is the mean of the satisfaction rates expressed by users on the service quality k attribute and Wk (importance weight) is a weight of the k attribute, calculated on the basis of the importance rates expressed by users. Specifically, is the ratio between the mean of the importance rates

expressed by users on the k attribute and the sum of the average importance rates of all the service quality attributes:

$$Wk = \frac{Ik}{\sum_{k=1}^{N} Ik}$$

CSI represents a good measure of overall satisfaction because it summarizes the judgments expressed by users about various service attributes in a single score. The more accurate the selection of the attributes, the more accurateness of the measure of the overall satisfaction. For this reason, the selected attributes should describe the service aspects exhaustively (Mazzulla, 2009).

2.5. CONCLUSION

To be useful and suitable, the public transport service needs to be available to take passengers where they want to go at the time they wish to travel. Quality of service influences customer satisfaction, passenger demand, investment decisions and revenue. However, the demand of public buses has been related to low-income Addis Ababa residents due to economic disparities and its less competitive service performance relative to other motorized modes. Therefore, good measurement of public transport performance and service quality is required to valuate and ensure more optimal policy decisions and management actions.

Based on various studies regarding quality determinants in public transportation the aspects mainly characterizing bus services are: Service availability, service frequency, service reliability, comfort, trip time, cleanliness, safety and security, fare, information and customer care.

Generally, it is necessary to understand the key indicators upon which transit performance depends, as these factors affect the user perception and creates a perception of the transit system in the user's mind.

Chapter Three: Methodology

3.1. INTRODUCTION

This chapter discusses about how to answer research questions and address objectives of the study. The methodology of the study includes study area selection criteria, research approach, data type and source, data collection techniques and data analysis and presentation technique. The study area selection criteria list why the study is undertaken in the selected city and route. In the research approach, type of research methods is discussed. The data type and source method described the type of data to be collected from different sources. The data collection technique described how the data was collected. Data analysis technique states methods used to analyze collected data.

3.2. STUDY AREA SELECTION CRITERIA

The study was done on Anbessa city bus of by focusing on single route, which is Bethel to Merkato. The reason behind selecting Addis Ababa and Bethel-Merkato corridor as study area is that:

- Addis Ababa is the only metropolitan in the country with continuously growing population and rapid spatial expansion.
- The city is nation's capital and main center of jobs and economic opportunities.
- The city has relatively various bus enterprises than other urban centers in the country.
- Merkato can be considered as Addis Ababa's major activity center.
- Bethel can be also considered as residential district.
- The route that extends from Bethel to Merkato passes through various economically active city centers with highly concentrated job options, which causes high demand of transport service.
- Anbessa buses serving along this route are characterized by overloading
- The route is categorized under one of highly congested corridors of the city, which makes the buses unreliable to its users and enforces bus users to longer trip time and waiting time.

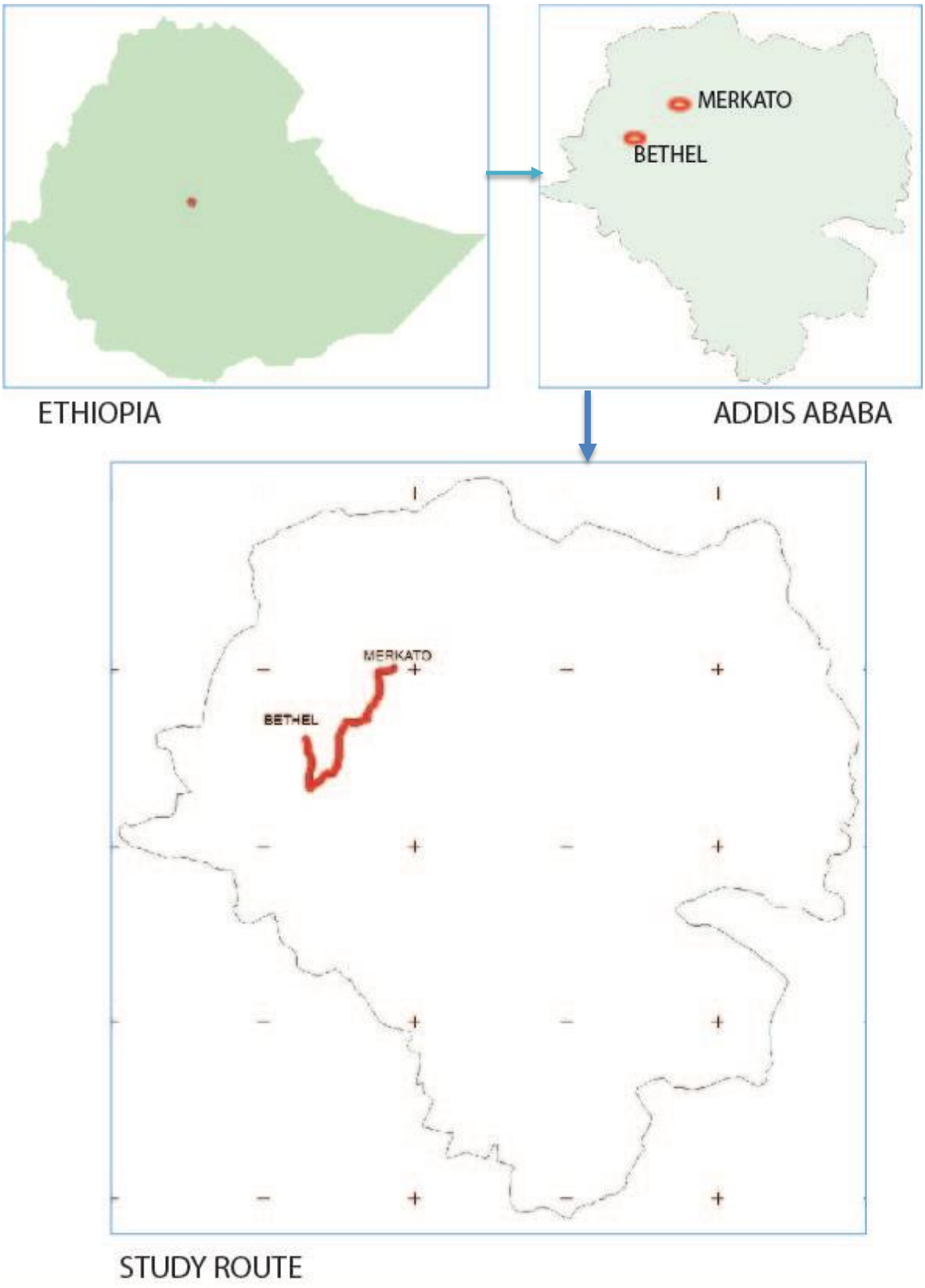


Figure 1: Location map (Source: computed by author, 2021)

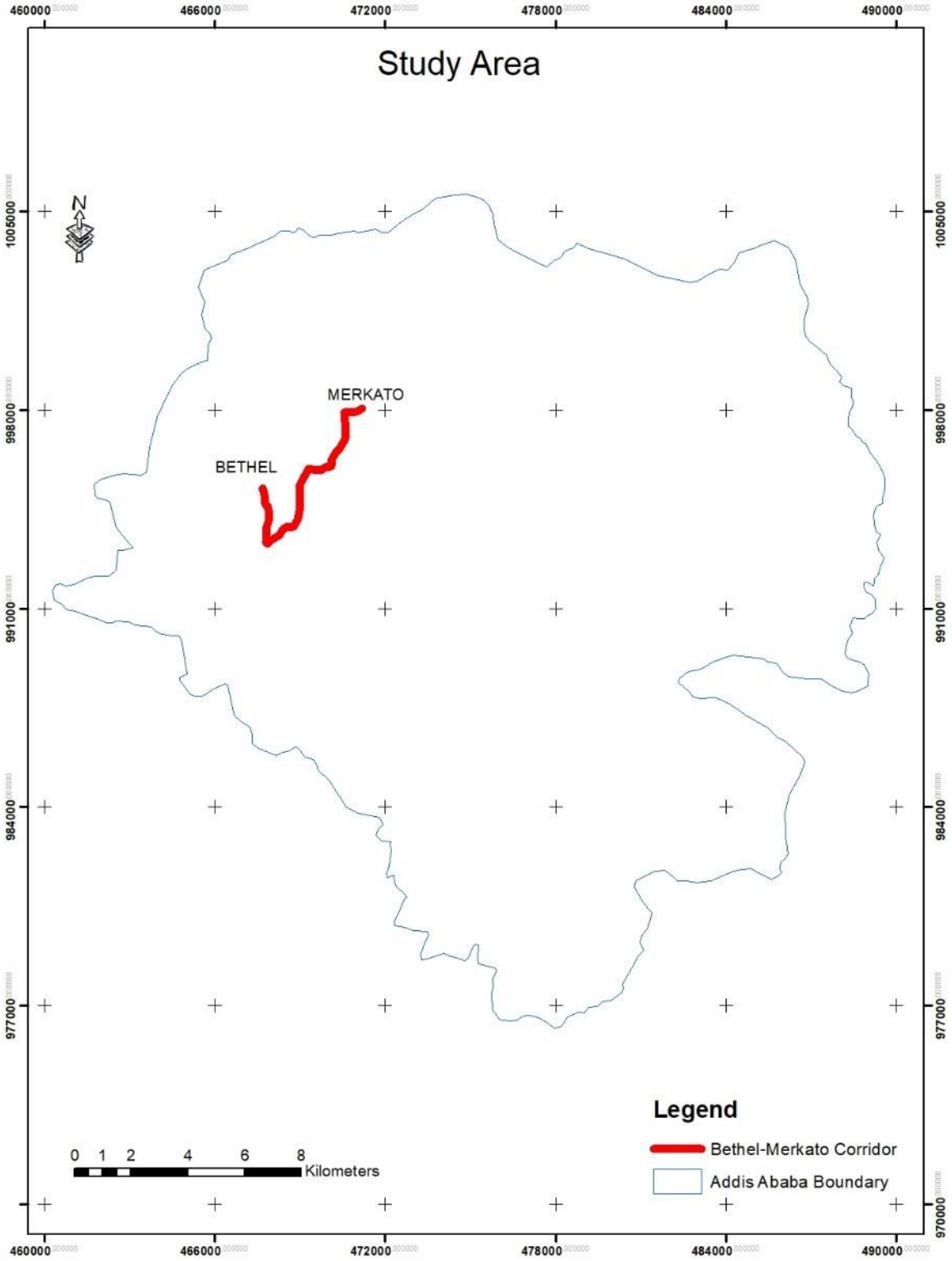


Figure 2: Study Area (Source: computed by author, 2021)

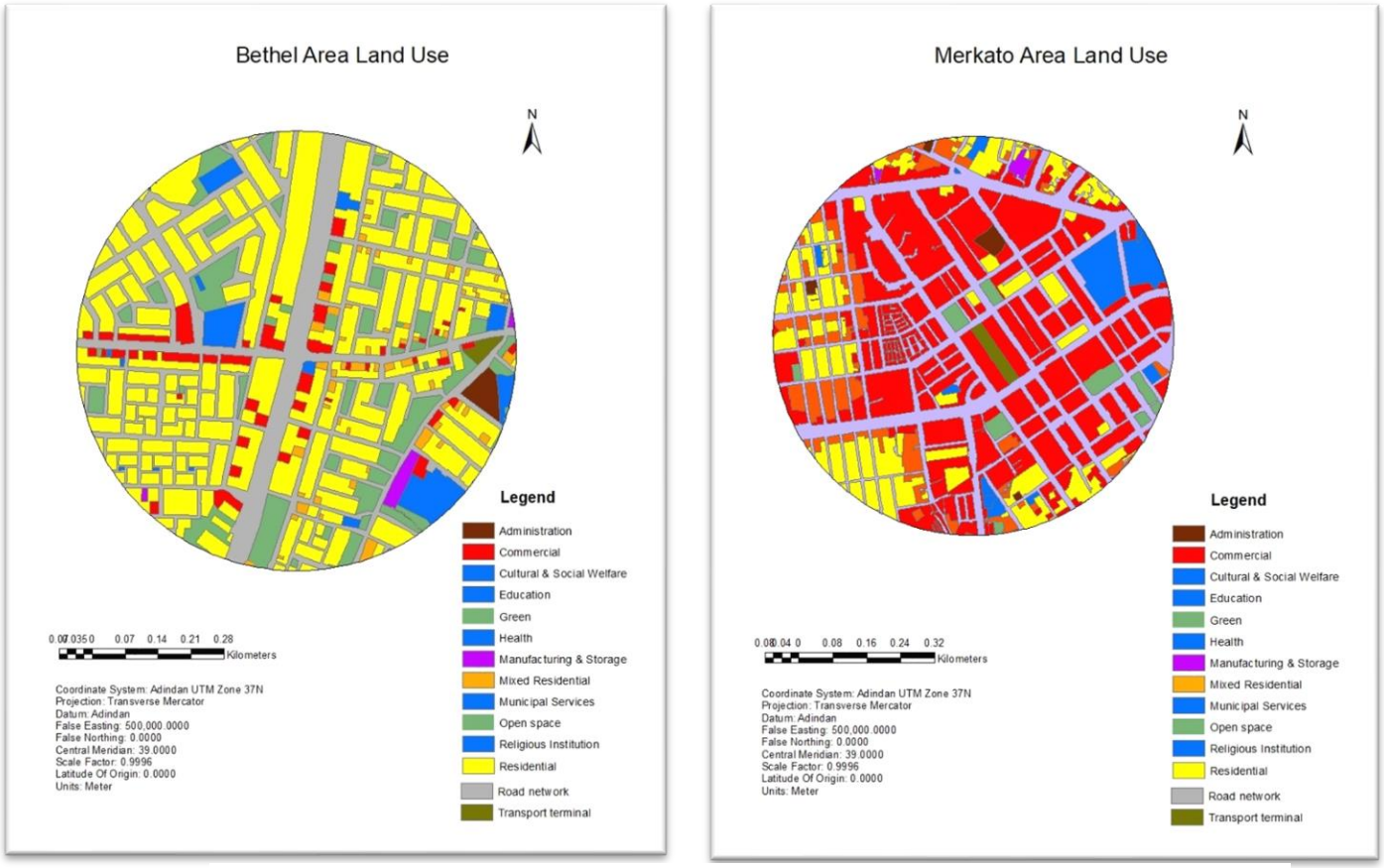


Figure 3: Bethel and Merkato land use (Source: Computed by author, 2021)

3.3. RESEARCH DESIGN

The research problem and the objectives will be followed by literature review. Next identification of data required to deal with and solve the problem will be indicated. For the collected data spatial and statistical analysis will be undertaken. After analysis the result will be discussed and based on the result conclusion and recommendation will be formulated. The outline of the research design has been illustrated in figure below.

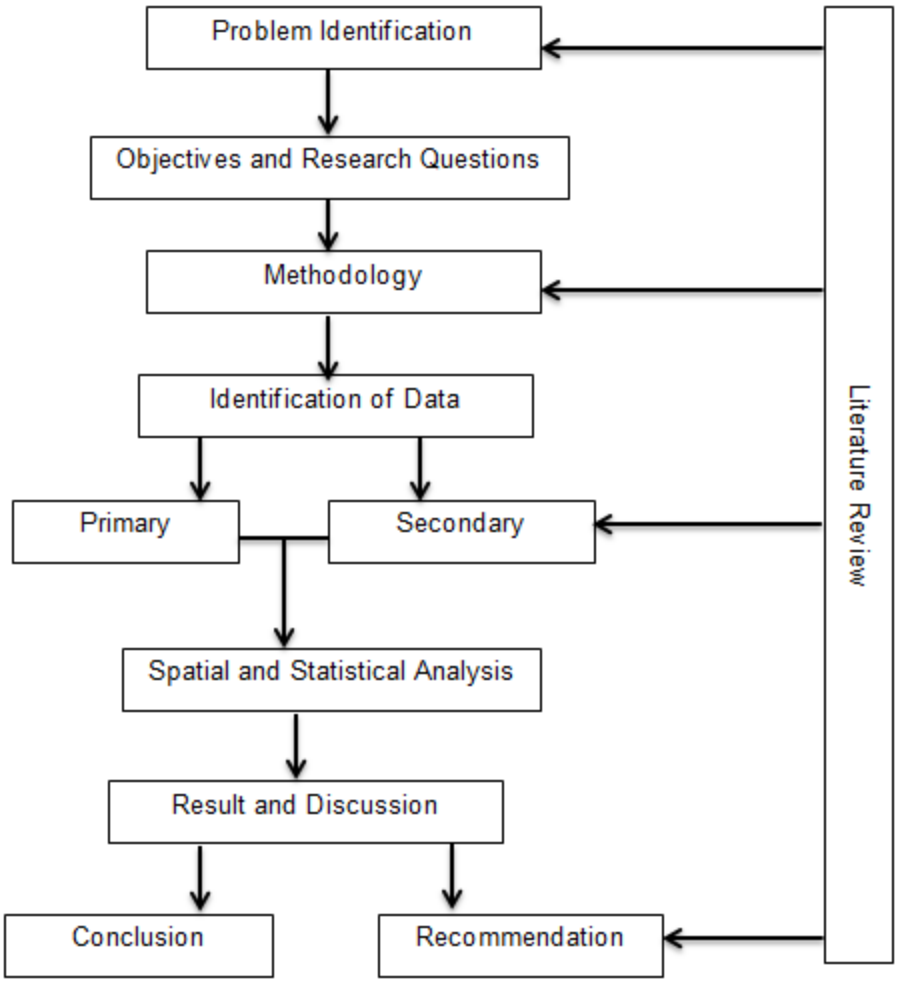


Figure 4: Outline of Research Design (Source: Computed by author, 2021)

3.4. RESEARCH APPROACH

The study was based on qualitative and quantitative type of research. It qualifies performance of public buses based on level of service along Bethel-Merkato route through performance indicators. The study quantifies performance of public buses based on level of service along this route via performance indicators. It also quantifies qualitative indicators based on international standards.

3.5. SAMPLING

Sampling is the process of using a small number or portion of a large target population to make conclusion about the whole population.

3.5.1. SAMPLING FRAME AND TARGET POPULATION

Sampling frame is the list of elements from which the sample is drawn. According to data from Addis Ababa Road Authority, Anbessa city bus is serving 663,000 peoples per day with 663 buses, which have the total share of 25.37% from total population served by public transport (AACTA, 2019). Along Bethel-Merkato corridor there are four (4) buses which are currently serving along this corridor.

From the above data it can be computed that in average each bus is serving 1000 peoples, which can be deduced to 4000 peoples along Bethel-Merkato route. Therefore, sampling frame for this study can be 4000 populations.

3.5.2. SAMPLING TECHNIQUES

In order to evaluate performance of Anbessa city bus regarding quality of service in case of Bethel-Merkato route, 351 persons are selected to answer interview questionnaires. The sample size is determined based on the below equation by considering 95% of confidence level and 5% of confidence interval.

$n = N*X / (X + N – 1)$,

where, $X = Z\alpha/22 -*p*(1-p) / MOE2$, and $Z\alpha/2$ is the critical value of the Normal distribution at $\alpha/2$, MOE is the margin of error, p is the sample proportion, and N is the population size.

3.6. DATA TYPE, METHOD OF COLLECTION AND SOURCE

The study uses both primary and secondary data types. Primary data types were collected from public bus users and operators, and secondary data types was gathered from Anbessa city bus enterprise, traffic agency and public transport agency. Both data types are spatial and statistical. Spatial data types are maps of bus network, bus stations and locations of spatial emphasis along Bethel-Merkato route. Whereas statistical data are number of users, trip times of various buses and users, number of buses along this corridor, frequency of buses, fares of different public transit along this route and number of accidents and crimes along Bethel-Merkato route.

Table 2: Data type and source

Data Type	Method of data Collection	Data Source
Primary Data	Questionnaire	Anbessa bus users on Merkato-Bethel corridor

(Qualitative and Quantitative data)	Personal observation	Visiting Stations, buses and photo
	Interview	Anbessa City Bus Enterprise, Addis Ababa transport Authority and Traffic Agency
Secondary data	Reading and reviewing different published and unpublished documents.	Journal articles, books, sectoral publications and websites.

3.7. VARIABLES

The purpose of this study is to evaluate performance of Anbessa city bus regarding quality of service, in case of Merkato-bethel Corridor.

Table 3: List of Variables

Variable types	**Variables**
Independent	Service Availability
	Service Frequency
	Service Reliability
	Comfort
	Safety and Security
	Fare
	Information
	Customer Care
	Cleanliness
	Trip Time
Dependent	Performance of quality of service

3.8. DATA ANALYSIS AND PRESENTATION TECHNIQUE

3.8.1. DATA ANALYSIS TECHNIQUE

The study used both qualitative and quantitative methods by using selected analysis methods. Qualitatively, the study describes performance of qualitative indicators such as service availability, cleanliness, fare, information and customer care. In addition to those indicators, personal observations were analyzed in qualitative method.

Quantitatively, the study used customer satisfaction index from service users view point and common values for the performance indicators, which majorly evaluates expected performance quality of service delivery from the view point of different expected standard performance levels. Customer satisfaction index represents a measure of transit performance according to customer wishes. Therefore, the measure of customer satisfaction provides a service quality measure. Customers express their points of view about the services by providing judgments on some service aspects by means of ad hoc experimental sample surveys (Mazzulla, 2009).

To measure customer satisfaction, numerical values from 1 to 5 were used in this study. According to (Mazzulla, 2009)Customer satisfaction index (CSI), which can be calculated by means of the satisfaction rates expressed by users, weighted on the basis of the importance rates, according to the following equation:

$$CSI = \sum_{k=1}^{N} (Sk * Wk)$$

Where Sk is the mean of the satisfaction rates expressed by users on the service quality k attribute and Wk (importance weight) is a weight of the k attribute, calculated on the basis of the importance rates expressed by users. Specifically, is the ratio between the mean of the importance rates expressed by users on the k attribute and the sum of the average importance rates of all the service quality attributes:

$$Wk = \frac{Ik}{\sum_{k=1}^{N} Ik}$$

In addition to customer satisfaction index, common values for the performance indicator were used. It measures overall performance of transit on study route based on different quality of service indicators. It majorly evaluates expected performance quality of service delivery from the view point of different expected standard performance levels.

Since, the customer satisfaction index can only represent the performance of the service quality in terms of service users, common values for the performance indicator can help the study to base its justification from both sides. Hence, performance of the service quality depends on the intended service to be given and the really happening on the ground.

The analysis from common values for the performance indicator has done by gathering data from service provider and personal evaluation of the service on specific route based on evaluation mechanisms on the index and expected average standards.

Finally, overall performance of Anbessa city bus service quality was stated based on the results from the description and measurement results of indexes, which are customer satisfaction index, common values for the performance indicators.

3.8.2. DATA PRESENTATION TECHNIQUE

The collected data was presented by using different presentation techniques such as Map, graph, tables and charts.

Chapter 4: Result and Discussion

4.1. INTRODUCTION

This chapter discourses about data description, result and discussion. The chapter discusses the data analysis and findings from 351 questionnaires completed by Anbessa bus users on Bethel-Merkato route, Addis Ababa traffic agency, Addis Ababa transport agency, Anbessa city bus enterprise, personal observations and from different secondary sources. The data from the above sources are analyzed via indicators evaluation indexes, which are route evaluation indexes and customer satisfaction indexes. The purpose of this study was to assess performance of Anbessa city bus based on quality of service, in the case of Bethel-Merkato route.

The study shows performance evaluation of Anbessa city bus on Bethel-Merkato route based on quality-of-service indicators. Finally, overall performance of Anbessa bus on this route based on quality of service has been evaluated via the values given by the respondents to each indicator, by using customer satisfaction index and route analysis method. As a result, tables, equations and graphs were intensively utilized in presenting the findings.

4.2. DATA DESCRIPTION

In this section the base line data used for the analysis were data from 351 questionnaires completed by Anbessa bus users, trip data and performance data. For performance data along Bethel-Merkato route regarding its attributes and quality indicators, data from survey questionnaires, Anbessa City Bus Enterprise, Addis Ababa Traffic Agency, Addis Ababa Transport Agency and personal observations has been collected and analyzed. For trip and socio-economic data and analysis responses from sample were used.

Socio-Economic

Respondent's gender, age structure and monthly income status are described on the table below.

Table 4: Respondent's socio-economic structure

Gender				
M			F	
	54%		46%	
Age				
8 to 14	15 to 24	25 to 49	50 to 60	Above 60
1%	30%	49%	17%	3%

Monthly Income Status in birr				
Below 2000	2000-5000	5000-10000	Above 10000	
22%	46%	30%	2%	

As indicated on the above table, most of the respondents were male 54%, 25-49 age group (49%) and mostly in the range of 2000–5000-birr monthly income (46%).

Trip

Respondents' trip purpose and trip frequency per week are described on the table below.

Table 5: Respondents trip data

Trip Purpose		Trip frequency	
Work	66%	Always	54%
Education	6%	Often	20%
Visit	7%	Sometimes	26%
Vacation	2%		
Other	19%		

According to the above table, respondent's trip purpose and weekly trip were revealed. Most of the respondent's trip purpose was for work (66.38%) and most of the respondents were making the trip in all days of the week (53.85).

4.2.1. PERFORMANCE

This section of the data description reveals the respondents' evaluation and data from other sources on quality of services performance regarding given indicators.

4.2.1.1. service Availability

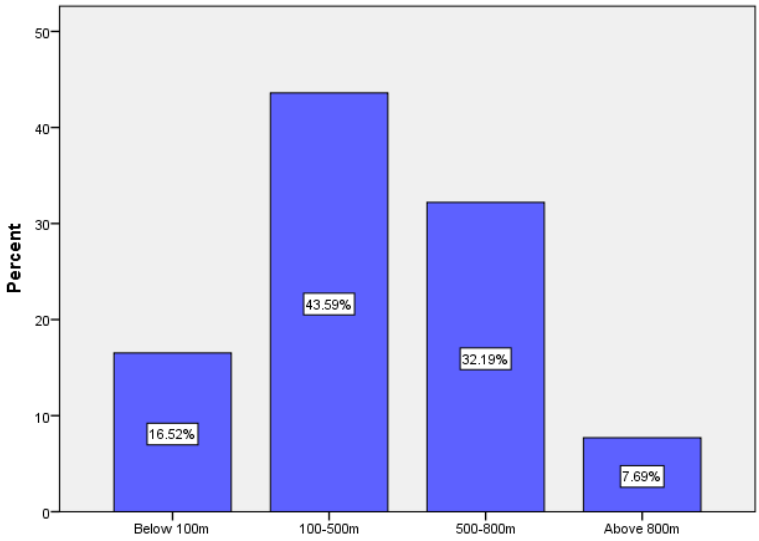


Figure 5: Respondents home vs. bus station distance

As shown on the figure below of the respondents, 16.52% walks below 100m from their home to the closest station, while 43.59% travels 100m-500m, 32.19% travels 500m-800m and the rest 7.69% travels more than 800m to reach the station.

4.2.1.2. Service Frequency

According to observation made and responses from operators along Bethel-Merkato route the number of headways is mostly 2 and sometimes 3 buses per hour during peak hours and during off peak hours mostly 3 buses per hour and sometimes 4 buses per hour.

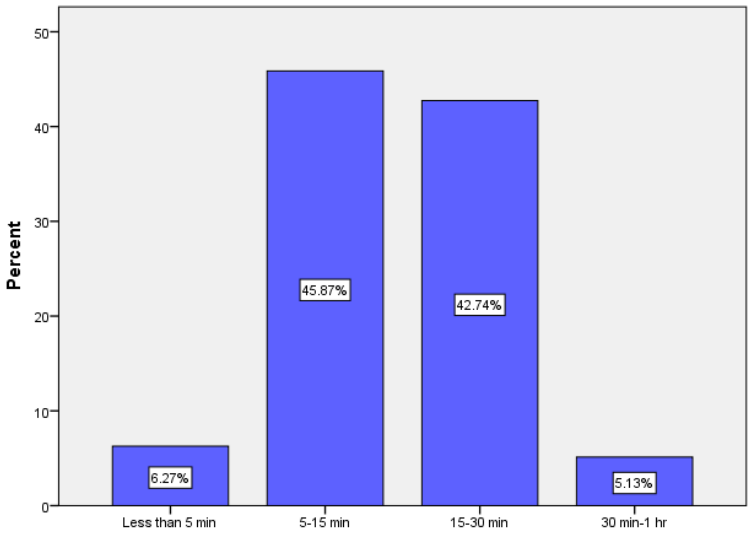


Figure 6: Frequency of successive buses

In general, the shortest waiting time in average varies between 15 minutes to 35 minutes. According to the respondents as described on the figure above, about 6% of them stated that the buses arrival time is less than 5minutes, 46% between 5-15minutes, and 43% 15-30minutes and 5% 30minutes-1hour.

4.2.1.3. Trip time

Based on personal observation, along Bethel-Merkato route, operational speed of Anbessa buses varies based on time of operation: peak and off-peak hours.

- During peak hours of the day operational speed of Anbessa bus along this route varies between 6.3 to 7.9 kilometers per hour (source: Author's computation, 2020).
- During off-peak hours, on holidays and weekend days its operational speed varies between 11.4 to 15.6 kilometers per hour (source: Author's computation, 2020).

According to operators, there is roughly given hourly trip speeds as guidance which is 15-25km per hour. However, keeping this trip speed is influenced by hours of the day and it varies between 30 minutes to 1 hour. Tickets are sold mostly at the station from inside the bus and sometimes inside the bus at the time of the ride by ticket sellers travelling with the bus. During stoppage at stations the bus stops for 3-4 minutes based on number of passengers boarding and aligning as well as new passengers buying tickets (source: Author's computation, 2020).

4.2.1.4. Service reliability

As every route and public transit services in Addis Ababa, there is no fixed arrival and departure times on Anbessa buses along Bethel-Merkato route. Sources from Anbessa City Bus Enterprise indicates that, the only known fixed times are operational periods which begins at 6:00 am and ends at 8:00 pm.

4.2.1.5. Comfort

According to observation made, during peak hours Anbessa buses along Bethel-Merkato route carries 140 to 170 passengers and during off peak hours varies with in bus's carrying capacity. A source from Anbessa City Bus Enterprise indicates that, each bus along this route has a carrying capacity of 100 passengers (30 seated and 70 standing). Passenger amenities at the stops such as shelters, benches, trash receptacles, lighting are available with some of them on the route are not totally functioning.

The figure below indicates respondent's perception on how comfortable the service in terms of conditions during onboard and stops, temperature, seats, number of peoples onboard, odor and noise.

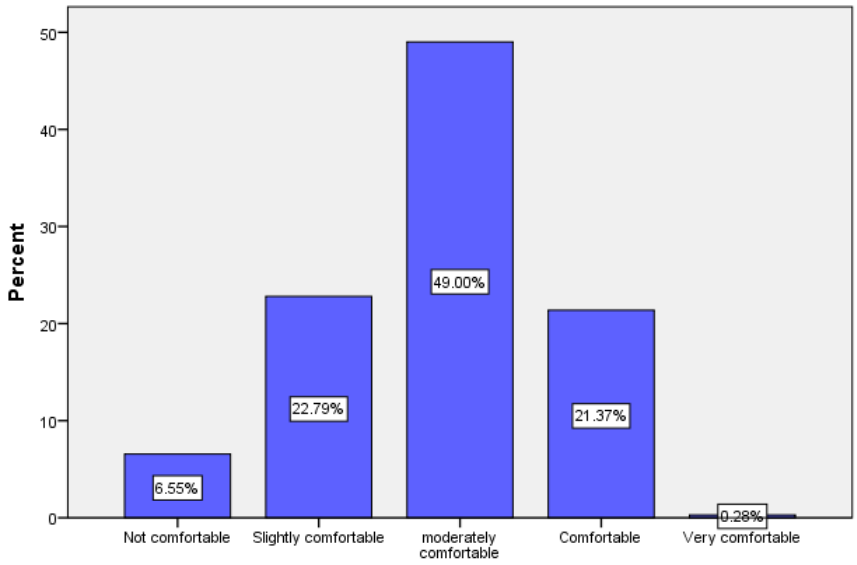


Figure 7: Comfort of buses in terms of conditions during onboard and stops, temperature, seats, number of peoples onboard, odor and noise

As shown on the above figure 0.28% as considers comfort of the service in terms of conditions during onboard and stops, temperature, seats, number of peoples onboard, odor and noise as very comfortable, 21.37% as comfortable, 49% as moderately comfortable, 22.79% as slightly comfortable and 6.55% as not comfortable.

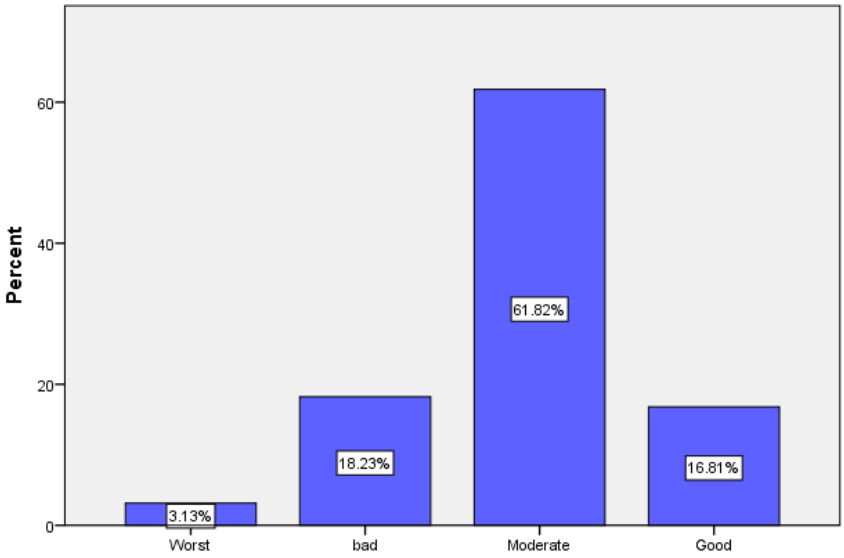


Figure 8: Comfort regarding shelters, benches, lighting and trash receptacles

The respondent's perception on how comfortable the service regarding shelters, benches, lighting and trash receptacles are described by the above figure, and according to the figure 61.82% considers comfort of the service regarding shelters, benches, lighting and trash receptacles as moderate, 18.23% as bad, 16.81% as good and 3.13% as worst.

4.2.1.6. Cleanliness

According to data from Anbessa City Bus Enterprise, there is preventive, breakdown & overhauling maintenance program for all buses. Regarding preventive maintenance, the enterprise follows:

- Daily visual pre-trip inspection.
- PM1 Inspection every 7 days,
- PM2 Inspection every 15 days,
- PM3 Inspection every two (2) months &
- PM4 Inspection every six (6) months.

Additionally, for new buses such as buses operating on Bethel-Merkato route: Level A Inspection every One (1) months, B Inspection every six (6) months and C Inspection every one year. The enterprise also gives drivers training & Certification of Competency (COC) services for its drivers and others. Buses serving along this route are new buses began functioning on 2018 (ACBSE, 2021).

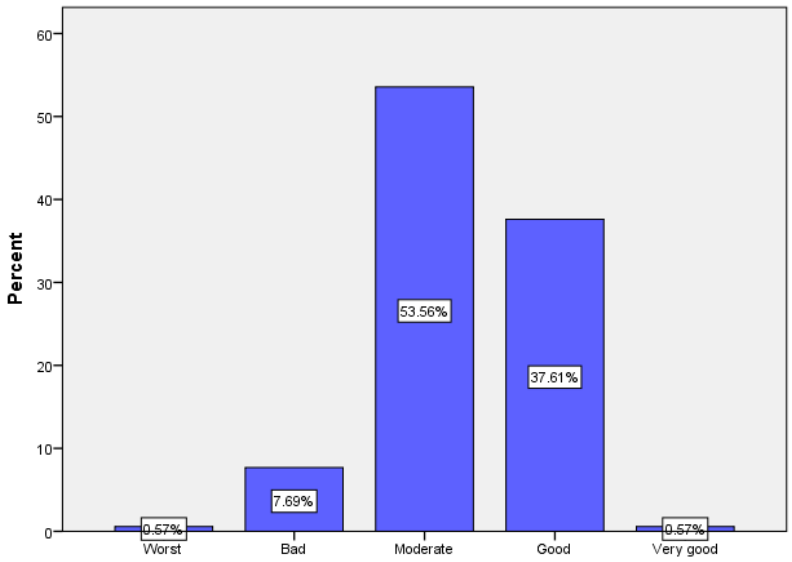


Figure 9: physical conditions of buses interior and exterior

The respondent's perception on physical conditions of buses interior and exterior is described on the figure above.

The above figure shows, 0.57% considers physical conditions of buses interior and exterior as very good, 37.61% as good, 54% as moderate, 7.69% as bad and 0.57% as worst.

4.2.1.7. Safety and security

According to data from Addis Ababa traffic and Addis Ababa Transport Agency, there have been 4 accidents on Anbessa buses along this route from January 2019 to November 2019 and 7 reported thefts. The graph below describes the respondent's perception of service safety from crime and accident.

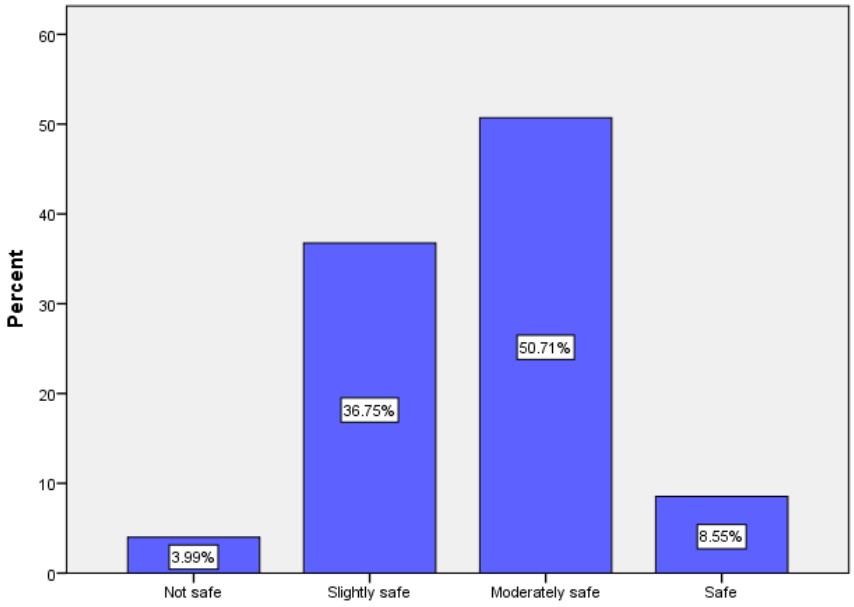


Figure 10: user's perception of service safety from crime and accident

Of the respondents as shown on the above figure, 51% considers service safety from crime and accident as moderately safe, 37% as slightly safe, 9% as safe and 4% as not safe.

Under the graph below, respondent's perception on service safety regarding behaviors of other passengers and service operators are presented.

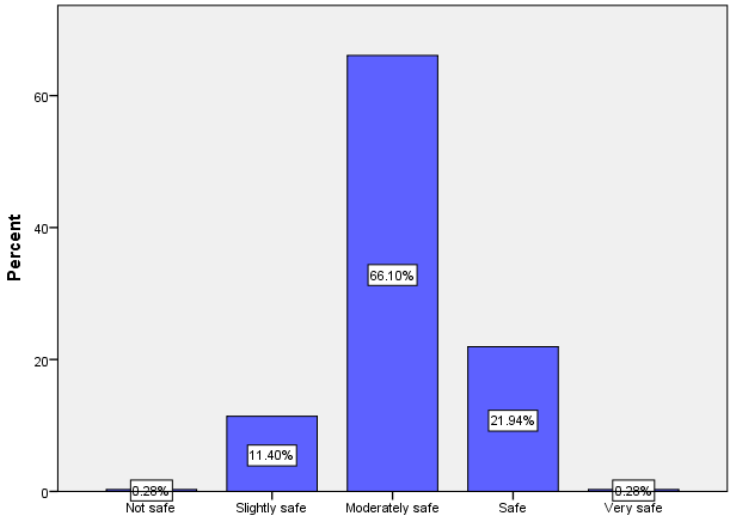


Figure 11: User's perception service safety regarding behaviors of other passengers and service operators

Of the respondents as shown on the graph below, 66.1% considers service safety regarding behaviors of other passengers and service operators as moderately safe, 21.94% as safe, 11.4% as slightly safe, 0.26% as very safe and 0.26% as not safe.

4.2.1.8. Fare

According to data from Addis Ababa Transport Agency, fare of Anbessa bus is regulated by the Federal Transport Authority (FTA) and the fare system is based on distance which are categorized under eleven (11) groups. For each group there is a flat and flexible fare. Fare considered under flat are for trip from the starting point and fare for the trip after the mid-distance is considered as flexible and it is a discount fare at half of the price.

Tickets are paper tickets valid for a single trip and are sold mostly at the station from inside the bus and sometimes inside the bus at the time of the ride by ticket sellers with in the bus. There is also pre – paid tickets for certain organizations with special arrangements and free travel passes that are granted to three family members of enterprise employees, national patriots and veterans of war.

On Bethel-Merkato route fare of the service is 3 birr and other modes such as taxis on similar route charges 6 birr and Sheger bus charges 4birr along this route.

Table 6: Fare system of Anbessa city bus

Distance	Fare (Birr.)	Passenger Share %	Description	Remark

<5kms	1.25	35.35	City center	80.63%
Up to 9kms	1.50	6.67	City center	
9-12kms	2.00	38.60	City center	
12-15kms	2.50	10.77	City Boundary	13.25%
15-18kms	3.00	1.83	City Boundary	
18-21kms	3.50	0.65	City Boundary	
21-24kms	4.50	2.07	Suburb	6.13%
24-30kms	5.00	2.29	Suburb	
30-40kms	9.00	1.36	Suburb	
40-47kms	10.00	0.29	Suburb	
≥ 47kms	13.00	0.12	Suburb	

source: Anbessa city bus enterprise, 2019

Respondent service fare in comparison to other transit agencies or modes operating on similar route is revealed via below graph.

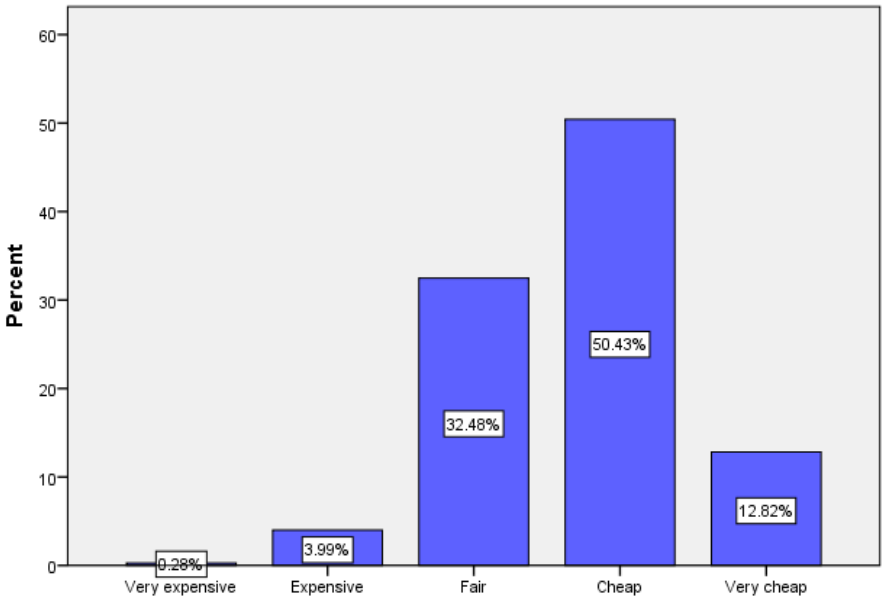


Figure 12: Users perception regarding fare

The above figure indicates of the respondents, 12% considers fare of service as very cheap, 51% as cheap, 33% as fair, 4% as expensive and 0.28% as very expensive.

4.2.1.9. FARE VS. INCOME STATUS RELATION

Figure below indicates relationship between respondent's income status and perception on service fare.

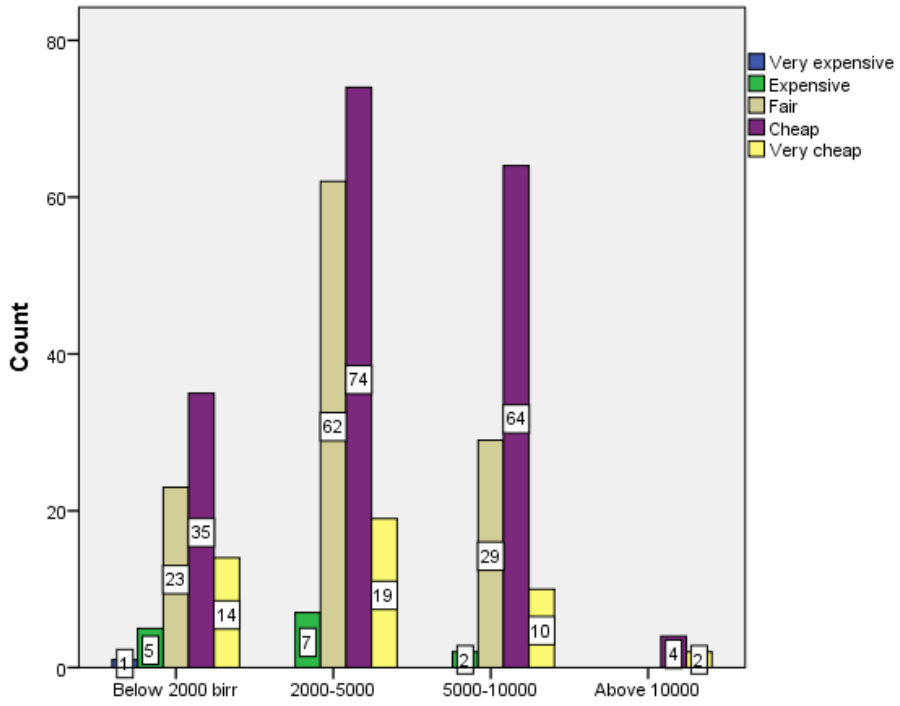


Figure 13: User's income status vs. fare relation

As shown on the above figure, some of the respondents with monthly income status below 2000 birr considers the service as very expensive and expensive and some of respondents with monthly income from 2000-5000 birr considers as expensive. Whereas, respondents with monthly income of more than 10000 birr considers the service fare as cheap and very cheap.

4.2.1.10. Information

Anbessa bus along this route doesn't have information such as routes and schedules, but there are origin and destination location names on screen at the head and on the side of buses. Respondent's insight regarding necessary service information is presented by the graph below.

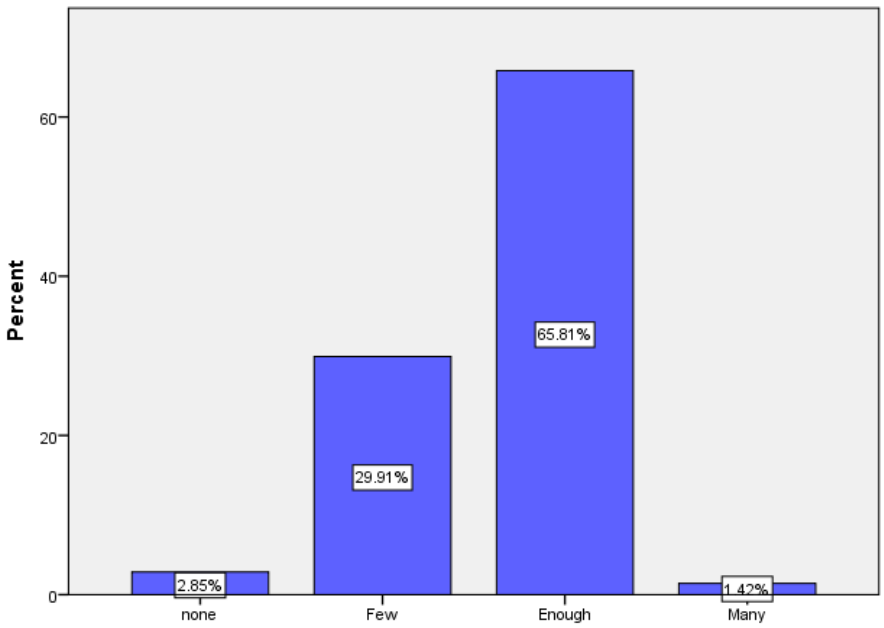


Figure 14: Users perception on available information

The above figure indicates that of the respondents, 3% considers availability of necessary information on the service as none, 29% as few, 66% as enough and 2% as many.

4.2.1.11. Customer care

According to the figure below of the respondents, 0.28% evaluates staffs in terms of customer care as worst, 10% as bad, 78% as moderate, 10% as good and 1% as very good.

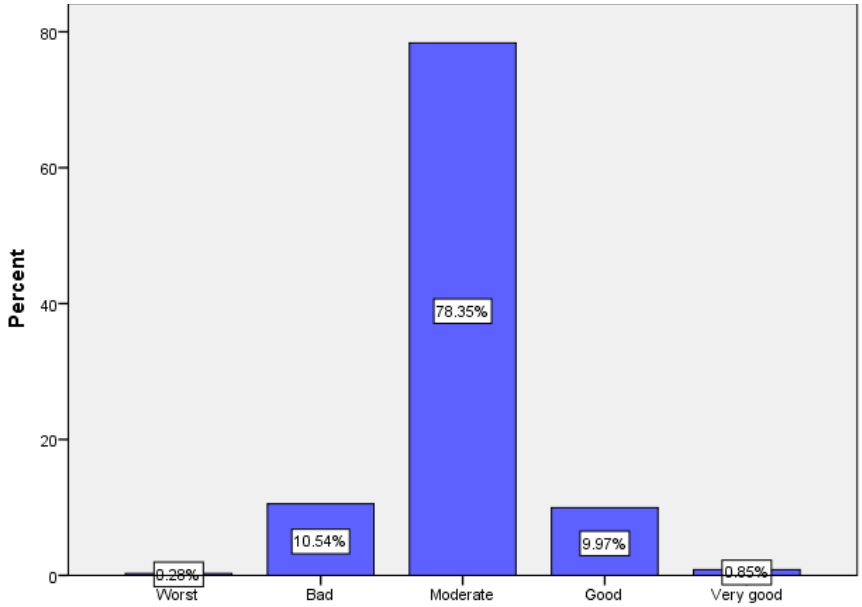


Figure 15: Users perception on customer care

4.2.2. BASELINE DATA FOR CUSTOMER SATISFACTION INDEXES

Data presented under this topic is responses from two parts of questionnaires collected from 351 Anbessa bus users on Bethel-Merkato route completed questionnaires while waiting at stations and travelling via buses on this route, with all respondents answering all of the questions. The findings and results presented here focuses on two important attributes that are necessary to analyze and find score of customer satisfaction index which are importance rates and satisfaction rates.

4.2.2.1. Importance rates

Attributes described below show how important the given indicators regarding quality of service for users of Anbessa city bus on Bethel-Merkato route. To evaluate the value of how important the indicators, Likert scales of importance with numeric values (such as not important (1), slightly important (2), moderately important (3), important (4) and very important (5)) were given for the respondents. Values and data of importance rates in terms of user perception are described via ten performance indicators to measure quality of service are categorized as below.

1. Importance rates of service availability

	Frequency	Percent
Moderately important	1	.3
Important	213	60.7
Very important	137	39.0
Total	351	100.0

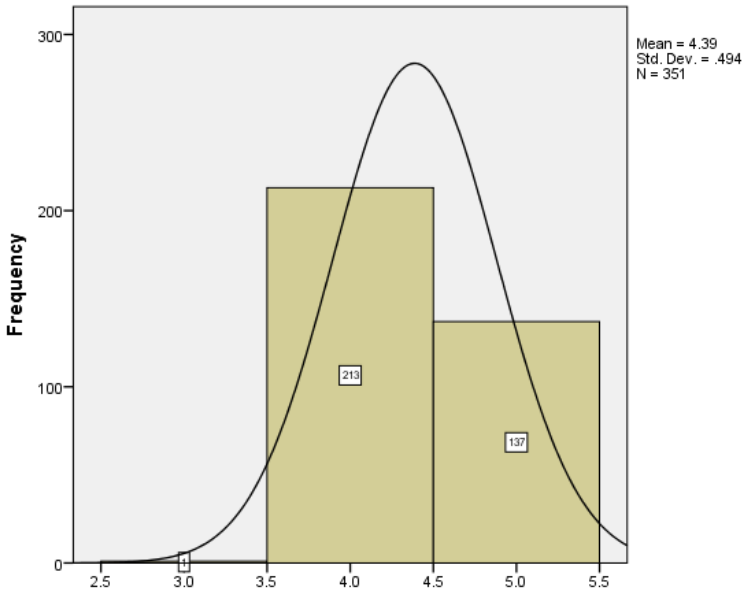


Figure 16: Importance rates of service availability

The above graph represents user perception regarding importance of service availability in terms of quality of service. According to the above data most of the respondents which are 60.7% perceives service availability as important indicator to measure performance of Anbessa city bus along Bethel-Merkato route regarding quality of service. The rest 39% perceives it as very

important, 0.3% as moderately important and 0% considers it as not important and slightly important. The above data has a mean value of 4.39.

2. Importance rates of service frequency

	Frequency	Percent
Moderately important	5	1.4
Important	139	39.6
Very important	207	59.0
Total	351	100.0

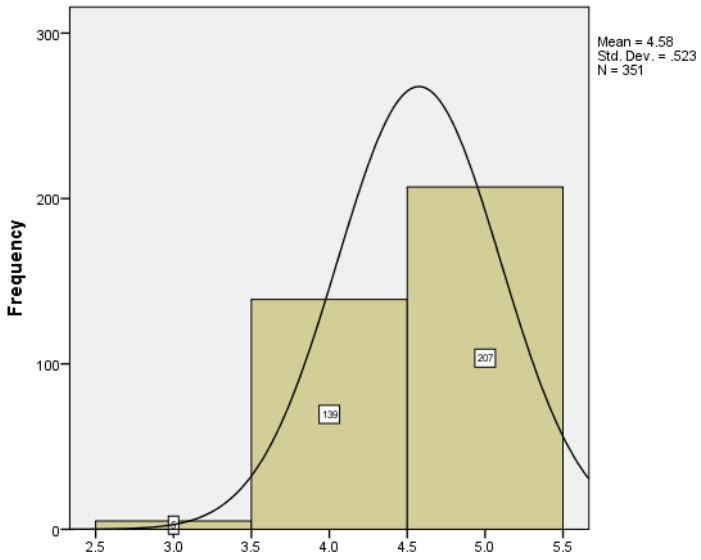


Figure 17: importance rates of service frequency

According to the above graph that represents user perception regarding importance of service frequency in terms of quality of service, most of the respondents which are 59% perceives service frequency as very important indicator to measure performance of Anbessa city bus along Bethel-Merkato route regarding quality of service. The rest 39.6% perceives it as important, 1.4% as moderately important and 0% considers it as not important and slightly important. The above data has a mean value of 4.58.

3. Importance rates of trip time

	Frequency	Percent
Moderately important	1	.3
Important	171	48.7
very important	179	51.0
Total	351	100.0

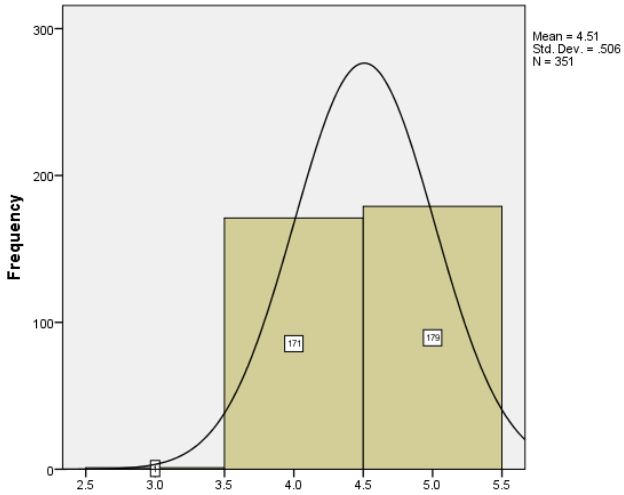


Figure 18: Importance rates of trip time

Of the respondents, 51% considers trip time as very important indicator to measure performance of Anbessa city bus along Bethel-Merkato route regarding quality of service with 48.7% as important, 0.3% as moderately important and 0% perceives as not important and slightly important. Importance rate of trip time has a mean value of 4.51.

4. Importance rates of reliability

	Frequency	Percent
Moderately important	3	.9
Important	148	42.2
Very important	200	57.0
Total	351	100.0

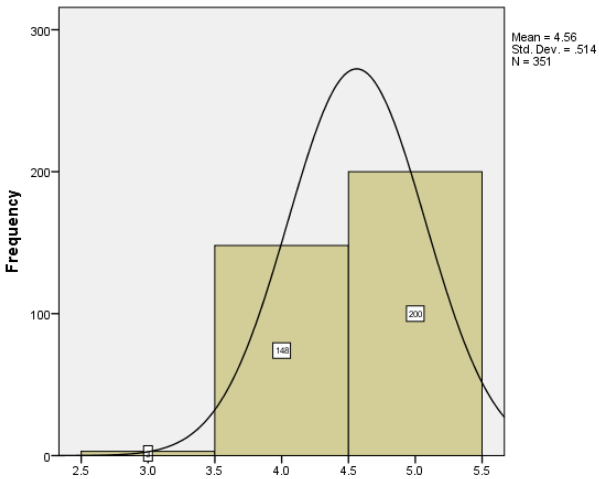


Figure 19: Importance rates of reliability

The above table and graph show importance rates of service reliability. Of the respondents, 57% considers service reliability as very important indicator to measure performance of Anbessa city bus along Bethel-Merkato route regarding quality of service with 42.2% as important, 0.9% as moderately important and 0% perceives as not important and slightly important. Importance rates of service reliability has a mean value of 4.56.

5. Importance rates of comfort

	Frequency	Percent
Moderately important	14	4.0
Important	103	29.3
Very important	234	66.7
Total	351	100.0

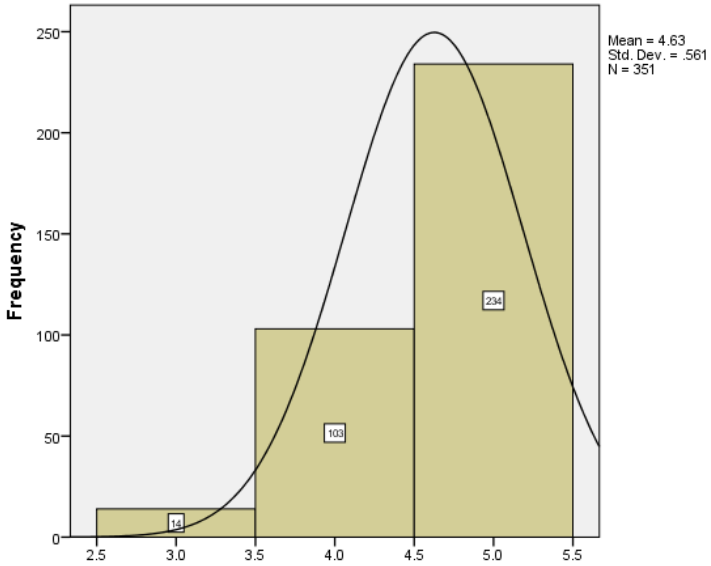


Figure 20: Importance rates of comfort

According to the above table ang graph which represents importance rates of comfort, 66.7% considers comfort as very important indicator to measure performance of Anbessa city bus along Bethel-Merkato route regarding quality of service with 29.3% as important, 4% as moderately important and 0% perceives as not important and slightly important. Importance rates of comfort have a mean value of 4.63.

6. Importance rates of safety and security

	Frequency	Percent
Moderately important	7	2.0
Important	91	25.9
Very important	253	72.1
Total	351	100.0

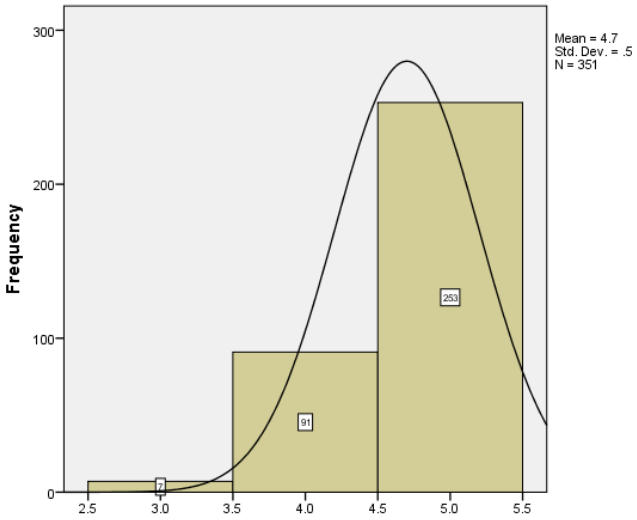


Figure 21: Importance rates of safety and security

Importance rates of safety and security based on user perception is described on the above table and graph. 72.1% of respondents considers safety and security as very important indicator to measure performance of Anbessa city bus along Bethel-Merkato route regarding quality of service with 25.9% as important, 2% as moderately important and 0% perceives as not important and slightly important. Importance rates of safety and security has a mean value of 4.7.

7. Importance rates of cleanliness

	Frequency	Percent
Moderately important	4	1.1
Important	95	27.1
Very important	252	71.8
Total	351	100.0

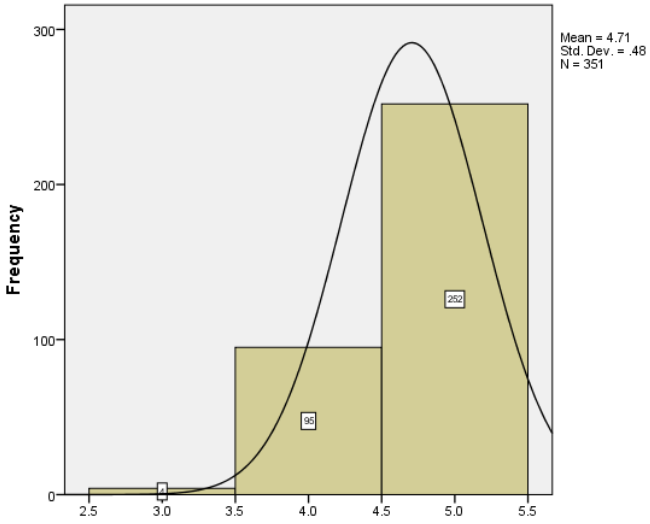


Figure 22: Importance rates of cleanliness

The above graph and table describe importance rates of cleanliness based on user perception to measure performance of Anbessa city bus along Bethel-Merkato route regarding quality of service. Of the respondents 71.8% considers cleanliness as very important indicator with 27.1%

as important, 1.1% as moderately important and 0% perceives as not important and slightly important. Importance rate of cleanliness has a mean value of 4.71.

8. Importance rates of fare

	Frequency	Percent
Slightly important	1	.3
Moderately important	24	6.8
Important	173	49.3
Very important	153	43.6
Total	351	100.0

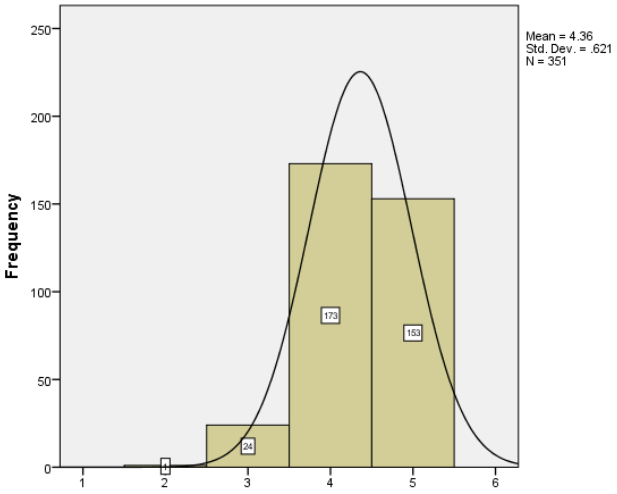


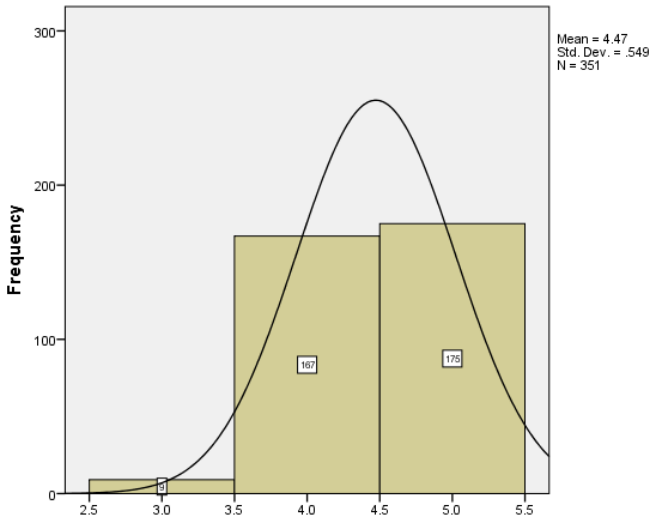
Figure 23: Importance rates of fare

The above table and graph describe importance rates of fare. Of the respondents, 49.3% considers fare as important indicator to measure performance of Anbessa city bus along Bethel-Merkato route regarding quality of service with 43.6% as very important, 6.8% as moderately important, 0.3% as slightly important and 0% perceives as not important. Importance rates of fare has a mean value of 4.36.

9. Importance rates of information

	Frequency	Percent
Moderately important	9	2.6
Important	167	47.6
Very important	175	49.9
Total	351	100.0

Figure 24: Importance rates of information



Importance rate of information is described via the above table and graph. Of the respondents, 49.9% considers information as very important indicator to measure performance of Anbessa city bus along Bethel-Merkato route regarding quality of service with 47.6% as important, 2.6% as moderately important and 0% perceives as not important and slightly important. Importance rates of information has a mean value of 4.47.

	Frequency	Percent
Moderately important	24	6.8
Important	168	47.9
Very important	159	45.3
Total	351	100.0

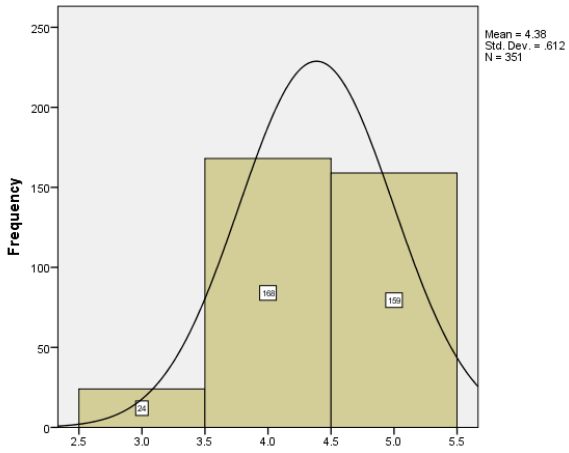


Figure 25: Importance rates of customer care

10. Importance rates of customer care

The above table and graph represent importance rates of customer care. Of the respondents, 47.9% considers customer care as important indicator to measure performance of Anbessa city bus along Bethel-Merkato route regarding quality of service with 47.9% as very important, 6.8% as moderately important and 0% perceives as not important and slightly important. Importance rates of customer care have a mean value of 4.38.

4.2.2.2. Satisfaction Rates

Attributes described below shows how satisfied the users of Anbessa city bus on Bethel-Merkato route with indicators regarding quality of service. To evaluate the value of how satisfied with the indicators, Likert scales of satisfaction with numeric values (such as not satisfied (1), slightly satisfied (2), moderately satisfied/ok (3), satisfied (4) and very satisfied (5)) were given for the respondents. Values and data of satisfaction rates in terms of user gained perception are described via ten performance indicators to measure quality of service are categorized as below.

1. Satisfaction rates of service availability

	Frequency	Percent
Very dissatisfied	7	2.0
Dissatisfied	104	29.6
ok	228	65.0
Satisfied	11	3.1
Very satisfied	1	.3
Total	351	100.0

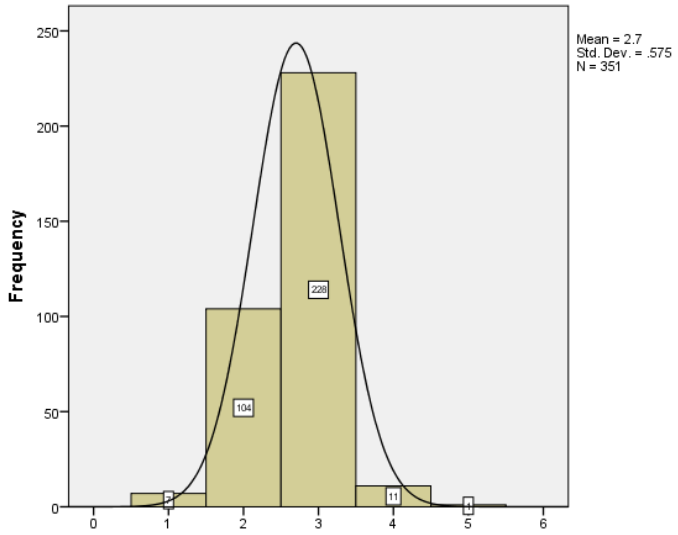


Figure 26: Satisfaction rates of service availability

The above table and graph show user's gained satisfaction rates regarding service availability. According to the above data most of the respondents which are 65% are ok/moderately satisfied with gained service availability, 29.6% are dissatisfied, 3.1% are satisfied, 2% are very dissatisfied and the rest 0.3% are very satisfied. The above data has a mean value of 2.7.

2. Satisfaction rates of service frequency

	Frequency	Percent
Very dissatisfied	6	1.7
Dissatisfied	83	23.6
ok	241	68.7
Satisfied	20	5.7
Very satisfied	1	.3
Total	351	100.0

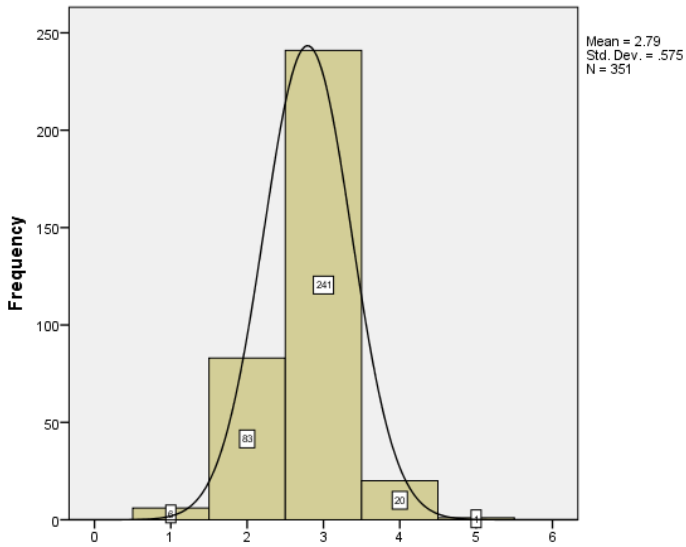


Figure 27: Satisfaction rates of service frequency

According to the above table and graph that represents user's gained satisfaction rates of service frequency, most of the respondents which are 68.7% labels gained service frequency as ok/moderately satisfied, 23.6% as dissatisfied, 5.7% as satisfied, 1.7% as very dissatisfied and 0.3% as very satisfied. The above data has a mean value of 2.79.

3. Satisfaction rates of trip time

	Frequency	Percent
Very dissatisfied	3	.9
Dissatisfied	94	26.8
ok	202	57.5
Satisfied	52	14.8
Total	351	100.0

Figure 28: Satisfaction rates of trip time

Of the respondents, 57.5% describes gained service in terms of trip time as ok/moderately satisfied with 26.8% as dissatisfied, 14.8% as satisfied and 0.9% as very dissatisfied. Satisfaction rate of trip time has a mean value of 2.86.

4. Satisfaction rates of reliability

	Frequency	Percent
Very dissatisfied	2	.6
Dissatisfied	116	33.0
ok	196	55.8
satisfied	34	9.7
Very satisfied	3	.9
Total	351	100.0

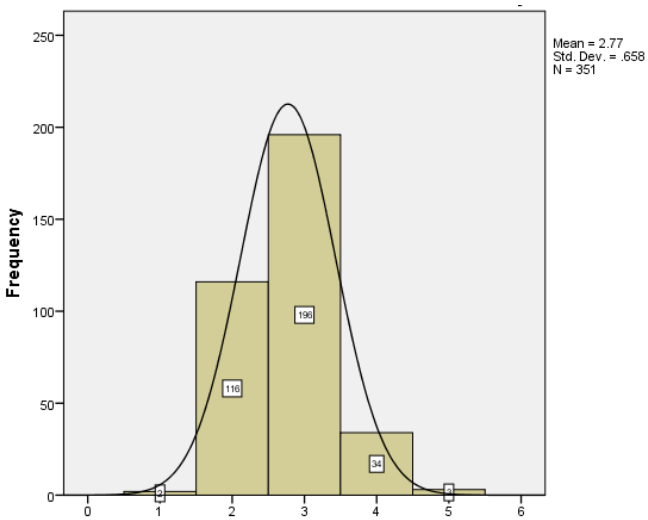


Figure 29: Satisfaction rates of reliability

The above table and graph show satisfaction rates of reliability. Of the respondents, 55.8% considers gained service reliability as ok/moderately satisfied with 33% as dissatisfied, 9.7% as satisfied, 0.9% as very satisfied and 0.6% as very dissatisfied. Satisfaction rates of service reliability have a mean value of 2.77.

5. Satisfaction rates of comfort

According to the above table ang graph which represents satisfaction rates of comfort, 46.4%

	Frequency	Percent
Very dissatisfied	31	8.8
Dissatisfied	124	35.3
ok	163	46.4
Satisfied	31	8.8
Very satisfied	2	.6
Total	351	100.0

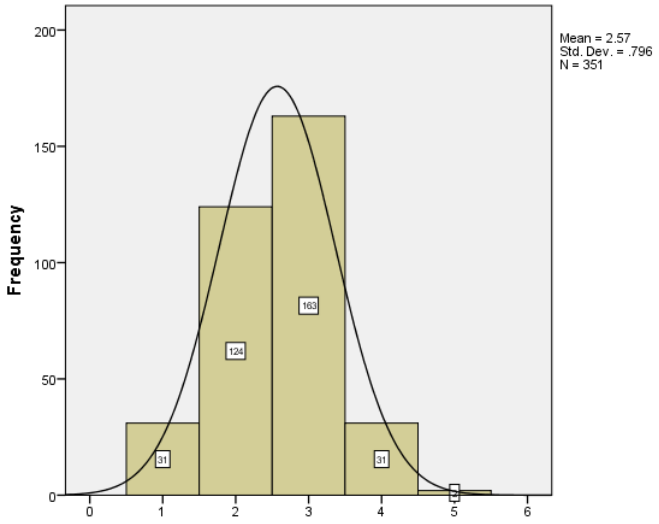


Figure 30: Satisfaction rates of comfort

considers gained comfort as ok/moderately satisfied with 35.3% as dissatisfied, 8.8% as very dissatisfied, 8.8% as satisfied and 0.6% as very satisfied. Satisfaction rate of comfort has a mean value of 2.57.

6. Satisfaction rates of safety and security

	Frequency	Percent
Very dissatisfied	58	16.5
Dissatisfied	138	39.3
ok	133	37.9
Satisfied	22	6.3
Total	351	100.0

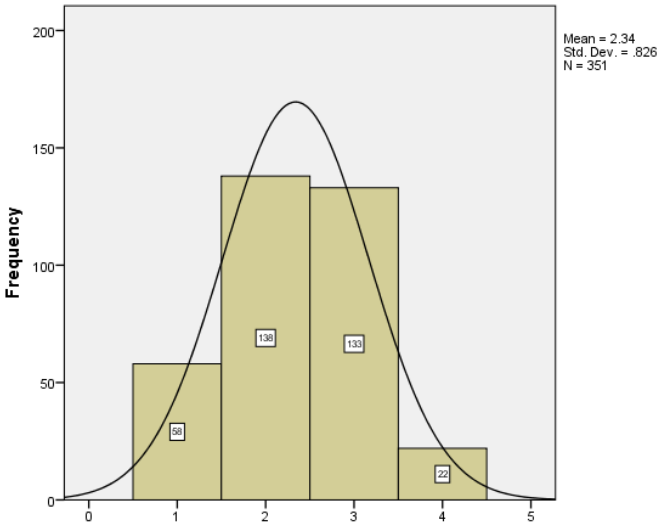


Figure 31: Satisfaction rates of safety and security

Satisfaction rates of safety and security based on user's gained perception is described on the above table and graph. 39.3% of respondents considers gained safety and security on Anbessa city bus along Bethel-Merkato route as dissatisfied with 37.9% as ok/moderately satisfied, 16.5% as very dissatisfied, 6.3% as satisfied and 0% describes as very satisfied. Satisfaction rates of safety and security has a mean value of 2.34.

7. Satisfaction rates of cleanliness

	Frequency	Percent
Very dissatisfied	69	19.7
Dissatisfied	147	41.9
ok	122	34.8
Satisfied	13	3.7
Total	351	100.0

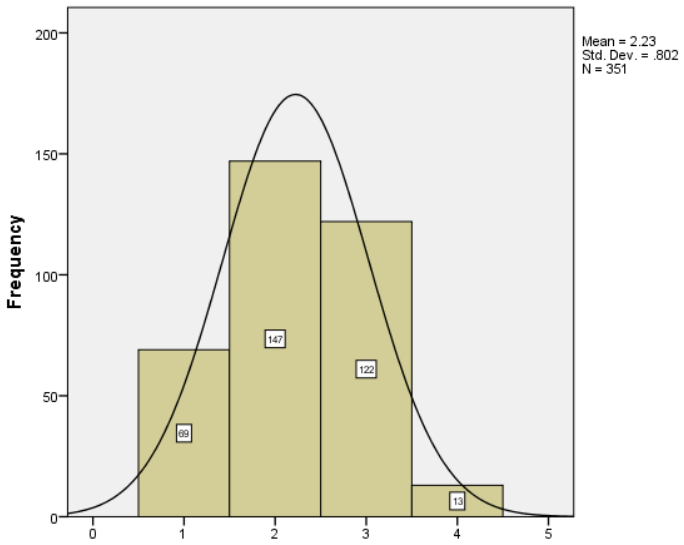


Figure 32: Satisfaction rates of cleanliness

The above graph and table describe satisfaction rates of cleanliness based on user perception on gained service from Anbessa city bus along Bethel-Merkato route. Of the respondents 41.9% describes gained cleanliness as dissatisfied with 34.8% as ok/moderately satisfied, 19.7% as very dissatisfied, 3.7% as satisfied and 0% as very satisfied. Satisfaction rate of cleanliness has a mean value of 2.23.

8. Satisfaction rates of fare

	Frequency	Percent
Very dissatisfied	5	1.4
Dissatisfied	9	2.6
ok	83	23.6
satisfied	229	65.2
Very satisfied	25	7.1
Total	351	100.0

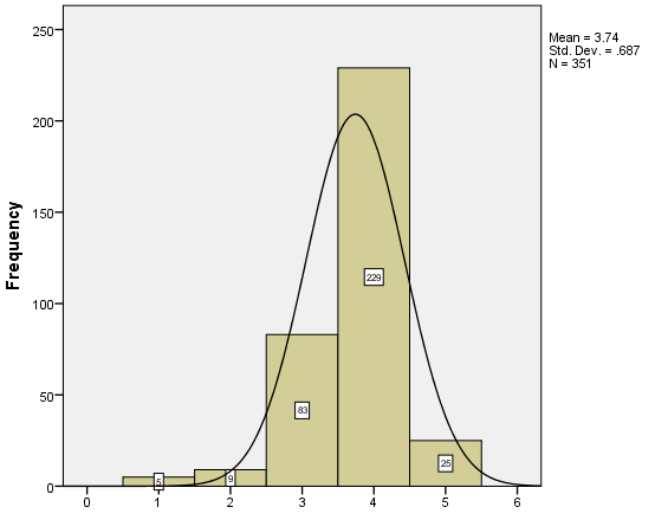


Figure 33: Satisfaction rates of fare

The above table and graph describe satisfaction rates of fare. Of the respondents, 65.2% considers gained fare as satisfied with 23.6% as ok/moderately satisfied, 7.1% as very satisfied,

2.6% as dissatisfied and 1.4% as very dissatisfied. Satisfaction rate of fare has a mean value of 3.74.

9. Satisfaction rates of information

	Frequency	Percent
Very dissatisfied	24	6.8
Dissatisfied	160	45.6
ok	135	38.5
Satisfied	32	9.1
Total	351	100.0

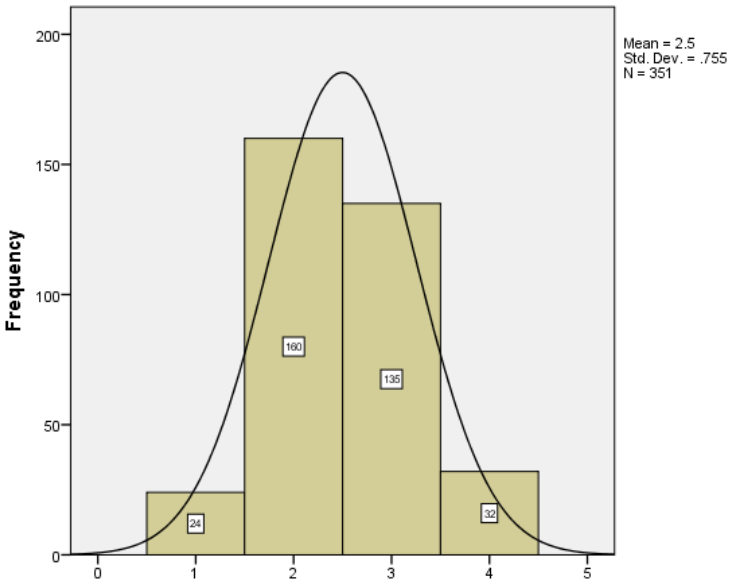


Figure 34: Satisfaction rates of information

satisfaction rates of information are described via the above table and graph. Of the respondents, 45.6% are dissatisfied by gained information from Anbessa city bus along Bethel-Merkato route with 38.5% as ok/moderately satisfied, 9.1% as satisfied, 6.8% as very dissatisfied and 0% as very satisfied. Satisfaction rates of Information have a mean value of 2.5.

10. Satisfaction rates of customer care

	Frequency	Percent
Very dissatisfied	9	2.6
Dissatisfied	131	37.3
ok	196	55.8
Satisfied	14	4.0
Very satisfied	1	.3
Total	351	100.0

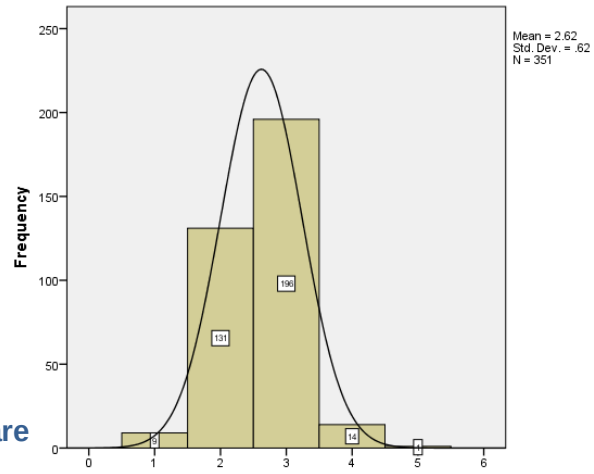


Figure 35: Satisfaction rates of customer care

The above table and graph represent satisfaction rates of customer care. Of the respondents, 55.8% are ok/moderately satisfied with customer care of Anbessa city bus along Bethel-Merkato

route with 37.3% are dissatisfied, 4% satisfied 2.6% are very dissatisfied and 0.3% are very satisfied. Satisfaction rates of customer care have a mean value of 2.62.

4.3. RESULTS

4.3.1. CUSTOMER SATISFACTION INDEX RESULT

To understand passengers' perception towards the service provided by the Anbessa bus along Bethel-Merkato route, 10 quality of service indicators were included in the survey questionnaire using the five-point Likert scale measurement and means of satisfaction rates expressed by users is weighted on the basis of importance rates of each indicator perceived by respondents.

Ten indicators (attributes) are considered with average satisfaction and importance rates reported in Table below, according to Likert scale from 1 to 5. By considering importance rates the overall satisfaction is 2.66, and the attribute with the highest satisfaction score is fare, which contributes to the overall satisfaction with an aliquot of 0.36. The less important indicator is cleanliness, with a value of 0.223. The value of Customer Satisfaction Index is 2.66 out of 5 and by converting this score into a percentage, the satisfaction index shows that the service is about 53.2% successful in satisfying its customers.

Table 7: Customer Satisfaction Index Results

No.	Indicators	Importance Score	Importance Weight	Satisfaction Score	Weighted Score
1	Availability	4.39	0.096	2.7	0.26
2	Frequency	4.58	0.1	2.79	0.279
3	Trip Time	4.51	0.099	2.86	0.28
4	Reliability	4.56	0.1	2.77	0.277
5	Comfort	4.63	0.1	2.57	0.257
6	Safety & Security	4.7	0.1	2.34	0.234
7	Cleanliness	4.71	0.1	2.23	0.223
8	Fare	4.36	0.096	3.74	0.36

9	Information	4.47	0.098	2.5	0.245
10	Customer Care	4.38	0.096	2.62	0.25
Total		**45.29**		**2.7**	**2.66**

Source: Computed by author, 2021

4.3.2. COMMON VALUES FOR THE PERFORMANCE INDICATORS RESULT

Results discussed under this title are values of certain indicators that can be calculated based on expected level of service quality to be delivered from the view point of different expected standard performance levels. Those indicators are service frequency, trip time, service reliability, comfort, safety and security; and their score is described on the table below.

Table 8: Common Values for the Performance Indicators

No.	Indexes	Score	
		Peak Hours	Off peak Hours
1	Service Frequency Index	25-35 minutes	15-20 minutes
2	Trip Time Index	6.3-7.89km per hour	11.5-15.6km per hour
3	Reliability Index	-	
4	Comfort Index	4.67-5.67 persons per seat	1-3.3 persons per seat
5	Safety Index	0.000004 accidents per passengers	
6	Security index	0.00007 crimes per trips	

Source: Computed by author, 2021

4.4. DISCUSSION

The findings from this study suggest that performance of Anbessa city bus along Bethel-Merkato route regarding quality of service is below needed performance level. As its score from customer satisfaction index indicates the service is only 53.2% successfully satisfied its customers. Results from common values for the performance indicators and overall performance of the service along this route are discussed based on ten quality of service indicators as following:

1. Service availability

Accessibility is described in terms of the distance passengers have to walk from their home to the bus stop (Iles, 2005). In dense urban areas the recommended walking distance ranges from 300-

500 meters while it is 500-1000 meters in low densely urban areas (Iles, 2005). Regarding this route 60.11% walks below 500m from their home to the closest station and the rest 39.88% travels 500m to reach the station. This indicates even if the service coverage is above average, the service is much behind the needed availability to successfully satisfy its users.

2. Service frequency

According to the results from common values for the performance indicators, the number of headways is 2-3 buses per hour during peak hours and 3-4 buses per hour during off peak hours. Such long headway and few numbers of vehicles per route which is only 4 buses, indicates that long waiting times at the stops are predictable. In other words, the shortest waiting time is 15-20 minutes during off peak hours and 25-35 minutes during peak hours which is below standards as indicated on (Seco & Gonçalves, 2007) the waiting time should not exceed 10-15 minutes for averagely performing bus system. This discourages people using the service and makes Anbessa less attractive compared to Taxi's despite its affordable fair.

3. Trip time

Based on results from common values for the performance indicators, Along Bethel-Merkato route, operational speed of Anbessa buses varies based on time of operation, peak and off-peak hours. During peak hours of the day operational speed of Anbessa bus along this route varies between 6.3-7.89 kms per hour and during off-peak hours and weekend days its operational speed varies between 11.5-15.67 kms per hour.

According to table 1 public bus system should operate with an average of 15 kilometers per hour and other scholars indicates that minimum operating speed for public buses along dense areas with mixed traffic is 10-12 kms per hour. Based on these indicators operational speed of Anbessa bus along Bethel-Merkato route can be considered under below average and during peak hours (which is 6.3-7.89 kms per hour) and average operating speed during off-peak and weekend days (which is 11.5-15.67 kms per hour).

4. Reliability

Service reliability is the ability of the transit system to adhere to schedule or maintain regular headways and a consistent travel time. As every route and public transit services in Addis Ababa, there is no fixed arrival and departure times for Anbessa buses along Bethel-Merkato route. Unreliable service or service doesn't have schedule results in additional travel and waiting time

for passengers. As a consequence, due to lack of schedule Anbessa bus is leading to loss of passengers and or limiting its passengers to those with few options and low income.

5. Comfort

The attribute most frequently used for evaluating comfort during the journey is linked to the degree of crowding on bus, regarding this attribute its score from common values for the performance indicators shows 4.67-5.67 persons per seat during peak hours which makes the trip highly suffocating. Even though, the service carries tolerable number of passengers during off peak hours (which is 1-3.3 persons per seat), conditions during peak hours facilitates suitable conditions for air borne diseases and makes the trip difficult for elders, children's and handicap peoples. Additionally, such overloaded and uncomfortable conditions increase user's vulnerability for theft and sexual harassment.

6. Safety and security

Regarding this indicator of the respondents, 50.71% considers service safety from crime and accident as moderately safe and 36.75% as slightly safe; and 66.1% considers service safety regarding behaviors of other passengers and service operators as moderately safe and 21.94% as safe. Scores from common values for the performance indicators shows Anbessa bus along this route has safety index of 0.000004 accidents per passengers and security index of 0.00007 crimes per trips. As described on multiple literatures, the service with such safety and security score can be considered as averagely safe and secure.

7. Cleanliness

Cleanliness refers to the physical condition of vehicles and facilities, and specifically the cleanliness of the bus interior and exterior, regarding this attribute 53.56% considers physical conditions of buses interior and exterior as moderate and 37.61% as good. The buses serving along this route are the recent and there is preventive, breakdown & overhauling maintenance program for all buses by the enterprise via different inspection periods from daily to weekly and monthly. Generally, the cleanliness of Anbessa bus along this route is in better level of quality and needs keeping current level and improvement for advancement is required.

8. Fare

Fare of Anbessa bus along this route is relatively cheap in comparison to taxi (which is 6birr) and Sheger bus (4birr) which are functioning along similar route. Out of total respondents, only 5.27% considers it as expensive and very expensive with the rest considers it as very cheap, cheap and

fair. Additionally, the attribute with the highest satisfaction score is fare, which contributes to the overall satisfaction with an aliquot of 0.36 and with satisfaction rate of 3.74 out of 5 in average its about 74.5% which is much higher than overall satisfaction score of 53.2%.

The problem with fare is its limited to few payment mechanisms and its payment/ticketing system which is the ticket for single trip is sold mostly at the station from inside the bus and sometimes inside the bus at the time of the ride by operators travels with the bus. Hence, such ticketing system extends buses stoppage period and overall trip time.

9. Information

Anbessa bus along this route has no information such as route and schedule, but there is only written origin and destination places on the head and side of buses. Hence, as indicated on (Transportation Research Board, 2003) such limited information limits and decreases the ability of potential passengers to use transit service.

10. Customer care

Regarding this indicator, Anbessa City Bus Enterprise are trying to improve and compete with other transit system by giving training and COC to its drivers to increase their courtesy and knowledge of drivers and operators. However, the enterprise doesn’t consider personnel appearance together with elements linked to the easiness of purchasing tickets or paying fare, presence and condition of the ticket issuing and validation machines, and effectiveness of the ticket selling network.

Chapter Five: Conclusion and Recommendations

5.1. CONCLUSION

The research performance evaluation of Anbessa city bus based on quality of service is done based on the problems that are observed on the city transit system by focusing on Bethel-Merkato route.

For the problems identified in the research problem statement three objectives and research questions were formulated. Then after, the methodology is designed to achieve objectives and to answer research questions. Research question one was answered by referring literatures and identifying performance indicators regarding quality of service, research question two was answered by customer satisfaction index and common values for the performance indicators whereas research question three was answered by referring literatures and identifying suitable responses for this route.

Performance indicators regarding quality of service were identified from different literatures and discussed under literature review section of the research. These quality-of-service indicators are service availability, service frequency, trip time, service reliability, comfort, safety and security, cleanliness, fare, information and customer care.

Customer satisfaction index was developed by calculating quality-of-service indicators importance rates and satisfaction rates of 351 respondents. The result of each indicator was calculated by CSI to give overall customer satisfaction rate of the service. Whereas common values for the performance indicators result was calculated by indexes for indicators and the data used was from Addis Ababa Transport Agency, Addis Ababa Traffic agency, Anbessa City Bus Enterprise, personal observations and results from different literatures. Then after the overall performance of Anbessa bus along Bethel-Merkato route was discussed.

Customer satisfaction index was calculated by considering ten indicators (attributes) with average satisfaction and importance rates, according to a scale from 1 to 5. By considering importance rates the overall satisfaction is 2.66, and the attribute with the highest satisfaction score is fare, which contributes to the overall satisfaction with an aliquot of 0.36. The less important indicator is cleanliness, with an aliquot of 0.223. The value of Customer Satisfaction Index is 2.66 out of 5 and by converting this score into a percentage, the satisfaction index shows that the service is about 53.2% successful in satisfying its customers. CSI result of Anbessa city bus along this route indicates low result in satisfying its users.

The result from common values for the performance indicators shows of expected level of service quality to be delivered from the view point of different expected standard performance levels, quality of service along this route is below average in some attributes and average in few attributes. Detail results and performance levels of each indicator was analyzed and discussed in chapter four under section of discussion.

Suitable responses were identified and discussed under recommendation section of the research. This section is classified into two different parts which are sustainable responses and recommendations for each indicator.

5.2. RECOMMENDATION

In this study, analysis and discussions have been carried out to evaluate performance level of Anbessa city bus along Bethel-Merkato route. As seen from the evaluation, it is clearly identified the quality of service along this route is low. Based on the evaluation carried out in the previous chapter, recommendations are proposed to improve Anbessa bus along Bethel-Merkato route quality of service and there should be possible solutions to improve quality of service by all stakeholders.

Public bus service operations are a very complex decision-making environment that tries to balance many but also conflicting objectives. (Berhan, 2013) Within such a complex decision-making environment and comparatively low infrastructures and facilities Anbessa city bus has attempted to fulfill the needs of people in and around the city of Addis Ababa. In this regard, the enterprise is contributing a lot in by facilitating the mobility of low-to-middle income people. The enterprise still needs to go beyond in improving the service quality. Suitable recommendations are discussed below.

- Fixed number of buses per route is scheduled almost in all the operating times. The bus utilization during off-peak hours is very low and most of the time buses run empty and incur additional cost without serving passengers. Whereas, in the peak hour's buses are forced to carry more passengers than their riding capacity per trip which negatively affects the service quality and the conditions of the buses. Thus, the enterprise should balance the number of buses scheduled per route per time periods based on passengers' demand distribution.
- The enterprise should also strategically design to replace the old buses with the new ones so that the Kilometers per Vehicle per Day and the fuel consumption would be improved.

This also would have a subsequent improvement on the availability of buses and result in better fleet utilization.

- In order to improve the service quality, Anbessa city bus should limit the carrying capacity of buses with 30 seat capacities to 60 passengers, and that of 50 seat capacities to 90 passengers based on the international standard allowable carrying capacity by increasing number of buses, reducing trip time and introducing buses with higher carrying capacity.
- The service aspect regarding fare includes characteristics of the monetary cost of the journey by bus, like the cost of a one-way ride, the cost of a transfer. Putting additional fare options have high chance of increasing modal choice of Anbessa city bus. Best examples are: the availability of discounted fares for students, the availability of volume discounts for monthly passes, the cost of parking at bus stops.
- Passenger information should be available at every stage of the rider's transit trip. Pre-trip information helps the rider to plan routes and connections. Pre-trip information needs consist of the location of the nearest bus stop, routes that travel to the desired destination and transfer locations, fare, time of departure, and approximate duration of the trip.
- In-transit information assists the rider at each decision point during the trip. In-transit information needs consist of the identification of the correct bus to board at the departure point; identification of bus stops for transfers or disembarking on the bus; how to transfer to another route at transfer points; cost, time limits, and restrictions; identification of the correct bus to board; area geography (i.e., location of the final destination in relation to the bus stop); return trip information at the destination (e.g., departure times and changes in route numbers).
- Supportive/confirming information repeats and reinforces data and decisions; it should be provided at any point during the trip when the rider may want to be reassured that he/she is progressing correctly and not getting lost.

Additionally, some recommendations that are categorized under sustainable mechanism are discussed below. To fulfill desirable goals and objectives, transportation planning and transport policy needs to focus on improvement of public transit efficiency. To achieve high level efficiency on public transit, we need to focus on sustainable problem alleviation methods, such as:

Introducing High occupancy vehicles (HOV) lanes to the city's transportation, which ensures that vehicles with two or more passengers have exclusive access to less congested lane to reduce operational/ travel time delays occurred due to congestion.

Adding Bus Rapid Transit (BRT) to Addis Ababa's transit system. It allows public bus to circulate on its own infrastructure, which improves performance and increase modal choice to the residents.

The city's transport authority should introduce traffic signal synchronization, which gives priority to public buses and improve incident management system by removing vehicles involved in accident as quickly as possible in order to reduce congestion, stops and delays experienced by buses.

Intelligent transportation service, which is combining communication and information technology with transportation system to improve transport networks for everyone should introduced to the city's transportation system. It can provide faster, cheaper and more reliable service.

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Appendix 1: Journal Article

Performance Evaluation of Anbessa City Bus Based on Quality of Service: The Case of Bethel-Merkato Route

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Abstract

Cities with poor public transport is characterized by suppressed social and economic advantages. However, providing a reliable, efficient and quality transportation service to the people is a challenging operation to the service provider. Since its establishment, Anbessa City Enterprise has passed through many ups and downs to improve and expand its transportation service in general. It has got major improvement so far. Yet, the enterprise could not be able to address the required quality and the ever-increasing transportation demand in and around the city of Addis Ababa. Hence, the Anbessa city bus service operation requires a continuous performance assessment for efficient and proper utilization of buses to serve the current and future customers' demand. As a result, any intervention in this regard cannot be fruitful unless the current level of performance and the gap in quality of service is identified scientifically. The purpose of this research is therefore to evaluate performance of Anbessa city bus based on quality of service specifically in the Bethel-Merkato route. To evaluate performance of Anbessa bus along this route, indicators regarding quality of service were identified from different literatures and discussed under literature review section of the research. Identified quality-of-service indicators are service availability, service frequency, trip time, service reliability, comfort, safety and security, cleanliness, fare, information and customer care. Two methods were developed to analyze the study. The first method was customer satisfaction index (CSI), this method analyzed overall customer satisfaction rate of the service by calculating quality-of-service indicators importance rates and satisfaction rates of 351 respondents. The second method was Common Values for the Performance Indicators, this method analyzed expected level of service quality to be delivered from the view point of different expected average performance levels.

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Key Words: Performance, indicators, Indexes, customer satisfaction, importance rates, satisfaction rates

1. Introduction

The rising population in cities increases the demand for basic services including urban space, which is limited (Kodukula, 2018).

Continuing rapid growth of the cities, low per capita income, and low automobile ownership in most million plus cities in the Sub-Saharan African cities means that the population will continue to rely heavily on public transport to meet their daily mobility needs. This dependence is expected to grow strongly for the foreseeable future and provision of efficient and effective public transport operations are critical to sustainable economic and social development. While investment in new transport infrastructure is required to help meet mobility needs it will not be sufficient on its own, even in those rare circumstances where it can be expanded to match the growth in travel demand. More effective use of existing infrastructure and equipment is both desirable and cost effective for the foreseeable future (Kumar, et al., n.d.).

Transit service is an option for a trip only when service is available at or near the locations and at times when a customer wants to travel, can get to and from the transit stops, knows how to use the service, and sufficient capacity is available at the desired time. If any of these factors is not satisfied, transit will not be an option for that trip either a different mode will be used, the trip will be taken at a less convenient time, or the trip will not be made at all.

The poor public transport suppresses the economic and social advantages for which the cities developed in the first place (Kumar, et al., n.d.). Public transportation plays a major role in the quality of life of individuals as well as the productivity of entire regions in every society (Berhan, 2013). However, providing a reliable, efficient and quality transportation service to the people is a challenging operation to the service provider.

In addition to Anbessa city bus, Sheger and Alliance public buses have been introduced to the city's transit system as a solution to the challenges Addis Ababa public transport were facing. However, still, the public buses could not be able to address challenges in their performance and the ever-increasing transportation demand in and around the city of Addis Ababa.

In this regard, Anbessa city bus sets a good example. Since its establishment, the enterprise has passed through many ups and downs to improve and expand its transportation service in general. It has got major improvement so far. However, still, the enterprise could not be able to address the required quality and the ever-increasing transportation demand in and around the city of Addis Ababa. Hence, the Anbessa city bus service operation requires a continuous performance assessment for efficient and proper utilization of buses to serve the current and future customers' demand.

2. Literature Review

2.1. Performance Measurements of Public Transit

As stated by (Eboli & Mazzulla, 2012) the measurement of transit performance represents a very useful tool for ensuring continuous increase of the quality of the delivered transit services, and for allocating resources among competing transit agencies.

Transit service quality can be evaluated by subjective measures based on passengers' perceptions, and objective measures represented by disaggregate performance measures expressed as numerical values, which must be compared with fixed standards or past performances (Eboli & Mazzulla, 2012).

There is a diversity of performance measures developed for describing different features of the transit services. These transit performance measures are based on point of views of passenger, agency, and community. Passenger's viewpoint reflects the passenger's perception of the service. The community's viewpoint measures transit's role in meeting broad community objectives, which measures the impact of a transit service on different aspects of a community (Eboli & Mazzulla, 2012).

2.2. Performance Indicators

According to (Dhingra, 2011) a performance indicator is more specifically a performance measure used to document progress toward a performance goal, and to monitor performance. Hence performance indicators are specific measurable outcomes used to evaluate progress towards established goals and objectives.

The aspects usually describing transit services can be distinguished into characteristics that more properly describe the service (e.g., frequency), and characteristics depending more on customer tastes and less easily measurable (e.g., comfort) (Eboli & Mazzulla, n.d.).

Based on various studies regarding quality determinants in public transportation the aspects mainly characterizing bus services are discussed below.

A. Service Availability

The attributes belonging to this category of service aspects are represented by characteristics of the route of the bus line in terms of path and coverage, number of bus stops, distance between bus stops and location of the bus stops. The stop spacing, or the distance between adjoining service stops of a path are important factors to balance the trade-off between rider convenience (stops with easy walking distances) and speed. Therefore, a transit stop must be located within walking distance, and the pedestrian environment in the area should not discourage walking.

B. Service Frequency

Service frequency/Regularity is the number of hourly departures, or the time between successive transport units. It is an important factor in one's decision to use transit; in fact, the more frequent the service, the shorter the waiting time when a bus or train is missed, and the greater the

flexibility that customers have in selecting travel times (Transportation Research Board, 2003). Also, in (Eboli, 2011) service frequency resulted to be the attribute with the highest weight on the overall transit service quality.

C. Trip Time

Commercial speed/Trip time, although directly related, the trip time is of easier perception by customers, which is all time spent on trip, including stopped time (Seco & Gonçalves, 2007). Travel time is a key factor when choosing a mode of transport. For work or school journeys, time importance is much higher (VABUOLYTĖ & UŠPALYTĖ-VITKŪNIENĖ, 2018).

D. Service Reliability

(Turnquist M, 1980) define transit service reliability as "the ability of the transit system to adhere to schedule or maintain regular headways and a consistent travel time". Unreliable service results in additional travel and waiting time for passengers. As a consequence, service unreliability can lead to loss of passengers, while improvements in reliability can lead to attraction of more passengers (El-Geneidy, 2007).

E. Comfort

Comfort during the journey is important for transit users, both the physical comfort regarding vehicles and comfort regarding ambient conditions on board or at stops (Eboli & Mazzulla, n.d.). The indicator most frequently used for evaluating comfort during the journey is linked to the degree of crowding on bus. (Tyrinopoulos, 2008) estimate the load of the vehicles as the number of passengers on board divided by the capacity of the vehicles.

F. Cleanliness

The indicators regarding cleanliness refer to the physical condition of vehicles and facilities, and specifically the cleanliness of the bus interior and exterior, having buses and shelters clean of graffiti, cleanliness of seating and windows, and so on. Clean buses tend to promote a good public image and help to attract and maintain ridership (Transportation Research Board, 1995).

G. Safety and Security

The aspect linked to safety and security indicates the degree of safety from crime or accidents and the feeling of security resulting from psychological factors; therefore, this aspect refers not only to safety from crimes while riding or at bus stops and from accidents, but also to safety related to the behavior of other persons and to the bus operation (Eboli & Mazzulla, n.d.). Generally, the term "safety" is used to indicate the possibility of being involved in a road accident, while the term "security" refers to the possibility of becoming the victim of a crime.

H. Fare

The service aspect regarding fare includes characteristics of the monetary cost of the journey by bus, like the cost of a one-way ride, the cost of a transfer, the availability of discounted fares (e.g., for students), the availability of volume discounts (e.g., for monthly passes), the cost of parking at bus stops (Eboli & Mazzulla, n.d.).

I. Information

Passengers need to know how to use transit service, where the access is located, where to get off in the proximity of their destination, whether any transfers are required, and when transit services are scheduled to depart and arrive. Without this information, potential passengers will not be able to use transit service (Transportation Research Board, 2003).

J. Customer Care

Customer care includes those elements needed to make easier and more pleasant the journey, like courtesy and knowledge of drivers, courtesy and helpfulness of ticket agents, personnel appearance, together with elements linked to the easiness of purchasing tickets or paying fare, presence and condition of the ticket issuing and validation machines, and effectiveness of the ticket selling network (Eboli & Mazzulla, n.d.).

2.3. Indicators Evaluation Indexes

The variety of performance indicators pointed out in international references, reveals that there still doesn't exist a consensus for a uniform and universal methodology for urban public transport systems' quality evaluation (Seco & Gonçalves, 2007). Of various indicators evaluation indexes, two indexes which are suitable for the study are selected and discussed below.

2.3.1. Common Values for Performance Indicators

Measures overall performance of transit on study route based on different quality of service indicators. It majorly evaluates expected performance quality of service delivery from the view point of different expected standard performance levels.

A. Service Frequency index: It can be calculated by the equation:

$F = \frac{Nd}{\mathrm{T}}$ ……Equation (1): frequency index (Seco & Gonçalves, 2007)

where F is the frequency (PT units/h), Nd is the number of public transport units' departures during a T period of time (in hours). The inverse of frequency gives the average time between departures or the regularity of the public transport units.

B. Trip time index: it can be calculated by the equation:

$Vc = \frac{L}{T}$ ……Equation (2): trip time index (Seco & Gonçalves, 2007)

where V_c is the commercial speed (km/h), L is the route length (km) and T is total travel time from origin to destination (in hours).

C. Service Reliability Index: It can be computed by the following equation:

$P = \frac{\sum PT \pm 5min}{\sum PT}$ ……Equation (3): reliability index (Seco & Gonçalves, 2007)

where P is the punctuality em %, ∑PT±5min. is the number of public transports that arrive between 0 and 5 minutes either before (worst case) or after the scheduled time, and ∑TP are all the public transport arriving.

D. Comfort Index: Bus occupancy can be a proxy to evaluate the trip comfort, calculated as:

$O = \frac{p}{S}$ ……Equation (4): comfort index (Seco & Gonçalves, 2007)

where O is the occupancy rate (%), P is the total number of passengers present at a given time or part of the network, and S is the number of seats available.

E. Safety and Security Index: it can be expressed by the total number of accidents (Acc) involving humans and property per 100 000 vehicles-kilometers per run or the number of accidents involving passengers per million of passengers carried. Can be calculated as:

$Sf = \frac{Acc}{100{,}000\ (vehicle-km)}$ ……Equation (5): safety index (Seco & Gonçalves, 2007)

Or

$Sf = \frac{Acc}{1000{,}000\ (passengers)}$……Equation (6): safety index (Seco & Gonçalves, 2007)

One security indicator can be crime rate on the system and can be calculated as:

$CR = \frac{Nc}{100{,}000\ trips}$ ……Equation (7): security index (Seco & Gonçalves, 2007)

where C_R is the annual crime rate and N_C is the number of annual reported crimes all over the system.

Generally, overall performance of public transit quality of service can be evaluated as indicated on the table below.

Table 9: Common values for the performance indicators. Source: (Seco & Gonçalves, 2007)

Indicators			
Reliability	High Frequency	Low Frequency	
	90% - ±5min	80% - ±5min	
Frequency	Peak hour	Off-peak hour	
	4 - 12 Vehicles/h	0.5 – 4 Vehicles/h	
Trip cost	Variable		
Trip time	Minimum	Average	Maximum
	6 km/h	15 km/h	25 km/h

2.3.2. Customer satisfaction Index

Customers express their points of view about the services by providing judgments on some service aspects by means of ad hoc experimental sample surveys, known in the literature as "customer satisfaction surveys." (Mazzulla, 2009).

A more direct measure for service quality evaluation is provided by an overall index, often called "Customer Satisfaction Index" (CSI) (Hill N., 2003). CSI represents a measure of service quality on the basis of the user/consumer perceptions on service aspects expressed in terms of importance rates, compared with user/consumer expectations expressed in terms of satisfaction rates (Mazzulla, 2009).

According to (Mazzulla, 2009)Customer satisfaction index (CSI), which can be calculated by means of the satisfaction rates expressed by

users, weighted on the basis of the importance rates, according to the following formula:

$CSI = \sum_{k=1}^{N}(Sk * Wk)$ ……Equation (8): customer satisfaction index (Mazzulla, 2009)

Where Sk is the mean of the satisfaction rates expressed by users on the service quality k attribute and Wk (importance weight) is a weight of the k attribute, calculated on the basis of the importance rates expressed by users. Specifically, is the ratio between the mean of the importance rates expressed by users on the k attribute and the sum of the average importance rates of all the service quality attributes:

$Wk = \frac{Ik}{\sum_{k=1}^{N} Ik}$ Equation (9): importance weight (Mazzulla, 2009)

CSI represents a good measure of overall satisfaction because it summarizes the judgments expressed by users about various service attributes in a single score. The more accurate the selection of the attributes, the more accurate the measure of the overall satisfaction. For this reason, the selected attributes should describe the service aspects exhaustively (Mazzulla, 2009).

3. Materials and Methods

3.1.Background of the Study Area

Hosting 30 percent of the urban population of Ethiopia, Addis Ababa, the capital of Ethiopia and the diplomatic center of Africa, is one of the fastest growing cities on the continent (UN-HABITAT, 2008). Its population have nearly doubled every decade. In 1984 the population was 1, 412, 575, in 1994 it was 2,112, 737, and it is currently thought to be 4 million. UN-HABITAT estimates that this number will continue to rise, reaching 12 million in 2024 (UN-HABITAT, 2008).

The study route coves a distance of 10.5kms with four (4) Anbessa buses functioning along the route. According to data from Anbessa city bus enterprise, Anbessa buses along this route serves a population of 1500-3000 per day.

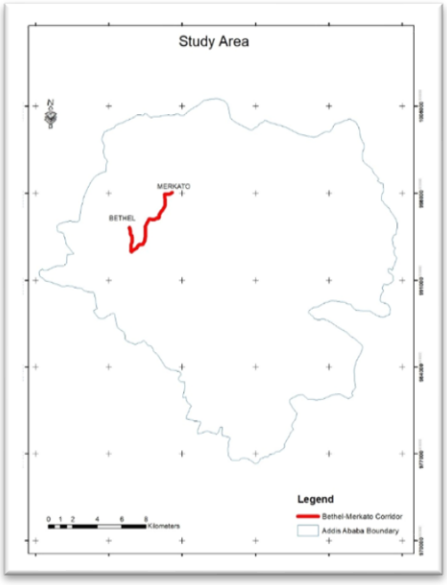

Figure 36: Study Route

Bethel is characterized predominantly by residential and mixed land uses with commercials along the main streets and disperse service activities. Merkato is the biggest open market in Africa and estimated that it hosts more than 13,000 people who are engaged in 7,100 business entities, and attracts over 200,000 people every day (Megento, 2018).

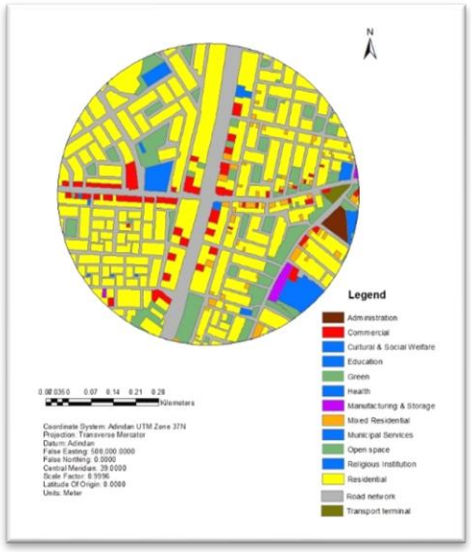

Figure 37: Bethel Area Land

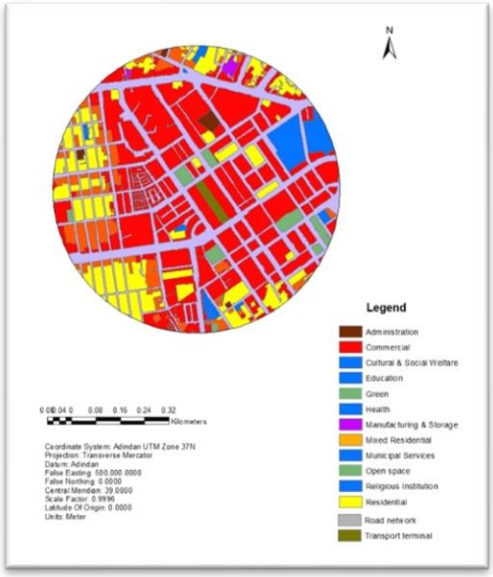

Figure 38: Merkato Area Land

3.2. The Study Design and Setting

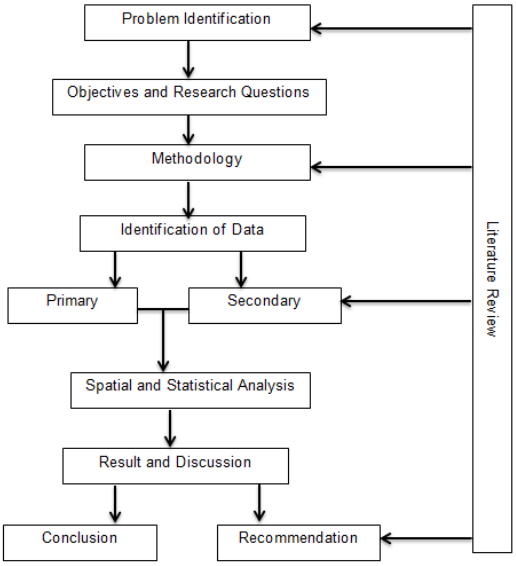

Figure 39: Research

The study was based on qualitative and quantitative type of research. It qualifies performance of public buses based on level of service along Bethel-Merkato route through performance indicators. The study quantifies performance of public buses based on level of service along this route via performance indicators. It also quantifies qualitative indicators based on international standards.

3.3. The type, Source and Acquisition

The study uses both primary and secondary data types. Primary data types were collected from public bus users and operators, and secondary data types was gathered from Anbessa city bus enterprise, traffic agency and public transport agency. Both data types are spatial and statistical. Spatial data types are maps of bus network, bus stations and locations of spatial emphasis along Bethel-Merkato route.

Table 10: List of Variables

Variable types	Variables
Independent	Service Availability
	Service Frequency
	Service Reliability
	Comfort
	Safety and Security
	Fare
	Information
	Customer Care
	Cleanliness
	Trip Time
Dependent	Performance of quality of service

3.4. Sample size Determination

According to data from Addis Ababa Road Authority, Anbessa city bus is serving 663,000 peoples per day with 663 buses, which have the total share of 25.37% from total population served by public transport. Along Bethel-Merkato corridor there are 4 bus which are currently serving along this route.

From the above data it can be computed that in average each bus is serving 1000 peoples, which can be deduced to 4000 peoples along Bethel-Merkato route. Therefore, sampling frame for this study can be 4000 populations.

In order to evaluate performance of Anbessa city bus regarding quality of service in case of Bethel-Merkato route, 351 persons are selected to answer interview questionnaires. The sample size is determined based on online sample size calculator method, which considers 95% of confidence level and 5% of confidence interval.

3.5. Data Analysis

The study was analyzed by using customer satisfaction index from service users view point and common values for the performance indicators, which majorly evaluates expected performance quality of service delivery from the view point of different expected standard performance levels.

To measure customer satisfaction, numerical values from 1 to 5 was used in this study and was calculated by means of the satisfaction rates expressed by users, weighted on the basis of the importance rates. Using the equation (8) and equation (9) under literature review section.

To measure performance of Anbessa bus along this route via common values for performance indicators equations 1,2,3,4,5,6,7 was used and the result was analyzed according to the table 1.

Finally, overall performance of Anbessa city bus service quality was stated based on the results from the description and measurement results of indexes, which are customer satisfaction index, common values for the performance indicators.

4. Results and Discussion

4.1.Introduction

The section discusses the data analysis and findings from 351 questionnaires completed by Anbessa bus users on Bethel-Merkato route, Addis Ababa traffic agency, Addis Ababa transport agency, Anbessa city bus enterprise, personal observations and from different secondary sources.

A total of 351 Anbessa bus users on Bethel-Merkato route completed questionnaires while waiting at stations and travelling via buses on this route, with all respondents answering all of the questions.

The data from the above sources are analyzed via indicators evaluation indexes, which are route evaluation indexes and customer satisfaction indexes.

4.2.Results

4.2.1. Participants Socio-Economic Result

In order to analyze and explain the socio-economic status of Anbessa bus along Bethel-Merkato route the study variables such as; gender, age, health status, monthly income was collected and explained in the survey through questionnaires. According to the survey conducted the result of the survey shows that out of the 351 participants in the research 46.2% were female and 53.8% male. Additionally, of the respondents, 1.14% is handicapped and the rest 98.86% is normal.

Of the respondents, 1.14% is 8-14, 29.91% is 15-

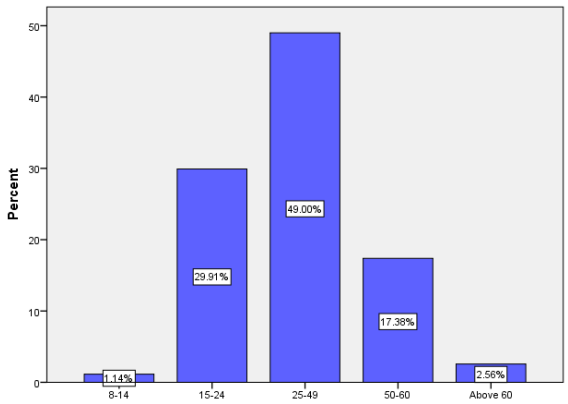

Figure 40: Respondents Age Structure

24, 49% is 25-49, 17.38% is 50-60 and 2.565 is above 60 years of age.

Of 351 respondents, 46.2% monthly income is 2000-5000 birr with 29.9% 5000-10000 birr, 22.2% below 2000 birr and 1.7% above 10000birr.

Table 11: Respondents Monthly Income

	Frequency	Percent
Below 2000 birr	78	22.2
2000-5000	162	46.2
5000-10000	105	29.9
Above 10000	6	1.7
Total	351	100.0

Generally, most of the respondents were male 53.8%, 25-49 age group (49%), mostly healthy (98.86%) and mostly in the range of 2000–5000-birr monthly income (46.2%).

4.2.2. Participants Trip Result

This section covered the respondents' trip purpose and trip frequency per week.

From 351 respondents, 66.38% makes the trip for work, 6.27% for education, 1.42% for vacation, 7.12% for family visit and the rest 18.8% travels for other purposes.

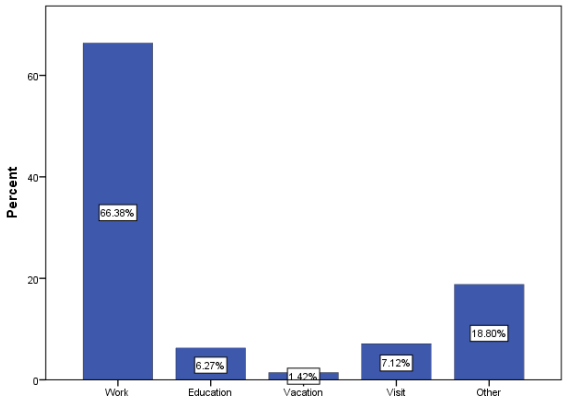

Figure 41: Respondents Trip Purpose

From the total respondents, most of them which are 53.85% travels all days of the week with those who travels often are 19.66% and the rest 26.5% sometimes on the days of the week.

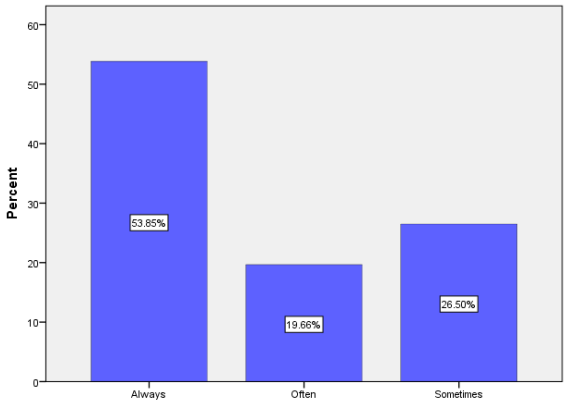

Figure 42: Respondents Weekly Trip Frequency

Of 351 respondents, those makes the trip always are majorly for work purpose which is 89.9% and secondly for education purpose which is 8.9% of the total; those makes the trip often are also majorly for work purpose with 75.3% and secondly for other purposes with 15.9%; and those makes the trip sometimes are dominated by travelers for other purposes which is 55.9% and secondly for visit purposes with 25.8%.

Table 12: Respondents trip purpose and frequency relation

		Trip Purpose					Total
		Work	Education	Vacation	Visit	Other	
Trip frequency per week	Always	168	17	0	1	3	189
	Often	52	4	2	0	11	69
	Sometimes	13	1	3	24	52	93
Total		233	22	5	25	66	351

Generally, travelers for work purpose mostly travels always and often and travelers for the other purpose's travels mostly sometimes.

4.2.3. Customer satisfaction Index Results

To understand passengers' perception towards the service provided by the Anbessa bus along Bethel-Merkato route, 10 quality of service indicators were included in the survey questionnaire using the five-point Likert scale measurement and means of satisfaction rates expressed by users is weighted on the basis of importance rates of each indicator perceived by respondents.

Ten indicators (attributes) are considered with average satisfaction and importance rates reported in Table below, according to Likert scale from 1 to 5. By considering importance rates the overall satisfaction is 2.66, and the attribute with the highest satisfaction score is fare, which contributes to the overall satisfaction with an aliquot of 0.36. The less important indicator is cleanliness, with an aliquot of 0.223. The value of Customer Satisfaction Index is 2.66 out of 5 and by converting this score into a percentage, the satisfaction index shows that the service is about 53.2% successful in satisfying its customers.

Table 13: Customer Satisfaction Index Results (Source: Computed by author, 2019)

No.	Indicators	Importance Score	Importance Weight	Satisfaction Score	Weighted Score
1	Availability	4.39	0.096	2.7	0.26
2	Frequency	4.58	0.1	2.79	0.279
3	Trip Time	4.51	0.099	2.86	0.28
4	Reliability	4.56	0.1	2.77	0.277
5	Comfort	4.63	0.1	2.57	0.257
6	Safety & Security	4.7	0.1	2.34	0.234
7	Cleanliness	4.71	0.1	2.23	0.223
8	Fare	4.36	0.096	3.74	0.36
9	Information	4.47	0.098	2.5	0.245
10	Customer Care	4.38	0.096	2.62	0.25
Total		**45.29**		**2.7**	**2.66**

4.2.4. Common Values for Performance Indicators Result

Results discussed under this title are values of certain indicators that can be calculated based on expected level of service quality to be delivered from the view point of different expected standard performance levels. Those indicators are service frequency, trip time, service reliability, comfort, safety and security; and their score is described on the table below.

Table 14: Common Values for the Performance Indicators (Source: Computed by author, 2019)

No.	Indexes	Score	
		Peak Hours	Off peak Hours
1	Service Frequency Index	25-35 minutes	15-20 minutes
2	Trip Time Index	6.3-7.89km per hour	11.5-15.6km per hour
3	Reliability Index	-	
4	Comfort Index	4.67-5.67 persons per seat	1-3.3 persons per seat
5	Safety Index	0.000004 accidents per passengers	
6	Security index	0.00007 crimes per trips	

4.3.Discussion

The findings from this study suggest that performance of Anbessa city bus along Bethel-Merkato route regarding quality of service is below needed performance level. As its score from customer satisfaction index indicates the service is only 53.2% successfully satisfied its customers. Results from common values for the performance indicators and overall performance of the service along this route is discussed based on ten quality of service indicators as following:

4.3.1. Service availability

Accessibility is described in terms of the distance passengers have to walk from their home to the bus stop (Iles, 2005). In dense urban areas the recommended walking distance ranges from 300-500 meters while it is 500-1000 meters in low densely urban areas (Iles, 2005). Regarding this route 60.11% walks below 500m from their home to the closest station and the rest 39.88% travels 500m to reach the station. This indicates even if the service coverage is above average, the service is much behind the needed availability to successfully satisfy its users.

4.3.2. Service frequency

According to the results from common values for the performance indicators, the number of headways is 2-3 buses per hour during peak hours and 3-4 buses per hour during off peak hours. Such long headway and few numbers of vehicles per route which is only 4 buses, indicates that long waiting times at the stops are predictable. In other words, the shortest waiting time is 15-20 minutes during off peak hours and 25-35 minutes during peak hours which is below standards as indicated on (Seco & Gonçalves, 2007) the waiting time should not exceed 10-15 minutes for averagely performing bus system. This discourages people using the service and makes Anbessa less attractive compared to Taxi's despite its affordable fair.

4.3.3. Trip time

Based on results from common values for the performance indicators, Along Bethel-Merkato route, operational speed of Anbessa buses varies based on time of operation, which is peak and off-peak hours. During peak hours of the day operational speed of Anbessa bus along this route varies between 6.3-7.89 kms per hour and during off-peak hours and weekend days its operational speed varies between 11.5-15.67 kms per hour.

According to table 1 public bus system should operate with an average of 15 kilometers per hour and other scholars indicates that minimum operating speed for public buses along dense areas with mixed traffic is 10-12 kms per hour. Based on these indicators operational speed of Anbessa bus along Bethel-Merkato route can be considered under below average and during peak hours (which is 6.3-7.89 kms per hour) and average operating speed during off-peak and weekend days (which is 11.5-15.67 kms per hour).

4.3.4. Reliability

Service reliability is the ability of the transit system to adhere to schedule or maintain regular

headways and a consistent travel time. As every routes and public transit services in Addis Ababa, there is no fixed arrival and departure times for Anbessa buses along Bethel-Merkato route. Unreliable service or service doesn't have schedule results in additional travel and waiting time for passengers. As a consequence, due to lack of schedule Anbessa bus is leading to loss of passengers and or limiting its passengers to those with few options and low income.

4.3.5. Comfort

The attribute most frequently used for evaluating comfort during the journey is linked to the degree of crowding on bus, regarding this attribute its score from common values for the performance indicators shows 4.67-5.67 persons per seat during peak hours which makes the trip highly suffocating. Even though, the service carries tolerable number of passengers during off peak hours (which is 1-3.3 persons per seat), conditions during peak hours facilitates suitable conditions for air borne diseases and makes the trip difficult for elders, children's and handicap peoples. Additionally, such overloaded and uncomfortable conditions increase user's vulnerability for theft and sexual harassment.

4.3.6. Safety and security

Regarding this indicator of the respondents, 50.71% considers service safety from crime and accident as moderately safe and 36.75% as slightly safe; and 66.1% considers service safety regarding behaviors of other passengers and service operators as moderately safe and 21.94% as safe. Scores from common values for the performance indicators shows Anbessa bus along this route has safety index of 0.000004 accidents per passengers and security index of 0.00007 crimes per trips. As described on multiple literatures, the service with such safety and security score can be considered as averagely safe and secure.

4.3.7. Cleanliness

Cleanliness refers to the physical condition of vehicles and facilities, and specifically the cleanliness of the bus interior and exterior, regarding this attribute 53.56% considers physical conditions of buses interior and exterior as moderate and 37.61% as good. The buses serving along this route are the recent and there is preventive, breakdown & overhauling maintenance program for all buses by the enterprise via different inspection periods from daily to weekly and monthly. Generally, the cleanliness of Anbessa bus along this route is in better level of quality and needs keeping current level and improvement for advancement is required.

4.3.8. Fare

Fare of Anbessa bus along this route is relatively cheap in comparison to taxi (which is 6birr) and Sheger bus (4birr) which are functioning along similar route. Out of total respondents, only 5.27% considers it as expensive and very expensive with the rest considers it as very cheap, cheap and fair. Additionally, the attribute with the

highest satisfaction score is fare, which contributes to the overall satisfaction with an aliquot of 0.36 and with satisfaction rate of 3.74 out of 5 in average its about 74.5% which is much higher than overall satisfaction score of 53.2%.

The problem with fare is its limited to few payment mechanisms and its payment/ticketing system which is the ticket for single trip is sold mostly at the station from inside the bus and sometimes inside the bus at the time of the ride by operators travels with the bus. Hence, such ticketing system extends buses stoppage period and overall trip time.

4.3.9. Information

Anbessa bus along this route has no information such as route and schedule, but there is only written origin and destination places on the head and side of buses. Hence, as indicated on (Transportation Research Board, 2003) such limited information limits and decreases the ability of potential passengers to use transit service.

4.3.10. Customer care

Regarding this indicator, Anbessa City Bus Enterprise are trying to improve and compete with other transit system by giving training and COC to its drivers to increase their courtesy and knowledge of drivers and operators. However, the enterprise doesn't consider personnel appearance together with elements linked to the easiness of purchasing tickets or paying fare, presence and condition of the ticket issuing and validation machines, and effectiveness of the ticket selling network.

5. Conclusion and Recommendations

5.1.Conclusion

The study performance evaluation of Anbessa city bus based on quality of service is done based on the problems that are observed on the city transit system by focusing on Bethel-Merkato route.

Customer satisfaction index was developed by calculating quality-of-service indicators importance rates and satisfaction rates of 351 respondents. The result of each indicator was calculated by CSI to give overall customer satisfaction rate of the service. Whereas common values for the performance indicators result was calculated by indexes for indicators and the data used was from Addis Ababa Transport Agency, Addis Ababa Traffic agency, Anbessa City Bus Enterprise, personal observations and results from different literatures.

The value of Customer Satisfaction Index is 2.66 out of 5 and by converting this score into a percentage, the satisfaction index shows that the service is about 53.2% successful in satisfying its customers. CSI result of Anbessa city bus along this route indicates low result in satisfying its users.

The result from common values for the performance indicators shows of expected level of service quality to be delivered from the view

point of different expected standard performance levels, quality of service along this route is below average in some attributes and average in few attributes.

Generally, performance of Anbessa bus along Bethel-Merkato route regarding its quality of service, which is evaluated by ten quality of service indicators is below expected standard.

5.2.Recommendations

In this study, analysis and discussions have been carried out to evaluate performance level of Anbessa city bus along Bethel-Merkato route. As seen from the evaluation, it is clearly identified the quality of service along this route is low. Based on the evaluation carried out in the previous section, recommendations are proposed to improve Anbessa bus along Bethel-Merkato route quality of service and there should be possible solutions to improve quality of service by all stakeholders.

Public bus service operations are a very complex decision-making environment that tries to balance many but also conflicting objectives. (Berhan, 2013) Within such a complex decision-making environment and comparatively low infrastructures and facilities Anbessa city bus has attempted to fulfill the needs of people in and around the city of Addis Ababa. In this regard, the enterprise is contributing a lot in by facilitating the mobility of low-to-middle income people. The enterprise still needs to go beyond in improving the service quality. Suitable recommendations are discussed below.

Fixed number of buses per route are scheduled almost in all the operating times. This increases the dead mileage of buses during off-peak and adversely affects the quality of the service during peak hours. The bus utilization during off-peak hours is very low and most of the time buses run empty and incur additional cost without serving passengers. Whereas, in the peak hour's buses are forced to carry more passengers than their riding capacity per trip which negatively affects the service quality and the conditions of the buses. Thus, the enterprise should balance the number of buses scheduled per route per time periods based on passengers' demand distribution.

The enterprise should also strategically design a means to replace the old buses with the new ones so that the Kilometers per Vehicle per Day and the fuel consumption would be improved. This also would have a subsequent improvement on the availability of buses and result in better fleet utilization.

In order to improve the service quality, Anbessa city bus should limit the carrying capacity of buses with 30 seat capacity to 60 passengers, and that of 50 seat capacity to 90 passengers based on the international standard allowable carrying capacity.

The service aspect regarding fare includes characteristics of the monetary cost of the journey by bus, like the cost of a one-way ride, the cost of a transfer. Putting additional fare options have high chance of increasing modal choice of Anbessa city bus. Best examples are: the

availability of discounted fares for students, the availability of volume discounts for monthly passes, the cost of parking at bus stops.

Passenger information should be available at every stage of the rider's transit trip. Pre-trip information helps the rider to plan routes and connections. Pre-trip information needs consist of the location of the nearest bus stop, routes that travel to the desired destination and transfer locations, fare, time of departure, and approximate duration of the trip.

In-transit information assists the rider at each decision point during the trip. In-transit information needs consist of the identification of the correct bus to board at the departure point; identification of bus stops for transfers or disembarking on the bus; how to transfer to another route at transfer points; cost, time limits, and restrictions; identification of the correct bus to board; area geography (i.e., location of the final destination in relation to the bus stop); return trip information at the destination (e.g., departure times and changes in route numbers).

Supportive/confirming information repeats and reinforces data and decisions; it should be provided at any point during the trip when the rider may want to be reassured that he/she is progressing correctly and not getting lost.

Additionally, some recommendations that are categorized under sustainable mechanism are discussed below. To fulfill desirable goals and objectives, transportation planning and transport policy needs to focus on improvement of public transit efficiency. To achieve high level efficiency on public transit, we need to focus on sustainable problem alleviation methods, such as:

- High occupancy vehicles (HOV) lanes: ensure that vehicles with two or more passengers have exclusive access to less congested lane, which reduces operational/ travel time delays occurred due to congestion.
- Bus Rapid Transit (BRT) system: allows public bus to circulate on its own infrastructure, improves performance and increase modal choice.
- Traffic Signal Synchronization: giving priority to public buses.
- Incident Management: removing vehicles involved in accident as quickly as possible, reduce congestion.
- Intelligent Transportation service

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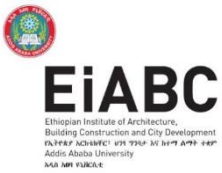
Appendix 2: Survey Questionnaire



To be conducted from Anbessa bus users on the Bethel-Merkato corridor

Time of Data collection_____

1. Origin of travel_____
2. Destination of travel_____
3. Did you, or will you, transfer to or from another mode/ bus during this trip?

No transfer on this trip (1)	Yes, I make one or more transfer on this trip (2)

4. If you transfer on this trip, what mode do you transfer to or from?

Taxi (1)	Higer/mid-bus (2)	Anbessa (3)	Sheger (4)	Other (5)

5. Sex

M	F

6. Age

Below 7	8-14	15-24	25-49	50-60	Above 60

7. Health status

Normal	Handicap

8. Income status per month

Below 800	801-3,000	3,001-5,000	5,001-10,000	Above 10,000

9. Trip purpose

Work (1)	Education (2)	Vacation (3)	Visit (4)	Other (5)

10. Trip frequency

Always (1)	Often (2)	Sometimes (3)

11. How frequently the buses arrive?

Less than 5 min. (1)	5-15 min. (2)	15-30 min. (3)	30 min.-1hr. (4)	Above 1 hr. (5)

12. During peak hour, how many buses arrive per hour?

Only 1 (1)	2-4 (2)	4-6 (3)	6-8 (4)	8-12 (5)

13. During of peak hour, how many buses arrive per hour?

Only 1 (1)	2-4 (2)	4-6 (3)	6-8 (4)	8-12 (5)

14. How far is your home from the station?

Less than 100m (1)	100m-500m (2)	500m-800m (3)	Above 800m (4)

15. Does the service have consistent travel time? If yes, what is its overall trip time per hour?

Less than 6km per hr.	6-15 km per hr.	15-25 km per hr.	Above 25 km per hr.

16. If your answer is no for the above question, how vary it is?

Less than 5 min.	5-15 min.	15-30 min.	30min.-1 hr.	Above 1 hr.

17. Stoppage time during onboard and offboard.

Less than 1 min.	1-2 min.	2-3 min.	3-4 min.	4-5 min.

18. Does the service have schedule?

yes	No

19. If your answer is yes for the above question, is the service adhere to the schedule?

yes	No

20. How comfortable is the service in terms of conditions during onboard and stops, temperature, seats, number of peoples on board, odor and noise?

Not comfortable (1)	Slightly comfortable (2)	Moderately comfortable (3)	Comfortable (4)	Very comfortable (5)

21. Conditions of bus stops regarding shelters, benches, lighting and trash receptacles.

Worst (1)	Bad (2)	Moderate (3)	Good (4)	Very good (5)

22. What is the physical conditions of the buses, interiors and exteriors?

Worst (1)	Bad (2)	Moderate (3)	Good (4)	Very good (5)

23. How safe the service is from the crime and accident?

Not safe (1)	Slightly safe (2)	Moderately safe (3)	safe (4)	Very safe (5)

24. Safety of the service related to the behavior of other persons and to the bus operators.

Not safe (1)	Slightly safe (2)	Moderately safe (3)	safe (4)	Very safe (5)

25. Fare of the service in comparison to other transit agencies or modes operating on similar route.

Very Expensive (1)	Expensive (2)	Fair (3)	Cheap (4)	Very cheap (5)

26. How many information's does the service have regarding? A. how to use the service; B. where the access is located; C. where to get off in the proximity of their destination; D. whether any transfers are required; E. and when transit services are scheduled to depart and arrive.

Only 1	2	3	4	All of listed

27. What is your evaluation of the staffs in terms of customer care?

Worst (1)	Bad (2)	Moderate (3)	Good (4)	Very good (5)

28. How satisfied you are with your trip?

Very satisfied (1)	Slightly satisfied (2)	Neither (3)	Slightly dissatisfied (4)	Very dissatisfied (5)

29. Below is a list of some performance indicators. In the column labeled importance rates, indicate on a scale of importance of the relevant indicators. Also, indicate in the column labeled satisfaction rates, on a scale of your degree of satisfaction with the level of provision of the performance indicators by Anbessa bus.

No.	Indicators	Importance Rates					Satisfaction Rates				
		Not important	Slightly important	Moderately important	Important	Very importan	Very Dissatisfie	Dissatisfied	Ok	Satisfied	Very Satisfied
1	Service Availability										
2	Service Frequency										
3	Trip time										
4	Service Reliability										
5	Comfort										
6	Safety and Security										
7	Cleanliness										
8	Fare										
9	Information										
10	Customer Care										

30. What types of measurements do you think will improve its quality of service?

Increasing number of buses	Increasing speed	Increasing carrying capacity of buses	Limiting buses carrying capacity based on allowable standards	Replacing old buses with new	Reducing fare	preparing all necessary information

Appendix 3: Anbessa City Bus Terminals and route information

መስመር ቁጥር	መነሻ	መተላለፊያ	መድረሻ	ኪ.ሜ	አውቶቡስ ብዛት	ተርሚናል
1	መገናኛ	ወሰን ግሮሰሪ ካራ	የካ አባዶ	11.2		መገናኛ
2	መካኒሳ ቆሬ	ተግባረ እድ ት/ ቤት	መርካቶ	11.1	4	መርካቶ
3	አየር ጤና	ዋቢ ሸበሌ	ጊዮርጊስ	10.8	9	ጊዮርጊስ
4	ቃሊቲ	ቄራ/ተግባረ ዕድ ት/ቤት	መርካቶ	19.4	1	መርካቶ
5	መካኒሳ ቆሬ	ዋቢ ሸበሌ	መርካቶ	12.7	4	መርካቶ
6	ቄራ	ጊዩርጊስ	ሰሜን አዲሱ ገበያ	9.9	8	ጊዮርጊስ
7	መገናኛ	ለገዳዲ/ ሰንዳፋ/ጮሌ ጊዮርጊስ	አሌልቱ	49	4	መገናኛ
8	ቀጨኔ	ሰሜን ሆቴል	መርካቶ	9.4		መርካቶ
9	ብራስ ክሊኒክ	ካሳንቺስ	ፒያሳ	10.5	3	ጊዮርጊስ
10	ኮተቤ መምህራን ኮሌጅ	ሾላ ገበያ	ፒያሳ	12.7	6	ጊዮርጊስ
11	ኮልፌ እፎይታ	ጊዩርጊስ	ም.ሆስፒታል	10	4	መርካቶ
12	ጉራራ	6 ኪሎ/ማርቆስ ቤ/ክ/	መርካቶ	9.9	7	መርካቶ
13	ጣልያን ኤንባሲ	4 ኪሎ	መርካቶ	9.9	3	መርካቶ
14	ቦሌ ቡልቡላ	ስታዲየም	ፒያሳ	12.3	5	ጊዮርጊስ
15	መገናኛ	4 ኪሎ	መርካቶ	10.4	4	መርካቶ
16	ኪዳነምህረት	አፍንጮ በር	መርካቶ	7.9	6	መርካቶ
17	ቄስቋም	5 ኪሎ	መርካቶ	9.1	3	መርካቶ
18	ቀራንዮ	18 ማዞሪያ	መርካቶ	7.3	5	መርካቶ
19	ሳንሱሲ	መድሀኒአለም ት/ቤት	ፒያሳ	12.8	38	ጊዮርጊስ
20	ድል ብር	ሩፋኤል	መርካቶ	8.6		መርካቶ
21	ፊሊ ዶሮ	18 ማዞሪያ	መርካቶ	8.6	5	መርካቶ
22	ሰሚት ኮንዲሚኒየም	cmc ሚካኤል/መገናኛ	ስታዲየም	14.3	4	ስታዲየም
23	ላንበረት	6 ኪሎ	መርካቶ	12	5	መርካቶ
24	ድሬ ሶሎሊያ ቡራዩ	አስኮ/መድሀኒአለምት/ቤት	መርካቶ	15.9	1	መርካቶ
25	ስታዲየም	ጎተራ/ሳሪስ/ቃሊቲ	ኢቃቂ	19		ስታዲየም
26	መርካቶ	ወለቴ/አ/ገና /ኬንቴሪ/	ሰበታ	25.5	4	መርካቶ
27	ሜክሲኮ	ሰፊራ	ገላን	14.9	10	ስታዲየም
28	አስኮ ሳንሱዚ	መድሀኒአለም ት/ቤት	መርካቶ	11.1	3	መርካቶ

29	አዲሱ ሰፈር ገብርኤል	ስታዲየም	መርካቶ	12.7		መርካቶ
30	ሱሉልታ	ወሰርቢ	መርካቶ	25.8	12	መርካቶ
31	ስታዲየም	4 ኪሎ	ሽሮ ሜዳ	7.4	3	ስታዲየም
32	ሃና ማርያም	መገናኛ	ስታዲየም	10.6	2	ስታዲየም
33	ኮተቤ ገብርኤል	መገናኛ	አራት ኪሎ	11.4	4	ጊዮርጊስ
34	ጀር/አደባባይ	ተግባረ እድ ት/ ቤት	መርካቶ	9.8	4	መርካቶ
35	ጀሞ አንድ	ላፍቶ	መርካቶ	15	3	መርካቶ
36	ካራ ቆሬ	ጣር ሃይሎች ሆስፒታል	ስታዲየም	11.7	4	ስታዲየም
36ልዩ	ካራ ቆሬ	ብስረተ ገብርኤል	ሜክሲኮ		3	ስታዲየም
37	ቀራንዮ	ዋቢ ሸበሌ	ጊዮርጊስ	12	3	ጊዮርጊስ
38	ጀሞ ሶስት	ጥቁር አንበሳ ት/ቤት	ስድስት ኪሎ	11	4	ጊዮርጊስ
39	ቦሌ ት/ቤት	4 ኪሎ	መርካቶ	9.6	3	መርካቶ
40	ካራአሎ	ላምበረት/4 ኪሎ	መርካቶ	17.9	3	መርካቶ
41	ኢየሱስ	4 ኪሎ	መርካቶ	8.5	3	መርካቶ
42	ቦሌ መዝናኛ	ገርጂ ሮባ	ሰሚት ኮንደምንየም	12.00	3	መገናኛ
43	መናገሻ	ድሬ ሶለሊያ/አስኮ/መድሀ/ት/ቤት	መርካቶ	30.2		መርካቶ
44	ለገዳዲ	ካራ/ላንበረት/4ኪሎ	መገናኛ		17	መገናኛ
45	ስታዲየም	ቀለመወርቅ ት/ቤት	ድል በር	8.6	3	ስታዲየም
46	ገርጂ	22 ማዞሪያ	አራት ኪሎ	11.2	4	ጊዮርጊስ
47	የነገው ሰው ት/ቤት	ፓስተር	መርካቶ	6	2	መርካቶ
48	ቦሌ ሚካኤል	ሰንሻይን	አዲሱ ገበያ	15.8	6	ጊዮርጊስ
49	ጨፌ አየት ኮንዲሚኒየም	ሲኤምሲ ሚካኤል	መገናኛ	11	6	መገናኛ
50	ኬንቴሪ	አየርጠየና	ጦር ሀይሎች	12	6	መርካቶ
51	**ቤተል**	**ጣር ሃይሎች ሆስፒታል**	**መርካቶ**	**10.5**	**4**	**መርካቶ**
52	ገርጂ	ሰንሻይን/ኢምግሪሽን	መርካቶ	14.1	6	መርካቶ
53	ቦሌ ሚካኤል	ግቢ ገብርኤል	ሽሮ ሜዳ	11.5	8	ጊዮርጊስ
54	ላፍቶ	ቄራ	ሜክሲኮ		5	ስታዲየም
55	ስታዲየም	4 ኪሎ	ጉራራ	9.5	4	ስታዲየም
56	ሳሪስ አቦ	ግቢ ገብርኤል	ሽሮ ሜዳ	14.2	6	ስታዲየም
57	ካራ	ሀና ማሪያም/መገናኛ	ስታዲየም	14.4		ስታዲየም
58	አለም ባንክ	ጣር ሃይሎች ሆስፒታል	ስታዲየም	12	2	ስታዲየም

58ልዩ	አለም ባንክ	ብስረተ ገብርኤል	ሜክሲኮ		3	ስታዲየም
59	ቤተል ሆስፒታል	ኮካ ፋብሪካ	ጊዮርጊስ	11.5	6	ጊዮርጊስ
60	ደብረዘይት	ቱሉ ዲምቱ/ቃሊቲ/ሳሪስ/ጎተራ	ስታዲየም	47.2	10	ስታዲየም
61	ጨፌ አያት ኮንዲሚኒየም	cmc ሚካኤል/መገናኛ	ስታዲየም	18	8	ስታዲየም
62	ሰበታ	ካራ ቆሬ/ቀጠና ሁለት	ስታዲየም	23.8	3	ስታዲየም
63	ሚኪሊላንድ	18 ማዞሪያ	መርካቶ	9.1	2	መርካቶ
64	መገናኛ	6ኪሎ	ጉራራ	9.5	5	መገናኛ
65	መርካቶ	ጣር ሃይሎች ሆስፒታል	አለም ባንክ	11	6	መርካቶ
66	መርካቶ	ጣር ሃይሎች ሆስፒታል	ካራ ቆሬ	10.5	6	መርካቶ
67	ጆሞ	ሳር ቤት	ስታዲየም	10.6	4	ስታዲየም
68	ጣር ሃይሎች ሆስፒታል	ግቢ ገብርኤል	ም.ሆስፒታል	10.2	1	ስታዲየም
69	ሳንሱሲ	ፒያሣ	ቦሌ ሚካኤል		3	መርካቶ
70	አዋሬ አደባባይ	ተግባረ እድ ት/ ቤት	አየር ጤና	12	2	ስታዲየም
71	ገርጂ መብራት ሃይል	22 ት/ፓሊስ	ባልቻ ሆስፒታል	10.9		ስታዲየም
72	ሃና ማሪያም	ዳማ ሆቴል	ሳርስ አቦ	4.9		ስታዲየም
73	ስታዲየም	ጣር ሃይሎች ሆስፒታል	ዊንጌት ት/ቤት	10.2	5	ስታዲየም
74	ሰሚት ኮንዲሚኒየም	ኡራኤል/ኢምግሪሽን	በግዮን መርካቶ		5	መርካቶ
75	6ኪሎ	ኦሎምፒያ	ቄራ	10.4	4	ጊዮርጊስ
76	መገናኛ	ሳሪስ አቦ	ገላን	18.2	5	መገናኛ
77	አየር ጤና	ብስራተ ገ/ኤል	ቄራ	5	4	ስታዲየም
78	መገናኛ	ዋቢ ሸበሌ	ጎፋ ካምፕ	12.4		መገናኛ
79	አራት ኪሎ	መገናኛ/ሰሚት መገንጠያ	ሳሚት ኮንዲሚኒየም	14.7	2	ጊዮርጊስ
80	ሽሮ ሜዳ	ስድስት ኪሎ	መገናኛ		4	መገናኛ
81	6ኪሎ	መድሀኒአለም ት/ቤት	ሳንሱሲ	11.1		ጊዮርጊስ
82	ጎሮ አደባባይ	22 ት/ፓሊስ	ባላቻ ሆስፒታል	14.6	10	መገናኛ
83	ጨፌ አያት ኮንዲሚኒየም	cmc ሚካኤል/መገናኛ	6ኪሎ	18	3	ጊዮርጊስ
84	ኮልፌ ዕፎይታ	ኮካ ፋብሪካ	ስታዲየም	9.5	2	ስታዲየም
85	መርካቶ	ታጠቅ ኬላ/መናገሻ/ሆለታ አራዳ	ሆለታ	45	4	መርካቶ
86	አየር ጤና	ጋርመንት	ሳሪስ አቦ	12.3	2	ስታዲየም
87	ውንጌት ት/ቤት	ጣር ሃይሎች ሆስፒታል	አየር ጤና	10.5	7	ስታዲየም
88	መርካቶ	ወሰርቢ/ሱሉልታ	ጫንጮ	40	1	መርካቶ

89	መርካቶ	ለገዳዲ ማዞሪያ	ሰንዳፋ	44	4	መርካቶ
90	ቤተል ሆስፒታል	ጣር ሃይሎች ሆስፒታል	ስታዲየም	10	5	ስታዲየም
91	ከአዲስ ከተማ	ሰበታ/ተፍኪ	ተጂ	52	2	መርካቶ
92	ሃና ማርያም	መካኒሳ ሚሸን	ባልቻ ሆስፒታል	9.6	2	ስታዲየም
93	ቦሌ ቡልቡላ	ሳሪስ አዲሱ ሰፈር/ቦሌ ሚካኤል	መገናኛ	15.2	4	መገናኛ
94	ፒያሳ	መድሀኒአለም ት/ቤት ሩ	ሚኪሊላንድ	9.9	2	ጊዮርጊስ
95	መርካቶ	ታጠቅ ኬላ/መናገሻ/18ማዞሪያ	አዲስ አለም	47	2	መርካቶ
96	መገናኛ	ገርጂ መ/ሀይል	ቦሌ ለሚ	9.2		መገናኛ
97	መገናኛ	አያት አደባባይ/አባ ኪሮስ	ለገጣፎ ሚሸን ት/ቤት	15.8	5	መገናኛ
98	ዱከም	ኮራ ማሪያም/አቃቂ/ቃሊቲ	ሳሪስ አቦ	26.3	3	ስታዲየም
99	ከአየር ጤና	ጀሞ	ሰበታ		4	ስታዲየም
100	ከጀሞ	ደሴ ሆቴል	መርካቶ	14.5	5	መርካቶ
101	ከመገናኛ	መሪ	አባ ኪሮስ አደባባይ	12	5	መገናኛ
102	ካራ	መገናኛ	ስታዲየም	13.7	5	ስታዲየም
103	**ጊዮርጊስ**	ሰሳር ቤት	ጄሞ	12.2	6	ጊዮርጊስ
104	ቄራ	ዮሴፍ ቤ/ክ	ቃሊቲ	8.3		ስታዲየም
105	አንፎ ሜዳ	ጦር ሀይሎች	ስታዲየም	12	4	ስታዲየም
106	መገናኛ	ሲኤምሲ ሚካኤል	ቦሌ አራብሳ	10.8		መገናኛ
107	ሳሪስ አቦ	ቃሊቲ	አቃቂ ቆርቆሮ	11.4		ስታዲየም
108	አስኮ አዲሱ ሰፈር	መሳለሚያ	ፒያሳ	9.3		ጊዮርጊስ
109	ሳሪስ አቦ	ቃሊቲ	ቱሉ ዲምቱ	12	3	ስታዲየም
110	ስድስት ኪሎ	ሳሪስ አቦ/ቃሊቲ	ቱሉ ዲምቱ	24.9		ስታዲየም
111	ፒያሳ	ሳነሱሲ	ድሬ ሶሎሊያ	16.6	3	ጊዮርጊስ
112	ክብ መስመር	6ኪሎ/18 ማዞሪያ/ለቡ መ/ሀይል/ቦ	ክብ መስመር	47.3	8	መገናኛ
113	መገናኛ	ጎሮ	ኮዩ ፈጨ	8.1	9	መገናኛ
114	ገላን	ቃሊቲ /ሳሪስ /ጎተራ	ስታዲየም	7.9	5	ስታዲየም
115	ሰፈራ	ሳር ቤት	ሜክሲኮ	9.4	8	ስታዲየም
116	ጀሞ ቁጥር 2	ጀፕ	መካኒሳ ሚካኤል	5.6	2	ስታዲየም
117	ሀይሌ ጋርመንት	ሳር ቤት	ሜክሲኮ	9.2	12	ስታዲየም
118	ከታጠቅ ኬላ	ታጠቅ ገብር/ል/ፍሊዶሮ/18 ማዞሪያ	መርካቶ	18	2	መርካቶ
119	መገናኛ	cmc አደባባይ	ስሚት ኮንዶሚንየም ገቢ	9.2	4	መገናኛ

120	መገናኛ	ጎሮ	ቂሊንጦ	12.1	6	መገናኛ
121	ቱሉ ዲምቱ	ሀይሌ ጋርመንት	ሜክሲኮ	10	14	ስታዲየም
122	አራት ኪሎ	አዲሱገበያ/ፍተሻ	እንጦጦ ማሪያም	16.6	2	ስታዲየም
123	መገናኛ	ወሰን	አባሎ ኮንደምንየም	12		መገናኛ
124	መገናኛ	ገርጂ መ/ሀይል	ቱሉዲምቱ	26	21	መገናኛ
125	መገናኛ	ቦሌ ሚሊኒየም	ሀይሌ ጋርመንት		8	መገናኛ