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Assessment of infrastructural integration of public transport system and its effect on service provision: The case of Mexico area Addis Ababa

By

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

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DECLARATION

I, the undersigned, do hereby declare that this research work titled "Assessment of infrastructural integration of public transport system and its effect on service provision: The case of Mexico area Addis Ababa" is my own original work, prepared under the guideline of Dr. Dagnachew Adugna and it has not been submitted to any other university/ institutions for any degree/ diploma & for other purposes. Materials and information used in this study other than my own are dually acknowledged and cited.

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CONFIRMATION

The research completed by Sisay Fantahun Abate titled "Assessment of infrastructural integration of public transport system and its effect on service provision: The case of Mexico area Addis Ababa" is conducted under my supervision, and it is submitted to the school of graduate studies of Addis Ababa university in partial fulfillment of the requirements for the Master's degree of Urban Planning.

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As a member of the Examiners board of the final Master's thesis open defense of Sisay Fantahun, we have read and evaluated the Thesis prepared by Sisay Fantahun entitled "Assessment of infrastructural integration of public transport system and its effect on service provision: The case of Mexico area Addis Ababa" and recommended to Ethiopian Institute of Architecture, Building Construction and City Development, Addis Ababa University to accept the Thesis for the Fulfillment of Requirements for the award of Degree of Master 's of Science in Urban Planning.

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Abstract

Public transport interchange integration is essential in easing the drawbacks that arises form making transfers. Ease of movement is the driving force of city development. Well integrated interchange smoothens trips and promotes business and educations to flourish. and so the planning process must be done with that notion behind. This study is targeted at investigating the Mexico area public transport interchanges to check for level of integration, user satisfaction and driving factors. The study location is in Addis Ababa's heart and near its central business district, which is the Mexico terminal stations. These stations are grouped in to six zones with varying trip direction/destination. In order to conduct the study a survey was conducted intercepting 428 transport users. The survey used variables to measure walking distance and a 5-point Likert scaling for service satisfaction. In addition, to get to the back story and planning process government stakeholders at Addis Ababa city transport bureau were interviewed. The results of the study revealed an average transfer distance of 364 meters crossing as much as three streets to make transfers. The discovered walking distance measures longer than conventional transport depo facility. Furthermore, the observed service was rated poorly across 18 variables that checked for information, time, movement, access, convenience, safety and emergency procedure. Moreover, it was revealed that government priority has shifted away from planning and executing transport interchanges to acquiring new fleets. Another point that was discovered was the change in administration and its consequence. As new administration arrived political will shifted away from interchange planning. The last finding of this study was lack of accountability towards negative actors on site. There was no solution provided after a significant portion of one of the stations was engulfed with construction. Even though a pilot project at Merkato showed how integration can be solved it quickly fail to administrative defects that officials pointed could hamper healthy operation. This study recommends the planning of a one roof interchange where users experience is part of the planning process.

Key words: Infrastructural integration, user experience, administrative process

Acronyms /Abbreviations

NMT	non-motorized transport
IPT	intermediate public transport
MMPT	Multimodal public transport
CCTV	Close-Circuit Television
AMPTI	Assessment Methodology for Public Transport Interchanges
LRT	light rail transit
AATB	Addis Ababa city transport bureau
SPSS	statistical package for the social sciences

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CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Transport operators provide service to important origins and destinations, but it is too expensive for them to provide direct service between all sites, therefore there will inevitably be some exchange stations (Rivasplata, 2003). What Travelers dislike the most about public transportation are stations (Yiu Kwok Kin, 2005). According to (Miller, 2004) Infrastructural integration of public transport involves establishment of points of transfer for transport users that are planned giving consideration to location, facilities, vehicular and pedestrian movement to create a conflict free and safe environment for transfer between modes.

Infrastructural integration encourages coordinated vehicular movement to foster a pedestrian-friendly and secure environment. Intermodal integration strives to coordinate and promote seamless, practical services of excellent quality in order to reduce the disruption of the interchanges (Saliara, 2014). It is essential for raising transportation service standards and boosting ridership (Vuchic, 1999).

User-friendly facilities and interconnections for riders that help them move more easily and reduce inconvenience imply an improved integration of public transport modes. In addition, a coordinated integration of different transport modes results in reduced congestion on the road, convenience to commuters, efficiency and cost effectiveness for the overall system (A. Aziz et al., 2018).

The existence of multiple transfers and the simultaneous operation of different modes necessitates coordination, cooperation and interaction among them to guarantee the image of a one unified system without creating confusion for commuters or revealing any interruption in the service provided (Saliara, 2014).

In Addis Ababa, the public transport sector sees 3.6 million trips happen on a daily basis. The current modality of the city encompasses 10,000 white and blue minibus taxis with 12 people capacity, 460 Higer Midi-buses that can accommodate 22 – 27 people and 487 Anbessa city buses with a total capacity of 100 people. In addition 6500 saloon taxis that seat four people as well as animal drawn carts used in mostly expansion areas (Fenta, 2014).

In September 2015 a 34 km long light rail transit was introduced to Addis in two lines, the North – south corridor and east - west corridor with 60,000 – 80,000 passengers per hour (Andualem & Takele, 2018). Besides, more recently, the city has seen a boom of ride hailing and booking startups that mandated private car owners and salon taxi operators as service providers and the middle body (a technology firm or software) as a source of customer. Pioneering this category is zay ride, which started operating in the city since July if 2016 (Dahir, 2019).

It is a city that hosts the federal and the Oromia regional governments. In addition, it is a center for international organizations such as United Nations Economic Commission for Africa (UNECA), African union and diplomatic organizations (FDRE transport master plan study, 2007). The fact that a city of this caliber lacks substantial review of its intermodal interchanges necessitates a further study on the matter; as such, this study hopes to contribute a case measured at one interchange location in the heart of the city that has a varied modal activity.

1.2 Statement of the problem

According to (Abreha, 2007) the prominent mode of transport within Addis Ababa is walking accounting 60 – 70%, while 98% of vehicular movement is covered by taxies and buses 72% and 26% respectively. On the other hand (ERA, 2005) argues the dominant public transport mode are buses and taxies with 40 % and 60% shares respectively. Such figures beg the question about the city's public transport interchange integration and how it can affect its future growth?

Responsibilities and structure of the city's transportation and infrastructure system are illustrated by (Abreha, 2007) as follows, public and private transport in the city is overseen by the transport authority while the roads are managed by the city's road authority AACRA. According to this fact, observed situations pertaining to public transport integration can be attributed to the city government's handlings.

Looking at other cities such as Singapore (Ibrahim, 2003) discussed the prevalence of various prominent service providers such as mass rapid transit (MRT), light rail transit, and taxi among others. According to (LTA, 2001) public transport system integration has helped the city to combat the situations related to scarce land for habitation and high population density. Thus facilitated in the creation of a successful transport system. Comparing Addis Ababa to the case of Singapore might be in appropriate but it helps show the gap in the coordination of government offices.

The aim of this study is first to identify the degree of infrastructure integration and how this affects the commuters. It is observed at the study site that transport users experience added time to traverse between transport interchanges which exposes them to environmental and safety factors. In addition, due to physical separation of interchanges, pedestrian activity of the site is increased, especially at crossing areas, which further leads to vehicular congestion as interchange point are distributed on opposite sides of the roads. The study also focuses on the cause of the observed level of public transport interchange integration to be able to propose markers that might lead to similar occurrences in other areas of the city.

1.3 Research objectives

1.3.1 General objective

To investigate the level of public transport interchange integration, its direct implication on commuters and the story behind the norm that is observed.

1.3.2 Specific objectives

- Identify the level of infrastructural integration as it relates to individual stations
- To investigate the effect of the observed level of integration on the commuters
- To explore the story behind the observed case and the causing factor

1.4 Research questions

1. What is the level of infrastructural integration of the public transport interchange of the study site?
2. What are the impacts of experienced by commuters pertaining to the observed level of integration?
3. What are the causing factors of the observed level of integration?

1.5 Significance of the study

This study would be a constructive element for future assessment and evaluation of similar interchange/stations throughout Addis Ababa. The government bodies such as Addis Ababa Transport Authority, city administration and private investors could make use of the findings for

their current and future endeavors. What the study wants to achieve is directly focused on the integration of public transportation interchange system and what that implies to its users, as well as the reason behind the observed state of the interchanges. Furthermore, it could be a starting point for further research for urban and transport planners whose hope is to conduct a study in a similar area.

1.6 Scope of the study

The study location is kept in Addis Ababa more specifically at the Mexico area (lideta sub city), the location encompasses the roundabout and the immediate transportation interchanges that serve destinations of Torhailoch, Garment, Lafto, Megenaga, Piassa, 4 kilo... etc. In addition, the time scope of the study is February of 2020 – December of 2022.

1.7 Organization of the document

This study is organized in to five chapters.

- Chapter one focuses on the background of the study, statement of problem, objectives of the study, research questions, scope and limitation of the study'
- Chapter two deals with review of findings of previous researches, approaches, methodology and gaps
- Chapter three discussed methodology of the study
- Chapter four presents result of survey and discussion
- Chapter five concludes and provides recommendation based on findings

CHAPTER TWO: REVIEW OF RELATED LITERATURE

2.1 Introduction

The aims of this study are to measure the level of multimodal public transport interchange integration at the Mexico area, and how the measured level of integration affects commuters in their experience and lastly, to understand the cause of such recorded levels to make recommendations to institutional frameworks. This study takes a sample transport hub at the city center but the tools utilized can be reused at other interchanges within the city. Therefore, the study can be a constructive addition to the transport-planning sector.

This chapter explores the literature behind multimodal public transport interchange integration, and the methods utilized to measure it. The review observed case studies of different cities to deduce fruitful approaches in answering the research questions. In addition, past studies related to the effects of inefficient transport interchange integration on commuters were reviewed to identify ways to measure user satisfaction and note their observation. Furthermore, as one of the objectives of this study, this chapter looks deeper in to systems and operation checklists that unravels how planners administer the transport sector. Finally, the chapter is concluded with a summary of the reviewed literature and the observed gaps.

2.2 Public transport interchange integration

In Poland Integrated interchange is defined by (Joournal of laws 2011, 2011) as a location where a comfortable change of transport mode undertakes. In addition, the location should encompass passenger infrastructure such as parking space, transportation stop, ticketing area and information on transport line status. Moreover (Heddebaut & Di Ciommo , 2018) define interchanges as a means for mutual integration among various and collective transport modes, including NMT (Non-motorized transport)

2.2.1 Transport terminal

Terminals could afford commuters the opportunity to remain connected while travelling across different mode networks. Such as, city bus, NMT, rapid transit, and private cars. Terminals could encompass a bus terminal, metro stations, and Multi-modal hub (Arora & Chandra).

The settings at terminals, such as the walkability, walking distance, weather, safety and availability of parking area significantly affects commuters' choice to connect to modes (Duncan & Cook, 2014).

2.2.2 The effects of failed interchange Integration

Most daily trips reveal the necessity to combine varied transport modes for commuters to reach their destination. This results in transfers between modes, which takes away the appeal of public transport (Guo & Wilson, 2011). As stated by (Lam & Xie, 2002) the satisfaction of transport users is affected by transfers. In addition, (Liu et al., 1997) mentioned, the opportunities for direct trips on public transport is becoming scarce and so, transfers are commonplace for most trips.

Most scholars agree on the disruptive nature of transfers at interchanges. For instance, (Hine & Scott, 2000) argue transfers affect the user's awareness in use and path choice. While (CTPS, 1997) regards transfers to be disruptive and have a travel disutility which discourages users.

One other deterring factor of transport service is access and egress. According to (Guo & Wilson, 2011) commuters satisfaction on rail journey is usually affected by the time spent on access and egress stages. (Krygsman et al., 2004) Coined it as the weakest part of the transport service but also with wait and transfer time. When mixing the accessibility of such places to elderly people, visually handicapped and physically disabled in the ever-evolving nature of transport system it will restrict their movement (Sun & Lau, 2021).

2.2.3 How to rectify transport interchange integration drawbacks

One way to increase efficiency of MMPT (Multimodal public transport) as proposed by (EU, 2016) is to reduce the separation distance between train, bus and NMT stops. This notion is shared by (A.F.D, 2014) in which, the efficiency of MMPT network can be amplified by physically drawing the varied modes in to a closed or open system facility.

(Monzon et al., 2016) Argued seamless mobility can be achieved by reducing the disruption of transfer between modes. One way to achieve that is to make it affordable. Therefore, (Miller A., 2004) suggests physical integration cab be applied without introducing major changes to the

existing transport network. Such endeavor is more convenient and economical for developing nations.

2.2.4 Features of an integrated public transport interchange

According to (Hussen, 2016) integrating MMPT is a challenging endeavor and that a robust cooperation and coordination among various stakeholders is required. To add to that (A.F.D, 2014) reflects the necessity of advanced financial and institutional framework. (Saliara, 2014) Argues a neutral Umbrella authority needs to unify the various stakeholders with autonomous metropolitan authority.

The other challenging factor of MMPT integration is location. (Terzis & Last, 2000) Argued interchange development should emphasize on a place with vast number of public transport mode intersect and with high volume of users. On most occasions, such places are deep inside city centers. Therefore, (Hussen, 2016) Highlighted locating such entities along the city center will demand free space or the compensation payment to acquire one.

The comfort aspect of interchanges has the possibility to be overlooked but, (Monzon et al., 2016) suggest consideration to comfort, security and reliability are becoming crucial elements. Furthermore, (Terzis & Last, 2000) reflect notion about attractiveness of interchanges, giving attention to physical and psychological reaction of users.

The consideration of handicapped people goes beyond people with reduced mobility but also others (Nosal hoy & Rogala, 2019). (Bühler et al., 2006) Suggests people who are deaf or hard hearing, or suffers of different sensory, psychological or intellectual disabilities as well. In addition, as stated by (Bühler et al., 2006) individuals with communication and perception problems such as foreigners who cannot read the local language and those who cannot read should be included in the above category. Other scholars such as (Pashkevich & Puławska, 2015) argue people with a heavy luggage; pregnant women and children should be included.

As stated by (Lucietti et al., 2016) the fundamental elements that make up an interchange are accessibility to the interchange, infrastructure, information services for the passengers, rental services and facilities. Furthermore, (Olszewski et al., 2014) suggest clarity, ease of disembarkation, comfort while waiting, safety while waiting and accessible security are essential.

Integrated as part of an interchange (Wilson & Yariv, 2011) point out three different areas: access/egress, the facilities and retail area. In addition to that, (Hernandez, 2015) further elaborates the importance of adequate lighting, clear line of sight and CCTV (Close-Circuit Television). Aside from security (Hammer et al., 2014) suggested reducing the distance between modes and integrating helpful aid of staff along the way should gain a focus.

What is becoming clearer is that information is essential that is why many scholars support its incorporation in to the system. Beyond that though (Hernandez, 2015) also reflected co-ordination between operators and transport services should be realized.

2.2.5 Fruits of integrated transport interchange

As pointed by (Maxwell, 2003) a well-integrated system turns the dreadful transfer stage to a beneficial part of the journey, thereby creating a holistic condition for users. This notion is also supported by (Berlepsch, 2018) which says, physical integration of different modes will decrease inconvenience and proximity among modes would confirm accessibility. Comfort was the outcome suggested by (Krygsman et al., 2004) as facilities would provide comfortable walking space, and environment.

(Miller A., 2004) Argued physically integrated transit system allows various types of travel needs and services. Apart from the user point of view (Tsami et al, 2013) explored how smart urban interchange encourages urban integration, a better use of waiting time, information rich, clean, safe and seamless transport service.

2.3 Measuring transport mode interchange integration

Proposed by (Bryniarska & Zakowsa, 2016) for a complete analysis of a selected interchange in Poland takes in to consideration the distance between tram/bus within the interchange. In addition to such figures, quality of the infrastructure such as the stops, footpath, and the availability of information were considered. On a similar note (Chauhan et al., 2021) inspected the transfer environment, important facilities, travel information, accessibility, comfort, convenience, staff management, ticketing and how these aspects affect the quality of service.

Other scholars focused on the user's end such as, (Lambas & Monzon, 2010) the performance of an interchange can only be evaluated by satisfaction of the users. In the same way (Lam & Xie, 2002) suggested traveler survey can assist in better understanding of the matter as well as become an effective tool in interchange development. Also (Lee, 2013) reflected the importance of user perception and how it can satisfy their needs.

According to (Espino et al. , 2021) there are four vital components of an urban public transport journey. These are the access/egress, walk time, waiting time, transfer between different legs of a trip and security inside and outside of a vehicle. Speaking of mode integration (Cherry & Townsend, 2012) used ordered logistic regression methodology on metro and bus services to conclude users were highly dissatisfied.

As stated by (Bryniarskaa & Zakowskaa, 2016) the assessment criteria for interchange evaluation can be a quantitative measure for both the interchange as a whole and its individual components. The indicators for the entire facility include compactness, visibility and additional facilities. When it comes to the spatial compactness it can be determined in two ways, one on the basis of the arithmetic mean of distances between all stops inside and second weighted average passage length and the flow of passengers using this passage. The visibility index is the arithmetic mean of number of tram/bus stops that are visible from every other stop. Lastly, the indicator for additional facilities is taken as a percentage of possible extra facilities. The quality of platforms and accessibility consider elements such as warning tiles with different color inset.

In Poland using the AMPTI (Assessment Methodology for Public Transport Interchanges) (Krukowska et al., 2014) put out a methodology with eight important indicators such as compactness, legibility of the node, additional equipment, core infrastructure, accessibility, safety and information.

According to (Haider et al., 2018) the Lahore public transport interchange design decisions sought for key design decisions to facilitate the transfer of passenger between modes, these are, the quantity of bays for passengers for disembarking or embarking, adequate platform size to handle ques, the walkway distance to minimize waiting time, an efficient fare collection, and information and wayfinding points.

Most importantly as pointed out by (Terzis & Last, 2000) interchanges should meet sustainability standards and should be desirable by users as their psychological responses are considerably affected by the design.

2.4 Measuring the impact of Transport interchange integration on the user

The public transport certification process (UNE-EN 13186, 2003) defined several terms including, customer satisfaction measure which is the level of quality that is covertly or openly expected by the users. In addition, the perceived quality level which is their experience with the service. On the other hand, the service provider targets some level of qualities and delivers effectively the level quality observed on site. Similarly (Parssuraman et al., 2002) Tried to assess the distinction between the perceived service quality and satisfaction, and so it was found to be, the perceived service quality is a global attitude relating to the preeminence of the service. In the other hand, it was found that satisfaction is related to a specific transaction.

(Hine & Scott, 2000) Undertook a series of focus groups as well as detailed interviews of public transport and car users in Scotland in order to determine how interchange is considered. In addition, to explore how the resulting perception affects public transport use. Through that endeavor, they have recognized some aspects correlated with a poor quality interchange character.

- The poor quality nature of the waiting environment
- Paying for facilities such as toilets that were also referred to as inadequate
- Poor provision of information
- unreliable telephone information services
- Personal security issues
- Poor lighting of facility
- Confusing ticketing and pricing systems
- Long distances between elements
- No public telephone
- Poor signage
- Unavailable staff members
- Difficulty of finding directions between modes

As reflected by (Hernandez et al., 2016) the five scale likert can be used to assess public transport users' experience. Such endeavors assessed travel information, wayfinding, time, movement, comfort, convenience, attractiveness, safety and security. A study done in Oslo by (Lunke, 2020) found that efficient transport routes with brief waiting time are more essential than short distance to stations. This notion is shared by (Lois et al., 2018) where reducing transfer disruption is key for seamless mobility. In addition, the author analyzed how attitudes towards various service factors forecasts general satisfaction.

To analyze user satisfaction (Silva & Bazrafshan, 2013) used structural equation model on eight transport interchanges to discover satisfaction increased with availability of guidance sign and decreased with graffiti. Supporting this notion is a study done by (Iseki & Taylor, 2010) who utilized ordered logistic regression at Los Angeles station to learn satisfaction was highly influenced by environmental safety and reliable transport rather than stops integration.

In studies done in the Netherlands 300 passengers were selected randomly to share their experience of the station off and on peak hours. The passengers were asked to rate six aspects namely, ambience, comfort, access, orientation, staff, safety and cleanliness. This tool was called the station experience-monitoring tool (Van der Hoeven et al., 2013). In addition according to (Ifigeneia et al., 2015) the above questions extra, ones were utilized to gain information about travel characteristics such as mode used, travel purpose, frequency of mode usage, and socio economic questions.

Apart from the environmental aspects scholars also studied about architecture. (Cascetta & Carteni, 2014) Utilized a comparative analysis of two rail stations with the major difference being their Architecture and the finding of the study showed females were highly affected by their travel choice related to the quality of the Architecture.

In Australia a railway station usability principles for the government of Victoria put forward seven principles to bolster effectiveness of a station: these are, accessibility, ease of navigation, comfort and amenities, information, safety, local area integration and community ownership and activity (The station user panel, 2011).

(Sara Hernanez, 2015) utilized a survey to assess the user satisfaction, preference for and choices of certain elements at urban transport interchange. The study selected 37 observed variables to

base the questionnaire on and made use of the 5-point Likert scale, which it deemed was the widely used method on the sector. The questionnaire was designed around the following 37 observed variables.

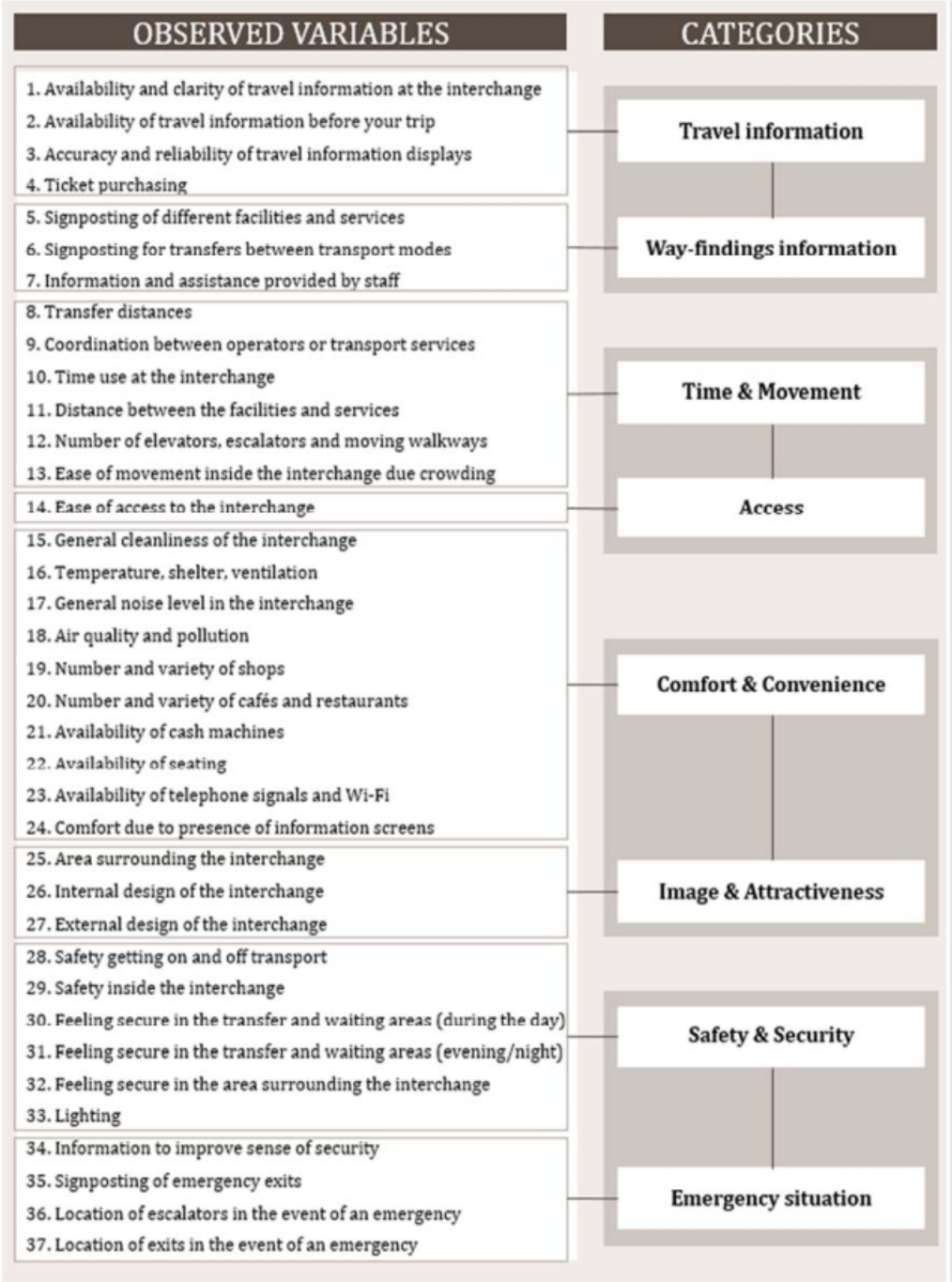


Figure 1List of observed variables in the travelers' satisfaction survey. Source the assessment methodology to make urban transport interchanges attractive for users

2.5 Attributable causes for public transport integration failure

A professional public service is characterized by the prevalence of accountability and responsibility of the stakeholders. Such bodies will show effectiveness, simplicity, transparency, efficiency, timely, responsive and adaptive standing (Suwarno & Ikhsan, 2006). One such endeavor governments could take is illustrated by (Suwarno & Ikhsan, 2006) the role of the government is important in passing policies that aim to harmonize transportation problems, one such program can be encouraging mass transit.

As discussed by (Edvardsson, 1997) service system includes resources that are paramount for execution of services. These can be achieved by meeting customer needs. This system consists of the users, the organizational structure, management, staff and technical resources.

The international association of public transport includes integration of modes as part of its 16 best practices. On its list coordination of modes was exemplified by common ticketing system, ease of transfer and expansion of routes to new users in a variety of mode options (Edwards & Stewart, 2008).

A case study of the Jakarta system that was analyzed by (Wijaya, 2009) shows how the role of the government was diminished only to providing licensing and how it lacked the ability to comprehensively monitor routes. Most of the bus transport operators are privately owned. Government oversight is so loose that a route could have 50% overlap with other routes. In addition, in this study quality of service was highly neglected running the system's punctuality, convenience and safety.

A further dive in to the Jakarta system by (Wijaya, 2009) reveals complex working structures. Although the planning and execution of traffic and transport decisions is given to an agency, the real power lays over the local development board and parliament. But public participation is a rarity to add to that since the Jakarta system lays inside the capital, the central government also plays a role.

2.6 Summary of reviewed literature

The reviewed literatures, all, agreed on the matter of a comfortable, efficient and safe environment where users could transfer between different transport modes. But when we dive deeper into each scholar's notion, it is obvious that various methods are utilized to reach such conclusions. On this portion of this chapter such methods will be identified and presented.

Raised topic	Summary
Terminology and definition	When it comes to integrated transport interchange all scholars agree on the definition – a comfortable and effective location where transfer of transport mode occurs. Building upon this foundation each scholar raise their own focus such as NMT, walkability, and technical aspects
The image of a dysfunctional interchange	Transfer is a disruptive and unavoidable part of commuting. It takes time, comfort and capacity which later deter user's motivation towards using public transport. The notion of accessibility is a major drawback on interchanges as their service should be inclusive.
Solution to a dysfunctional interchange	Minimizing separation distance between modes can greatly solve transfer issues.
The features of functional interchanges	- Cooperation between planning, financial and local authorities is essential. In addition, - Locating an interchange where intersection of services occurs - The importance of comfort, appeal and security to satisfy users - Being accessible to all (special needs, those who can't read, those with luggage…)

	- Information and wayfinding
Benefits of a functional interchange	- Time saving, safe, seamless, and comfort
Measuring level of integration	- Distance of separation, quality of infrastructure (stops, paths, information boards, wayfinding) were one set of metrics used for evaluating an interchange - Comfort, staff support, ticketing and accessibility (for special needs, those with luggage, pregnant women) were pointed out based on user experience - Access/egress, security, waiting and walking time were addressed as a vital component that need to be measured - Infrastructure facilities, visibility index (the average number of stops visible from every other stop) are ways to assess special compactness - The eight AMPTI indicators are all intersecting with other metrics
Assessing the Impact of dysfunctional interchange integration	- The five scale Likert scale can be used to assess user satisfaction on the infrastructural provision of an interchange - Safety, waiting time, and wayfinding were among the most sought after qualities at interchanges - Architecture and its role in influencing user mindset - Aside from all the desirable qualities expected from an interchange the Australian government also included the aspects of local integration of interchanges and their impact on their surrounding community

Attributable causes	A case study done in Jakarta revealed that the complexity of governance and the sheer private ownership of modes created an uncomfortable and overlapping routes that neglects some of its users. In addition the absence of public input deprives effectiveness of the provided service

Table 1 Summary of reviewed literature. Source: Researcher

2.7 Research gap

The reviewed literatures highly reflect the realities of the developed world and not the actual g-round situation for countries such as ours. From what is observed here, there is a lack of information and study done on Addis Ababa city public transport interchange. Especially when incorporating the varied modes that are in operation as it can cast a knowledge hole on the sector.

The metrics used to analyze interchanges are relating to a different transportation culture owing to the fact that here there are unique modes of transport that doesn't exactly fit into the western institution. In addition, the cultural, social and economic situation doesn't go on the same level as the Europeans or North American. Lastly, the planning and administration culture is also different. These factors are part of the observed gap.

All the peculiar qualities that we hold demands an assessment that is worthy of the locality. Therefore, this study aims to contribute and possibly nominate a literature for future studies in Addis Ababa.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Description of the study Area

Addis Ababa, is the largest metropolitan area and one of the two City Administrative states of Ethiopia, it serves as a seat of international organizations such as AU, ECA, EU office, and Embassies for foreign countries; it is the political and economic capital of Ethiopia and the center for Africa. Addis Ababa is located at the east of Africa on the geographic coordinate 8.9806° North latitude and 38.7578° East longitude, at the edge of the great east African rift valley. The highest point in the city is rather on the north side just outside the border at mount Intoto at 3200 m above sea level. With 527 square kilometers of area the city has a population of 7.178 million as of 2018 (Population of Addis Ababa, 2019).

The city hosts a variety of transportation modes such as city bus, express bus, higer bus, mini bus, blue taxies, Bajaj and recently introduced LRT, meter taxies and ride (private vehicle taxi service). The population of Addis Ababa has been growing fast specially in the 1960 and 1970s. The growth is expected to continue. According to the 1994 census, the population of Addis Ababa was 2.3 million. Modest estimates of the population in the year 2015 vary from 4.1 million to 4.6 million while the United Nations Development Program has given an estimate of 6.6 million people in 2015. Much of the population growth is expected to happen due to internal migration of people from rural areas to Addis Ababa (Meron Kassahun, 2007).

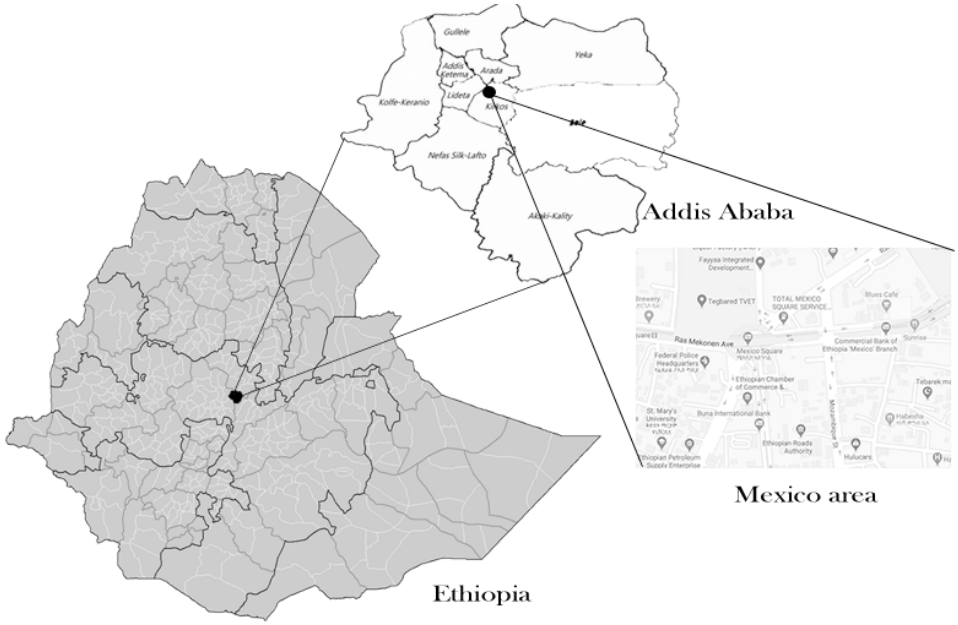


Figure 2 Location map - Addis Ababa Mexico Area Source: google & researcher

3.2 Site selection criteria

The study area was selected due to the following factors

1. The unique geographical situation – being located at the center of the city it is connected to all the other interchanges via a transport mode
2. Its where the LRT meets the conventional road transportation, the LRT line goes from north to south as well as east to west, but starting from Stadium to Lideta the two lines run together, Mexico is the Mid-point where the greatest number of transport users can be attained
3. The fact that it is located near the CBD of the city makes it ideal to conduct the study, as commuter arrive from all sides of the city to stay or to traverse
4. It's part of the main east to west traffic corridor, that makes it a sensitive site and so deserving of a study
5. Most modes of public transportation operate at this location except – Bajaj

The individual stops at the study area are: – Bole + 4 kilo taxi drop off and intake point, Megenagna + 22 + Kasanchis +Piassa drop off and intake point. Lafto + saris drop off and intake point, Jemo + garment drop off and in take point and lastly Torhailoch + Abinet drop off and in take area (grouped under six main zones) for the sake of this study. It should be considered that the mentioned destinations are not the only ones served by Mexico terminal but others do exist for example – taxi for hire services are free to operate wherever necessary although some act as a supplementary to mini bus routes, the others are (Kera, Lideta, Filwuha, Stadium, Sarbet, Mekanisa, and others), short length routes that are generalized under their respective longer routes.

Mini bus taxi, Higer bus, city bus, express bus, taxi for hire, LRT that operate under the five main zones with in the Mexico interchange are studied and analyzed; data is collected on site, as well as the respective government office.

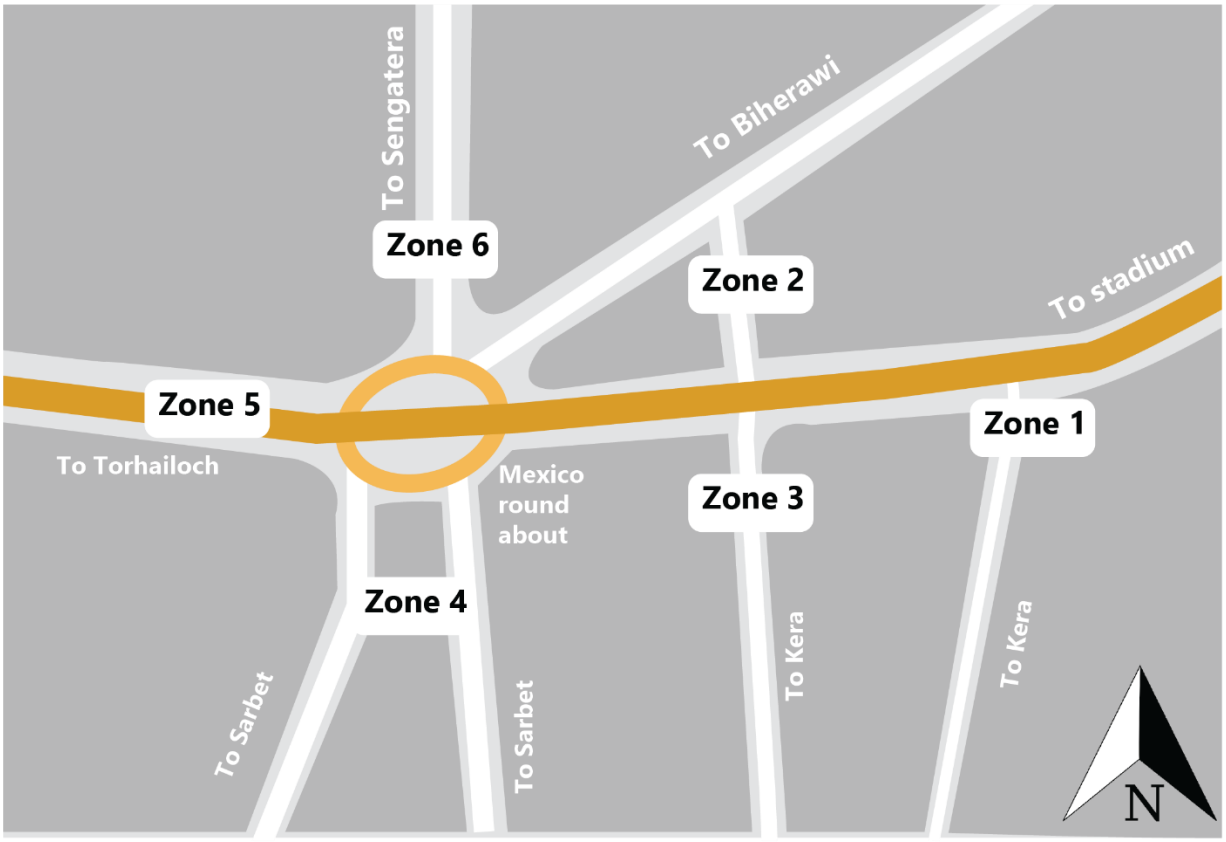


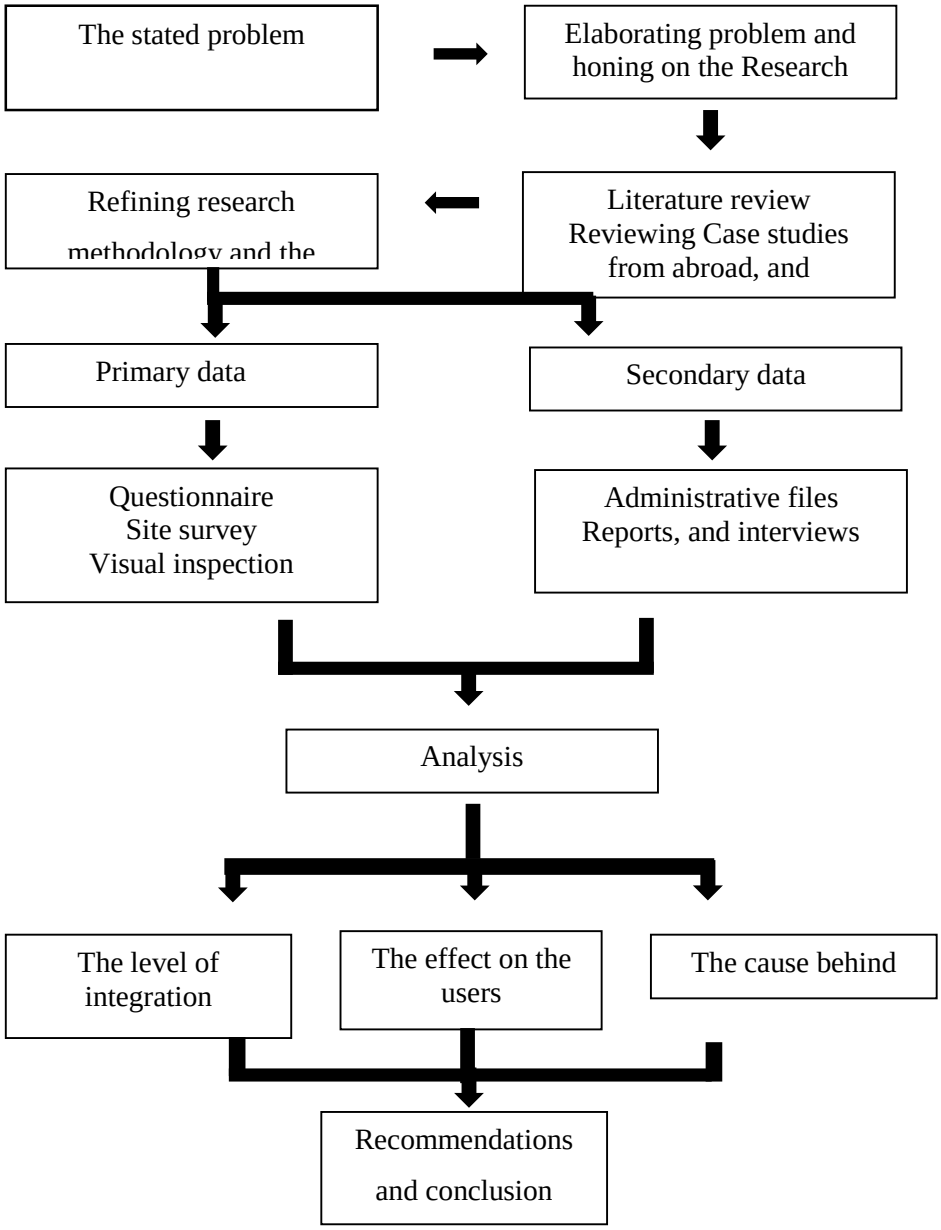
Figure 3 Study area division illustration. Source the researcher

3.3 The research design

3.3.1 The research process

The objectives of this study are to measure the level of integration of various transport modes, to assess the effects that the users face on the observed level of integration and to go behind the cause for the observed integration. In order to collect data and reach to results site surveys, stakeholder interviews and observations were made.

Figure 4 The research process Source the researcher



This study is an exploratory research which hopes to measure existing conditions on the study site to identify city transport interchange integration situations. In order to achieve that goal, the study involved site survey of transport users, stakeholder opinions and observations based on the methods taken from other similar studies.

3.4 Data sources and types

The study consists of both primary and secondary sources. The primary data is collected on site using intercept surveys, and site observations. The secondary data includes literatures from other studies and interviews.

Qualitative and quantitative data were used to assess site conditions. The qualitative data encompasses the user experience, opinions, and utilized literatures. While the quantitative data covers time of transfer, distance of separation via site observation, and user rankings.

3.5 Sampling design

The convenience non-probability sampling technique was utilized to collect data, because the study area is composed various moving parts which presents a challenge when it comes to focusing on data collection as the taxi and bus ques change rapidly. In addition, due to the geographic vastness and separation of each stops Stratified sampling was used to further randomize the collection process among the six study zones.

3.5.1 Identifying the sample size

Acquiring the exact number of population at the study location is impossible since there is no previous data on population size. But based on the figure provided by (AA city transportation bureau, 2020) and (Fortune, 2016) Anbessa and Sheger city bus served more than 930,000 people per day; added to that, according to Addis Ababa city transport bureau (AATB), close to 3000 minibus taxies served more than 1.1 million passengers. Lastly light rail transit (LRT) reportedly served 60,000 – 80,000 passengers per hour (Andualem & Takele, 2018). With all these modes and others operating in the city, the study area does surely receive at least 100,000 passengers per day if not more owing to its central location. Therefore, this highly assumed number could make it a candidate the Cochran formula, which is used for an unknown population number to determine the sample size. (Uakarn, 2021). With a 95% confidence and 0.05 sampling error the Z is taken as 1.96; by using the formula the study population was 385 samples of which each study zone received 77 sample size. Furthermore, in order to explore the behind the scenes of transport system management, stakeholders from Addis Ababa Transport bureau were interviewed to gain insight on the observed integration. The interview shades a light on the matter, and when it is combined

with the opinion and response of the users it creates a clearer picture which can be used as an input for future studies.

$$n = \frac{z^2}{4e^2}$$

n = sample size p = the population proportions e = acceptable sampling error (e = 0.05) z = z value at reliability level or significance level. - Reliability level 95% or significance level 0.05; z = 1.96 - Reliability level 99% or significance level 0.01; z = 2.58

Figure 5 The Cochran Formula

3.5.2 Sampling technique

The data was collected using randomly selected survey participants from transport ques. The survey was composed of a quantifiable question such as the Origin destination relationship, transfer time, and the Likert scale for user experience. The site is vast but for the sake of this study it was divided to Six zones which each received 77 respondent quota. At zones with multiple mode presence the allocated respondent quota is further divided equally among them.

By conducting the survey, it is possible to identify factors that might have eluded planners. In addition, such questionnaires open the possibility for new qualitative data to appear, one that can only be gained from long exposure to the site. Beyond the sampled population, government stakeholders from Addis Ababa transport bureau were approached to explore how the city public transport interchange system is designed and managed.

3.6 Data collection Questionnaire

3.6.1 Questionnaire

A structured close-ended questionnaire with one open-ended opinion column were used to assess the variables such as the transfer time, mode usage, Origin destination matrix, socio-economic

condition, frequency of usage and user's opinion. As for the exploratory interview with government stake holders, a series of open-ended questions were conducted to collect current working data and Likert scale to assess their interpretation of the current situation.

3.6.2 Field observation

Observing the movement of people, vehicles, the effect of transport service on the surrounding area, and images taking were employed.

3.6.3 Government stakeholders interview

To explore the inner working of city-wide public transport interchange administration and planning, and to hone in at the target location and how norms evolved, stakeholders were approached to provide their expert view.

3.7 Data analysis

3.7.1 Qualitative data

The qualitative data such as opinions, comments, and feedbacks collected from three government officers were analyzed using Thematic analysis where interview responses were transcribed and coded to be categorized into parent thoughts or themes that align with the objective of the study. No manipulation was introduced to the received Reponses.

3.7.2 Quantitative data

The quantitative data which includes quantified user experience metrics, time metrics, distance metrics, and other socio-economical metrics were analyzed using descriptive statistics. The descriptive statistics were applied to all metrics to summarize the collected data.

3.7.3 Analysis tools

The qualitative data was analyzed using Microsoft word and Excel to transcribe and code themes. These greatly support in summarizing respondent's opinion and identifying patterns. The

quantitative data was analyzed using IBM SPSS Statistics which is a powerful statistical analysis tool. The map illustrations were created using Adobe Illustrator.

3.8 Variables

The independent variables of the study are those which are not changed but used as a controlling factor. These are the socio-economic, demographic, transport mode usage habits, trip habits, transfer durations and separation. As for dependent variables, which are the resulting elements, the infrastructural integration of elements of the target hub, user experience and stakeholder responses can be mentioned.

The questionnaire that was conducted to users included socio-economic, demographic, trip rate(habit), transfer time, distance, origin destination and mode usage habit variables. In addition, the summarized user experience measurement variables categorized under the eight area, which are –

- Travel information
- Way-finding
- Time and movement
- Access
- Comfort and convenience
- Attractiveness
- Safety
- Emergency situation were included.

The interview questions for stakeholders includes, role in agency, time spent working in agency, assessments of observed interchange integration level (Likert scale) based on the above mentioned 8 variables, justifications for their scaling preference, their response regarding interchange management system, best case scenario and future actions if possible.

No.	Variables	Type of variable	Measurement and presentation method
1	Gender, Age, occupation, or background information, and income	Independent variable	Descriptive statistics with cross tabulation, graphs and charts
2	Habit, rate, mode usage habit, transfer time, origin and destination, interchange usage frequency	Independent variable	Descriptive statistics with tables, graphs and charts
3	Transport interchange integration level	Dependent variable	Descriptive and inferential statistics with tables, graphs and charts
4	User experience ratings	Dependent variable	Ranking using the five-point Likert scale, descriptive and inferential statistics with tables, graphs and charts
5	Stakeholders background	Independent variable	Content analysis
6	Stakeholders rankings and justifications, opinions	Dependent variable	Ranking, content analysis, categorization presented with tables, graphs and charts

Table 2 Observed Variables. Source: the researcher

Based on the work of (Sara Hernanez, 2015) The 37 user experience and satisfaction measurement variables are comprehensive. Therefore, they are summarized and regrouped to ease the user survey for this study.

No.	Variable	category	Measurement method
1	Rate the signage or posters for route and fee description	Information	Likert scale (very satisfied to very dissatisfied) and
2	Rate the signage or posters for facilities		

3	Rate the assistance provided onsite by coordinators		presented with descriptive statistics
4	Rate distance traveled to transfer	Time, Access and movement	Likert scale (very productive to wasted time) and presented with descriptive statistics
5	Rate time elapsed at transfer		Likert scale (very satisfied to very dissatisfied) and presented with descriptive statistics
6	Rate ease of movement on site		
7	Rate the cleanliness of interchange	Comfort & convenience	
8	Rate the site condition – shelter, ventilation		
9	Rate the site condition – noise		Likert scale (very satisfied to very dissatisfied) and presented with descriptive statistics
10	Rate the site condition – financial service (bank or ATM)		
11	Rate the site condition – facilities (café, toilets)		Likert scale (very satisfied to very dissatisfied) and presented with descriptive statistics
12	Rate the site condition – seating area or chairs		
13	Rate sidewalk condition	Attractiveness	
14	Rate the design of the interchange if any		
15	Rate the security on transfer (travelled path) or waiting area during day time	Safety	
16	Rate the security on transfer (travelled path)or waiting area during night time		
17	Rate the availability of lightings		

18	Rate the emergency signage and procedure if any	Emergency	Likert scale (very satisfied to very dissatisfied) and presented with descriptive statistics

Table 3 User experience and satisfaction variables summarized format, Source Sara Hernandez 2015

In addition to using the above variable for questionnaire an extra exploratory questions were employed to account for the local conditions. Such as ques, road crossing, waiting time and standing location while on que.

3.9 Data presentation

The analyzed data was presented using graphs, charts, tables and illustrations

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Results

4.1.1 Socio-economic description

4.1.1.1 Participants demographic analysis

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	183	42.8	42.8	42.8
	Male	245	57.2	57.2	100.0
	Total	428	100.0	100.0	

Table 4 A table that shows the gender share of respondents Source: The researcher

A total of 428 responses were collected from the target location, of which 57% of the respondents were male and 42% were female.

Age range

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	(1) <12	1	.2	.2	.2
	12 to 20	28	6.5	6.5	6.8
	21 – 35	204	47.7	47.7	54.4
	36 – 50	151	35.3	35.3	89.7
	51 and above	44	10.3	10.3	100.0
	Total	428	100.0	100.0	

Table 5 Table showing the Age distribution of the respondents. Source: the researcher

The survey reviewed various age ranges, from which the age range from 21 – 35 and 36 – 50 were prominent, 47.7% and 35.3% respectively. The second prominent respondent age ranges are 51 and above and 12 – 20 were constituted 10.3% and 6.5% respectively.

4.1.1.2 Occupation of respondents

Occupation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Full-time employee	71	16.6	16.6	16.6
	Government employee	69	16.1	16.1	32.7
	Housewives	17	4.0	4.0	36.7
	Part-time employee	43	10.0	10.0	46.7
	Retired	13	3.0	3.0	49.8
	Self employed	101	23.6	23.6	73.4
	Student	98	22.9	22.9	96.3
	Unemployed	16	3.7	3.7	100.0
	Total	428	100.0	100.0	

Table 6 Table showing the Occupation of the respondents. Source: the researcher

Looking at the occupation metric self-employed and students' respondents accounted for 23.6% and 22.9% respectively, while Full-time employees and government employees covered 16.6% and 16.1% respectively. As opposed to full time employees part timers stood at 10%. Housewives were 4%, unemployed 3.7% and finally retired respondents 3%.

4.1.1.3 Income of respondents

Monthly income

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	< 2500	138	32.2	32.2	32.2
	2500 – 4500	40	9.3	9.3	41.6
	4501 – 6500	51	11.9	11.9	53.5
	6501 – 10,000	140	32.7	32.7	86.2
	Above 10,000	59	13.8	13.8	100.0
	Total	428	100.0	100.0	

Table 7 Table showing monthly income of the respondents. Source: the researcher

Regarding monthly income 32.7% of the respondents said they receive between 6501 – 10,000 birr, while 32.2% responded they earn below 2500 birr. For the income ranges 4501 – 6500 and above 10,000 respondents reflected 11.9% and 13.8% respectively. Lastly the income ranges 2500 – 4500 saw 9.3% of the respondents agreeing with it.

4.1.2 Participants trip and modal characteristics

The survey explored the six stations at Mexico area which are - Zone 1 – The Shiromeda/Bole line, Zone 2 – Piassa and Megenagna line, Zone 3 - Lafto line, Zone 4 – Jemo line, Zone 5 - Torhail line and Zone 6 – the Teklehaimanot/ Torhail line. The following data are presented making use of their destination for ease of understanding.

4.1.2.1 Origin of respondents

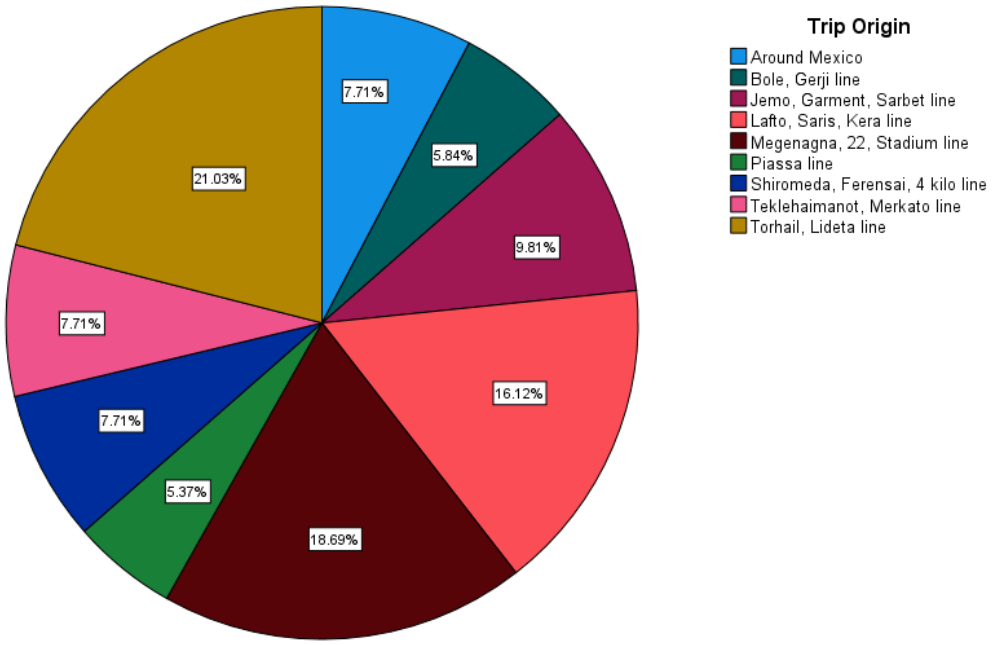


Figure 6 A pie chart that shows the origin of the respondents. Source: the researcher

When it comes to the origin of the respondents 21% of the respondents arrived from Torhail/Lideta line, 18.69% from Megenagna line, and 16.1% from Lafto/Kera line. The rest of the respondents including 9.8% from Jemo line, at 7.7% each from Teklehaimanot line and Shiromed/4kilo line, 5.84% from Piassa line and finally respondents originating from Mexico area accounted for 7.7%.

4.1.2.2 Modal usage share of arriving respondents

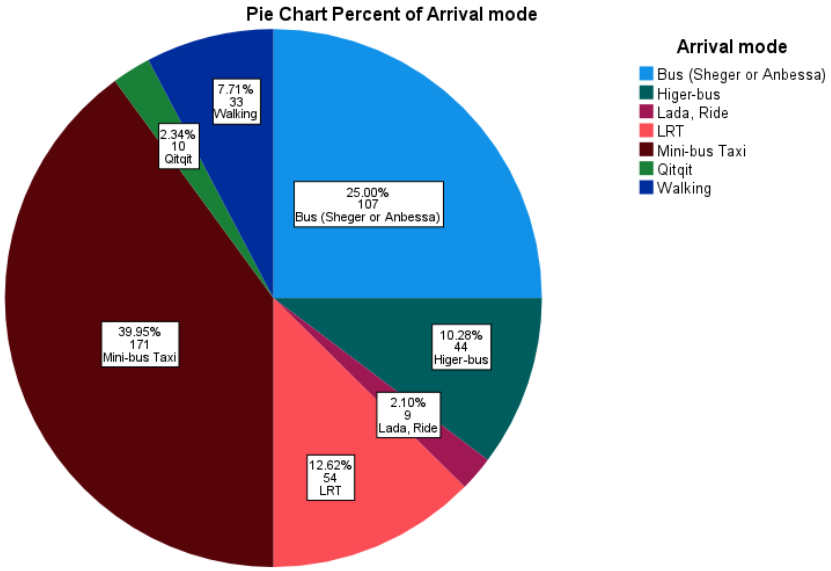
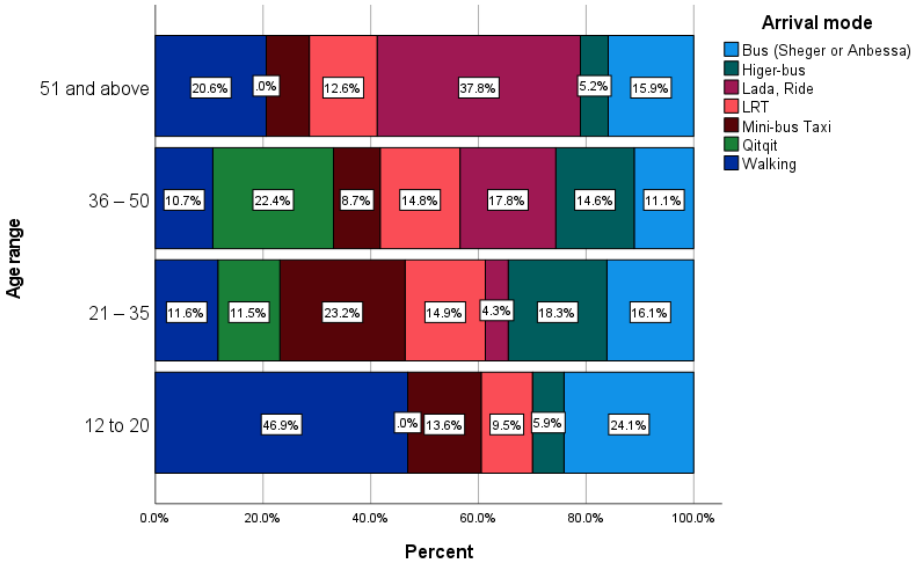


Figure 7A pie chart that shows the share of modes for arriving respondents. Source: the researcher

At 39.9% Minibus taxi was used to arrive, following that 25% Bus 12% LRT, 10.2% Higer bus, 2.3% Qitqit, and 9% Lada/ride. Those who responded they walked accounts 7.7%.

4.1.2.3 Age distribution among arriving respondents' modal usage



For the 12 – 20 age range walking accounted for 46.9%, Bus 24.1%, and Minibus taxi 13.6%. moving to the 21 – 35 age range 23.2% used minibus taxi, 18.3 Higer bus, 16.1% bus, 14.9% LRT and 11.6% by walking. Moving on to the 36 – 50 age range 22.4% used Qitqit, 17.8% Lada/ride, 14.6% Higer bus and 11.1% bus. Lastly for the age 51 and above at 37.8% Lada/ride, 20.6% walking, and 15.9% bus.

Figure 8A graph that shows the age distribution among arriving respondents. Source: the researcher

4.1.2.4 Popular mode usage related to the trip from origin

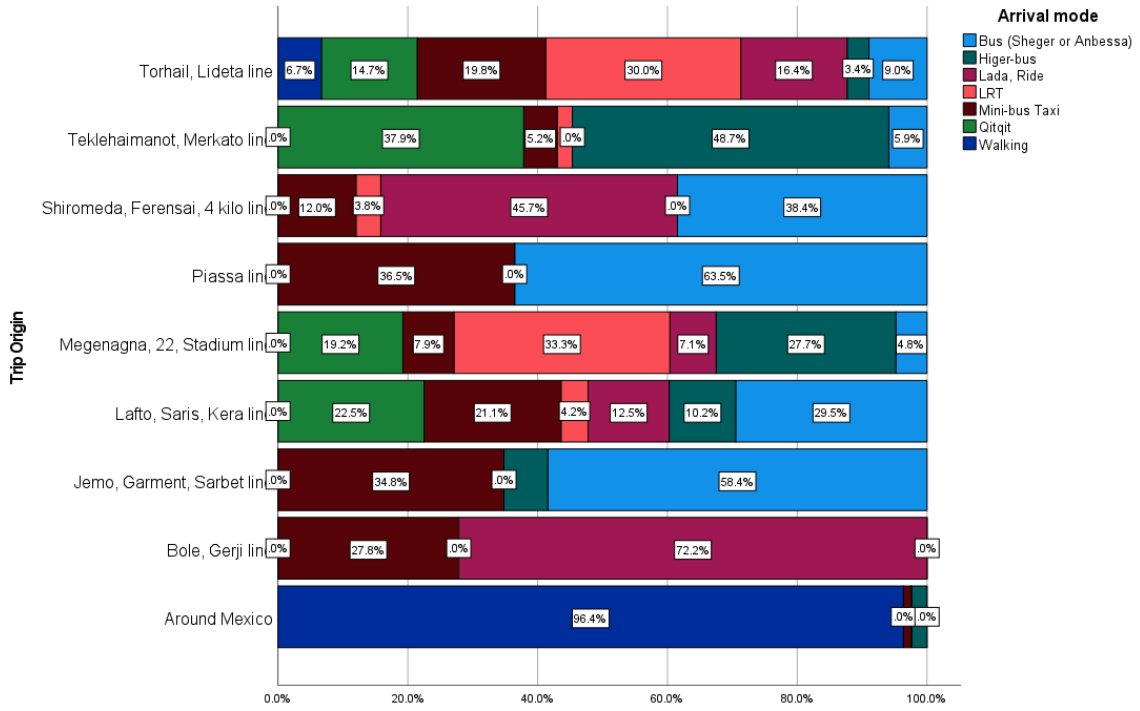


Figure 9 A graph that shows the popular mode usage related to the trip from origin. Source: the researcher

For the Torhail line LRT accounted 30% share, while Minibus Taxi 9.8%, Lada/ride 19.8% and Qitqit 14.7%. Regarding the Teklehaimanot line at 48.7% Higer bus was utilized while Qitqit stood at 37.9%. the Shiromeda line was served by 45.7% Lada/ride, 38.4% bus and 12% Minibus taxi. The Piassa line saw 63.5% bus usage and 36.9% Lada/ride utilization. Megenagna line saw 33.3% of its respondents using LRT, 27.7% Higer bus, and 19.2% Qitqit. The Lafto line was served with 29.5% bus fleet, 22.5% Qitqit, and 21.1% Minibus taxis. Jemo line saw 58.4% and 34.8% usage of Bus and Minibus taxi. The Bole line had 72.2% Lada usage and 27.8% Minibus taxi usage. Lastly 96% of the respondents who arrived from Mexico area walked.

4.1.2.5 Destination of the respondents

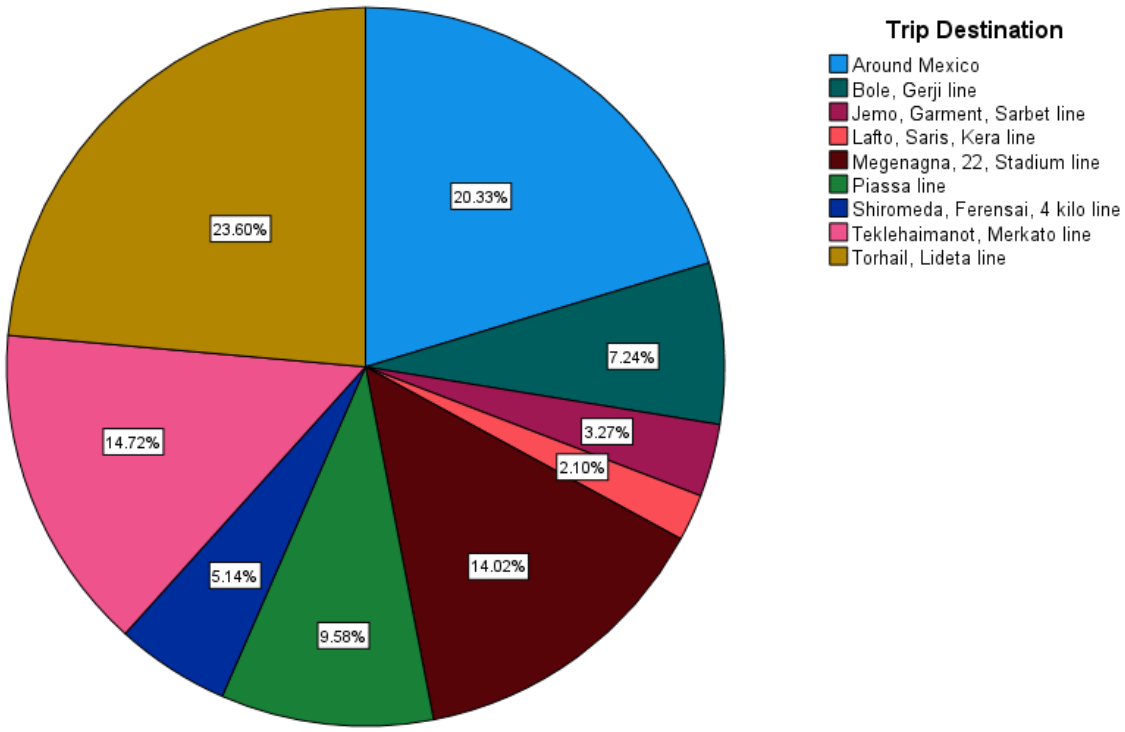
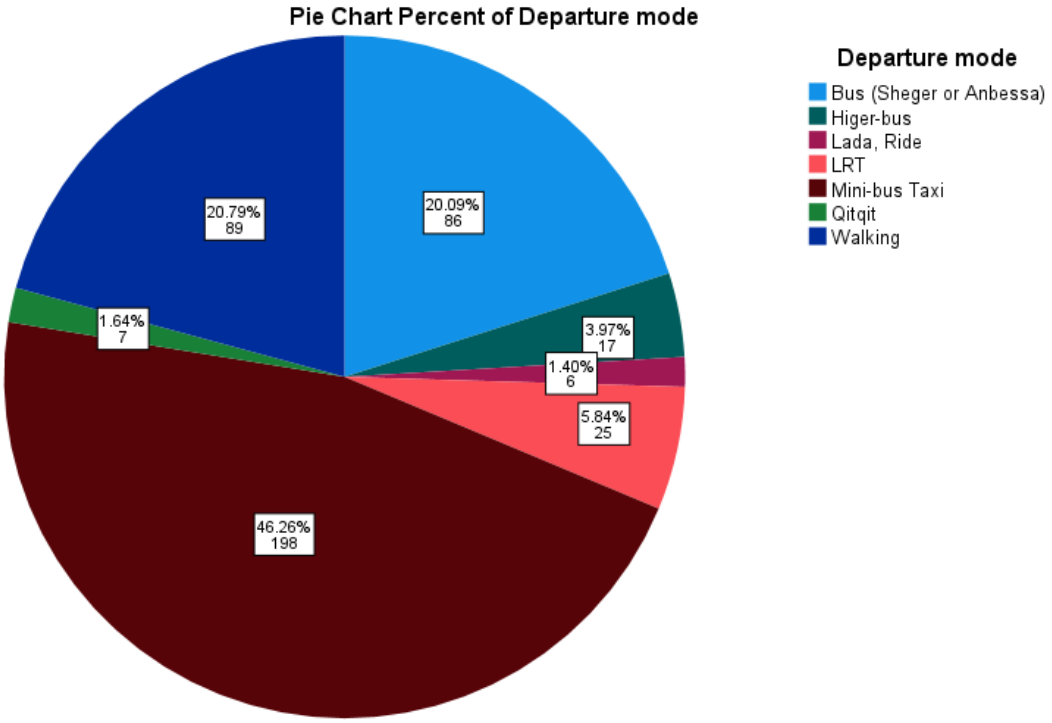


Figure 10 A Pie chart that shows Destination of respondents. Source: the researcher

23.6% of the respondents were headed towards Torhail while 20.33% stayed around Mexico. 14.72% of the respondents were departing to Teklehaimanot, at 14.02% Megenagna direction travelers were followed by 9.5% Piassa line goers. Bole and Shiromeda lines both received 7.2% and 5.14% of the respondents respectively. Lastly the Jemo line 3% and 2% Lafto line.

4.1.2.6 Modal usage shares of departing respondents

Figure 11A pie chart that shows the modal usage shares of departing respondents



46.2% used Mini bus taxies to depart while Bus and Walking received 20% each.

4.1.2.7 Age distribution among departing respondents' modal usage

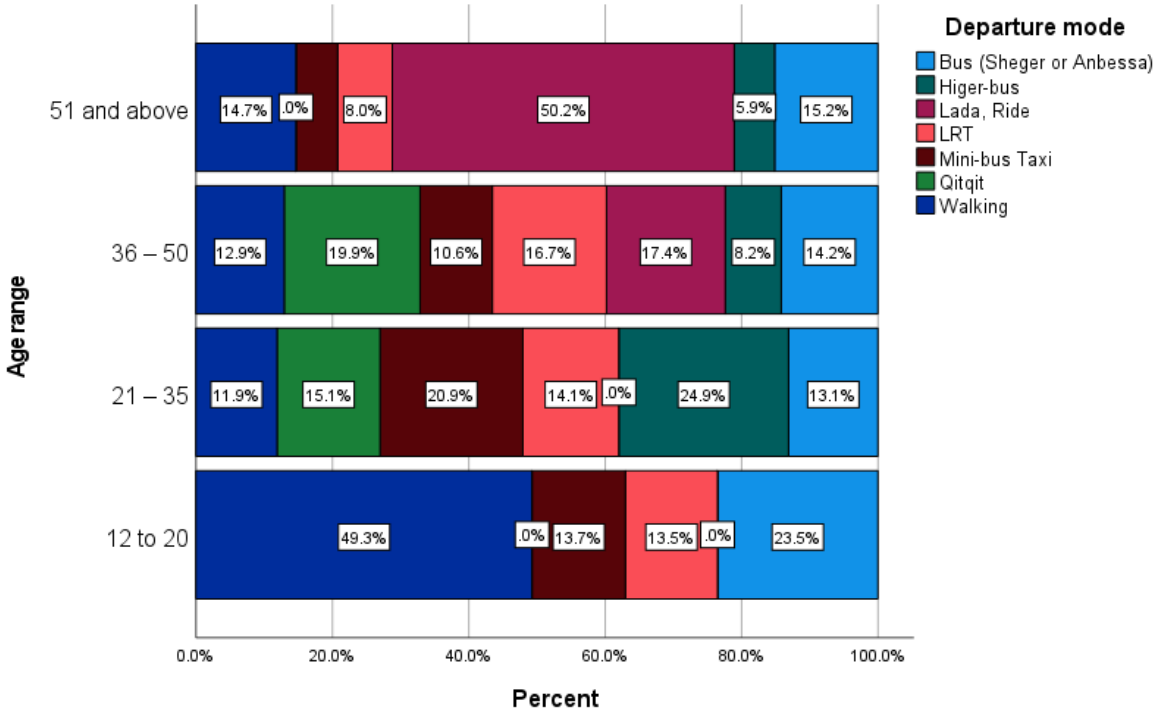


Figure 12 A chart that shows the age distribution among departing respondents' modal usage. Source: the researcher

For the age group 12 – 20 Walking took 49% while Bus users were 23.5%. and for the age range 21 – 35 Higer came in at 24.9% then Minibus taxi with 20.9%. in addition to the two modes Qitqit, LRT and Bus accounted for 15%, 14.1% and 13.1% respectively. Coming to the age range 36 – 50 it is observed that Qitqit and Lada accounted for 19% and 17% of the departure respectively. While LRT and Bus measured at 16% and 14% respectively. Lastly for the age range above 51 50% used Lada to depart with Bus and Walking measuring 15% and 14% respectively.

4.1.2.8 The Origin and Destination relationship

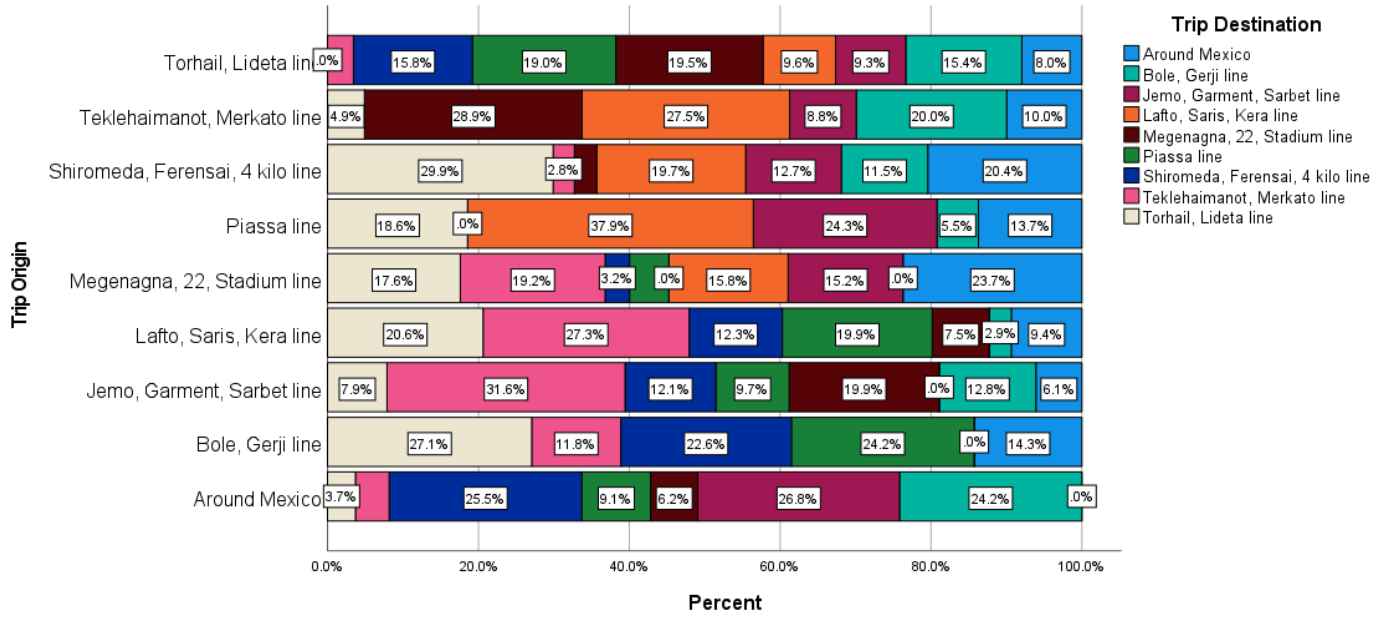


Figure 13 A graph that shows the origin and destination relationships. Source: the researcher

For trips originating from Mexico 25% went to the Shiromeda line, 26% to the Jemo line and 24% to the Bole line. For trips that originated from the Bole line 27% went towards Torhail, 24% to the Piassa line and 22% to the Shiromeda line. When looking at the respondents that arrived from the Jemo line 32% of them went to the Teklehaimanot line while 20% went to the Megenagna line. For respondents who arrived from Lafto 27% undertook the Teklehaimanot line while 20% and 19% of the respondents departed towards Torhail and the Piassa line respectively.

For the trips that originated from the Megenagna line 23% stayed around Mexico while 19% and 17% headed towards the Teklehaimanot and Torhail line. When looking at the Piassa line 37% departed towards to the Lafto line, 24% went to the Jemo line and 18% towards Torhail. For the respondents that arrived from the Shirmeda line 30% departed towards Torhail, 20% stayed around Mexico, and 19% travelled towards the Lafto line. For the trips that originated from the

Teklehaimanot line 28% went to the Megenagna line while 27% went to the Lafto line. Lastly the trips that originated from the Torhail line the Piassa and Megenagna lines departure scored 19% each.

4.1.2.9 The frequency of transfers

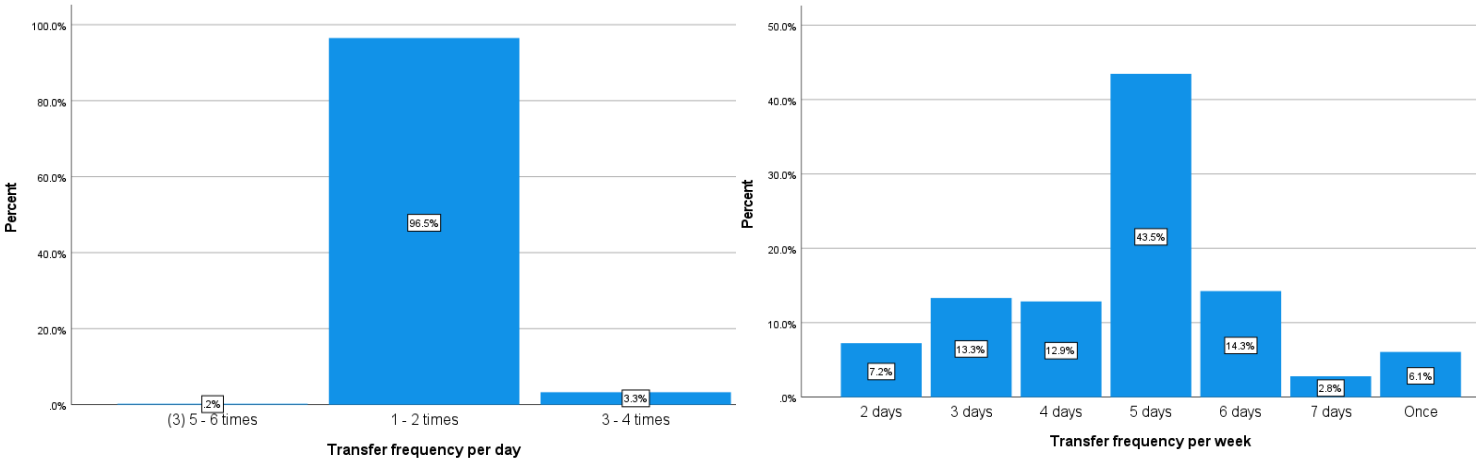


Figure 14 Bar Graphs that measure frequency of transfer per day and per week. Source: the researcher

Seen of the left graph 96% of the respondents said they only transferred once or twice a day, while 3% responded three to four times. In addition to the frequency of transfer per day, the transfer per week also wa considered and it resulted, 43% of users coming to the site five days a week.

4.1.2.10 The time of transfers

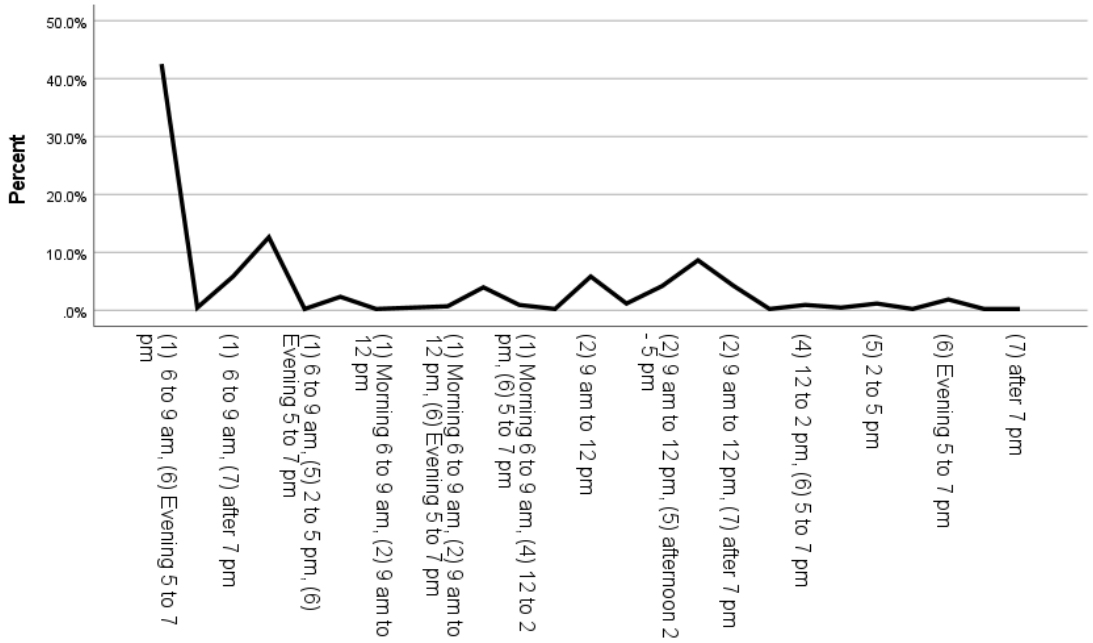


Figure 15A line chart that shows the time of the day when transfers occur. Source: the researcher

From the above line graph, it is observed that 50% of the transfers occur during the early morning - morning and early evening - evening hours.

4.1.3 Data presentation on station Integration

This section of chapter four presents the results that are used to measure the level of integration between the existing transport stations (drop off and take on points).

4.1.3.1 Distance travelled by transferring respondents

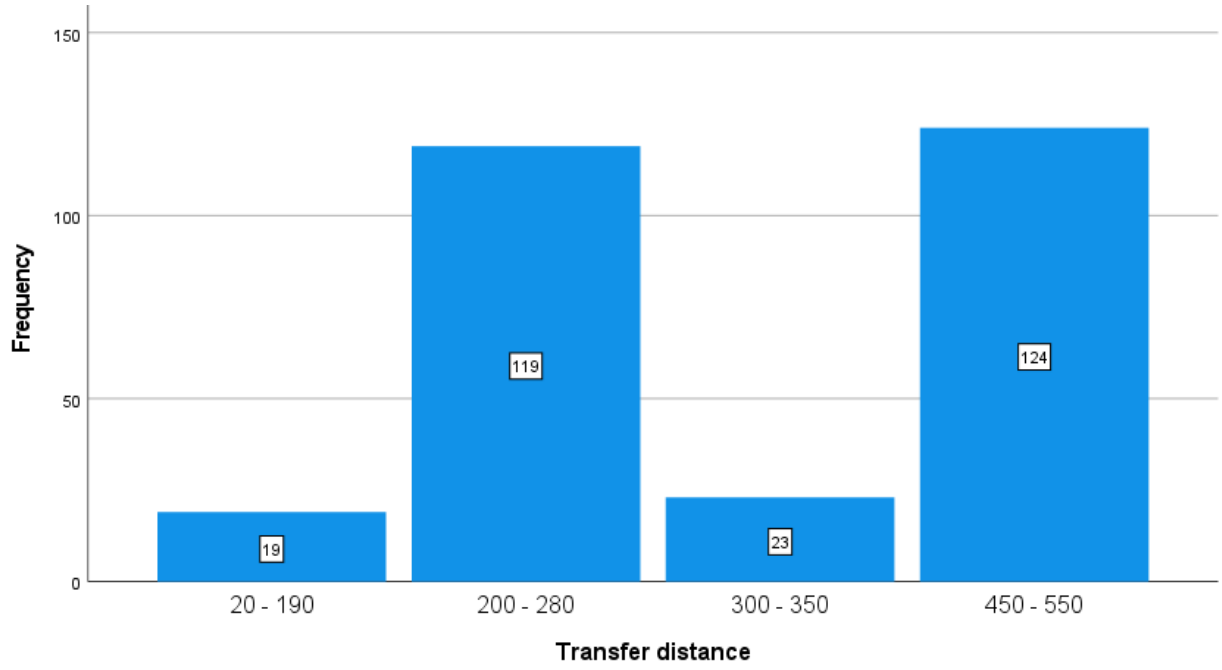


Figure 16 A chart that shows the distance travelled while transferring at the study location. Source: the researcher

The respondents were asked about their trip itinerary, for which they referred to one of the six zones. Using that information, the distance of separation was incorporated with their response. Looking at the distance travelled in the form of walking from one drop off to another take on point, the result shows two prominent values. 40% of the respondents walked a distance between 450 – 500 meters. While 31% of the respondents lied between 230 – 260 meters. The average distance travelled lies just beyond 350 meters at 364 meters.

4.1.3.2 The relationship between Distance travelled and respondents' demography

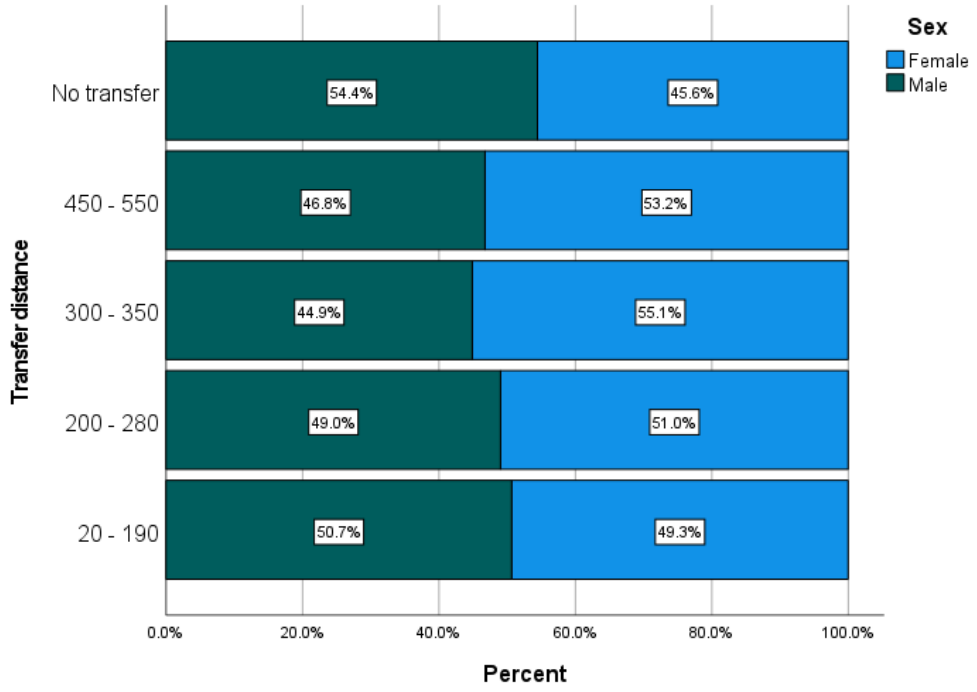


Figure 17A chart that shows the relation between sex and distance travelled. Source: the researcher

For the distance travelled between 450 – 500-meter female accounted for 53% while the male was 46%. On the other hand, the 20 – 190-meter distance travelled saw 50% of the male and 49% female.

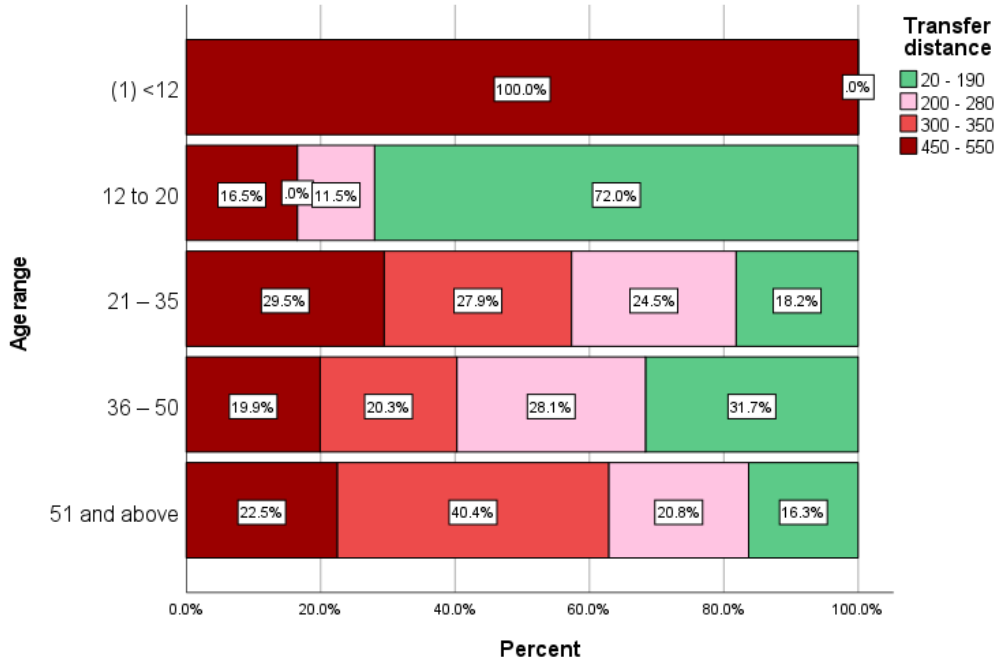


Figure 18A graph that shows the relationship between age and distance traveled. Source: the researcher

For the age 12 and under all respondents walked between 450 and 550 meters, while 72% of the age bracket 12 – 20 walked 20 – 190 meters. For the age group 21 – 35 56% walked 300 – 550 meters on the other hand, only 39% 36 – 50 age group walked the same distance. For the age group 51 and above 62% of them walked 300 to 550 meters.

4.1.3.3 The relationship between distance travelled and trip characteristics

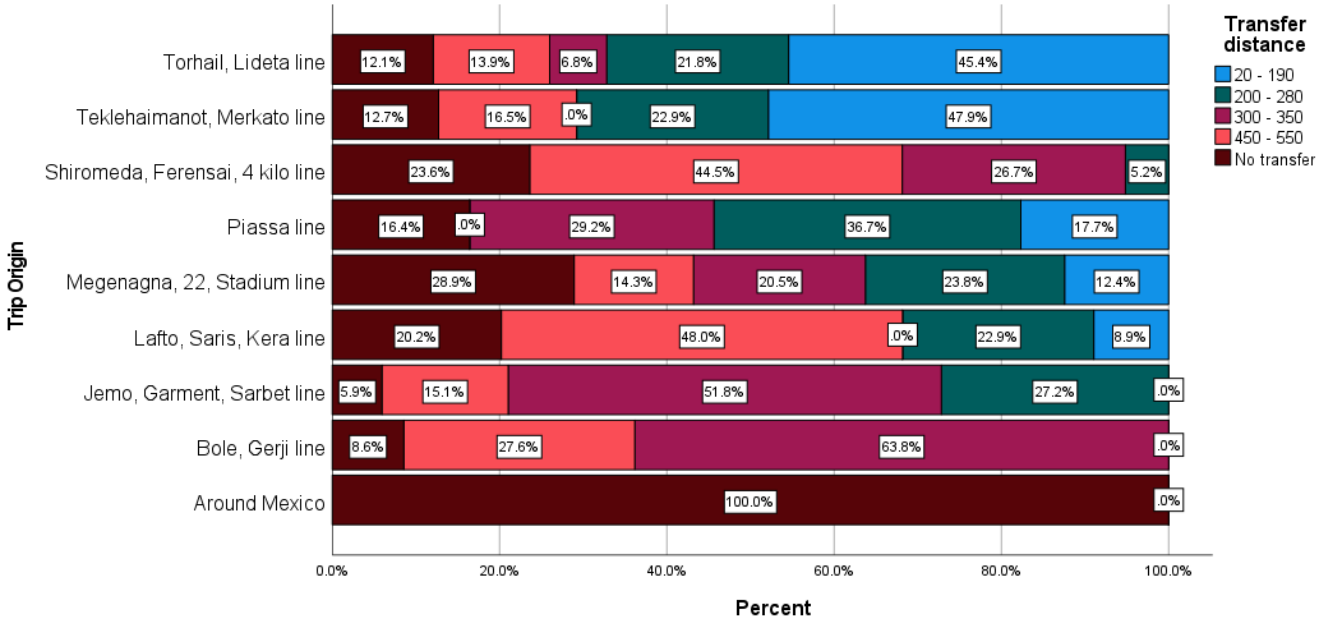


Figure 19 Chart that shows the transfer distance undertaken by arriving respondents to make their transfer. Source: the researcher

91% of the Respondents who arrived from the bole line walked 300 to 550 meters to make their transfers while 93% those who arrived from the Jemo line walked between 200 to 550 meters to make their transfers. looking at the 65% respondents who came from the Shiromeda line walked 300 to 550 meters to make their transfers. The 48% respondents who arrived from the Lafto line walked 450 to 550 meters to make their connection while only 34% the arriving respondents from the Megenagna line walked 300 to 550 meters to catch another mode of transport. 53% of the Piassa line arrivals walked 20 to 280 meters to make their transfers. On the other hand, 78% and 66% of the respondents from the Teklehaimanot and Torhail line walked 20 to 280 meters respectively.

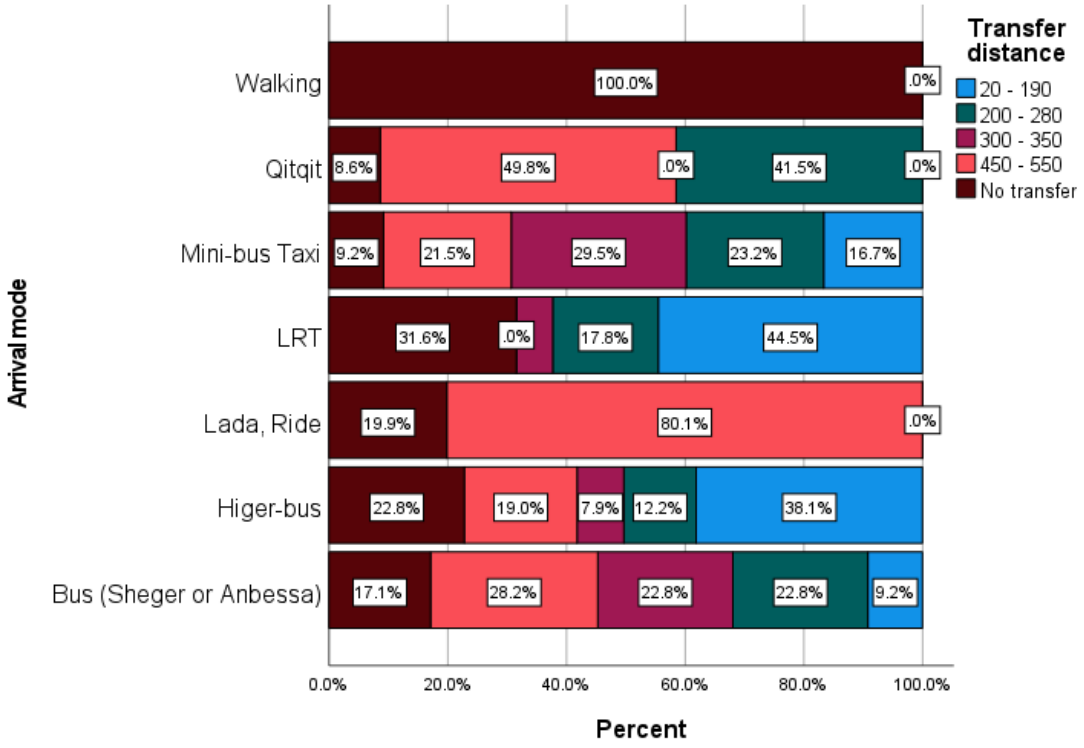


Figure 20 A chart that shows the arrival mode and distance travelled to make transfers. Source: the researcher

50% of the respondents who arrived with a Bus they walked between 300 – 550 meters to make their connection. On the other hand, 50% and 61% of Higer bus and LRT users only walked 20 to 280 meters respectively to make their transfers. 80% of Lada/Ride users walked 450 – 550 meters to make their connections. 50% of Mini Bus users walked 300 – 500 meters to make transfers. Lastly 49% of Qitqit users walked 450 – 550 meters to make connections.

4.1.3.4 Respondents satisfaction with travelled distance

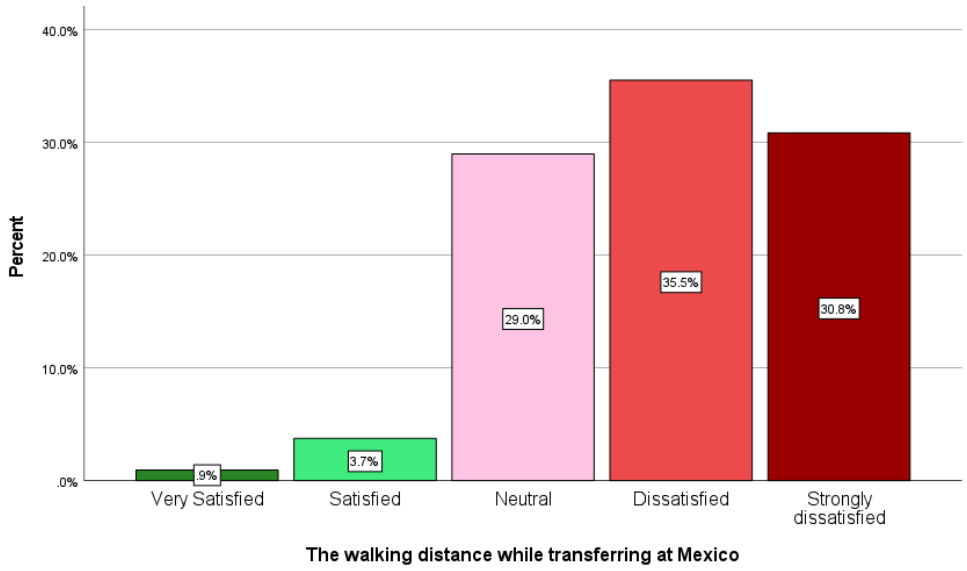


Figure 21A graph that shows the satisfaction of respondents when it comes to travelled distance. Source: the researcher

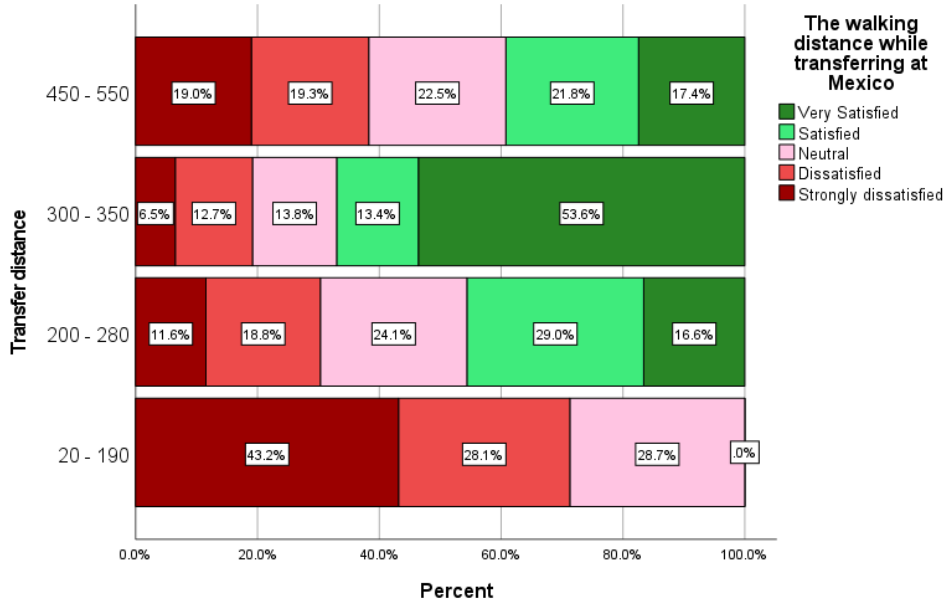


Figure 22 A graph that shows the satisfaction of respondents with travelled distance. Source: the researcher

65% of the respondents said they were not happy with the walking distance while 29% were neutral to the notion. On the other hand, 71% of those who walked 20 – 190 meters were generally unhappy with their experience while for the 200 – 280 meters range only 29% were unhappy. With a similar trend 19% of 300 – 350 meter travelers were unhappy. Lastly for the 450 – 550 range 38% were unhappy with their travelled distance.

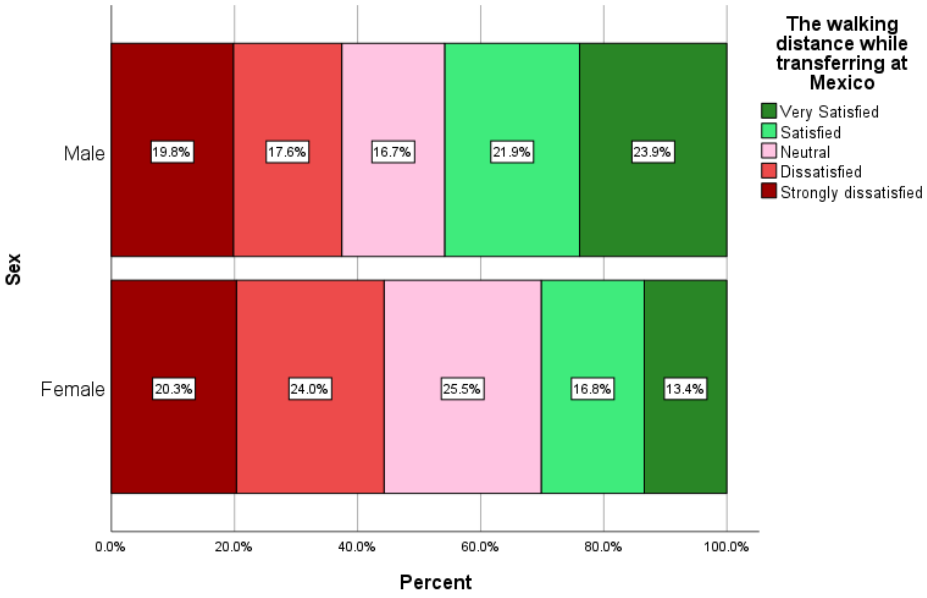


Figure 23a graph that shows the satisfaction of travelled distance with gender. Source: the researcher

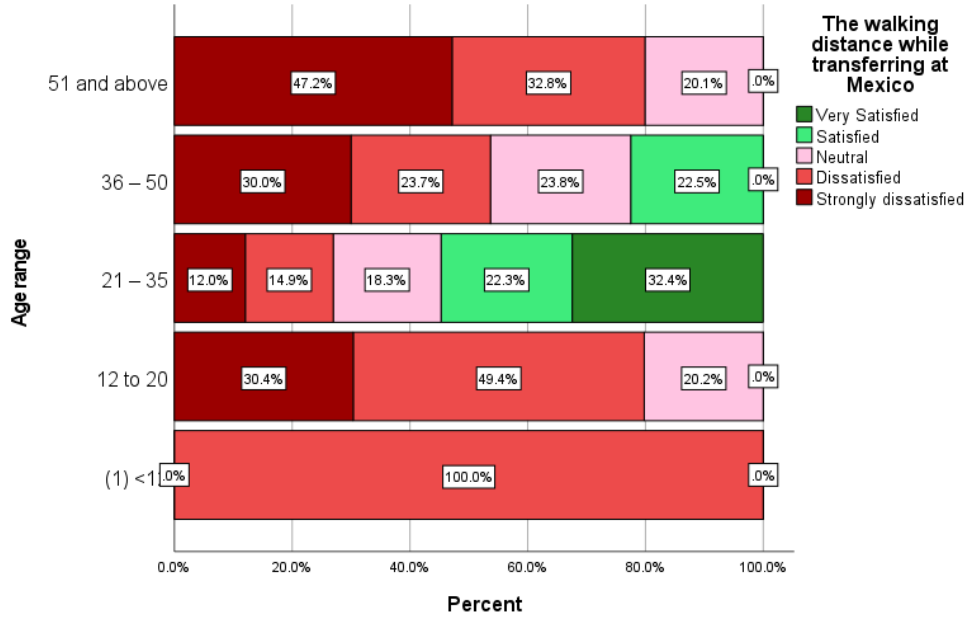


Figure 24 A graph that shows the travelled distance and age range. Source: the researcher

When looking at the gender of the respondents with their satisfaction, 44% of male and 37% of the female were unhappy with their travelled distance. On the other hand, the age range reveals, 100% and 79% of under 12 and 12 – 20 years were unhappy with their travelled distance respectively. On a similar trend for the age range 36 – 50 and then above 50 53% and 79% respectively were unhappy regarding the distance travelled. Differently though, the 21 – 35 age range saw 54% of its occupants being happy with the travelled distance.

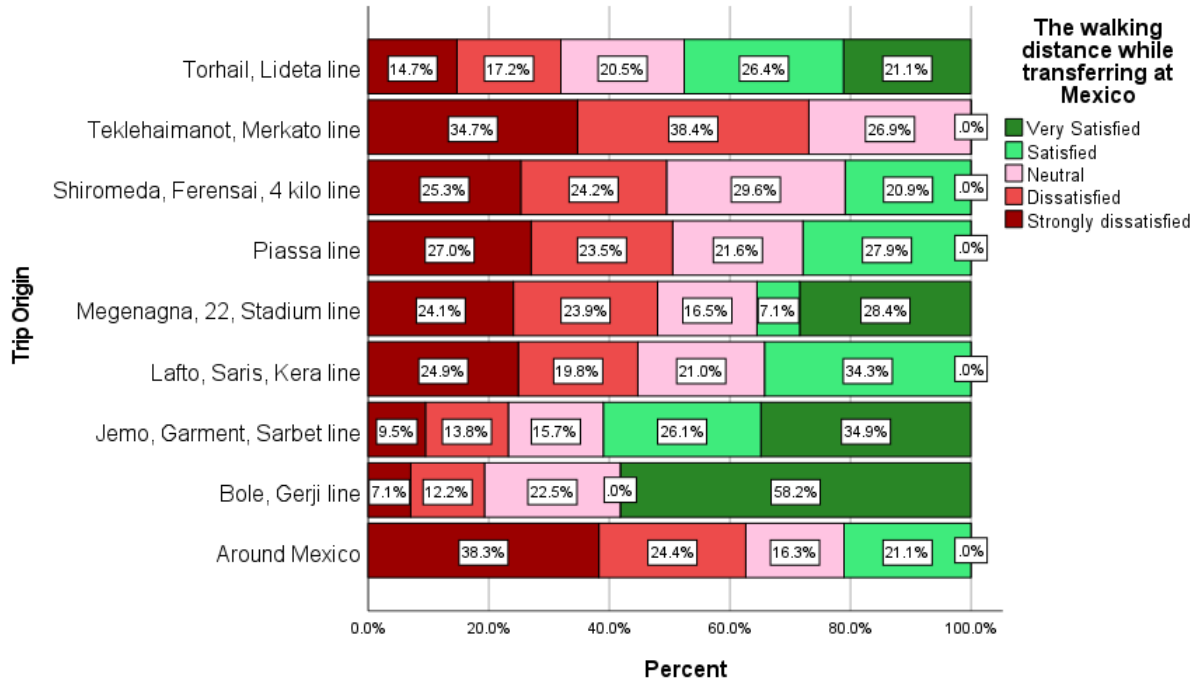


Figure 25 A graph that shows the travelled distance satisfaction for trip origin. Source: the researcher

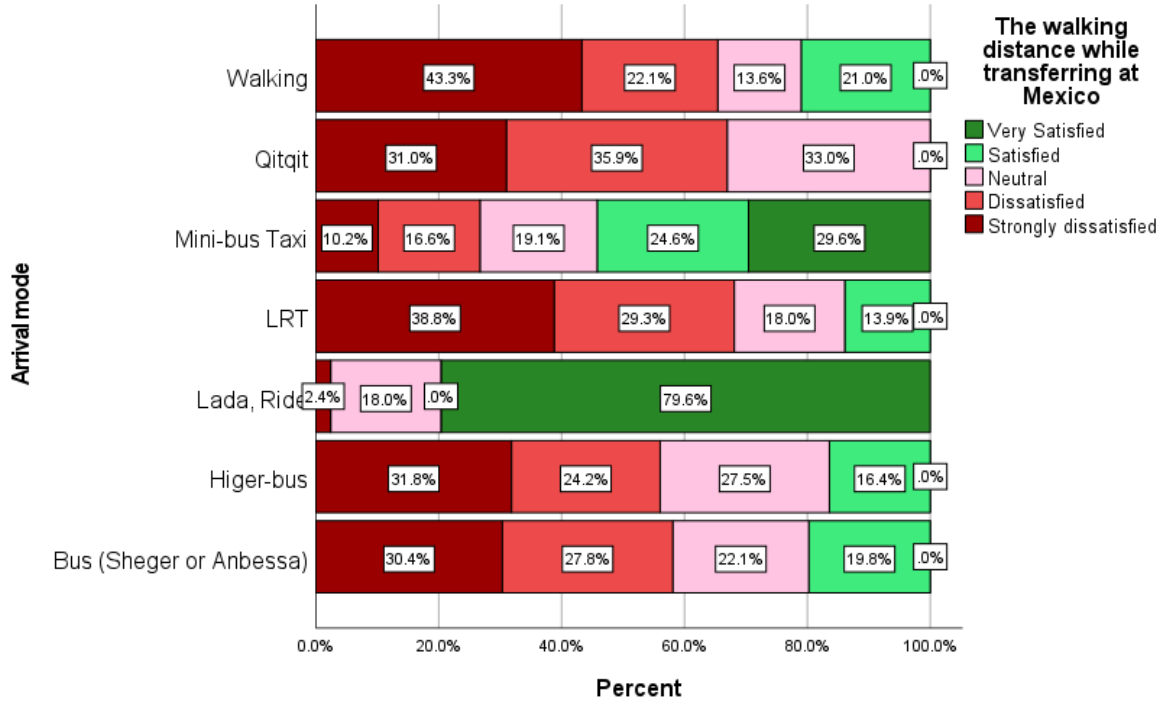


Figure 26 A graph that shows the travelled distance by arriving mode. Source: the researcher

focusing on the satisfaction of distance travelled for trip origin, 62% of the respondents that started their journey from the Mexico area were not satisfied by their walking distance. on the other hand,

for the 47%, 58% and 60% of the respondents who came from the Torhail, Bole and Jemo lines were happy with their walking distance respectively. For the trips that originated from the Lafto and Megenagna lines, 45% and 48% of the trip takers respectively were unhappy. Looking at the Piassa and Shiromeda lines, 50% and 49% said they were not generally satisfied by the walking distance. Lastly trips that originated from Teklehaimanot73% were un happy with the transfer distance.

for the mode utilized arriving to Mexico, 57% and 66% of Bus and Higer users responded negatively to travelled distance satisfaction. On the other hand, 79% and 54% of Lada/Ride and Minibus users the travelled distance was favorable. For the 65% respondents who walked it was an unhappy experience. Lastly 67% and 68% Qitqit and LRT users showed dissatisfaction on the travelled distance.

4.1.4 User experience and satisfaction measurement

The study site was assessed against 23 variables categorized in 5 observations.

4.1.4.1 Information and Signage observation

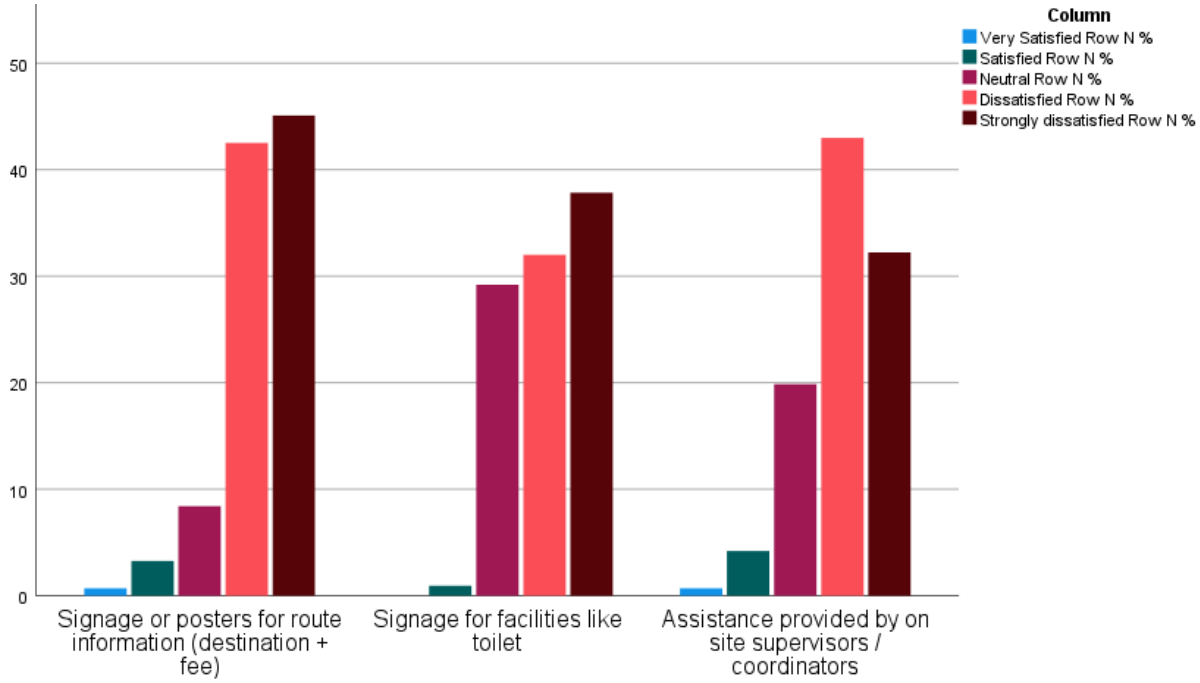


Figure 27 A graph that shows Information and Signage observation. Source: the researcher

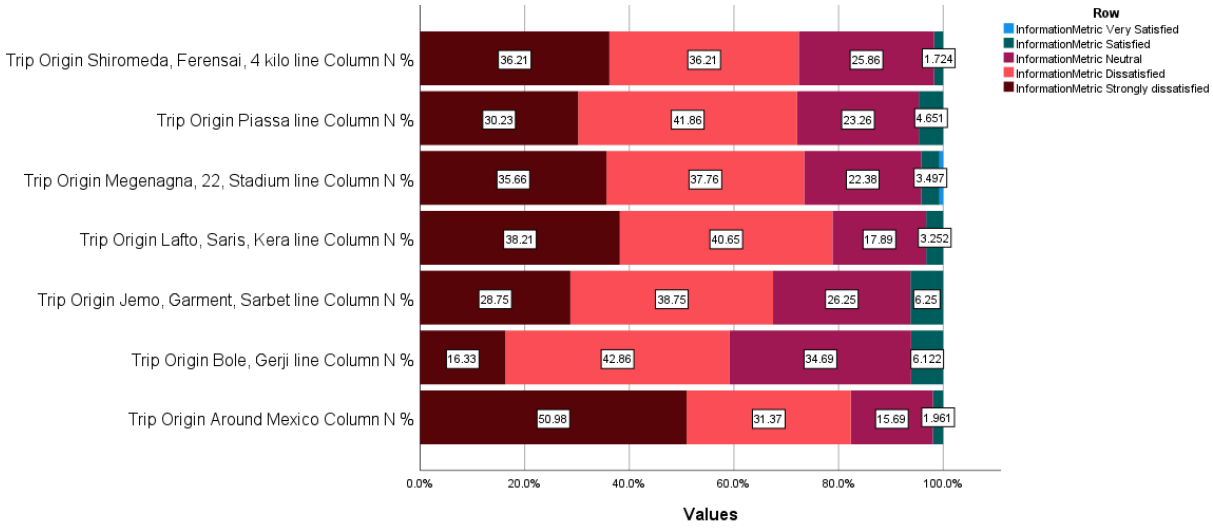


Figure 28 A graph that shows information and signage observation by origin of trip

Looking at the satisfaction level of signage of travel information, sign for facilities and staff support, 85%, 70% and 74% general dissatisfaction on the existing situation respectively for the information signage, toilet signage and staff assistant variables. When looking closer to the availability of signage for terminating trips, all the trips termination points were lacking of a satisfactory signage according to respondents.

4.1.4.2 Time, movement and access observation

The time, movement and access observations categorize three variables. These variables are, the time usage at interchanges, the travelled distance, and the ease of movement.

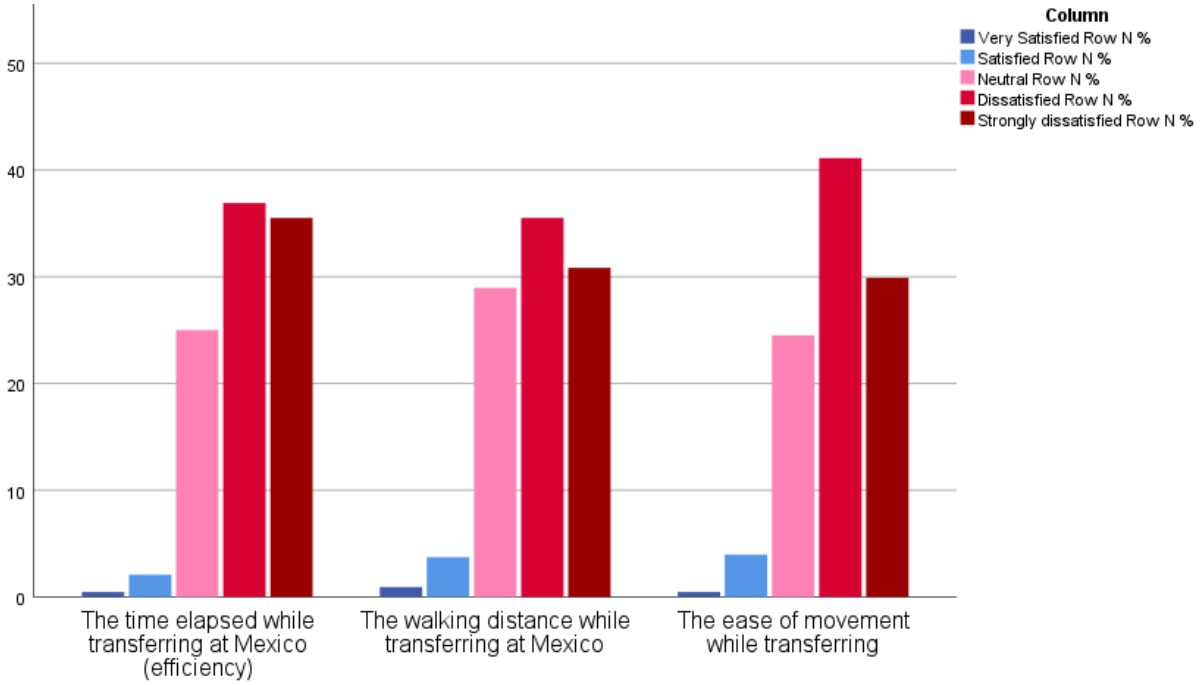


Figure 29 A graph that shows Time, movement and access observation. Source: the researcher

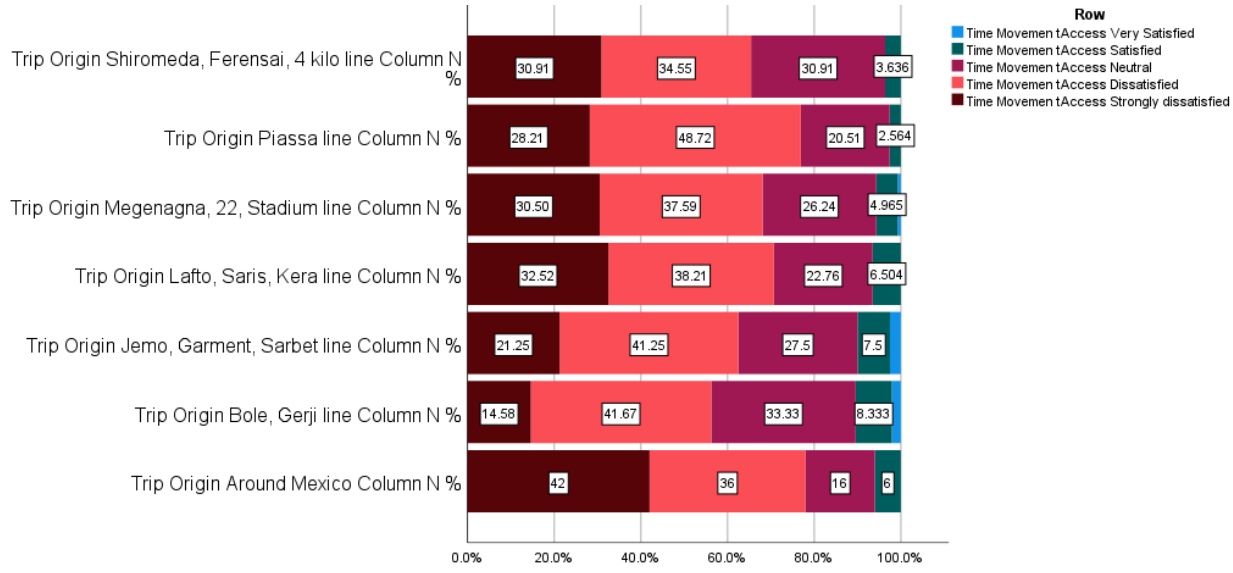


Figure 30A graph that shows the time, movement and ease satisfaction level by origin of trip. Source: the researcher

Looking at the satisfaction level of time, movement and access observation, it shows 71%, 66% and 71% general dissatisfaction on the existing situation respectively for the elapsed time, walking distance and ease of movement variables. When the satisfaction is further analyzed through the origin google, 78%, 70% and 76% of respondents from the Mexico area, the Lafto and the Piassa

line were unhappy about how the site catered to their needs. While the trip that originated from the Bole line showed a 56% dissatisfaction.

4.1.4.3 Comfort and convenience observation

The comfort and convenience observation includes six variables which are, the cleanliness of the site, the shelter and ventilation conditions, the nose, the availability of financial institutions or ATMs and interchange facilities such as seating area and toilets.

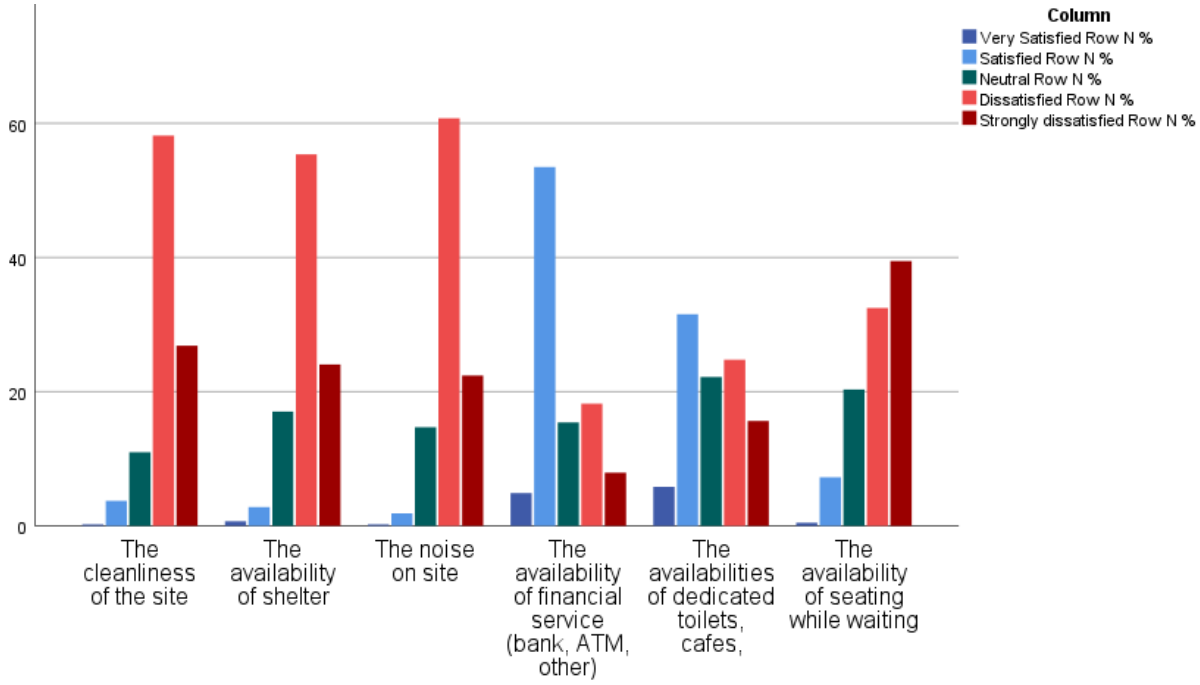


Figure 31 A graph that shows the comfort and convenience satisfaction of respondents. Source: the researcher

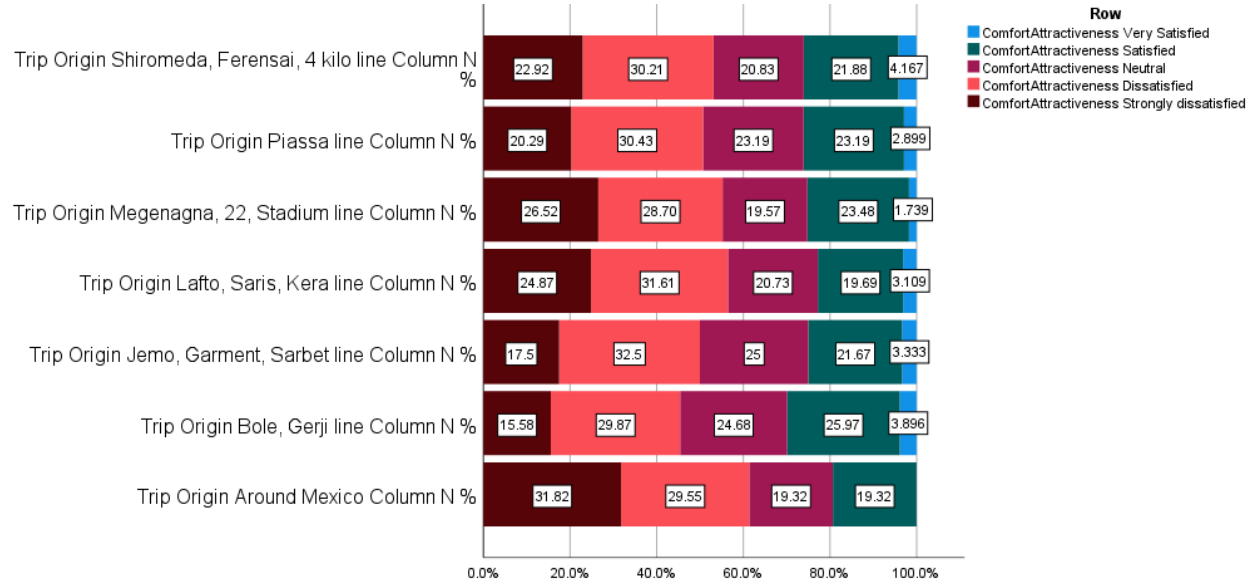


Figure 32 A graph that shows the comfort and convenience by trip origin. Source: the researcher

Observing the satisfaction level of comfort and convenience observation, it shows 90%, 78%, 83% and 69% general dissatisfaction on the existing situation respectively for the site cleanliness, availability of shelter, noise, and the availability of seating variables. On the other hand, for the variables, availability of ATM, and toilet facilities 55% and 35% of the respondents were generally happy. Coming to the satisfaction based on the trip origin or the drop off point, 61% of the respondents that start their journey from the Mexico area are unhappy with the comfort and convenience observation. The observation showed 44% dissatisfaction for the Bole line respondents.

4.1.4.4 Site character/Attractiveness observation

The site character observation included two variables which are – the condition of the pedestrian way and the overall layout of the site.

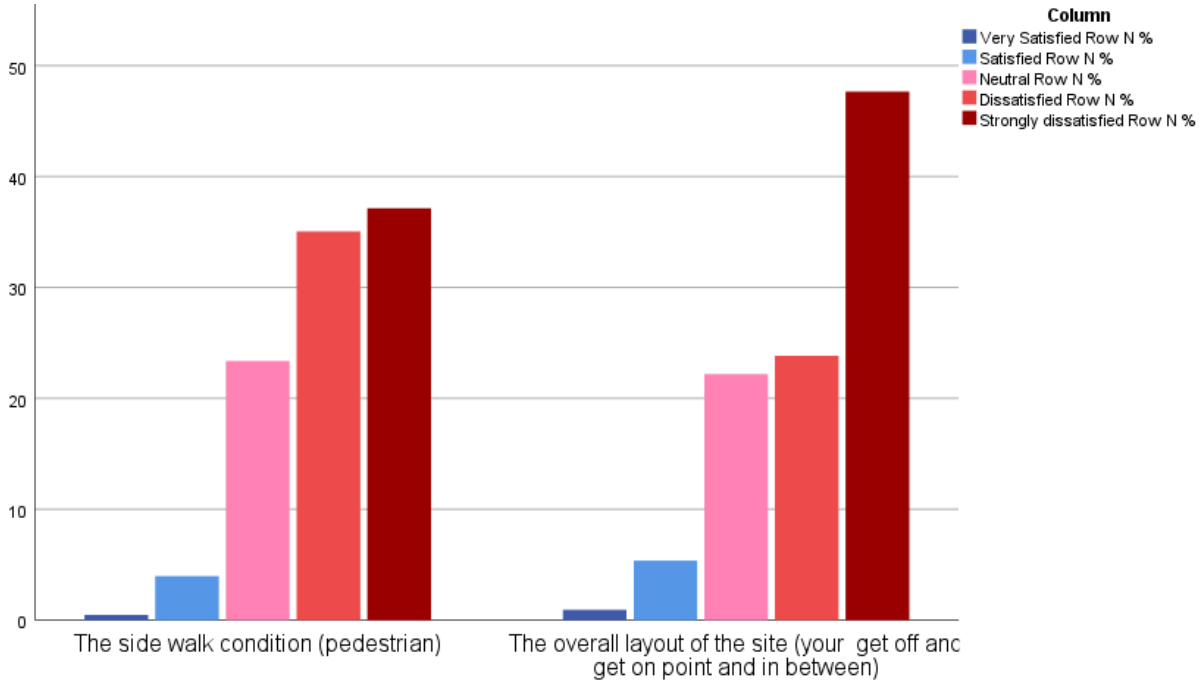


Figure 33 A graph that shows the satisfaction level for the Attractiveness observation. Source: the researcher

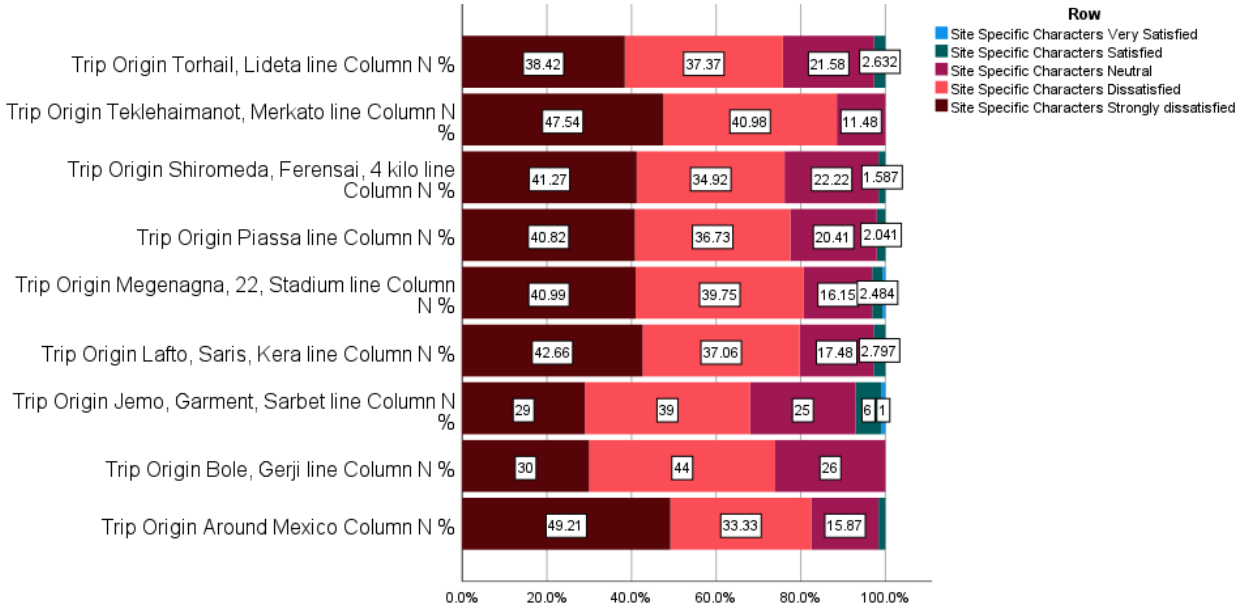


Figure 34 A graph that shows the site character satisfaction by trip origin observation. Source: the researcher

Looking at the satisfaction level of Site character observation, it shows 71% and 70% general dissatisfaction on the existing situation respectively for the pedestrian way condition and overall site layout variables. Assessing the response based on the trip origin reveals, 88% of the Teklehaimanot line respondents were unhappy while 68% of the Jemo line respondents were generally dissatisfied.

4.1.4.5 Safety observation

The security observation includes three variables which are – safety doing transfer during the day, safety doing transfer during the night and the lighting condition.

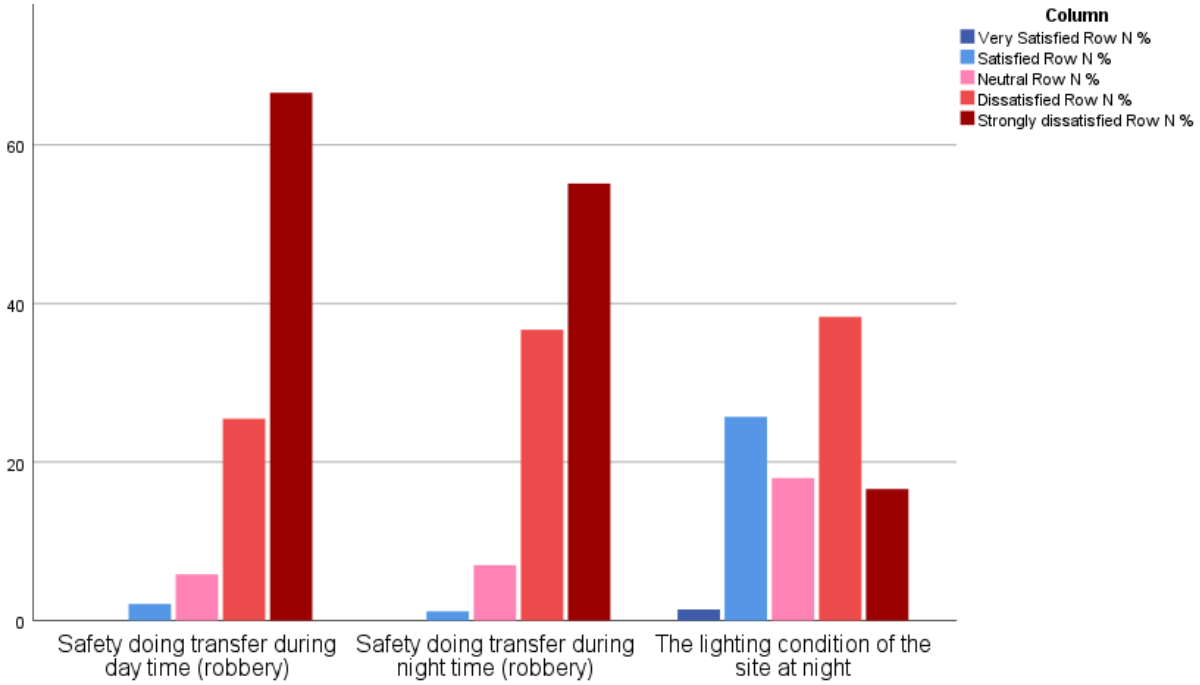


Figure 35A graph that shows the satisfaction level for the safety observation. Source the researcher

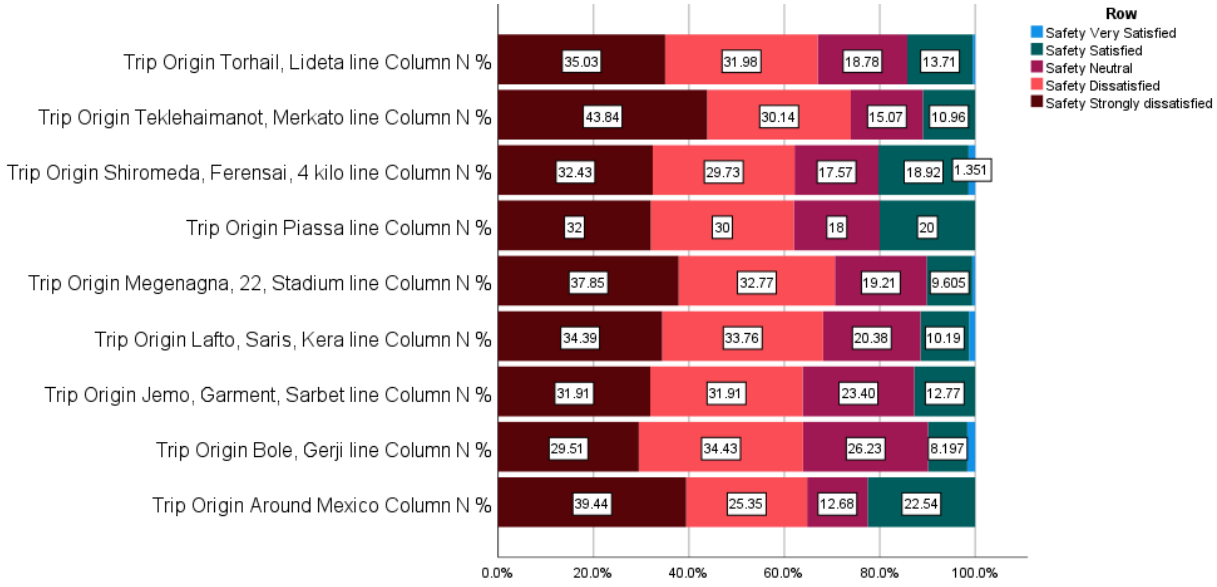


Figure 36 A graph that shows the safety satisfaction by trip origin. Source: the researcher

Observing the satisfaction level of safety observation, it reveals 90% each general dissatisfaction on the existing situation respectively for safety doing transfer during the day and safety doing transfer during the night variables. On the other hand, 56% of the respondents were unhappy about the lighting condition at night. Looking at safety observation through the trip origin, the 73% of the Teklehaimanot line respondents were not feeling safe.

4.1.4.6 Emergency signage and procedure observation

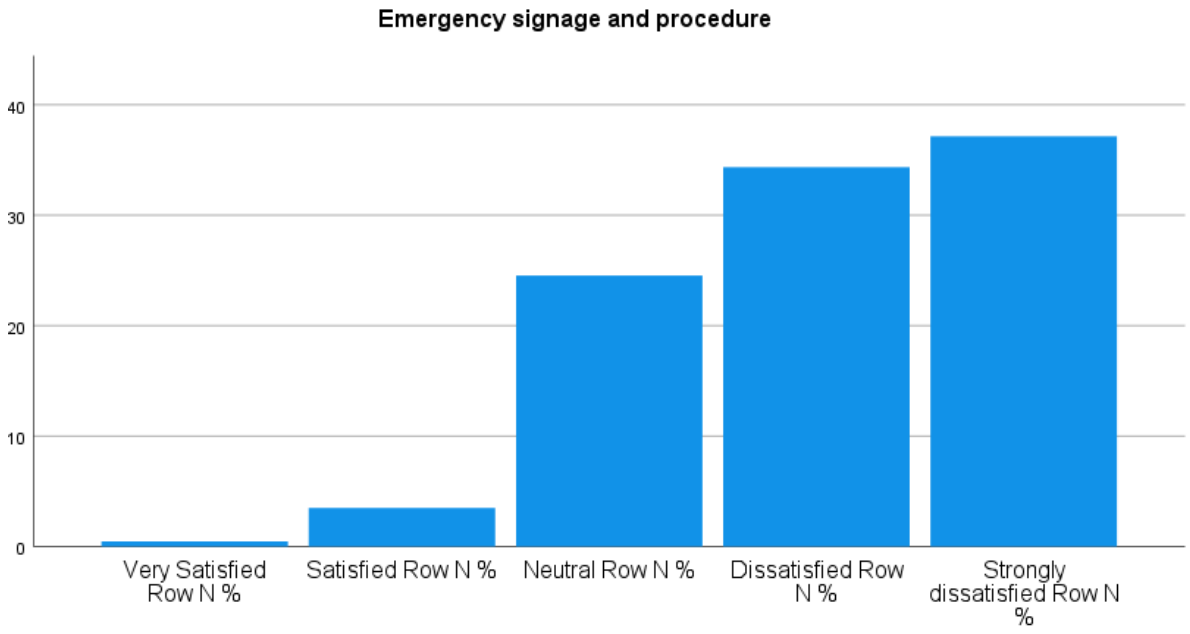


Figure 37 A graph that shows the emergency signage and procedure satisfaction observation. Source: the researcher

More than 65% of the respondents were unhappy with the current site condition when it comes to emergency signage and procedure.

In addition to the 18 variables some site specific conditions observation questions were asked to the respondents. These are concerned with, the queuing phenomenon, multiple road crossing, waiting time and traffic safety.

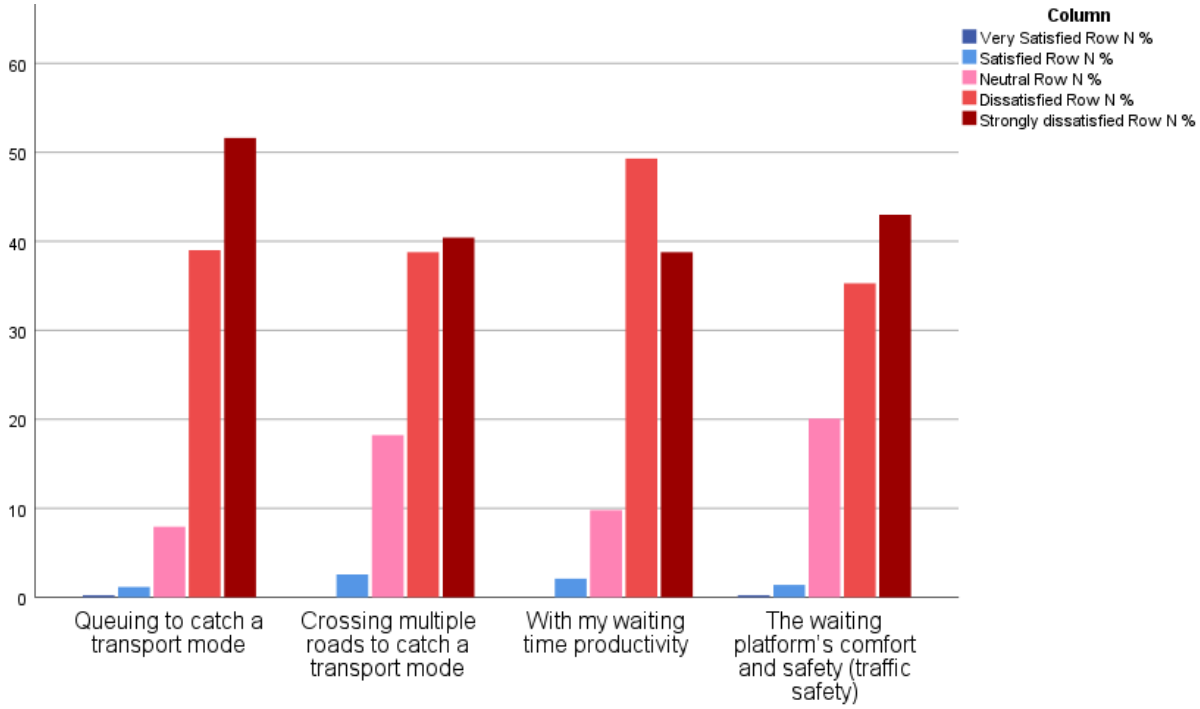


Figure 38 A graph that shows the site specific conditions satisfaction. Source: the researcher

The additional observation shows 85% of respondents being unhappy about the queuing to catch a mode of their choice, as well as at more than 75% disliking the idea that they crossed multiple roads on the process. In addition, more than 85% said they were unproductive at their transfer point while more than 75% suggested they don't feel traffic safety.

The last piece of the survey was to gain insight and feedback from the respondents to discover any new substantial material that this study could fail to cover.

Suggested feedback and extra information	Frequency
The holding capacity of the current terminal is insufficient and so stakeholders should plan based on users number	2
The place lacks a sense of design and planning	2
The crowded pedestrian ways make it difficult to get service	10
The long waiting times	2
A certain building construction is taking up the available queuing space	1
Some routes are not fully permitted to operate, which makes it inconvenient for us users	1

It is inconvenient, I make the trek because I am obligated to not by choice	2
It is getting worse day by day	1
It is not comfortable	2
Pedestrian way commercial activity should be regulated	2
Increasing the quantity of fleet for LRT, Buses and other supporting fleets	1
The Minibus taxi need regular controlling	1
Transport demand management is highly required in order to use the available resource properly	1
It Is not convenient	3
The pedestrian ways are not enough to accommodate regular people and transport users	1
There is no delineation between buses and taxis it is confusing	1
The people with special need suffer the most	2
The site is tiring and boring	5
Demand is higher than the supply	1
Unaffordable transportation tariffs	2
It is a very risky place	1

Table 4 Compilation of the feedbacks provided by users as par tof the open ended questionnaire. Source: the researcher

4.1.5 Stake holder's reflection

In an effort to explore the background of the observed level of interchange integration and to assess their take on the matter a series of questions were forwarded to government officials at Addis Ababa transport bureau. Who were responsible for the roles - City bus rapid development team lead, transport infrastructure development, supervision and contract administration team lead and transport terminal administration team. Their responses were assessed using the thematic method and is presented below.

No.	Theme	Summarized response
1	Definition of an Integrated interchange	• Physical integration • Service integration • Technological integration • fare integration • standardized system • sheltered space • image building (vanity) • transport with commerce and supporting facilities • efficient use of space - multi story
2	requirements for integration	• centralized under one roof • toilet facility • pedestrian space • digital & intelligent system • waiting area • comfort • delineate between motorized and non-motorized • bridges to bypass traffic • Land allocation • Political will • no need for feasibility study
3	Does Addis Ababa have such interchanges	• Merkato pilot project • the planned Megenagna site • others according to mater plan
4	Observed problems	• shifted priority (Government) • Land acquisition problems and politics • lack of comprehensive city wide plan • infrastructure administration problem

5	Who is responsible/stakeholders	• transport infrastructure directorate under a limited political will • terminal administration (day to day administration only) • The municipality directly (on some special occasions such as the Merkato project)
6	The condition at Mexico	• hectic • unsecured (sensitive offices such as the police commission) • narrow roads • accident • robbery
7	Solutions	• The Merkato intra-city public transport terminal • the Megenagna multi story terminal • proposed Mexico area terminal • incorporation of technology • outsourcing day to day administration of terminals • incorporate extra purpose such as making them tourist attraction points

Table 5 A table that shows the summarized response of the interviewed government take holders at the Addis Ababa transport bureau. Source: the researcher

4.2 Discussion

4.2.1 The socio-economic characteristics of the respondents

From the 428 respondents 42% were female and 57% male. Furthermore, the data revealed 47.7% of the respondents were between the age 21 – 35, while the next dominant age group was 26 – 50 at 35.3%. looking at the occupation of the respondents it became clear that students and self-employed respondents were dominant at 22.9% and 23.6% respectively. But overall the observation saw a total 42% employees of any kind (fulltime/part-time or government) which makes the trips undertaken to be regular and the observation to be current. Looking at the income spectrum, 32.7% of the respondents earn between 6501 – 10,000 ETB while the next earners, which are less than 2500 birr, are 32.2%. this can be attributed to the fact that 22.9% of the respondents are students and students mostly earn less.

4.2.2 Trip and modal characteristics

The trip origin was assessed to figure out which parts of the six zones or station the respondents belonged to. Having that information helped identify which station is experiencing the longest distance travelled and the most unfavorable conditions related to the Likert scale used. With that said, at 21% the Torhail line was the largest origin point for this survey. This is the case due to the fact that the Torhail line has two stations at Zone 5 and Zone 6. The next major origin point was the Megenagna line at 18%, the Megenagna line is served by Minibus taxis, Higer buses, Buses and LRT. LRT also pushes the Torhail line respondent number. The third largest portion is the Lafto line at 16%. The rest of the origin points are similar in proportion.

The survey included modal usage to assess which mode is preferred on which route. Considering the mode utilized to get to Mexico Minibus Taxis are the most dominant at 40%. This can be attributed to the fact that Mexico doesn't have a comprehensive bus terminal within it, the nearest such terminal is at Stadium. The other factor for such large portion is the limited service observed on site concerning Higer bus, Lada and Qitqit fleets. The Higer bus is a niche mode of fleet only related to the trips going to the Megenagna, and teklehaimanot line. The next biggest modality used to arrive is the bus understandably due to the centrality of the Mexico area most trips converge and so buses also take advantage of that but not as competitively to Minibuses as it is expected due to the centrality of the site.

Looking closer at the popular fleet used to arrive on site, the Bole line is highly travered with Lada/Ride fleets than any other form of transport. The second best chosen form is the mini-bus. On the other hand, Jemo line arrivals are 58% done using the Bus as with the Piassa line with 63%. Similar to the Bole line 47% the Shiromeda line arrivals also made use of Lada to arrive but unlike bole the second highest utilized mode was the bus. For the rest of the lines, such as Lafto, Megenagna, and Torhail a variety of fleets were used to arrive suggesting that there is a robust supply of modes at their trip origin.

Observing the destinations Torhail and the Mexico areas are the most popular, followed by Teklehaimanot and Megenagna. With that most outgoing trips were made by making a use of Mini-bus taxies at 46% and then by walking and buses. Since the Mexico area was the second most favored destination it is understandable that walking comes the second most popular mode of transport as far as departures are concerned. Comparing the origin and the destination with another it is observed that there is a varied trip habit when no single line of origin prefers a single line of departure.

The survey observed the frequency of transfers to assess how commuters make use of the site on a daily, weekly and hourly basis. 86% of the transfers that occur on the site are 1 to 2 times a day while 3% said 3 to 4 times. Since most of the commuters under this survey are students and employees this trend of school and work schedule. When it comes to the highest observed frequency per week, at 45% commuters made their transfers 5 days a week, which corresponds with the 5 working days of the week. The most common times of transfers during the day are at more than 40% are the 6 to 9 am morning time and then after 5 pm. Typical of a working schedule. The respondents are very well aware of the site due to their regular usage of the site.

4.2.3 Measuring the level of integration

As reflected by (Bryniarska & Zakowsa, 2016), the assessment criteria for interchange evaluation can be a quantitative measure for both the interchange as a whole and its individual components. Therefore, meaning the distance of separation and pointing out the extremities helps how well integrated they are. In order to achieve such goals, we need to observe the walking distance and its impact on stations, age groups, and utilized modes.

The transfer distance is a key part of assessing how well the physical stations or the six zones are integrated, and which of the six zone experiences the longest trek. Since the respondents don't know how far they walk their origin route termination and destination take on point separation distance was used to assign their walking distance. With that said, the shortest trek was 20 meters where passengers simply crossed streets to catch a different mode of transport. On the other hand, the longest trek measured 550 meters where as much as 3 streets were crossed. Looking at the data it revealed at more than 45% most respondents walked 450 to 550 meters to make transfers. While more than 35% walked between 230 to 280 meters.

Looking at the distance travelled by age bracket, the age groups 51 and above, 21- 35 and 12 and under walked the most, which is 300 – 550 meters. While the age range between 12 – 20 walked the least distance 20 – 190 meters. The fact that older people walked more presents a transfer challenge, in addition, the same experience would be most difficult for people with special needs such as wheelchair users.

Assessing which zones experienced the most distance of walking, we find that Zones 1,2, and 4 or at 90% the Bole station or Zone 1, at 70% the Shiromeda station, and at 67% the Jemo station experienced the most walking transfer distance of 300 – 550 meters. On the other hand, Zones 5 and 6 walked the least or between 20 - 190 meters. Coming on to the longest walking experienced with modes, 49%, 80% and 51% of Qitqit, Lada/ride and Bus users walked 300 to 550 meters respectively. While 44% of LRT users walked 20 – 190 meters. This can be attributed to that fact that the LRT has two stations at the Mexico site, specifically at Zone 5 and Zone 1 where the separation between the two can be as much as 550 meters. Therefore, commuters can choose to get off at their convenient station and reduce their transfer trek. This can also tell us that the most separated stations on the site are Zones 1 and Zone 5/6 or Bole/Shiromeda and Torhail stations.

As part of the user experience/satisfaction 18 variables were explored by the respondent. One of which is the variable travelled distance satisfaction measurement. This can help assess the impact of distance on the user. Generally, 65% of the respondents feel unhappy about their walking distance. Walking distance is an issue for the respondents for the distance of separations of 450 - 550 and 20 – 190 meters. While for the 300 – 350 meter and 200 – 280 meter it is more favored. But more than 45% of the total walks occurred for the 450 – 550-meter separation. Looking at the age of the respondents who rated their walking distance, all of the under 12 were unsatisfied but

most importantly 72% of age 51 and above were unhappy the only age group that showed some level of positive experience was the age bracket 21 – 35 at 54% satisfaction rate.

When comparing which station's respondents were the unhappiest regarding their walking distance, we can observe that at 72% the Teklehaimanot station or Zone 6 respondents were unhappy followed by those who originated from around the Mexico area at 62%. While Zone 4 or Jemo respondents were satisfied at 61%. And when we looking at which modes users were the unhappiest, walking, Qitqit, LRT, Higer bus and City bus users all above 50% were unsatisfied. On the other hand, Lada users were the happiest at 79.6%. this shows how every mode available is not well integrated except for the Lada/Ride mode. In addition to that, the Teklehaimanot station or Zone 6 is the least integrated from the rest unlike Zone 4 or Jemo station that is most integrated.

Lastly we can use the method provided by (Bryniarska & Zakowsa, 2016) to check the overall compactness of the site by finding the average distance travelled between the shortest and longest distance travelled and comparing it against an international case study, The Hong Kong planning standards and guidelines (The government of Hong Kong special administrative region, 2021).

The planning standard states for a multi-story bus depo it should measure at least 80 m width and a minimum area of 8000 to 10,000 square meters. Therefore, taking an assumption, for a two story depo the floor area becomes 4000 – 5000 square meters which means 50 to 62.5 meter long building. But in reality depos include more than two stories therefore the total built area reduces with the dimensions. In addition, such facilities incorporate mechanical vertical circulation options therefore commuters have more options to reduce their walking distance. For this study's survey area which is the Mexico interchange the average walking distance when making transfer is 364 meters which is more than a bus depo building dimension.

4.2.4 User experience and satisfaction

One of the objective of this study is to identify the effects felt by transport users on site therefore, a 5- point Likert satisfaction measurement was employed on a modified version of (Sara Hernanez, 2015) variable observation. After assessing the respondent's preferences, the following data was also compared from individual station perspective to assess which of the six zones is in a better *standing than the others.

The first category includes three variables related to signage and information (destination, fee, facilities direction and assistance) where on the three observations respondents were overwhelmingly unsatisfied. This suggests that there is little to no infrastructure that conveys travel information. This is dangerous as it can directly impact new users as well as regular users with a different itinerary. And since seeking support result in unsatisfactory response from site coordinators users rely on other user's guide to get to their mode of choice. Looking at the zones, all of the six stations suffered the same situation with more than 55% of the respondent at each station feeling unhappy about the existing signage.

The second category studied is the time and movement variables. At more than 65% each, the three observed variables, which are elapsed time, walking distance and ease of movement, were dominated by unhappy respondents. Each of the six stations were unhappy about the time and movement category. As suggested by (Espino et al. , 2021) Access/egress, walk time, and waiting time are among the four vital component of an urban public transport journey. And so such result directly negates the mentioned principle.

The comfort and convenience category includes six variables related to cleanliness of the site, shelter, noise, financial service, toilet facilities and seating area. Three of the variables which are the cleanliness, shelter and noise saw more than 75% each unsatisfied respondents leading us to conclude comfort is inexistent on the site. And for the availability of seating area 70% responded that they are not happy. Site observation revealed only bus station have such seating and they have a limited capacity. The two positive responses are the availability of ATMs/financial institutions and toilets albeit not dedicated to transport user but rather café/restaurant users. All of the six zones experience a high level of dissatisfaction towards the comfort and convenience variables except for the above mentioned two. Noise and cleanliness can't be controlled on site due to the fact that there is no designated location for transport usage. The surrounding business and intuitions share the land with the six stations. Not to mention the very location of the station creates opens the possibility for noise pollution.

Observing the fourth category we find the side walk condition and overall site layout rating. Close to 70% of the respondents did not like the side walk condition nor the overall layout of the site. And this feeling was overwhelmingly dominant at each of the six zones/stations.


Figure 39 Images that show the lack of seating area and the condition of the side walk. Source: the researcher

The fifth category focuses on safety by measuring variables such as feeling safe during day time transfer, night time transfer and the lighting condition of the site at night. At more than 90% and 93% the respondents were unsatisfied when they made their transfers during day and night time respectively. As for the light 53% of the respondents don't believe that there is adequate lighting condition at night. These creates the constant worry inside of user's head which makes their experience even more worse. Looking at this variable across zones, all zones experience the dissatisfaction at a rate more than 62%.

The sixth category is about emergency signage specifically, signs related to procedures to follow. At 65% the respondents are unhappy with the condition at the site.

The second 5-point Likert scale measured site specific or often observed cases such as long ques, multiple road crossing, waiting time and comfort. At more than 80% and above each variable showed intense dissatisfaction from the respondents. Specially the ques sparked more than 90% of the respondents to be unhappy. While the comfort of the waiting platform receiving more than 75% dissatisfaction. Waiting time productivity was very poor according to more than 85% of the respondents.

The survey included an open ended question where respondents can give more insight based on their exposure to the site and it uncovered major issues and reiterated on discovered issues, such as-

- the capacity of the site and users number mismatch. 10 respondents felt it was very crowded
- there were routes that were not regulated or sanctioned according to some users. One example was the Gerji line. Such states take away the reliability of the transport mode and promotes chance based trips.
- The long waiting time accompanied by comfortless facility that resulted in tiresome and boring feelings. These will deter the productivity of users further affecting the productivity of the city
- The risk of accessing the site
- What little space there was available was being siphoned by construction project such as the Oromia tower near Zone 2 Megenagna and Piasa station. This indicates the cooperation between facility administrators and other enterprises. Lack of responsibility or regulation.
- The other major flag was the pedestrian way commercial activities which at times completely block walk ways forcing people to walk on the road creating safety hazards.
- The transport fleets specially the Minibus taxis need regular monitoring

4.2.5 discussion on responses obtained from stakeholders

As was seen on the report by (Wijaya, 2009) in Jakarta, the stakeholders diminished their involvement on their infrastructure leaving holes to be filled by private service providers. According to users' opinion the site seems to lack a central regulating body that manifests themselves on the ground. In addition, (Edvardsson, 1997) highlighted plans need to meet user's need and so the system is inclusive of the users aside from the technical, managerial or organization structure. The interview that was conducted at Addis Ababa transport Bureau at Megenagna 3M b uilding 9^{th} and 10^{th} floors revealed some issues related to the cohesion that was said paramount above.

The interview officials believed the requirements must be user centric in that they should portray physical, service, technological integration. In addition, standardization was the way forward. they also iterated that a sheltered all inclusive (fleet) facility can be part of the solution. But the major

issue that was raised was the political will to execute such projects. This can be expressed through the fact that previously planned projects were deprived of their allocated land at time of administrative change. The other failure point is the administration of built infrastructures such as the Merkato depo. It supposedly fell very dirty and neglected because it was not adequately allocated the administrative umbrella. Even though there is a department at the bureau that focuses on terminal upkeep their operational extent has been reached. But the official under interview suggested a tried and true model where the administration could welfare if it were outsourced to private entities.

Finally, the bureau officers eluded to that fact that change was coming by the form of the Megenagna 8 story intra-city interchange depo. It currently has the strong motivation but will it come to fruition we will wait and see.

CHAPTER FIVE: CONCLUSIONS AND RECOMENDATIONS

5.1 Conclusions

The objectives of this study are 1. To measure the level of integration of public transport modes 2. Identify the effect felt by the users and 3. To go behind the scenes to possibly discover the reasons. In order to achieve these goals 428 respondents were surveyed at the Mexico area terminal. The observation discovered various conditions that will be presented below.

5.1.1 Level of integration

For this objective transfer distance was a key factor in identifying the separation between the six zones. And so the observation saw the minimum transfer distance of 20 meter but it also recorded the maximum at 550 meters. Now it is important to keep in mind that several roads, as much as three, were crossed during such trek. The other discovery is the average walking distance which is at 364 meters and that was even longer than a regular integrated interchange of size 8000 – 10,000 square meters (The government of Hong Kong special administrative region, 2021).

5.1.2 User satisfaction/ felt effects

By measuring the user satisfaction level on 18 variables provided by (Sara Hernanez, 2015) it is possible to gaze and evaluate globally measured requirements for an interchange from the eyes of this study's respondents. In addition, this study left an open ended question which further revealed feelings felt by respondents.

All of the 18 variables categorized under six categories revealed high dissatisfactions, except for availability of ATMs and café based toilets. A further look at which of the six zones experience the worst case, none can be singled out as the condition is similar zone to zone.

According to the observation users felt –

- Information was lacking
- Support from site supervisors was inadequate

- A change in trip itinerary can be as much difficult as a new user due to the fact that information was lacking
- Long walking distances
- Uncomfortable waiting area
- Time wastage
- Unclean and shelter lacking environment
- Disappointing waiting area/pedestrian way
- Fear or robbery, fear of transfer during day and at night
- Lacking emergency case procedure
- unhappiness related to long ques, multiple road crossings, long waiting times, and comfort.
- In addition, crowded environment, lack of monitoring and risk situations were raised by users
- Private entities grabbing of available land to squeeze user area/ transport area which further exacerbated the comfort issue.

5.1.3 Stakeholder's take

By directly asking the government stakeholders it became possible what is contributing to the observed level of integration at the site. Even though the situation predates the current municipal or ministerial administration, significant efforts were focused elsewhere to rectify the situation. Such actions can be building robust fleet and trying pilot depo project. By the stakeholder's own expression such measures are good signs but when looking at the big picture trends dictate a core problem that is the political will and priority to see projects through. In addition to that, proper day to day administration of such facilities to fulfill their purposes. Another point that was raised by transport users was the case of private entity government cooperation. The building construction near Zone 2 fully erased the pedestrian way while cutting halfway on to the road making it unsafe for users and drivers alike. Such incursions were not supposed to occur as the terminal administration office should have the proper power to exercise or even the municipality has the regulation to prevent such phenomenon.

5.2 Recommendations

5.2.1 recommendations for interchange integration

Special compactness is essential part of public transport journey (Espino et al. , 2021). By decreasing the distance of separation it is possible to significantly improve the travel experience. In addition, the (The government of Hong Kong special administrative region, 2021) recommendation on the size of a regular interchange is surpassed by the currently observed detached stations at the Mexico area. Which begs the necessity that these detached stations should be covered in one roof. They can be integrated vertically where elevators and escalators could ease the access/egress. Interchange facilities clearly delineate between motorized and non-motorized areas therefore users won't be crossing multiple roads to access their mode of choice. One roof service could incorporate extra income generating ventures for the planning organ such as shops and rentable spaces. These spaces support the transport provision activity in turn. Based on the interview with the government stakeholder, the Mexico area development has another potential site, 10,000 square meters near the Wabishebele hotel, that land can be developed quickly into a multi-story structure that can connect buses, taxies and the other modes but it fails to incorporate LRT. Therefore, a better location near the "Buna ena Shai" building could be swapped by the potential near the Wabishebele hotel to create an all-inclusive one roof integration. This study also recommends that further study to be conducted to better scrutinize the makeup of the exact interchange.

5.2.2 Recommendation for user experience rectification

As presented by (Hine & Scott, 2000) as well as other scholars, the quality of the waiting environment, supporting facilities (toilets), robust information system, safety, security, aiding staff members and distances of separation are the core planning element of an interchange. And so this study recommends based on its observation, a one roof service with ample space for ques, sheltered space with a clear delineation of motorized and non-motorized area. Furthermore, a well light environment with productivity incentives in-mind such as WiFi service, workstations, could significantly improve user satisfaction. Employing security check points, closed circuit camera's and available staff members will make it safe to use even late at night. Information is everything to any service and so incorporating local and international multi-lingual visual and audio

informants will make the service universal. Introducing ramps, elevators and escalators will make it accessible to all not to mention easy to use for pregnant women, and people with cargo.

5.2.3 Recommendation for administrative and planning organs

(Suwarno & Ikhsan, 2006) reflected, a professional service is characterized by accountability and responsibility. Therefore, there should be clear policies, regulations and a means to inforce when it comes to intruding organs. The planning organ should make it paramount that a comprehensive plan or city scape multilevel plan is essential. This can include fleet management, depo planning, road planning and education to mention some. Transportation is the lifeline of a city as it drives its economic activity therefore, actively lobbying and justifying the construction of an interchange at the study location should become one priority among others planned. As was said by one of the stakeholders the site is sensitive because of the federal police commission and its security is an important element. One best way to achieve that is centralizing and bounding terminal activity to prevent spillover effects on the road.

Terminal administration is another issue that should be robust. Private organ participation can insure a healthy operation cycle. Plus, it could potentially contribute to the repayment of the construction of such facility.

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Annex I: Publishable Manuscript

Assessment of infrastructural integration of public transport system and its effect on service provision: The case of Mexico area Addis Ababa

Sisay Fantahun Abate

Abstract

Public transport interchange integration is essential in easing the drawbacks that arises form making transfers. Ease of movement is the driving force of city development. Well integrated interchange smoothens trips and promotes business and educations to flourish. and so the planning process must be done with that notion behind. This study is targeted at investigating the Mexico area public transport interchanges to check for level of integration, user satisfaction and driving factors. The study location is in Addis Ababa's heart and near its central business district, which is the Mexico terminal stations. These stations are grouped in to six zones with varying trip direction/destination. In order to conduct the study a survey was conducted intercepting 428 transport users. The survey used variables to measure walking distance and a 5-point Likert scaling for service satisfaction. In addition, to get to the back story and planning process government stakeholders at Addis Ababa city transport bureau were interviewed. The results of the study revealed an average transfer distance of 364 meters crossing as much as three streets to make transfers. The discovered walking distance measures longer than conventional transport depo facility. Furthermore, the observed service was rated poorly across 18 variables that checked for information, time, movement, access, convenience, safety and emergency procedure. Moreover, it was revealed that government priority has shifted away from planning and executing transport interchanges to acquiring new fleets. Another point that was discovered was the change in administration and its consequence. As new administration arrived political will shifted away from interchange planning. The last finding of this study was lack of accountability towards negative actors on site. There was no solution provided after a significant portion of one of the stations was engulfed with construction. Even though a pilot project at Merkato showed how integration can be solved it quickly fail to administrative defects that officials pointed could hamper healthy operation. This study recommends the planning of a one roof interchange where users experience is part of the planning process.

Key words: Infrastructural integration, user experience, administrative process

1. INTRODUCTION

Transport operators provide service to important origins and destinations, but it is too expensive for them to provide direct service between all sites, therefore there will inevitably be some exchange stations (Rivasplata, 2003). What Travelers dislike the most about public transportation are stations (Yiu Kwok Kin, 2005). According to (Miller, 2004) Infrastructural integration of public transport involves establishment of points of transfer for transport users that are planned giving consideration to location, facilities, vehicular and pedestrian movement to create a conflict free and safe environment for transfer between modes.

Infrastructural integration encourages coordinated vehicular movement to foster a pedestrian-friendly and secure environment. Intermodal integration strives to coordinate and promote seamless, practical services of excellent quality in order to reduce the disruption of the interchanges (Saliara, 2014). It is essential for raising transportation service standards and boosting ridership (Vuchic, 1999).

User-friendly facilities and interconnections for riders that help them move more easily and reduce inconvenience imply an improved integration of public transport modes. In addition, a coordinated integration of different transport modes results in reduced congestion on the road, convenience to commuters, efficiency and cost effectiveness for the overall system (A. Aziz et al., 2018).

The existence of multiple transfers and the simultaneous operation of different modes necessitates coordination, cooperation and interaction among them to guarantee the image of a one unified system without creating confusion for commuters or revealing any interruption in the service provided (Saliara, 2014).

The aim of this study is first to identify the degree of infrastructure integration and how this affects the commuters. It is observed at the study site that transport users experience added time to traverse between transport interchanges which exposes them to environmental and safety factors. In addition, due to physical separation of interchanges, pedestrian activity of the site is increased, especially at crossing areas, which further leads to vehicular congestion as interchange point are distributed on opposite sides of the roads. The study also focuses on the cause of the observed level of public transport interchange integration to be able to propose markers that might lead to similar occurrences in other areas of the city.

2. LITERATURE REVIEW

Most daily trips reveal the necessity to combine varied transport modes for commuters to reach their destination. This results in transfers between modes, which takes away the appeal of public transport (Guo & Wilson, 2011). As stated by (Lam & Xie, 2002) the satisfaction of transport users is affected by transfers. In addition, (Liu et al., 1997) mentioned, the opportunities for direct trips on public transport is becoming scarce and so, transfers are commonplace for most trips.

Most scholars agree on the disruptive nature of transfers at interchanges. For instance, (Hine & Scott, 2000) argue transfers affect the user's awareness in use and path choice. While (CTPS, 1997) regards transfers to be disruptive and have a travel disutility which discourages users.

The other challenging factor of MMPT integration is location. (Terzis & Last, 2000) Argued interchange development should emphasize on a place with vast number of public transport mode intersect and with high volume of users. On most occasions, such places are deep inside city centers. Therefore, (Hussen, 2016) Highlighted locating such entities along the city center will demand free space or the compensation payment to acquire one.

The comfort aspect of interchanges has the possibility to be overlooked but, (Monzon et al., 2016) suggest consideration to comfort, security and reliability are becoming crucial elements. Furthermore, (Terzis & Last, 2000) reflect notion about attractiveness of interchanges, giving attention to physical and psychological reaction of users.

The consideration of handicapped people goes beyond people with reduced mobility but also others (Nosal hoy & Rogala, 2019). (Bühler et al., 2006) Suggests people who are deaf or hard hearing, or suffers of different sensory, psychological or intellectual disabilities as well. In addition, as stated by (Bühler et al., 2006) individuals with communication and perception problems such as foreigners who cannot read the local language and those who cannot read should be included in the above category. Other scholars such as (Pashkevich & Puławska, 2015) argue people with a heavy luggage; pregnant women and children should be included.

As stated by (Lucietti et al., 2016) the fundamental elements that make up an interchange are accessibility to the interchange, infrastructure, information services for the passengers, rental services and facilities.

Furthermore, (Olszewski et al., 2014) suggest clarity, ease of disembarkation, comfort while waiting, safety while waiting and accessible security are essential.

Integrated as part of an interchange (Wilson & Yariv, 2011) point out three different areas: access/egress, the facilities and retail area. In addition to that, (Hernandez, 2015) further elaborates the importance of adequate lighting, clear line of sight and CCTV (Close-Circuit Television). Aside from security (Hammer et al., 2014) suggested reducing the distance between modes and integrating helpful aid of staff along the way should gain a focus.

What is becoming clearer is that information is essential that is why many scholars support its incorporation in to the system. Beyond that though (Hernandez, 2015) also reflected co-ordination between operators and transport services should be realized.

(Miller A., 2004) Argued physically integrated transit system allows various types of travel needs and services. Apart from the user point of view (Tsami et al, 2013) explored how smart urban interchange encourages urban integration, a better use of waiting time, information rich, clean, safe and seamless transport service.

2.1 Measuring transport mode interchange integration

Proposed by (Bryniarska & Zakowsa, 2016) for a complete analysis of a selected interchange in Poland takes in to consideration the distance between tram/bus within the interchange.

As stated by (Bryniarskaa & Zakowskaa, 2016) the assessment criteria for interchange evaluation can be a quantitative measure for both the interchange as a whole and its individual components. The indicators for the entire facility include compactness, visibility and additional facilities. When it comes to the spatial compactness it can be determined in two ways, one on the basis of the arithmetic mean of distances between all stops inside and second weighted average passage length and the flow of passengers using this passage. The visibility index is the arithmetic mean of number of tram/bus stops that are visible from every other stop. Lastly, the indicator for additional facilities is taken as a percentage of possible extra facilities. The quality of platforms and accessibility consider elements such as warning tiles with different color inset.

In Poland using the AMPTI (Assessment Methodology for Public Transport Interchanges) (Krukowska et al., 2014) put out a methodology with eight important indicators such as compactness, legibility of the node, additional equipment, core infrastructure, accessibility, safety and information.

2.2 Measuring the impact of Transport interchange integration on the user

As reflected by (Hernandez et al., 2016) the five scale likert can be used to assess public transport users' experience. Such endeavors assessed travel information, wayfinding, time, movement, comfort, convenience, attractiveness, safety and security.

Apart from the environmental aspects scholars also studied about architecture. (Cascetta & Carteni, 2014) Utilized a comparative analysis of two rail stations with the major difference being their Architecture and the finding of the study showed females were highly affected by their travel choice related to the quality of the Architecture.

In Australia a railway station usability principles for the government of Victoria put forward seven principles to bolster effectiveness of a station: these are, accessibility, ease of navigation, comfort and

amenities, information, safety, local area integration and community ownership and activity (The station user panel, 2011).

(Sara Hernanez, 2015) utilized a survey to assess the user satisfaction, preference for and choices of certain elements at urban transport interchange. The study selected 37 observed variables to base the questionnaire on and made use of the 5-point Likert scale, which it deemed was the widely used method on the sector. The questionnaire was designed around the following 37 observed variables.

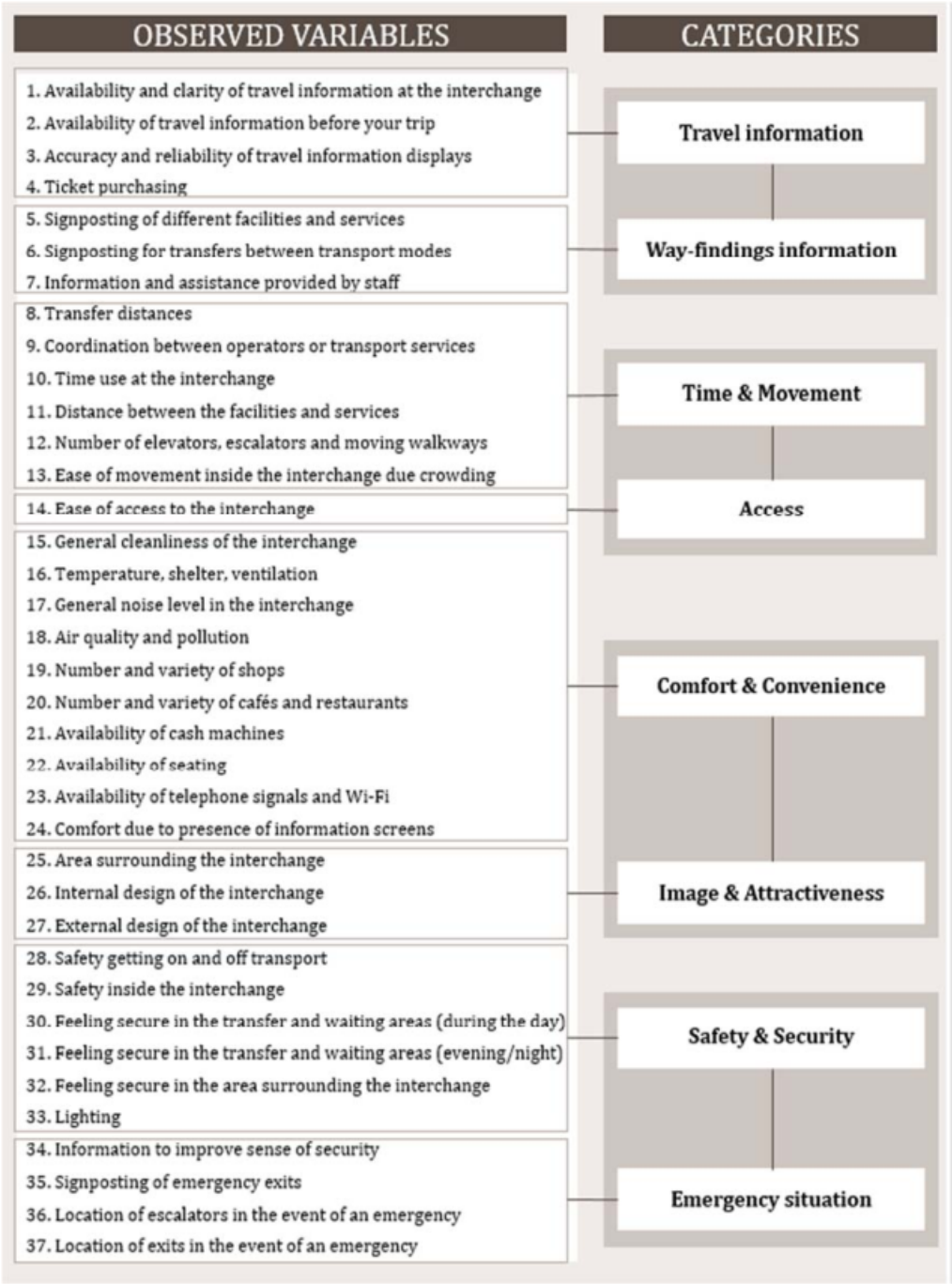

Figure 40 List of observed variables in the travelers' satisfaction survey. Source the assessment methodology to make urban transport interchanges attractive for users

2.3 Attributable causes for public transport integration failure

A professional public service is characterized by the prevalence of accountability and responsibility of the stakeholders. Such bodies will show effectiveness, simplicity, transparency, efficiency, timely, responsive and adaptive standing (Suwarno & Ikhsan, 2006). One such endeavor governments could take is illustrated by (Suwarno & Ikhsan, 2006) the role of the government is important in passing policies that aim to harmonize transportation problems, one such program can be encouraging mass transit.

As discussed by (Edvardsson, 1997) service system includes resources that are paramount for execution of services. These can be achieved by meeting customer needs. This system consists of the users, the organizational structure, management, staff and technical resources.

A case study of the Jakarta system that was analyzed by (Wijaya, 2009) shows how the role of the government was diminished only to providing licensing and how it lacked the ability to comprehensively monitor routes. Most of the bus transport operators are privately owned. Government oversight is so loose that a route could have 50% overlap with other routes. In addition, in this study quality of service was highly neglected running the system's punctuality, convenience and safety.

A further dive in to the Jakarta system by (Wijaya, 2009) reveals complex working structures. Although the planning and execution of traffic and transport decisions is given to an agency, the real power lays over the local development board and parliament. But public participation is a rarity to add to that since the Jakarta system lays inside the capital, the central government also plays a role.

3. METHODOLOGY

3.1 Description of the study Area

The city hosts a variety of transportation modes such as city bus, express bus, higer bus, mini bus, blue taxies, Bajaj and recently introduced LRT, meter taxies and ride (private vehicle taxi service). The population of Addis Ababa has been growing fast specially in the 1960 and 1970s. The growth is expected to continue. According to the 1994 census, the population of Addis Ababa was 2.3 million. Modest estimates of the population in the year 2015 vary from 4.1 million to 4.6 million while the United Nations Development Program has given an estimate of 6.6 million people in 2015. Much of the population growth is expected to happen due to internal migration of people from rural areas to Addis Ababa (Meron Kassahun, 2007).

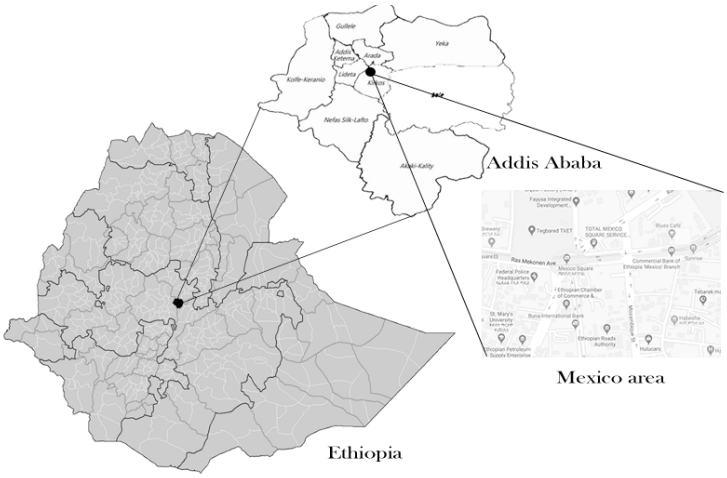

Figure 41 Location map - Addis Ababa Mexico Area Source: google & researcher

3.2 The research design

This study is an exploratory research which hopes to measure existing conditions on the study site to identify city transport interchange integration situations. In order to achieve that goal, the study involved site survey of transport users, stakeholder opinions and observations based on the methods taken from other similar studies.

The study consists of both primary and secondary sources. The primary data is collected on site using intercept surveys, and site observations. The secondary data includes literatures from other studies and interviews.

Qualitative and quantitative data were used to assess site conditions. The qualitative data encompasses the user experience, opinions, and utilized literatures. While the quantitative data covers time of transfer, distance of separation via site observation, and user rankings.

The convenience non-probability sampling technique was utilized to collect data, because the study area is composed various moving parts which presents a challenge when it comes to focusing on data collection as the taxi and bus ques change rapidly. In addition, due to the geographic vastness and separation of each stops Stratified sampling was used to further randomize the collection process among the six study zones.

Acquiring the exact number of population at the study location is impossible since there is no previous data on population size. But based on the figure provided by (AA city transportation bureau, 2020) and (Fortune, 2016) Anbessa and Sheger city bus served more than 930,000 people per day; added to that, according to Addis Ababa city transport bureau (AATB), close to 3000 minibus taxies served more than 1.1 million passengers. Lastly light rail transit (LRT) reportedly served 60,000 – 80,000 passengers per hour (Andualem & Takele, 2018). With all these modes and others operating in the city, the study area does surely receive at least 100,000 passengers per day if not more owing to its central location. Therefore, this highly assumed number could make it a candidate the Cochran formula, which is used for an unknown population number to determine the sample size. (Uakarn, 2021). With a 95% confidence and 0.05 sampling error the Z is taken as 1.96; by using the formula the study population was 385 samples of which each study zone received 77 sample size. Furthermore, in order to explore the behind the scenes of transport system management, stakeholders from Addis Ababa Transport bureau were interviewed to gain insight on the observed integration. The interview shades a light on the matter, and when it is combined with the opinion and response of the users it creates a clearer picture which can be used as an input for future studies.

$$n = \frac{z^2}{4e^2}$$

n = sample size p = the population proportions e = acceptable sampling error (e = 0.05) z = z value at reliability level or significance level. - Reliability level 95% or significance level 0.05; z = 1.96 - Reliability level 99% or significance level 0.01; z = 2.58

Figure 42 The Cochran Formula

The data was collected using randomly selected survey participants from transport ques. The survey was composed of a quantifiable question such as the Origin destination relationship, transfer time, and the Likert scale for user experience. The site is vast but for the sake of this study it was divided to Six zones which each received 77 respondent quota. At zones with multiple mode presence the allocated respondent quota is further divided equally among them.

A structured close-ended questionnaire with one open-ended opinion column were used to assess the variables such as the transfer time, mode usage, Origin destination matrix, socio-economic condition, frequency of usage and user's opinion. As for the exploratory interview with government stake holders, a series of open-ended questions were conducted to collect current working data and Likert scale to assess their interpretation of the current situation.

To explore the inner working of city-wide public transport interchange administration and planning, and to hone in at the target location and how norms evolved, stakeholders were approached to provide their expert view.

The qualitative data such as opinions, comments, and feedbacks collected from three government officers were analyzed using Thematic analysis where interview responses were transcribed and coded to be categorized into parent thoughts or themes that align with the objective of the study. No manipulation was introduced to the received Reponses.

The quantitative data which includes quantified user experience metrics, time metrics, distance metrics, and other socio-economical metrics were analyzed using descriptive statistics. The descriptive statistics were applied to all metrics to summarize the collected data.

3.3 Variables

No.	Variables	Type of variable	Measurement and presentation method
1	Gender, Age, occupation, or -- background information, and income	Independent variable	Descriptive statistics with cross tabulation, graphs and charts
2	Habit, rate, mode usage habit, transfer time, origin and destination, interchange usage frequency	Independent variable	Descriptive statistics with tables, graphs and charts
3	Transport interchange integration level	Dependent variable	Descriptive and inferential statistics with tables, graphs and charts
4	User experience ratings	Dependent variable	Ranking using the five-point Likert scale,

			descriptive and inferential statistics with tables, graphs and charts
5	Stakeholders background	Independent variable	Content analysis
6	Stakeholders rankings and justifications, opinions	Dependent variable	Ranking, content analysis, categorization presented with tables, graphs and charts

Table 8 A table that shows the types of variables of the study. Source: the researcher

4. RESULTS

4.1 Demography and trip characteristics

A total of 428 responses were collected from the target location, of which 57% of the respondents were male and 42% were female. The survey reviewed various age ranges, from which the age range from 21 – 35 and 36 – 50 were prominent, 47.7% and 35.3% respectively. The second prominent respondent age ranges are 51 and above and 12 – 20 were constituted 10.3% and 6.5% respectively.

The survey explored the six stations at Mexico area which are - Zone 1 – The Shiromeda/Bole line, Zone 2 – Piassa and Megenagna line, Zone 3 - Lafto line, Zone 4 – Jemo line, Zone 5 - Torhail line and Zone 6 – the Teklehaimanot/ Torhail line. The following data are presented making use of their destination for ease of understanding.

When it comes to the origin of the respondents 21% of the respondents arrived from Torhail/Lideta line, 18.69% from Megenagna line, and 16.1% from Lafto/Kera line. The rest of the respondents including 9.8% from Jemo line, at 7.7% each from Teklehaimanot line and Shiromed/4kilo line, 5.84% from Piassa line and finally respondents originating from Mexico area accounted for 7.7%.

At 39.9% Minibus taxi was used to arrive, following that 25% Bus 12% LRT, 10.2% Higer bus, 2.3% Qitqit, and 9% Lada/ride. Those who responded they walked accounts 7.7%.

23.6% of the respondents were headed towards Torhail while 20.33% stayed around Mexico. 14.72% of the respondents were departing to Teklehaimanot, at 14.02% Megenagna direction travelers were followed by 9.5% Piassa line goers. Bole and Shiromeda lines both received 7.2% and 5.14% of the respondents respectively. Lastly the Jemo line 3% and 2% Lafto line.

For trips originating from Mexico 25% went to the Shiromeda line, 26% to the Jemo line and 24% to the Bole line. For trips that originated from the Bole line 27% went towards Torhail, 24% to the Piassa line and 22% to the Shiromeda line. When looking at the respondents that arrived from the Jemo line 32% of them went to the Teklehaimanot line while 20% went to the Megenagna line. For respondents who arrived from Lafto 27% undertook the Teklehaimanot line while 20% and 19% of the respondents departed towards Torhail and the Piassa line respectively.

For the trips that originated from the Megenagna line 23% stayed around Mexico while 19% and 17% headed towards the Teklehaimanot and Torhail line. When looking at the Piassa line 37% departed towards to the Lafto line, 24% went to the Jemo line and 18% towards Torhail. For the respondents that arrived from the Shirmeda line 30% departed towards Torhail, 20% stayed around Mexico, and 19% travelled towards the Lafto line. For the trips that originated from the Teklehaimanot line 28% went to the Megenagna line while 27% went to the Lafto line. Lastly the trips that originated from the Torhail line the Piassa and Megenagna lines departure scored 19% each.

4.2 Data presentation on station Integration

The respondents were asked about their trip itinerary, for which they referred to one of the six zones. Using that information, the distance of separation was incorporated with their response. Looking at the distance travelled in the form of walking from one drop off to another take on point, the result shows two prominent values. 40% of the respondents walked a distance between 450 – 500 meters. While 31% of the respondents lied between 230 – 260 meters. The average distance travelled lies just beyond 350 meters at 364 meters.

91% of the Respondents who arrived from the bole line walked 300 to 550 meters to make their transfers while 93% those who arrived from the Jemo line walked between 200 to 550 meters to make their transfers. looking at the 65% respondents who came from the Shiromeda line walked 300 to 550 meters to make their transfers. The 48% respondents who arrived from the Lafto line walked 450 to 550 meters to make their connection while only 34% the arriving respondents from the Megenagna line walked 300 to 550 meters to catch another mode of transport. 53% of the Piassa line arrivals walked 20 to 280 meters to make their transfers. On the other hand, 78% and 66% of the respondents from the Teklehaimanot and Torhail line walked 20 to 280 meters respectively.

50% of the respondents who arrived with a Bus they walked between 300 – 550 meters to make their connection. On the other hand, 50% and 61% of Higer bus and LRT users only walked 20 to 280 meters respectively to make their transfers. 80% of Lada/Ride users walked 450 – 550 meters to make their connections. 50% of Mini Bus users walked 300 – 500 meters to make transfers. Lastly 49% of Qitqit users walked 450 – 550 meters to make connections.

65% of the respondents said they were not happy with the walking distance while 29% were neutral to the notion. On the other hand, 71% of those who walked 20 – 190 meters were generally unhappy with their experience while for the 200 – 280 meters range only 29% were unhappy. With a similar trend 19% of 300 – 350 meter travelers were unhappy. Lastly for the 450 – 550 range 38% were unhappy with their travelled distance.

4.3 Data presentation on user experience and satisfaction measurement

Looking at the satisfaction level of signage of travel information, sign for facilities and staff support, 85%, 70% and 74% general dissatisfaction on the existing situation respectively for the information signage, toilet signage and staff assistant variables. When looking closer to the availability of signage for terminating trips, all the trips termination points were lacking of a satisfactory signage according to respondents.

Looking at the satisfaction level of time, movement and access observation, it shows 71%, 66% and 71% general dissatisfaction on the existing situation respectively for the elapsed time, walking distance and ease of movement variables. When the satisfaction is further analyzed through the origin google, 78%, 70% and 76% of respondents from the Mexico area, the Lafto and the Piassa line were unhappy about how the site catered to their needs. While the trip that originated from the Bole line showed a 56% dissatisfaction.

Observing the satisfaction level of comfort and convenience observation, it shows 90%, 78%, 83% and 69% general dissatisfaction on the existing situation respectively for the site cleanliness, availability of shelter, noise, and the availability of seating variables. On the other hand, for the variables, availability of ATM, and toilet facilities 55% and 35% of the respondents were generally happy. Coming to the satisfaction based on the trip origin or the drop off point, 61% of the respondents that start their journey from the Mexico area are unhappy with the comfort and convenience observation. The observation showed 44% dissatisfaction for the Bole line respondents.

Looking at the satisfaction level of Site character observation, it shows 71% and 70% general dissatisfaction on the existing situation respectively for the pedestrian way condition and overall site layout variables. Assessing the response based on the trip origin reveals, 88% of the Teklehaimanot line respondents were unhappy while 68% of the Jemo line respondents were generally dissatisfied.

Observing the satisfaction level of safety observation, it reveals 90% each general dissatisfaction on the existing situation respectively for safety doing transfer during the day and safety doing transfer during the night variables. On the other hand, 56% of the respondents were unhappy about the lighting condition at night. Looking at safety observation through the trip origin, the 73% of the Teklehaimanot line respondents were not feeling safe.

More than 65% of the respondents were unhappy with the current site condition when it comes to emergency signage and procedure.

In addition to the 18 variables some site specific conditions observation questions were asked to the respondents. These are concerned with, the queuing phenomenon, multiple road crossing, waiting time and traffic safety.

The additional observation shows 85% of respondents being unhappy about the queuing to catch a mode of their choice, as well as at more than 75% disliking the idea that they crossed multiple roads on the process. In addition, more than 85% said they were unproductive at their transfer point while more than 75% suggested they don't feel traffic safety.

The last piece of the survey was to gain insight and feedback from the respondents to discover any new substantial material that this study could fail to cover.

Suggested feedback and extra information	Frequency
The holding capacity of the current terminal is insufficient and so stakeholders should plan based on users number	2
The place lacks a sense of design and planning	2
The crowded pedestrian ways make it difficult to get service	10
The long waiting times	2
A certain building construction is taking up the available queuing space	1
Some routes are not fully permitted to operate, which makes it inconvenient for us users	1
It is inconvenient, I make the trek because I am obligated to not by choice	2
It is getting worse day by day	1
It is not comfortable	2
Pedestrian way commercial activity should be regulated	2
Increasing the quantity of fleet for LRT, Buses and other supporting fleets	1
The Minibus taxi need regular controlling	1
Transport demand management is highly required in order to use the available resource properly	1
It Is not convenient	3
The pedestrian ways are not enough to accommodate regular people and transport users	1
There is no delineation between buses and taxis it is confusing	1
The people with special need suffer the most	2
The site is tiring and boring	5
Demand is higher than the supply	1
Unaffordable transportation tariffs	2
It is a very risky place	1

Table 9 Compilation of the feedbacks provided by users as par tof the open ended questionnaire. Source: the researcher

4.4 Data presentation on stake holder's reflection

No.	Theme	Summarized response
1	Definition of an Integrated interchange	• Physical integration • Service integration • Technological integration • fare integration • standardized system • sheltered space • image building (vanity) • transport with commerce and supporting facilities • efficient use of space - multi story
2	requirements for integration	• centralized under one roof • toilet facility • pedestrian space • digital & intelligent system • waiting area • comfort • delineate between motorized and non-motorized • bridges to bypass traffic • Land allocation • Political will • no need for feasibility study
3	Does Addis Ababa have such interchanges	• Merkato pilot project • the planned Megenagna site • others according to mater plan
4	Observed problems	• shifted priority (Government) • Land acquisition problems and politics • lack of comprehensive city wide plan

		• infrastructure administration problem
5	Who is responsible/stakeholders	• transport infrastructure directorate under a limited political will • terminal administration (day to day administration only) • The municipality directly (on some special occasions such as the Merkato project)
6	The condition at Mexico	• hectic • unsecured (sensitive offices such as the police commission) • narrow roads • accident • robbery
7	Solutions	• The Merkato intra-city public transport terminal • the Megenagna multi story terminal • proposed Mexico area terminal • incorporation of technology • outsourcing day to day administration of terminals • incorporate extra purpose such as making them tourist attraction points

Table 10 A table that shows the summarized response of the interviewed government take holders at the Addis Ababa transport bureau. Source: the researcher

4.5 Discussion

From the 428 respondents 42% were female and 57% male. Furthermore, the data revealed 47.7% of the respondents were between the age 21 – 35, while the next dominant age group was 26 – 50 at 35.3%. looking at the occupation of the respondents it became clear that students and self-employed respondents were dominant at 22.9% and 23.6% respectively. But overall the observation saw a total 42% employees of any kind (fulltime/part-time or government) which makes the trips undertaken to be regular and the observation to be current. Looking at the income spectrum, 32.7% of the respondents earn between 6501 –

10,000 ETB while the next earners, which are less than 2500 birr, are 32.2%. this can be attributed to the fact that 22.9% of the respondents are students and students mostly earn less.

The trip origin was assessed to figure out which parts of the six zones or station the respondents belonged to. Having that information helped identify which station is experiencing the longest distance travelled and the most unfavorable conditions related to the Likert scale used. With that said, at 21% the Torhail line was the largest origin point for this survey. This is the case due to the fact that the Torhail line has two stations at Zone 5 and Zone 6. The next major origin point was the Megenagna line at 18%, the Megenagna line is served by Minibus taxis, Higer buses, Buses and LRT. LRT also pushes the Torhail line respondent number. The third largest portion is the Lafto line at 16%. The rest of the origin points are similar in proportion.

The survey included modal usage to assess which mode is preferred on which route. Considering the mode utilized to get to Mexico Minibus Taxis are the most dominant at 40%. This can be attributed to the fact that Mexico doesn't have a comprehensive bus terminal within it, the nearest such terminal is at Stadium. The other factor for such large portion is the limited service observed on site concerning Higer bus, Lada and Qitqit fleets. The Higer bus is a niche mode of fleet only related to the trips going to the Megenagna, and teklehaimanot line. The next biggest modality used to arrive is the bus understandably due to the centrality of the Mexico area most trips converge and so buses also take advantage of that but not as competitively to Minibuses as it is expected due to the centrality of the site.

Looking closer at the popular fleet used to arrive on site, the Bole line is highly travered with Lada/Ride fleets than any other form of transport. The second best chosen form is the mini-bus. On the other hand, Jemo line arrivals are 58% done using the Bus as with the Piassa line with 63%. Similar to the Bole line 47% the Shiromeda line arrivals also made use of Lada to arrive but unlike bole the second highest utilized mode was the bus. For the rest of the lines, such as Lafto, Megenagna, and Torhail a variety of fleets were used to arrive suggesting that there is a robust supply of modes at their trip origin.

Observing the destinations Torhail and the Mexico areas are the most popular, followed by Teklehaimanot and Megenagna. With that most outgoing trips were made by making a use of Mini-bus taxies at 46% and then by walking and buses. Since the Mexico area was the second most favored destination it is understandable that walking comes the second most popular mode of transport as far as departures are concerned. Comparing the origin and the destination with another it is observed that there is a varied trip habit when no single line of origin prefers a single line of departure.

The survey observed the frequency of transfers to assess how commuters make use of the site on a daily, weekly and hourly basis. 86% of the transfers that occur on the site are 1 to 2 times a day while 3% said 3 to 4 times. Since most of the commuters under this survey are students and employees this trend of school and work schedule. When it comes to the highest observed frequency per week, at 45% commuters made their transfers 5 days a week, which corresponds with the 5 working days of the week. The most common times of transfers during the day are at more than 40% are the 6 to 9 am morning time and then after 5 pm. Typical of a working schedule. The respondents are very well aware of the site due to their regular usage of the site.

As reflected by (Bryniarska & Zakowsa, 2016), the assessment criteria for interchange evaluation can be a quantitative measure for both the interchange as a whole and its individual components. Therefore, meaning the distance of separation and pointing out the extremities helps how well integrated they are. In order to achieve such goals, we need to observe the walking distance and its impact on stations, age groups, and utilized modes.

The transfer distance is a key part of assessing how well the physical stations or the six zones are integrated, and which of the six zone experiences the longest trek. Since the respondents don't know how far they walk their origin route termination and destination take on point separation distance was used to assign their walking distance. With that said, the shortest trek was 20 meters where passengers simply crossed streets

to catch a different mode of transport. On the other hand, the longest trek measured 550 meters where as much as 3 streets were crossed. Looking at the data it revealed at more than 45% most respondents walked 450 to 550 meters to make transfers. While more than 35% walked between 230 to 280 meters.

Looking at the distance travelled by age bracket, the age groups 51 and above, 21- 35 and 12 and under walked the most, which is 300 – 550 meters. While the age range between 12 – 20 walked the least distance 20 – 190 meters. The fact that older people walked more presents a transfer challenge, in addition, the same experience would be most difficult for people with special needs such as wheelchair users.

Assessing which zones experienced the most distance of walking, we find that Zones 1,2, and 4 or at 90% the Bole station or Zone 1, at 70% the Shiromeda station, and at 67% the Jemo station experienced the most walking transfer distance of 300 – 550 meters. On the other hand, Zones 5 and 6 walked the least or between 20 - 190 meters. Coming on to the longest walking experienced with modes, 49%, 80% and 51% of Qitqit, Lada/ride and Bus users walked 300 to 550 meters respectively. While 44% of LRT users walked 20 – 190 meters. This can be attributed to that fact that the LRT has two stations at the Mexico site, specifically at Zone 5 and Zone 1 where the separation between the two can be as much as 550 meters. Therefore, commuters can choose to get off at their convenient station and reduce their transfer trek. This can also tell us that the most separated stations on the site are Zones 1 and Zone 5/6 or Bole/Shiromeda and Torhail stations.

As part of the user experience/satisfaction 18 variables were explored by the respondent. One of which is the variable travelled distance satisfaction measurement. This can help assess the impact of distance on the user. Generally, 65% of the respondents feel unhappy about their walking distance. Walking distance is an issue for the respondents for the distance of separations of 450 -550 and 20 – 190 meters. While for the 300 – 350 meter and 200 – 280 meter it is more favored. But more than 45% of the total walks occurred for the 450 – 550-meter separation. Looking at the age of the respondents who rated their walking distance, all of the under 12 were unsatisfied but most importantly 72% of age 51 and above were unhappy the only age group that showed some level of positive experience was the age bracket 21 – 35 at 54% satisfaction rate.

When comparing which station's respondents were the unhappiest regarding their walking distance, we can observe that at 72% the Teklehaimanot station or Zone 6 respondents were unhappy followed by those who originated from around the Mexico area at 62%. While Zone 4 or Jemo respondents were satisfied at 61%. And when we looking at which modes users were the unhappiest, walking, Qitqit, LRT, Higer bus and City bus users all above 50% were unsatisfied. On the other hand, Lada users were the happiest at 79.6%. this shows how every mode available is not well integrated except for the Lada/Ride mode. In addition to that, the Teklehaimanot station or Zone 6 is the least integrated from the rest unlike Zone 4 or Jemo station that is most integrated.

Lastly we can use the method provided by (Bryniarska & Zakowsa, 2016) to check the overall compactness of the site by finding the average distance travelled between the shortest and longest distance travelled and comparing it against an international case study, The Hong Kong planning standards and guidelines (The government of Hong Kong special administrative region, 2021).

The planning standard states for a multi-story bus depo it should measure at least 80 m width and a minimum area of 8000 to 10,000 square meters. Therefore, taking an assumption, for a two story depo the floor area becomes 4000 – 5000 square meters which means 50 to 62.5 meter long building. But in reality depos include more than two stories therefore the total built area reduces with the dimensions. In addition, such facilities incorporate mechanical vertical circulation options therefore commuters have more options to reduce their walking distance. For this study's survey area which is the Mexico interchange the average walking distance when making transfer is 364 meters which is more than a bus depo building dimension.

One of the objective of this study is to identify the effects felt by transport users on site therefore, a 5- point Likert satisfaction measurement was employed on a modified version of (Sara Hernanez, 2015) variable

observation. After assessing the respondent's preferences, the following data was also compared from individual station perspective to assess which of the six zones is in a better standing than the others.

The first category includes three variables related to signage and information (destination, fee, facilities direction and assistance) where on the three observations respondents were overwhelmingly unsatisfied. This suggests that there is little to no infrastructure that conveys travel information. This is dangerous as it can directly impact new users as well as regular users with a different itinerary. And since seeking support result in unsatisfactory response from site coordinators users rely on other user's guide to get to their mode of choice. Looking at the zones, all of the six stations suffered the same situation with more than 55% of the respondent at each station feeling unhappy about the existing signage.

The second category studied is the time and movement variables. At more than 65% each, the three observed variables, which are elapsed time, walking distance and ease of movement, were dominated by unhappy respondents. Each of the six stations were unhappy about the time and movement category. As suggested by (Espino et al. , 2021) Access/egress, walk time, and waiting time are among the four vital component of an urban public transport journey. And so such result directly negates the mentioned principle.

The comfort and convenience category includes six variables related to cleanliness of the site, shelter, noise, financial service, toilet facilities and seating area. Three of the variables which are the cleanliness, shelter and noise saw more than 75% each unsatisfied respondents leading us to conclude comfort is inexistent on the site. And for the availability of seating area 70% responded that they are not happy. Site observation revealed only bus station have such seating and they have a limited capacity. The two positive responses are the availability of ATMs/financial institutions and toilets albeit not dedicated to transport user but rather café/restaurant users. All of the six zones experience a high level of dissatisfaction towards the comfort and convenience variables except for the above mentioned two. Noise and cleanliness can't be controlled on site due to the fact that there is no designated location for transport usage. The surrounding business and intuitions share the land with the six stations. Not to mention the very location of the station creates opens the possibility for noise pollution.

Observing the fourth category we find the side walk condition and overall site layout rating. Close to 70% of the respondents did not like the side walk condition nor the overall layout of the site. And this feeling was overwhelmingly dominant at each of the six zones/stations.

The fifth category focuses on safety by measuring variables such as feeling safe during day time transfer, night time transfer and the lighting condition of the site at night. At more than 90% and 93% the respondents were unsatisfied when they made their transfers during day and night time respectively. As for the light 53% of the respondents don't believe that there is adequate lighting condition at night. These creates the constant worry inside of user's head which makes their experience even more worse. Looking at this variable across zones, all zones experience the dissatisfaction at a rate more than 62%.

The sixth category is about emergency signage specifically, signs related to procedures to follow. At 65% the respondents are unhappy with the condition at the site.

The second 5-point Likert scale measured site specific or often observed cases such as long ques, multiple road crossing, waiting time and comfort. At more than 80% and above each variable showed intense dissatisfaction from the respondents. Specially the ques sparked more than 90% of the respondents to be unhappy. While the comfort of the waiting platform receiving more than 75% dissatisfaction. Waiting time productivity was very poor according to more than 85% of the respondents.

The survey included an open ended question where respondents can give more insight based on their exposure to the site and it uncovered major issues and reiterated on discovered issues, such as-

- the capacity of the site and users number mismatch. 10 respondents felt it was very crowded

- there were routes that were not regulated or sanctioned according to some users. One example was the Gerji line. Such states take away the reliability of the transport mode and promotes chance based trips.
- The long waiting time accompanied by comfortless facility that resulted in tiresome and boring feelings. These will deter the productivity of users further affecting the productivity of the city
- The risk of accessing the site
- What little space there was available was being siphoned by construction project such as the Oromia tower near Zone 2 Megenagna and Piasa station. This indicates the cooperation between facility administrators and other enterprises. Lack of responsibility or regulation.
- The other major flag was the pedestrian way commercial activities which at times completely block walk ways forcing people to walk on the road creating safety hazards.
- The transport fleets specially the Minibus taxis need regular monitoring

As was seen on the report by (Wijaya, 2009) in Jakarta, the stakeholders diminished their involvement on their infrastructure leaving holes to be filled by private service providers. According to users' opinion the site seems to lack a central regulating body that manifests themselves on the ground. In addition, (Edvardsson, 1997) highlighted plans need to meet user's need and so the system is inclusive of the users aside from the technical, managerial or organization structure. The interview that was conducted at Addis Ababa transport Bureau at Megenagna 3M b uilding 9th and 10th floors revealed some issues related to the cohesion that was said paramount above.

The interview officials believed the requirements must be user centric in that they should portray physical, service, technological integration. In addition, standardization was the way forward. they also iterated that a sheltered all inclusive (fleet) facility can be part of the solution. But the major issue that was raised was the political will to execute such projects. This can be expressed through the fact that previously planned projects were deprived of their allocated land at time of administrative change. The other failure point is the administration of built infrastructures such as the Merkato depo. It supposedly fell very dirty and neglected because it was not adequately allocated the administrative umbrella. Even though there is a department at the bureau that focuses on terminal upkeep their operational extent has been reached. But the official under interview suggested a tried and true model where the administration could welfare if it were outsourced to private entities.

Finally, the bureau officers eluded to that fact that change was coming by the form of the Megenagna 8 story intra-city interchange depo. It currently has the strong motivation but will it come to fruition we will wait and see.

5. CONCLUSIONS

For this objective transfer distance was a key factor in identifying the separation between the six zones. And so the observation saw the minimum transfer distance of 20 meter but it also recorded the maximum at 550 meters. Now it is important to keep in mind that several roads, as much as three, were crossed during such trek. The other discovery is the average walking distance which is at 364 meters and that was even longer than a regular integrated interchange of size 8000 – 10,000 square meters (The government of Hong Kong special administrative region, 2021).

By measuring the user satisfaction level on 18 variables provided by (Sara Hernanez, 2015) it is possible to gaze and evaluate globally measured requirements for an interchange from the eyes of this study's respondents. In addition, this study left an open ended question which further revealed feelings felt by respondents.

All of the 18 variables categorized under six categories revealed high dissatisfactions, except for availability of ATMs and café based toilets. A further look at which of the six zones experience the worst case, none can be singled out as the condition is similar zone to zone.

According to the observation users felt –

- Information was lacking
- Support from site supervisors was inadequate
- A change in trip itinerary can be as much difficult as a new user due to the fact that information was lacking
- Long walking distances
- Uncomfortable waiting area
- Time wastage
- Unclean and shelter lacking environment
- Disappointing waiting area/pedestrian way
- Fear or robbery, fear of transfer during day and at night
- Lacking emergency case procedure
- unhappiness related to long ques, multiple road crossings, long waiting times, and comfort.
- In addition, crowded environment, lack of monitoring and risk situations were raised by users
- Private entities grabbing of available land to squeeze user area/ transport area which further exacerbated the comfort issue.

By directly asking the government stakeholders it became possible what is contributing to the observed level of integration at the site. Even though the situation predates the current municipal or ministerial administration, significant efforts were focused elsewhere to rectify the situation. Such actions can be building robust fleet and trying pilot depo project. By the stakeholder's own expression such measures are good signs but when looking at the big picture trends dictate a core problem that is the political will and priority to see projects through. In addition to that, proper day to day administration of such facilities to fulfill their purposes. Another point that was raised by transport users was the case of private entity government cooperation. The building construction near Zone 2 fully erased the pedestrian way while cutting halfway on to the road making it unsafe for users and drivers alike. Such incursions were not supposed to occur as the terminal administration office should have the proper power to exercise or even the municipality has the regulation to prevent such phenomenon.

6. Recommendations

Special compactness is essential part of public transport journey (Espino et al. , 2021). By decreasing the distance of separation it is possible to significantly improve the travel experience. In addition, the (The government of Hong Kong special administrative region, 2021) recommendation on the size of a regular interchange is surpassed by the currently observed detached stations at the Mexico area. Which begs the necessity that these detached stations should be covered in one roof. They can be integrated vertically where elevators and escalators could ease the access/egress. Interchange facilities clearly delineate between motorized and non-motorized areas therefore users won't be crossing multiple roads to access their mode of choice. One roof service could incorporate extra income generating ventures for the planning organ such as shops and rentable spaces. These spaces support the transport provision activity in turn. Based on the interview with the government stakeholder, the Mexico area development has another potential site, 10,000 square meters near the Wabishebele hotel, that land can be developed quickly into a multi-story structure that can connect buses, taxies and the other modes but it fails to incorporate LRT. Therefore, a better location near the "Buna ena Shai" building could be swapped by the potential near the Wabishebele hotel

to create an all-inclusive one roof integration. This study also recommends that further study to be conducted to better scrutinize the makeup of the exact interchange.

As presented by (Hine & Scott, 2000) as well as other scholars, the quality of the waiting environment, supporting facilities (toilets), robust information system, safety, security, aiding staff members and distances of separation are the core planning element of an interchange. And so this study recommends based on its observation, a one roof service with ample space for ques, sheltered space with a clear delineation of motorized and non-motorized area. Furthermore, a well light environment with productivity incentives in-mind such as WiFi service, workstations, could significantly improve user satisfaction. Employing security check points, closed circuit camera's and available staff members will make it safe to use even late at night. Information is everything to any service and so incorporating local and international multi-lingual visual and audio informants will make the service universal. Introducing ramps, elevators and escalators will make it accessible to all not to mention easy to use for pregnant women, and people with cargo.

(Suwarno & Ikhsan, 2006) reflected, a professional service is characterized by accountability and responsibility. Therefore, there should be clear policies, regulations and a means to inforce when it comes to intruding organs. The planning organ should make it paramount that a comprehensive plan or city scape multilevel plan is essential. This can include fleet management, depo planning, road planning and education to mention some. Transportation is the lifeline of a city as it drives its economic activity therefore, actively lobbying and justifying the construction of an interchange at the study location should become one priority among others planned. As was said by one of the stakeholders the site is sensitive because of the federal police commission and its security is an important element. One best way to achieve that is centralizing and bounding terminal activity to prevent spillover effects on the road.

Terminal administration is another issue that should be robust. Private organ participation can insure a healthy operation cycle. Plus, it could potentially contribute to the repayment of the construction of such facility.

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Annex II: City transport interchange integration assessment and experience measurement

Thank you for filling the following survey that explores public transport usage experience at interchanges.

Date of survey_____ zone_____ survey conductor's name_____

Sex ___ (1) male (2) female

Age____ (1) <12 (2) 12-20 (3) 21 – 35 (4) 36 – 50 (5) 51 and above

Occupation___(1) student (2) fulltime (3) part-time (4) self-employed (5) unemployed (6) housewife (7) retired

Monthly income___ (1) < 2500 (2) 2500 – 4500 (3) 4501 – 6500 (4) 6501 – 10,000 (5) above 10,000

Trip origin_____

(1) Shiromeda, Ferensai, 4 kilo line (2) Megenagna, 22, Kasanchis, Stadium line (3) Bole, Gerji line (4) Saris, Kera, Lafto line (5) Garment, Sarbet line (6) Torhail, Lideta line (7) Teklehaymanot, Merkato line (8) Piassa, Addisu Gebeya, Asko line (9) Mexico area

What mode of transport did you use to get here_____

(1) Bus (Sheger or Anbessa) (2) Qitqit (3) Higer (4) LRT (5) Minibus taxi (6) Ride sharing (7) walking

Trip destination_____

(1) Shiromeda, Ferensai, 4 kilo line (2) Megenagna, 22, Kasanchis, Stadium line (3) Bole, Gerji line (4) Saris, Kera, Lafto line (5) Garment, Sarbet line (6) Torhail, Lideta line (7) Teklehaymanot, Merkato line (8) Piassa, Addisu Gebeya, Asko line (9) Mexico area

What mode of transport will you use to depart_____

(1) Bus (Sheger or Anbessa) (2) Qitqit (3) Higer (4) LRT (5) Minibus taxi (6) Ride sharing (7) walking

How often do you transfer between modes at Mexico interchange per day _____

(1) 1 - 2 (2) 3 - 4 (3) 5 - 6 (4) 7 – 8 (5) 9 and above

How many time a week do you transfer at Mexico _____

(1) 7 days (2) 6 days (3) 5 days (4) 4 days (5) 3 days (6) 2 days (7) once

At what time of the day do you usually transfer at Mexico _____

(1) early morning 6- 9 am (2) morning 9 am – 12 Pm (4) Mid-day 12 – 2 pm (5) afternoon 2 – 5 pm (6) early evening 5 – 7 pm (7) after 7 pm

12. User experience and satisfaction survey questions

Assessment question	Strongly satisfied(5)	Satisfied (4)	Neutral (3)	Dissatisfied (2)	Very dissatisfied(1)
Signage or posters for route information (destination + fee)					
Signage for facilities like toilet					
Assistance provided by on site supervisors / coordinators					
The time elapsed while transferring at Mexico (efficiency)					
The walking distance while transferring at Mexico					
The ease of movement while transferring					
The cleanliness of the site					
The availability of shelter					
The noise on site					
The availability of financial service (bank, ATM, other)					
The availabilities of dedicated toilets, cafes,					
The availability of seating while waiting					
The side walk condition (pedestrian)					
The overall layout of the site (your get off and get on point and in between)					
Safety doing transfer during day time (robbery)					
Safety doing transfer during night time (robbery)					

The lighting condition of the site at night					
Emergency signage and procedure					

13. further exploratory questions related to the local condition

Assessment question	Strongly satisfied(5)	Satisfied (4)	Neutral (3)	Dissatisfied (2)	Very dissatisfied(1)
Queuing to catch a transport mode					
Crossing multiple roads to catch a transport mode					
With my waiting time productivity					
The waiting platform's comfort and safety (traffic safety)					

14. please share your opinion and recommendation about the condition of the interchange here at Mexico

_____

_____

Annex III: City transport interchange integration background interview

Thank you for agreeing to sit down with me. The objectives of this study are 1. To measure the level of integration of public transport interchanges at Mexico area, 2. To assess the user experience and possible felt-impacts. 3. To explore the background of the observed integration at Mexico site from the administrative and planning point of view.

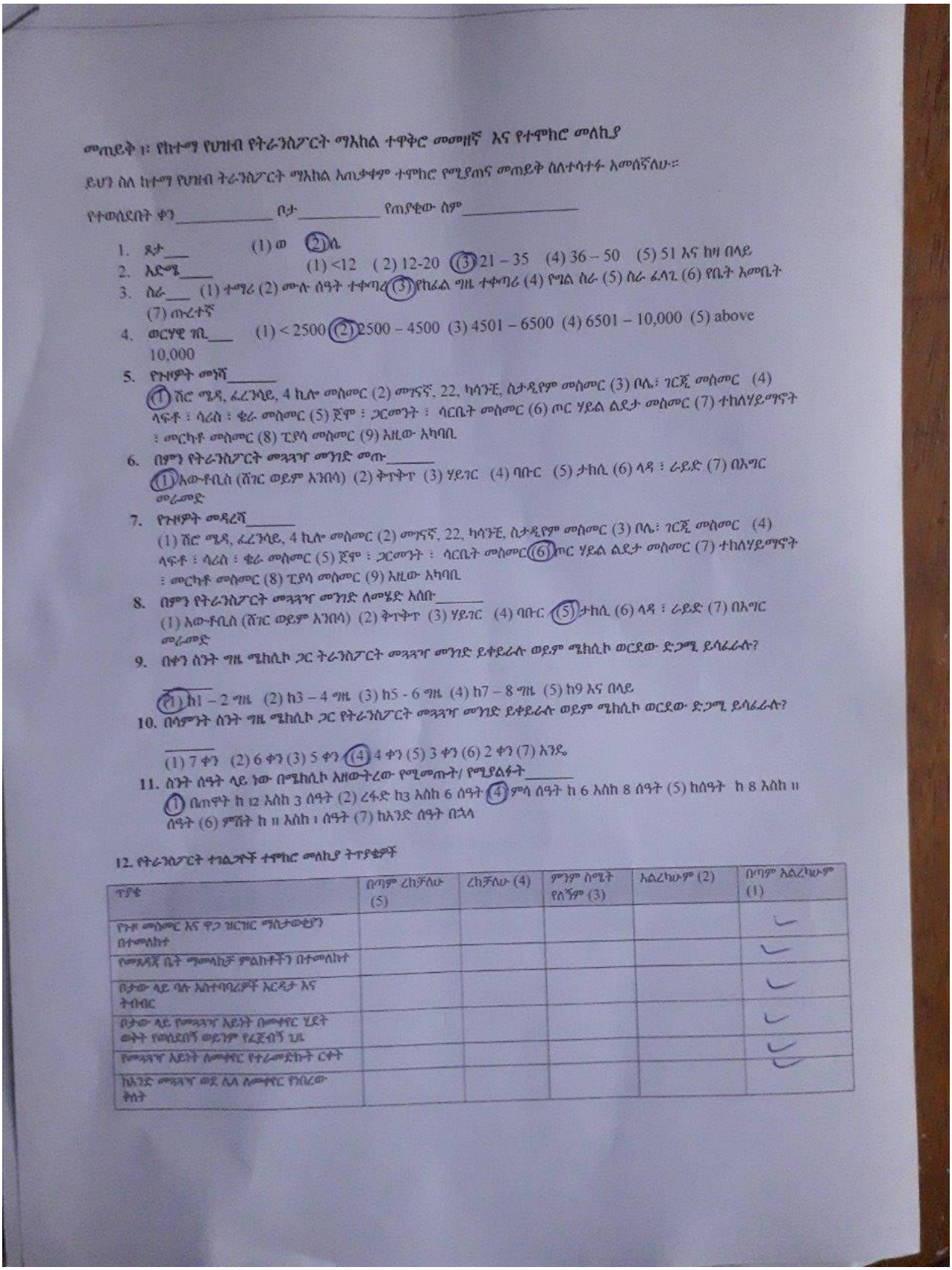
My stay with you will focus more on the third objective but we will raise some ideas on the other two as well.

Date of Interview_____ office name_____

With that I will start with your

1. Role in your organization
   _____
2. What is a public transport interchange as defined by your organization?
3. What are the requirements for such facilities?
4. Does Addis Ababa have such facilities? If so can you give examples?
5. Who administers such facilities on a day to day basis?
6. Focusing on the Mexico area how is the interchange organized? Who are the stake holders?
7. Is it operating as intended?
8. What problems can you point for that particular site regarding integration of different transport modes?
9. What solutions have you developed?

Annex IV: Sample filled out questionnaire



መጠይቅ ፡ የከተማ የህዝብ የትራንስፖርት ማእከል ተዋቅሮ መመዘኛ እና የተሞከሮ መለኪያ

ይህን ስለ ከተማ የህዝብ ትራንስፖርት ማእከል አጠቃቀም ተሞክሮ የሚያጠና መጠይቅ ስለተሳተፉ አመሰናለሁ።

የተወሰደበት ቀን_____ ቦታ_____ የጠያቂው ስም_____

1. ጾታ___ (1) ወ (2) ሴ
2. እድሜ____ (1) <12 (2) 12-20 (3) 21 – 35 (4) 36 – 50 (5) 51 እና ከዛ በላይ
3. ስራ___ (1) ተማሪ (2) ሙሉ ሰዓት ተቀጣሪ (3) የከፊል ግዜ ተቀጣሪ (4) የግል ስራ (5) ስራ ፈላጊ (6) የቤት እመቤት (7) ጡረተኛ
4. ወርሃዊ ገቢ___ (1) < 2500 (2) 2500 – 4500 (3) 4501 – 6500 (4) 6501 – 10,000 (5) above 10,000
5. የጉዞዎት መነሻ_____ (1) ሽሮ ሜዳ, ፈረንሳይ, 4 ኪሎ መስመር (2) መገናኛ, 22, ካሳንቺ, ስታዲየም መስመር (3) ቦሌ፣ ገርጂ መስመር (4) ላፍቶ ፡ ሳሪስ ፡ ቄራ መስመር (5) ጀሞ ፡ ጋርመንት ፡ ሳርቤት መስመር (6) ጦር ሃይል ልደታ መስመር (7) ተከለሃይማኖት ፡ መርካቶ መስመር (8) ፒያሳ መስመር (9) አዚው አካባቢ
6. በምን የትራንስፖርት መጓጓዣ መንገድ መጡ_____ (1) አውቶቢስ (ሸገር ወይም አንበሳ) (2) ቅጥቅጥ (3) ሃይገር (4) ባቡር (5) ታክሲ (6) ላዳ ፡ ራይድ (7) በእግር መራመድ
7. የጉዞዎት መዳረሻ_____ (1) ሽሮ ሜዳ, ፈረንሳይ, 4 ኪሎ መስመር (2) መገናኛ, 22, ካሳንቺ, ስታዲየም መስመር (3) ቦሌ፣ ገርጂ መስመር (4) ላፍቶ ፡ ሳሪስ ፡ ቄራ መስመር (5) ጀሞ ፡ ጋርመንት ፡ ሳርቤት መስመር (6) ጦር ሃይል ልደታ መስመር (7) ተከለሃይማኖት ፡ መርካቶ መስመር (8) ፒያሳ መስመር (9) አዚው አካባቢ
8. በምን የትራንስፖርት መጓጓዣ መንገድ ለመሄድ አሰቡ_____ (1) አውቶቢስ (ሸገር ወይም አንበሳ) (2) ቅጥቅጥ (3) ሃይገር (4) ባቡር (5) ታክሲ (6) ላዳ ፡ ራይድ (7) በእግር መራመድ
9. በቀን ሰንት ግዜ ሜክሲኮ ጋር ትራንስፖርት መጓጓዣ መንገድ ይቀይራሉ ወይም ሜክሲኮ ወርደው ድጋሚ ይሳፈራሉ? _____ (1) ከ1 – 2 ግዜ (2) ከ3 – 4 ግዜ (3) ከ5 - 6 ግዜ (4) ከ7 – 8 ግዜ (5) ከ9 እና በላይ
10. በሳምንት ሰንት ግዜ ሜክሲኮ ጋር የትራንስፖርት መጓጓዣ መንገድ ይቀይራሉ ወይም ሜክሲኮ ወርደው ድጋሚ ይሳፈራሉ? _____ (1) 7 ቀን (2) 6 ቀን (3) 5 ቀን (4) 4 ቀን (5) 3 ቀን (6) 2 ቀን (7) አንዴ
11. ሰንት ሰዓት ላይ ነው በሜክሲኮ አዘውትረው የሚመጡት/ የሚያልፉት_____ (1) ቤጠዋት ከ 12 እስከ 3 ሰዓት (2) ረፋድ ከ3 እስከ 6 ሰዓት (4) ምሳ ሰዓት ከ 6 እስከ 8 ሰዓት (5) ከሰዓት ከ 8 እስከ ፲፩ ሰዓት (6) ምሽት ከ ፲፩ እስከ ፩ ሰዓት (7) ከአንድ ሰዓት በኋላ

12. የትራንስፖርት ተገልጋዮች ተሞክሮ መለኪያ ትጥያቄዎች

ጥያቄ	በጣም ረክቻለሁ (5)	ረክቻለሁ (4)	ምንም ስሜት የለኝም (3)	አልረካሁም (2)	በጣም አልረካሁም (1)
የጉዞ መስመር እና ዋጋ ዝርዝር ማስታወቂያን በተመለከተ					✓
የመጸዳጃ ቤት ማመላለሻ ምልክቶችን በተመለከተ					✓
ቦታው ላይ ባሉ አስተባባሪዎች እርዳታ እና ትብብር					✓
ቦታው ላይ የመጓጓዣ አይነት በመቀየር ሂደት ውስት የወሰደበኝ ወይንም የረጅብኝ ጊዜ					✓
የመጓጓዣ አይነት ለመቀየር የተረመድኩት ርቀት					✓
ከአንድ መጓጓዣ ወደ ሌላ ለመቀየር የከፈረው ቅስት					✓

በቦታው ደጃፍ				✓	
በቦታው ላይ ባለው መጠለያ				✓	
በቦታው ባለው ድምጽ				✓	
በቦታው ባለው የባንክ ፣ ኤቲኤም አገልግሎቶች		✓			
በቦታው ባለው ለተጓዦች የተወሰነ የመጸዳጃ አገልግሎት እና የካፌ አቅርቦቶች					✓
ትራንስፖርት በመጠበቅ ግዜ የምቀመጥበት ቦታን በተመለከተ					✓
የእግረኛ መጓጓገው ያለበት ሁኔታ ወርጄ እስከም ሳፈር ፣ የምሰለፍበት ቦታ					✓
ባጠቃላይ በቦታው ላይ የትራንስፖርቶቹ አቆማመጥ ሁኔታ ወርጄ እስከም ሳፈር					✓
በቀን ከአንድ ትራንስፖርት ወደ ሌላ ስሄድ ከሌቦች ደህንነትን ይሰማኛል					✓
በምሽት ከአንድ ትራንስፖርት ወደ ሌላ ስሄድ ከሌቦች ደህንነትን ይሰማኛል					✓
በምሽት የአካባቢው የመንገድ መብራት መኖር እና መብራት		✓			
የአደጋ ግዜ ምልክቶች እና ማድረግ ስላለብኝ ድርጊቶች					✓

13. አካባቢውን ያማከሉ ተጨማሪ ጥያቄዎች

ጥያቄዎች	በጣም ረክቻለሁ (5)	ረክቻለሁ (4)	ምንም ስሜት የለኝም (3)	አልረካሁም (2)	በጣም አልረካሁም (1)
ትራንስፖርት ለመያዝ መሰለፊ					✓
ትራንስፖርት ለመያዝ/ለመቀየር ከአንድ በላይ አስፓልት በመሻገሬ					✓
ትራንስፖርት ለመያዝ በምቆይበት ግዜ ያለኝ ምርታማነት ፣ ግዜ አጠቃቀም					✓
የትራንስፖርት መጠበቂያ ቦታው ምቾት እና የትራፊክ ደህንነት					✓

14. እባክዎትን ሚከሰኮ ስላለው የትራንስፖርት መያዣ እና ማውረጃ ሁኔታ ያለዎትን ሃሳብ እና ምክር ያጋሩን

[illegible]

[illegible] Transport የምንጠቀመው፡፡