DIGITAL MIGRATION FOR WORK AND STUDY

POTENTIAL OF HOUSING DEVELOPMENTS IN ADDIS ABABA TO INCORPORATE E-WORKING, E-LEARNING AND SUPPORTIVE INFRASTRUCTURES.

THE CASES OF ENDERASE, MICKEY LELAND AND BOLE ARABSA PROJECT 15 CONDOMINIUM SITES, ADDIS ABABA, ETHIOPIA

Thesis submitted to the Graduate Programs Director of the Ethiopian Institute of Architecture, Building Construction and City Development (EiABC), Addis Ababa University, in partial fulfillment of the requirements for the Masters of Science Degree in Housing and Sustainable Development

By: AYELE BEDADA DUGUMA

February, 2019

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Date: February, 2019

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Declaration

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

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Certification:

Here with, I state that AYELE BEDADA DUGUMA has carried out this research work on the topic entitled “DIGITAL MIGRATION FOR WORK AND STUDY” subtitled “POTENTIAL OF HOUSING DEVELOPMENTS IN ADDIS ABABA TO INCORPORATE E-WORKING, E-LEARNING AND INNOVATION ACTIVITIES. THE CASES OF ENDERASE, MICKEY LELANDAND BOLE ARABSA PROJECT 15 CONDOMINIUM SITES, ADDIS ABABA, ETHIOPIA” under my supervision and it is sufficient for submission for defense.

Imam Mahmoud Hassen

Signature _____

Date: _____

Abstract

Recent global technological developments are bringing Eco-friendly solutions to urban situation where there are ineffective uses of resource and loss of time. While there are local researches that studied housing developments from angles of open spaces, relocation, job creation and income generation, construction technology and etc., there are no studies in housing made through ICT and other related supportive infrastructures, regarding Homeworking and Learning from Home.

This research studies the existing ICT and related technology types and the extent of their usage at three different condominiums in the city Addis Ababa in relation to e-learning and e-working in order to investigate the potential of housings in Addis Ababa to incorporate homeworking and learning from home activities. The research in general shades light on the potential of housing developments in Addis Ababa in terms of meeting the needs of residents in flexible living, working and schooling conditions.

The research employs qualitative and quantitative data simultaneously. All household members from selected blocks are surveyed through interview while sampling of sites, blocks and households is done through random and systematic sampling. Key informant and resident Questioners are conducted through self-enumeration and Interviewer-assisted techniques in open and close ended formats. The research questions indicate four main areas: (1) the existing technology types and (2) the extent of their use, (3) favorability of selected housing developments for e-learning and e-working and (4) the future of housing development in Addis Ababa in meeting the needs of residents in flexible living, working and schooling conditions.

Findings show, there are high potentials for e-learning and e-working at Enderase, Mickey Leland and Bole Arabsa project 15 condominium sites as most of the residents use internet, are computer literate and have expressed strong interest to engage in e-working and e-learning activities. Since almost all of the country's universities are connected through an underground data cable and online education is being conducted at university levels, even without internet service, e-learning can be implemented though Ethernet by connecting housing with the universities. The research in general recommended the integration of technological organizations and innovation centers of the city during implementation of housing projects to upgrade housing developments. This furthermore allows residents to be effective and benefit from the global economy. Spatial recommendations of the research include: ICT infrastructure layout at different clusters of housing blocks, housing units, communal blocks and proposed supportive infrastructures through consideration of urban spaces and housing units' arrangement during integration of ICT infrastructure; existing land use plan, if there is any, while introducing supportive and related infrastructures.

Key Words: *Homeworking; Learning from Home; ICT and Housing; Technology Oriented Housing Development; Digital Migration.*

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I. Acknowledgement

My father, Ato Bedada Dugumaa (Obboo Badhaadhaa Dhugumaa) also famously known as Abaa Daamaa, has been and will always be my strength. His pride, glory, privilege, kindness and wisdom outline the outer most boundaries of my existence. These are his abundant values that I cannot possibly complete exploring during my life on earth. My gratitude to him is one that I cannot put to words.

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February 2019

II. Definitions

Cisco	Is an American multinational technology conglomerate headquartered in San Jose, California, in the center of Silicon Valley that develops, manufactures and sells networking hardware, telecommunications equipment and other high-technology services and products.
Clients	Devices such as Laptops, tablets, phones, smart TVs, PC and Etc.
Condominium	Is a building for residential or other purpose with five or more separately owned units and communal elements, in a high-rise building or in a row of houses, and includes the land holding of the building.
Digital Migration	Is an act of using digital means to access different activities and opportunities such as work and study as opposed to physical migration to do similar.
Fab city	A project founded by the Fab Foundation, Fab Lab Barcelona and IAAC. In order to create globally connected and locally productive community.
Home workers	Are individuals who perform their formal work from home under legal conditions.
Integrated Housing Development(IHDP)	A public urban housing scheme designed to use housing as instrument for poverty alleviation and job creation in Ethiopia
Mobile workers	Are individuals who perform their formal work not always from an office but from any temporary location they are by means of logging on to the company directories to work or just submit their work under legal conditions.
Office workers	Are individuals who work their formal jobs at formal office during formal hours under legal conditions.
Partial home workers	Are individuals who perform their work partial at office and partially from home under legal conditions.

III. Introductory Notes

- This research is conducted by the researcher during the period of time September 2017 to February 2019 at the Ethiopian Institute of Architecture, Building Construction and City Development, EiABC, Addis Ababa University.

- The researcher has published the content of this research at LAP Lambert Academic Publication as a book on 2018 with ISBN: 978-613-9-89004-0, ASIN: 6139890047. And on September 2017, on research gate as a preprint with DOI: 10.13140/RG.2.2.22754.02248. In regards to the population size of Addis Ababa, the above publications referred to the 2007 Census which is 3,384,569. Whereas, this document refers to a projected population size of the city for 2019 which is 5,295,069.

- For the purpose of this research the term E-Learning and E-working are used interchangeably with the term learning from Home and Home working respectively. In some parts of the document the phrase Digital migrations for work and study is also used to represent E-Learning and E-working or Homeworking and learning from home.

- Even if the study can be implied for all housing developments, this research is studied by taking in to consideration condominium developments that are government sponsored multistory and multifamily housing developments.

- The research indicates home workers are more productive than other types of workers and do not face social isolation in an appropriately planned environment. In regard to E-Working the research recognizes Home workers and Partial Home works.

- The visual (illustration) recommendation section of this document should not be taken as a Local Development Plan or Neighborhood Design. The section is intended to illustrate some particular theoretical recommendations of the research.
- In this document the term technology is used particularly for the expression of ICT and other supportive infrastructures (technology Laboratories) that are studied along with housing developments in regards to learning from home and home working. The terms

'technology laboratory' and 'innovation center' and 'digital fabrication laboratories' are used interchangeably.

- In this research document the general facts of housing issues and technologies related to e-learning and e-working are discussed generally and specifically. These discussions are intended to exhaust possible inferences that could be drawn from the topic at hand in relation to the general area of housing studies, e-learning, e-working and supportive infrastructures. Example could be: the female to male ratio description at study areas can show the importance of consideration of technology oriented housing development in bringing equity to residents in the context of the study area.

- Average family size is calculated by the researcher for all three specific sites and population size of the specific site is drawn from that whenever the referred CSA (2006) average family size of the country 5 differs from the calculated family size.

- This research refers to the condominium sites as housing developments by taking in to consideration the fact that even if the sites are habited already, developments are still being carried out with in the sites and future plans are also therefore developments according to the existing land use plan whenever there is one.

IV. Acronyms

AA	Addis Ababa
AAiT	Addis Ababa Institute of Technology
Acas	Advisory, Conciliation and Arbitration Service
ATM	Automated Teller Machine
AP	Access point
B	Block
CB	Communal Block
CBE	Commercial Bank of Ethiopia
CBI	Confederation of British Industry
CEMR	Council of European Municipalities and Regions
CITCC	China International Telecommunication Construction Corporation
CNC	Computer Numerical Control
DIDO	Data in data out
DIY	Do It Yourself
DSL	Digital Subscriber Line
EASSy	Eastern Africa Submarine Cable System
EEPCO	Ethiopian Electric Power Corporation
EiABC	Ethiopian Institute of Architecture, Building Construction and City Development
EPI	Extended Phase Interferometry
ETA	The Ethiopian Telecommunication Agency
ETB	Ethiopian Birr
EthRNet	The Ethiopian Education and Research Network
EU	European Union
EVDEO	Evolution Data Only
Fab Lab	Digital Fabrication Laboratory
FDI	Foreign direct investment
FL	Fixed Line
FDRE	Federal Democratic Republic of Ethiopia
GBps	gigabytes per second
GPRS	General Packet Radio Service
GSM	Global System for Mobile
IAAC	Institute of advanced architecture, Catalina
ICT	Information communication technology
IHDP	Integrated Housing Development Program
ILO	International Labour Organization
INSA	Information Network Security Agency
IoT	Internet of Things
IP	Internet Protocol
IPR	Intellectual property rights
IT	Information Technology
K-12	Kindergarten to 12th grade
KBps	kilobyte per second
LAN	Local Area Connection
LDP	Local Development Plan
LOS	Line of Site
LSE	London School of Economics
LTE	Long Term Evolution

MBps	Megabytes per second
MCIT	Ministry of Communication Information Technology
MoLSA	Ministry of Labour and Social Affairs
MOST	Ministry of Science and Technology
MOU	Memorandum of understanding
MSc.	Master of Science
MXit	Message Xchange it
N	Actual sample size
n	Assumed sample size
NHD	Neighborhood Design
NGO	Nongovernmental organization
NSTAC	The US National Security and Telecommunications Advisory Committee
OSTDA	Oromiya Science and Technology Development Agency
PC	Personal Computer
PITO	Product in Trash Out
PSTN	Public Switched Telecommunication Network
Re	Response Rate
TV	Television
TVET	Technical and vocational education and training
UK	United kingdom
UNECA	United Nations Economic Commission for Africa
US	United States
USD	United States Dollar
VPN	Virtual Private Network
Wi-Fi	Wireless Fidelity
WLAN	Wireless Local Area Network

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1. CHAPTER ONE: Introduction

Tylor et al (2012) Described that cities play an important role in shaping the global economy, culture and society, but they are also shaped by it and they are places where countervailing forces match and local reactions to globalization become especially visible. As such Addis Ababa as a global city should be identified as a place where exchange of social, economic and cultural attributes take place. A city as part of the phenomenon happening through globalization affects other cities and gets affected by them as well. Tylor et al (2012) also states that cities are places where countervailing forces match and local reactions to globalization become especially visible. Consequently, the adverse effects of globalization are particularly apparent as well: not only economic exchange, migration, communication, and technological development take place predominantly in cities, but also political conflict, cultures clashing and amalgamating, and violence.

The IHDP housing projects that are located in the periphery of Addis Ababa are presenting difficulty to residents to address their daily endeavors of work and education. The shortage of infrastructure or the missing effective planning of the city contributes to these problems. The existing urban system exposes the residents to a considerable loss of time and energy. In general, the research studied the unsatisfied basic needs of residents caused by shortage of infrastructure and the possibility of meeting their needs through understanding the technology penetration in the city. The research studies at a specific level the favorability of Enderase, Mickey Leland and Bole Arabsa condominium housing for Homeworking, learning from home and supportive infrastructure. Furthermore objectives are set to see current appropriate technological infrastructures, influence of the internet in facilitation of opportunities for the residents. Studies are also made to indicate sustainable solutions to further housing provision for the residents of the city, the advantage of technology in addressing equity[1] for residents in terms of information, education and job and opportunities that will make the residents to effectively function locally and globally.

1.1. Background of the Study

The country Ethiopia is geographically found in east Africa having Eritrea, Djibouti, Somali Land, Kenya and Sudan as neighboring countries. It is mentioned in ILIC (2014) that Addis Ababa, the capital city of Ethiopia, which is by far the largest in the country located almost at the geographical center of the national territory, covers an area size of 51948.85 hectare and a population of 2,738,248 persons (CSA, 2006). Addis Ababa has a history of a little more than 125 years. IT is a young city. According to the 2007 census the population of Addis Ababa grew to be 3,384,569 with a yearly growth rate of 3.8%. This indicate the current population of the city cab be estimated to be 5,295,069.

[1] All residents of Addis Ababa do not have equal opportunity to access information needed for their different endeavors due to different socio economic reasons. Therefore easy access to information and education supported by technology oriented environment helps them to have better opportunity that addresses all parts of the community and their endeavors.

Figure 1: Location map of Addis Ababa with its ten sub cities.
Source: ILIC 2014, edited by the researcher

The Integrated Housing Development Program (IHDP) is implemented throughout Ethiopia. This research studies three selected Integrated Housing Developments located in Addis Ababa the capital city of Ethiopia namely Enderase, Mickey Leland and Bole Arabsa Project 15 condominium sites.

Kebede (2014) described that the government of Ethiopia has been trying to improve the inner city slums of Addis Ababa. Consequentially introduced the Integrated Housing Development Program (IHDP) which is a government led and financed housing provision program for low-and middle-income households in Ethiopia. She further discussed that the IHDP program is a major current government approach to solving the housing challenges of the city. It has an objective of providing sustainable low-cost housing units to low and middle income urban dwellers that are in urgent need of decent dwellings. (Kebede, 2014)has also mentioned in her paper that the IHDP has objectives such as: Speeding up the supply of low-cost housing for the poor; Renewing major urban land; Boosting the economy by generating employment opportunities for the poor; Developing the existing run-down kebele housing by moving the residents into the new apartments so land can be freed up for the construction of more new housing. It is stated by MoWUD (2014) that the IHDP, also commonly known as condominium housing program, is public housing program which is the continuation of Grand Addis Ababa Housing Program launched country wide.

1.2. **Statement of the Problem**

The lack of undeveloped central-city land combined with the initial undesirability to undertake projects in occupied and slum areas led many projects to be located on the periphery of Addis Ababa, which has proven problematic for both beneficiaries' livelihoods and infrastructure provision. There are insufficient employment opportunities in such locations and transportation to access the city center is costly and time consuming. Furthermore, the cost of infrastructure provision is greater on peripheral sites, which increases the overall project cost and in particular the cost to an already financially overstretched local government UN-HABITAT (2010) With a large deficit of housing and

luck of appropriate management system and appropriate technology integration to solve the problem, Addis Ababa faces a challenging future in addressing the needs of the residents. The city housing management sector needs to look in to innovative and complex approaches to address the matter. The city also experiences population increase as it receives migrants from other regions of the country.

The new housing projects in the city can be described as unsustainable seen through the influences of the new trends of technology in the lives of residents of the city Addis Ababa and the globe. Developments like Bole Arabsa and Mickey Leland condominium sites are located away from work and education infrastructures of the city. As a result, residents are having difficulty in reaching to the city core for different activities. This is due to the shortage and depletion of infrastructure that connects them to the facilities. Congested roads, shortage of resource and overpopulation is driving the experience of people in getting to and from work, school, home very costly in terms of time, performance reduction, energy lose and environment pollution and leaves no suitable conditions or time for job creation. As a result residents are looking to a more flexible conditions for work, schooling and living. In the near future the housing sector needs to address the demand of the people that arises from these challenges. This might implicate the fact that the integration of housing developments with education sectors, offices and industries in order to accommodate the needs of the inhabitants of the city.

Figure 2: Usage of notice board for information access and queue for transportation.
Source: Picture taken by the researcher

The figure above indicates that residents of Addis Ababa gathering information from notice boards and newspapers on street and spending long hours on queues to get transportation services.

1.3. **Research Objectives**

The research objectives are described below in two levels: general and specific.

1.3.1. General Objectives

The general objectives of the research are:

- To understand housing against the arising issues in living condition as a result of infrastructure and housing shortage in addressing basic needs.
- To understand and measure the level of technology penetration that can be a solution for the above mentioned issues.

1.3.2. Specific Objectives

The research seeks to see Specific objectives of the research are:

- To study Enderase, Mickey Leland and Bole Arabsa condominium housing in terms of favorability for Homeworking (E-working), learning from home (E-learning).
- To see if there are appropriate technological infrastructures introduced in the housing development to insure the sustainable competency of the residents in the country and in global frontiers.
- Influence of the internet in productivity and business facilitation in the housing neighborhoods or projects.
- To indicate the advantage of technology in addressing equity[2] for residents in terms of information, education and work opportunities.
- To indicate sustainable solutions to further housing provision for the residents of the city.

1.4. **Research Questions**

The research focuses on four specific questions that are shown below.

- What are the technology types used in condominium housing developments at Enderase, Mickey Leland and Bole Arabsa project 15 sites?

- What is the extent of ICT (information and communication technology) and related technology, use in condominium housing developments at Enderase, Mickey Leland and Bole Arabsa project 15 sites, particularly in the area of e-learning and e-working?

- What is the future of housing development in Addis Ababa in terms of meeting the needs of residents in flexible living, working and schooling conditions?

  Are the condominium housing developments favorable for Homeworking and E-Learning?

  What are the challenges to integrate and benefit from technologies at the housing developments in terms of Homeworking (E-Working), E-Learning?

  What are the possibilities to shape housing developments in Addis Ababa in terms of technology?

[2] All residents of Addis Ababa do not have equal opportunity to access information needed for their different endeavors due to different socio economic reasons. Therefore easy access to information and education supported by technology oriented environment helps them to have better opportunity that addresses all parts of the community and their endeavors.

1.5. Relevance of the Study

Addis Ababa's population size is estimated to be 5,295,069 as of 2019 as indicated in the subchapter 1.1 of this document. 700,000 of these people are residing in the 140,000 housing units provided by the IHDP. There are 166 IHDP sites all over the city, in all ten sub cities. The study of these housing developments against their sustainability in being suitable to future needs of technology oriented living conditions is necessary (ILIC, 2014). According to the Housing Development office of Addis Ababa 274,634 houses unites are constructed and are under construction since 2004. The development of condominium houses started by building 750 model house units around Gerji in 2004. Which means the IHDP is and on the process of housing 274,634 x 5=1,373,170 people in general. By considering the average family size in Addis Ababa to be 5, this fact makes the population size of the IHDP to be one fourth as large as the total population of Addis Ababa. This means 5,295,069 (AA population)/1,373,170 (IHDP population) =3.856 (population ratio between AA and IHDP). This ratio indicates IHDP to be a more reasonable domain to study housing condition against the objectives of the research as also described by (ILIC, 2014).

This research studies and indicates different means to facilitate different faculties of residents such as working, learning and living. The research also indicates a way to address the ever growing housing demand of the residents of the city.

1.6. Significance of the Study

The research studies the current activities of residents of Enderase, Mickey Leland and Bole Arabsa Condominiums in their working, learning and living situations and presents a theory to readjust these activities to meet the needs for efficiency and performance of the people in their different faculties. Furthermore, it is an obvious fact that global access and consumption of data by the people is possible in today's society, the definition of territory has changed. People socialize and make business across countries and continents. As such the research studies the level of this phenomenon in the city and looks in to ways on how the residents can benefit from it. The research presents visual recommendations created for the selected sites. Showing a housing development that is parallel with the research objectives. The research formalizes a replicable methodology to provide a wide spread solution for similar cases. Based on the findings from the analysis of the data from case study and experiments of visual studies, the research presented recommendations. This study can benefit urban planners, architects, designers, researchers and policy makers alike in their endeavor of planning for housing development that takes the integration of ICT and related technologies in to consideration. The research shades light on to the understanding of digital territories and their spatial character. The research indicates a way to make housing developments to be sustainable both socially and economically through the introduction of e-learning and working (homeworking). The research indicates an overlapping development that brings work and education services to home making the development of the city in general more effective in its usage of time, money and resource.

1.7. Scope the Study

1.7.1. Thematic

Housing developments have been understood as living places and are strictly zoned in urban layout of cities as residential. While housing developments indicate the integration of commercial and

communal services as part of the development in general, the housing units are designed and used only for living purposes. Nevertheless, studies show the usage of housing units for purposes of economic activities in addition to just living. This research studies in general the characteristics of housing developments and specifically the IHDP in regards to living, E-learning and E-working. This is in order to investigate and analyze the significance of E-learning and E-working in the lives of the residents of these housing developments. The research looked in detail on technological penetration through ICT and related technologies.

In this regard, the research studied specific topics such as:

- Technology oriented functions available to facilitate e-learning, e-working and related activities.
- Internet in general and Social Medias in regards to facilitating the communication and productivity of the residents.
- Opportunities of appropriate technology in solving problems of shortage of infrastructure that is needed by the residents to work, study and live efficiently.

Furthermore the research studied the patterns of residents in addressing their daily lives and examines these patterns against the efficiency of time usage, economy and energy wastage by residents.

The research presented visual recommendations created for the selected sites. Indicating a direction towards a housing development that is parallel with the research objectives. The research formalized a replicable methodology to provide a wide spread solution for similar cases. Based on the findings from the analysis of the data from case study and experiments of visual presentation, the research presented recommendations.

1.7.2. Spatial Scope

The research focuses on housing developments in Addis Ababa particularly Enderase, Mickey Leland and Bole Arabsa project 15 Condominium sites that are parts of the IHDP in line with the specific objectives of the research. The research does not specifically study housing developments in the city that are different from condominium housings such as real estates, cooperative housings, kebele housings, ETC. The research also studied selected technology oriented government and private organization in general and as best practices few selected technology related developments in Ethiopia and Barcelona, Spain to look in to indicators of future influences on housing.

1.8. **Limitation of the Study**

1.8.1. Gap between the research concept and existing developments

Limitation of the study is the physically weak connection between the housing developments in the city (the survey areas) and the research areas (contextual background). As most developments in the city are not planned with consideration of ICT and related technologies at planning levels as opposed to the growing interest of the residents, the existing developments do not provide excessive evidences and cases for the research questions stated. This can also be attributed to the fact that the research concept is relatively new and different from developments that are present in the city as such it plans to study the potential of the developments in regards to the research objectives and questions. Therefore as the research progressed, the questionnaires that are presented to

respondents help to address the research questions in a more specific manner by portraying the residents or respondents state of mind.

Due to shortage of time and budget allocated for the research the sample size considered for analysis is relatively small and the site Bole Arabsa Projet 15 has presented a challenge to the researcher due to (1) its far distance, (2) majority of the house units and blocks where not inhabited at the time of data collection and (3) those that are inhabited are all rentals. Nevertheless, after collection of data is done ,the researcher has checked the feed backs gathered from the sites with other condominium housing that is convenient to the researcher due to proximity particularly 'Kolfe Keranio sub city kara kore condominium site' for cross checking. The cross checking of feed backs is relatively coherent to the other sites.

1.8.2. Archival data are used for portions of the research instead of surveyed data

In order to effectively use the limited time scheduled for the research, optimized methods are used to determine sample size which intern optimized the data amount collected. Yet secondary data are used for analysis in case of particular bodies while initial plans were to collect primary data. As the research used both survey and archival method for data collection the limitation is within choice of method usage rather than error.

1.8.3. Accessibility of particular organizations for interview

As indicated in 2.3.2 part of this document, some organization were not available for interview (collection of primary data) as a result secondary data is used in order to incorporate the effect of the organizations in the study. But the organizations are addressed through secondary data as the research uses archival methods as well as survey method.

1.9. **Organization of the Research**

The research document has eight main chapters. The first chapter which is the introduction comprises: Background Study ,Statement of the Problem, Hypothesis of the Study, Research Objectives (General Objectives and Specific Objectives), Research Questions, Relevance of the Study, Significance of the Study, Scope, Limitation of the Study and this subchapter Organization of the Study. The second chapter of the document includes Research Methodology, Site Selection for Survey, Data Types and Data Collection, Data Survey and Data Validation (Data Sampling and Block Definition and Data Validation).

The third chapter Literature Review starts with discussion about Appropriate Technology, Eco-Culture, Understanding the New Territory, Factors Influencing Living Places Incorporate Work, Factors Influencing Living Places Incorporate Education, Working conditions for the New Generation , Internet and Social Media Penetration and its Influence in Work and Related activities, Internet of Things (IOT). The fourth chapter Contextual Review Discusses about E-learning in Ethiopia, Technology Affiliations in Ethiopia, Mobile Banking in Ethiopia, Internet and Social Media Usage in Ethiopia, Digital Fabrication and other Technology Related Activities in Addis Ababa, Over view on Condominium Housing Development and Policy. Chapter five Case Study also discusses about the selected cases Enderase, Mickey Leland and Bole Arabsa Condominium Sites in line with Visual Description, General Data Presentation of the Site, Appropriate Technology Application, Ambition of Residents and Purpose of Internet Use. Chapter six which is Data Analysis analyzes the data Presented in chapter five. After analyzing each sites separately the chapter discusses the three sites in comparison to each other. This chapter also analyses information from key informants and technology oriented organization in Addis Ababa. Chapter seven presents the findings from the previous chapters in line

with research questions stated. Chapter eight makes theoretical and spatial recommendation. The spatial recommendation yields visual recommendations that reflect the data analysis and recommendations.

2. CHAPTER TWO: Research Methodology and Method

The research questions are structured as “what” type of questions that adopt "how many" or "how much" line of inquiry. This suggested the preference to use data from archival and survey methods instead of case study. Mixed methods design is used directing the research to apply both qualitative and quantitative data in parallel to increase insight towards the research objective and questions. Quantitative data is acquired through closed ended questions presented through questionnaire, direct observation and archived data gathered from organizations, literatures and websites. Qualitative data is acquired through open ended questionnaire, photographs, sketches, direct observation, and case (interviewee) stories and achieved information. The survey and archival data collection process took the following pattern (not in exact sequence but included): (1) questionnaire (2) (a) coded and (2) (b) captured (3) editing (4) estimation. Subchapter 2.3 explains site selection for survey. Selection of the research area which is the Integrated Housing Development Program (IHDP) is done through non-probability purposive sampling following the fact that the IHDP houses 1,383,170 persons which is one fourth of the Addis Ababa population which is estimated to be 5,295,069 the large area IHDP covers and the controlled environment it creates to access data. Selection of specific sites is done through systematic random sampling that yielded three sites namely Enderase, Mickey Leland and Bole Arabsa Project 15. Primary and secondary data are collected through the following methods (1) Self-enumeration (2) Interviewer-assisted (1a) Personal Interviews (1b) Telephone Interviews are used for cross checking in cases of faulty responses during Self-enumeration (3) Direct Observation (4) Administrative Data (5) Combining Methods.

The survey is implemented specifically in six levels (1) Selection of study area which is the Integrated Housing Development (IHDP) through purposive non random sampling (2) Selection of site was made though systematic sampling. (3) Blocks are selected through systematic sampling from each site, (4) family units are selected through simple random sampling from each sampled blocks, (4) all family members are addressed through a nonprobability sampling. (6) Key informants are surveyed through purposive sampling. Data validation is performed at two levels (1) Validation of data during and after data collection through (2) Response rata validation. As such the subchapter describes the research design in line with understanding what Technology Oriented and Updated Housing Development is and understanding what Infrastructure for Urban development that Answers to Social Needs is in the current day. Finally the research design frame work is illustrated.

2.1. Research Methodology

This research is studied with survey or archival strategies. It is recognized by the researcher that only a portion of the research questions (questions concerning key technology focused organizations) can be answered by archival strategies. Most of the research questions can only be achieved through survey as the information such as technology usage by residents is not completely documented by any organization or the information is not accessible. This research used both quantitative and qualitative data therefore mixed methods research methodology is applied. This is to maximize the depth of the meaning of the data that will allow the researcher to understand the research objectives and find satisfactory answers to the questions.

Mixed methods design is a method that includes both qualitative and quantitative data collection and analysis in parallel form Kemper, Springfield, & Teddlie, Handbook of mixed methods in social and behavioral Research (2003) Mixed method is the use of mixed data (numerical and text) and alternative tools (statistics and analysis), but apply the same method (Bazeley, 2012).As such this research employs archival and survey methods. Archival methods are used to use historical data for analysis however it is pointed out by John & Ventresca (2001) that archival methods are also

employed by scholars engaged in non-historical investigations of documents and texts produced by and about contemporary organizations, often as tools to supplement other research strategies (field methods, survey methods, etc.) Thus, archival methods can also be applied to the analysis of digital texts including electronic databases, emails, and web pages. As Smith (1984) has argued, written texts play an especially significant role in organizations because they codify in a potent fashion, that which has been said and thought. Once it is written down, organizational talk takes on new dimensions of veracity, credibility, and efficacy, an authoritatively instrumental life of its own, often travelling well beyond the intent or expectations of the author.

As reviewed by the researcher from Statistics Canada (2010) suggested the data collection followed the following pattern, not necessary in exact sequence but included the activities, (1) questionnaire (or form) is a group or sequence of questions designed to obtain information on a subject from a respondent. After the data are collected, they are (2) (a) coded and, if a computer-assisted collection method was not used, (2) (b) captured. Coding is the process of assigning a numerical value to responses to facilitate data capture and processing in general. Some questions have coded response categories on the questionnaire; others are coded after collection during a manual or automated process. The purpose of (3) editing is to better understand the survey processes and the survey data in order to ensure that the final survey data are complete, consistent and valid. The amount of editing performed is a trade-off between getting every record 'perfect' and spending a reasonable amount of resources (time and money) in achieving this goal. And during data presentation, (4) estimation is carried out after which in this particular research the data will go through data analysis, conclusion and recommendation.

2.2. Site Selection for Survey

The IHDP project is selected through purposive sampling because of its relevance attributed to the size of the project and size of population it incorporates. And as the project (IHDP) is relatively new, it is safe to assume that there is an opportunity to gather information that are freshly documented and are not lost through the process and use of the development.

In the case of this research Enderase, Mickey Leland and Bole Arabsa condominium sites are selected through systematic sampling. The sites are selected for sampling as a result of their different nature of proximity to social infrastructures such as governmental and nongovernmental organizations, schools and universities. Enderase, Mickey Leland and Bole Arabsa condominium sites are with the closest proximity, medium proximity and farthest from the social infrastructures respectively. Therefore their study presents the needed variation, cross examinations and information for insuring the intended replicable nature of the research for inference use for other similar or related developments. Further sampling rationales are presented in 2.3 and 2.4.1 chapters of this document. See also table 1 of this document to see summery of sampling and data collection techniques used at different levels of the research. Data sampling was made in six levels. (1) Selection of study area which is the Integrated Housing Development (IHDP) through purposive non random sampling (2) Selection of site was made though systematic sampling. (3) Blocks are selected through systematic sampling from each site, (4) family units are selected through simple random sampling from each sampled blocks, (4) all family members are addressed through a Census survey. (6) Key informants are surveyed through purposive sampling. The following paragraphs reviewed from statistics Canada supports the researcher's choice to use probability sampling for more levels of the survey over purposive sampling. The above six survey methods are further elaborated in 2.4 sub chapter of this document.

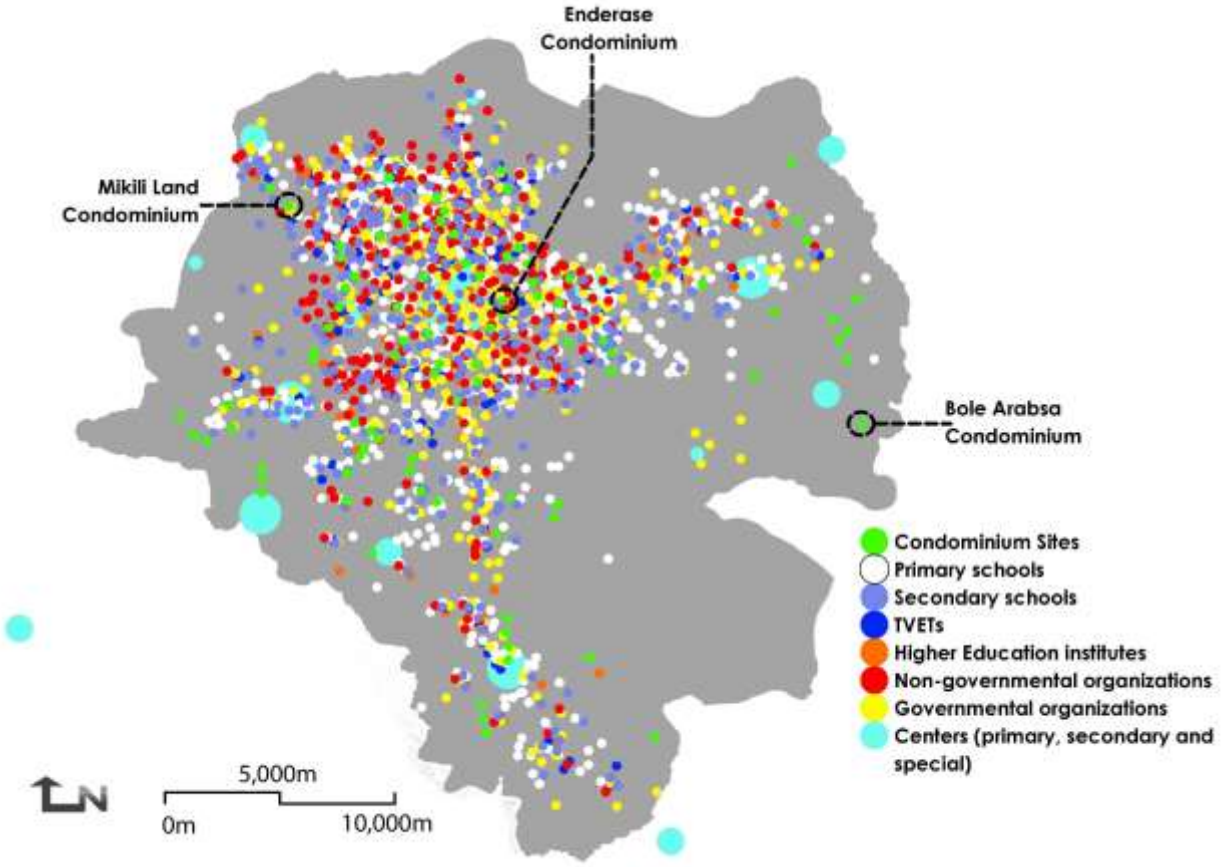

Figure 3: Selected sites in relation to different social infrastructures in Addis Ababa

Source: Map created by the researcher

The site selection allows studying the relationship between the selected sites and social services such as schools, higher education institutes, governmental and non-governmental organizations. The selection of the three sites Enderase, Mickey Leland and Bole Arabsa condominium is mostly attributed to this phenomenon.

2.3. Data Types and Data Collection Techniques

2.3.1. Data Types

Primary and secondary data that has been of both quantitative and qualitative types are used for the purpose of this research. Primary data extracted through interviews, discussions, observations, photographs taken by the researcher. Secondary data included official documents, official websites, and books other unpublished documents (archived3 documents).

[3] …archival methods can be thought of as a loosely coupled constellation of analytic endeavors that seek to gain insights through a systematic interrogation of the documents, texts, and other material artifacts that are produced by and about organizations. Source: Archival Research Methods by Marc J. Ventresca and John W. Mohr.
Other lectures also present: In archival research, researchers analyze data pulled from existing records, such as census data, court records, personal letters, old newspapers,

2.3.2. Data Collection Techniques

During data collection the following methods are employed. These methods are reviewed from (Statistics Canada, 2010) by the researcher. The methods are **(1) self-enumeration**. Self-enumeration methods require a very well-structured, easy to follow questionnaire with clear instructions for the respondent. A telephone number to obtain help completing the questionnaire may be included. Self-enumeration methods require a very well-structured, easy to follow questionnaire with clear instructions for the respondent. A telephone number to obtain help completing the questionnaire may be included. With self-enumeration, the respondent completes the questionnaire without the assistance of an interviewer…When paper-based, and this method is called Paper and Pencil Interviewing (PAPI), when computer-based it is called Computer-Assisted Self Interviewing (CASI). **(2)Interviewer-assisted.** There are two types of interviewer-assisted method **(a) Personal Interviews**. With personal interviews, the interview is conducted face-to-face with the respondent. Usually, personal interviews are conducted at the person's residence or place of work. For some target populations, this is the only feasible method of data collection, for example, when telephone interviews are not possible or when the survey requires a visit to sample or locate members of the population (e.g., to complete listing of an area frame). **(b)Telephone Interviews**. Telephone interviews offer a reasonable response rate at a reasonable cost. In Canada, they have medium to high response rates, lower than personal interviews but higher than self-enumeration (the typical response rate at Statistics Canada is 70-85%). Some self-enumeration surveys use telephone interviews for follow-up in order to achieve a better response rate. **(3)Direct Observation**. Direct measurement is usually precise and when observations only are made there is no response burden. However, when measurements of people are made, the study subjects may find these measurements risk some or burdensome: for example, a medical study that takes blood samples from patients. This can result in low participation rates. **(4)Administrative Data**. Some surveys can obtain the information they require from existing administrative data. Administrative data are those that have been collected for administrative purposes (e.g., to administer, regulate or tax activities of businesses or individuals) as opposed to statistical purposes (to study groups of individuals, businesses, farms, etc.). **(5)Combining Methods**. Often the most satisfactory collection strategy is to offer respondents a choice of data collection methods. The advantages of combining methods include improved response rates, fewer response errors and faster collection. One disadvantage of combining methods is that collection may be more complex and expensive. Another disadvantage is that it produces heterogeneous data that can complicate processing and analysis. For example, if a self-enumeration mail-out survey is conducted and nonrespondents are followed-up by telephone with a shorter questionnaire, then both versions of the questionnaire must be reconciled during processing. And bias may be introduced if data from the telephone interviews are of better quality than the self-enumeration questionnaires, which will complicate data analysis.

In most cases during data collection, respondents required more time than one day to respond to the questions due to different reasons such as time shortage, more time to understand the questions therefore call back method is used. In some cases respondents needed assistance of the surveyor in this case the researcher. In all cases the questionnaires are finally checked with the respondents before the questionnaires are collected. Secondary data is collected from literature reviews, contextual reviews and also attained from documents prepared by authorities in the city related to housing developments in Addis Ababa (Archived data). Primary data is collected through observations of the researcher and data collection with specifically designed questioners. Questioners are

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etc.(Agency records/utilization data, Existing data, Actuarial records and Legislative and Governmental documents)

prepared in appropriate amount of categories to address all concerns of the research areas. Both open ended and close ended questioners are prepared and are presented to the following specific bodies:

Residents and business owners from the three selected sites; Authorities related to housing development; Ethiopian Telecommunication Corporation; Commercial Bank of Ethiopia; Selected governmental and non-governmental employers.

Discussions were made with representatives of:

Ethiopian Education and Research Network (ETHERNET); Public relations and publication office of the Addis Ababa mayor.

Some of the governmental institutions specifically related to technology that were not accessed physically due to time shortage or absence of feedback from the organizations to the request letter presented by the researcher are addressed through secondary data. These secondary data are collected from the organizations' offices and their official websites. The organizations that are considered are: **National Science, Technology and Innovation (STI); The Ethiopian Telecom, the Ministry of Communication & Information Technology (MCIT); The Ministry of Science and Technology (MOST).**

See also table 1 of this document to see summery of sampling and data collection techniques used at different levels of the research.

2.4. Data Survey and Data Validation

2.4.1. Rational for Sampling and Sample Size

It is stated by (Turner, 2003) Probability sampling in the context of a household survey refers to the means by which the elements of the target population - geographic units, households and persons - are selected for inclusion in the survey. The requirements for probability sampling are that each element must have a known mathematical chance of being selected and that chance must be greater than zero and numerically calculable. It is important to note that the chance of each element being selected need not be equal but can vary in accordance with the objectives of the survey. It is this mathematical nature of probability samples that permits scientifically- grounded estimates to be made from the survey. More importantly it is the foundation upon which the sample estimates can be inferred to represent the total population from which the sample was drawn. A crucial feature and by-product of probability sampling in surveys is that sampling errors can be estimated from the data collected from the sample cases, a feature that is not mathematically justifiable when non-probability sampling methods are used. In addressing the need of the research to investigate the future of housing developments in the study area, all housing and technology related government bodies are to be sampled from and studied against the interest of the sampled residents. The same measure is also taken to study the significance of introducing E-learning, E-working to housing developments and the development of Addis Ababa city in general.

In this section of sampling techniques and sample size, the key issues of the research are considered in line with the research questions. The current extent of usage and types of technology in housing development are important for the study. In order to address these issues, sampling was made among residents of the selected condominium sites. Probability sampling is used in sampling residents at block levels (condominium Blocks) to increase reliability, estimation of sample errors and to maximize the possibility of inference that can be made about the residents under consideration. In

order to address the same issue, all age groups and sex are sampled at house hold level as questionnaires were filled through discussion by all the family members. (Tongco & C, 2007)[4] Pointed out by referring to (Bernard, 2002) and (Lewis & Sheppard, 2006) that Purposive sampling is a nonrandom technique that does not need underlying theories or a set number of informants. Simply put, the researcher decides what needs to be known and sets out to find people who can and are willing to provide the information by virtue of knowledge or experience.

In order to decide on sample size for key informants, this research applied purposive sampling. Among the technology oriented organizations in Addis Ababa. The selected key informants are National Science, Technology and Innovation (STI), the Ethiopian Telecom, the Ministry of Communication & Information Technology (MCIT), the Ministry of Science and technology (MOST), and the Ethiopian Education and Research Network (EthERNet). Data collection is conducted by avoiding situations that might contaminate evidences and by insuring the replicable and reliability of the method in order to make the method valid for other similar or related researches and projects. In order to increase accuracy of data, both quantitative and qualitative data are collected until signs of repetition are observed. See also the following table 1 of this document to see summery of sampling and data collection techniques used at different levels of the research data collection process.

Future of housing development in Addis Ababa in terms flexible living, working and schooling conditions

Are the condominium housing developments favorable for Homeworking and E-Learning?

What are the challenges to integrate and benefit from technologies at the housing developments in terms of Homeworking (E-Working), E-Learning and supportive technology laboratories?

What are the possibilities to shape housing developments in Addis Ababa in terms of ICT and Technology Laboratories?

Summary of surveyed area, survey techniques, data types and data collection techniques

Table 1: Summary of surveyed area, survey techniques and data types and collection techniques

Area (level) of SURVEY	**Survey technique (Sampling)**	**Data types**	**Data collection techniques**	**Specific Sources Include:**
The general Study area	Integrated Housing Development (IHDP)	Primary and secondary Qualitative and quantitative	Interview , literature, and Archival	Addis Ababa Housing Development Project Office, Addis Ababa City Mayor's Office, ILIC, Google Maps. housing Development Bureau
Site selection	Systematic Random sampling (Probability sampling)	Primary and secondary Qualitative and quantitative	Interview , literature, photographs, sketches, observation and Archival	Addis Ababa Housing development project Office, Addis Ababa City Mayor's Office, ILIC, Researcher's observation, Google Maps, housing Development Bureau.
Block selection	Systematic sampling (Probability sampling)	Primary and secondary Qualitative and	Interview , literature, photographs,	Addis Ababa Housing Development Project Office, ILIC, Researcher's observation, Google Maps, Condominium Housing site committee

[4] Ma. Dolores C. Tongco's paper can be found from: http://hdl.handle.net/10125/227

		quantitative	sketches, observation and Archival	offices, housing Development Bureau.
House unit selection	Simple random sampling (Probability sampling)	Primary and secondary Qualitative and quantitative	Interview , photographs, sketches, observation and Archival	Addis Ababa Housing Development Project Office, Researcher's Observation and interviews conducted, Google Maps, Condominium Housing site committee offices, Block Coordinators, housing Development Bureau.
Family member selection	All individuals in the household are considered	Primary and secondary Qualitative and quantitative	Interview , photographs, sketches, observation and Archival	Addis Ababa Housing Development Project Office, Researcher's Observation and interviews conducted, Google Maps, Condominium Housing site committee offices, Block Coordinators, housing Development Bureau.
Technology related organizations and other key informants	Purposive sampling (Non-Probability sampling)	Primary and secondary Qualitative and quantitative	Interview , photographs, sketches, observation and Archival	Researcher's Observation and interviews conducted, Google Maps and internet official websites, housing Development Bureau.
Technology types used in condominium housing developments	All technology devices and applications used by the interviewed individuals(house hold members) are listed	Primary Qualitative and quantitative	Interview, observation and photographs	Addis Ababa Housing Development Project Office, Researcher's Observation and interviews conducted, Condominium Housing site committee offices, Block Coordinators, Ethio telecom office, housing Development Bureau.
Extent of technology use in condominium housing developments	Different levels of sampling are used to acquire this information. Systematic random sampling for site study, all technology affiliations of residents is listed.	Primary and secondary Qualitative and quantitative	Interviews, observation, photographs and Archival.	Addis Ababa Housing Development Project Office, Researcher's Observation and interviews conducted, Condominium Housing site committee offices, Block Coordinators, Ethiotelecom office, Housing Development Bureau.
Future of housing development in Addis Ababa in terms of flexible living, working and schooling conditions.	Systematic random sampling for selection of technology related organizations in the city, all technology affiliations of residents is listed	Primary and secondary Qualitative and quantitative	Interviews, literature, observation, literature, Archival.	Addis Ababa Housing Development Project Office, Researcher's Observation and interviews conducted, Condominium Housing site committee offices, Ethio telecom office and other technology oriented organizations and centers in the city, housing Development Bureau.

2.4.2. Block Definition in Data Survey

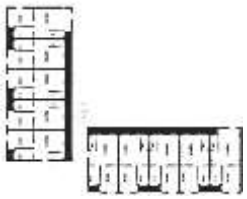
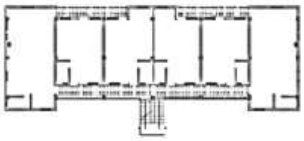
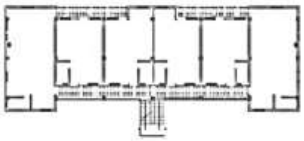
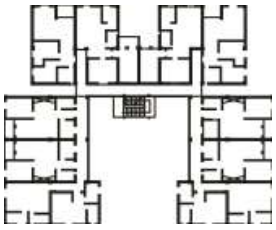
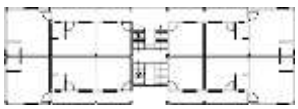
As shown on the above table 1, Systematic Random Sampling (Probability sampling) is employed to select or sample blocks from the identified sites in 2.2 subchapter of this document. Among Enderase, Mickey Leland and Bole Arabsa Project fifteen Condominium sites, three blocks are selected from each site resulting in total of nine blocks. To evenly distribute the questionnaire, one questionnaire per six households is presented which was in most cases equivalent to one questioner per one story. This is because most of the blocks have six households per each floor. As such forty-five[5] households are sampled for this research assuming the blocks to be five stories. It is observed by the researcher that there is more than one type of blocks on the condominium sites and it became necessary to define the term block for the sake of formulating the mentioned data collection principle. Therefore a block is defined for the purpose of this research as a structure housing six households per story and thirty households in general. If the block houses sixty households, it shall be considered as two blocks and if it houses ninety households it shall be considered as three blocks. This method of categorizing

[5] See Appendix B, Appendix C and Appendix D for the list of response of the residents

increased the reliability and reliability of the research sampling method. See the table below to understand how the blocks from the three sites are categorized.

Table 2: Typology Study for data sampling.

The selected blocks mapped in the later parts of this document in the subchapters of the respective selected sites graphical descriptions on figure 10, figure 24 and figure 37.

Condominium site	Block types addressed	Logic
Enderase condominium Site	 B1 x1  B2 x1	The site is listed as having two blocks Namely: B1 and B2. B1 has two wings and both wings are the same size as B2 and each of these wings incorporate similar amount of shops and residents as B2. Following the block definition of the research B1 is considered as two blocks by naming each wings as B1a and B2a.
Mickey Leland Condominium Site	 B49 x 1  B123 x 1	B49 has 5 story and 6 households per floor meets exactly the definition of blocks sated. B123 has 5 story and 6 households per floor and is considered as two blocks following the definition of blocks sated.
Bole Arabsa Project 15 Condominium site	 B243 x 1 B629 x 1 B647 x 1	This block typology from Bole Arabsa has two stair cases and three stories unlike the blocks from Enderase and Mikili Land. Each floor of this block houses twelve households. By eliminating the first or the last six house holds the block satisfied the definition of block sated for the research. And three similar blocks are considered for data collection. Namely B243,B629 and B647

2.4.3. Data and Response Rate Validation

2.4.3.1. Data validation

When working with qualitative data, the concepts of trustworthiness, dependability, transferability, and credibility are also used. According to (McMillan & Schumacher, 2001), validity is the degree to which the interpretations and concepts have mutual meanings between the participants and the researcher. Reliability, on the other hand, according to (Silverman, 2004), is the degree to which the findings of the research are independent of accidental circumstances.

(Joppe, 2000) Defines reliability as the extent to which results are consistent over time, and are an accurate representation of the total population under study. If the results of a study can be reproduced under a similar methodology, then the instrument is considered to be reliable.

In order to insure the validity of Data collected the following measures were taken:

- Data is collected until repetition of answers to the questionnaires is visible.
- Data was collected randomly to avoid conflict of interest by the researcher.
- Callback method was employed to insure completion of data collection was made without avoiding non responsive samples and not replacing them with available not sampled residents or blocks to maximize reliability of the data and the process of data collection.
- All age, income and sex groups are included by conducting group discussions among all family members during data collection.
- The precision of data collected are cross checked among respondents and observation by the researcher during and after data collection.

2.4.3.2. Response rate validation

The research further validates the data collected by making use of the following method. This validation is used to validate the response rate not the sampling or the sample size.

Response rate enables to determine the margin of error in the sampling process[6].

$$\text{Response rate} = \frac{\text{Total N0. Responded} \times 100}{\text{Total No. of Sample} - \text{No. No Response}}$$

Given the number of sample (total) respondents = n
Number residents that responded = n
Number of organizations that did not responded = 0
Number of invalid response =0

$$\text{Response Rate} = \frac{n \times 100}{n-0} = 100\%$$

Margin of error = 100% - 100% =0

[6] This method of validation is also used by Hewan Tsegaye on her research in 2015 titled "Assessment of Science, Technology and Innovation Policy and its implementation: The Case of Ministry of Science and Technology of Ethiopia in 2015"

In order to determine the actual size of sample for the study, the following calculation was made.
Assumed sample size (n) = n house holds
Response Rate (Re) = 100%
Actual sample size (N) = $\frac{n \times 100}{Re}$

$= \frac{n \times 100}{100} = n$

Therefore, Re x N = n x 100. Meaning, $Re = \frac{nx100}{N}$

Response rates between 50% and 92% for questionnaire surveys have been reported as valid (Duman, 1978, Saunders et al 1997 and Ngesa et al, 2003).

The sample size for this research is 45 and the amount of valid response the researcher got is 36. See the table below for detail insight. Therefore by using the following formula, we can validate this research's data collection.

$Re = \frac{nx100}{N}$

$Re = \frac{36x100}{4} =$ **80%** which is well within the range of validity.

Table 3: Questionnaire distribution and percentage response.

site	interviewed blocks	Number of questionnaire Distributed	number of response	Response percentage
Enderase	B1a	5	5	100%
	B1b	5	5	100%
	B2	5	5	100%
Mickey Leland	B 49	5	5	100%
	B123a	5	5	100%
	B 123b	5	5	100%
Bole Arabsa Project 15	B 243	5	2	40%
	B 647	5	2	40%
	B 629	5	2	40%
Total number of questionnaire Distributed			45	
Total response			36	
Average Response			4	
Average response/ Total Response=Response Rate			9	

Check with figures included in subchapters titled graphic description of each sites (subchapter 5.2.1, 5.3.1 and 5.4.1) under data presentation section of this document to see the location of the interviewed blocks as they are illustrated in the maps. The specific figures are figure 10, figure 24 and figure 37.

2.4.4. Research Design

The research design can be discussed in the following three sections based on the research interest areas.

2.4.4.1. Technology Oriented and Updated Housing Development

The impact of the research on housing development can be seen through the following summary.

Table 4: Summary of the study with regard to housing development process.

	Inputs	Output 1	Output 2	Output 3
Appropriate technology	-Upgrade housing with technology infrastructure that will allow all residents have equal access to knowledge and skill development. -Include more relevant technology related stakeholders in housing development	-Equity and technology oriented environment for all residents. -Effective access to education and work. -Provision of more housing developments to the city residents. The multipurpose housing development can create an opportunity for the government to provide more housing infrastructure for the community.	-Recommendation for Technology Oriented housing Development	-Visual recommendation for the selected sites
Appraisal	-The provision of the infrastructure should be through subsidy as residents are marginally stretched in their financial status.	-The introduction of intensive technology such as ICT in to housing development requires proper awareness among the developers and residents to effectively and safely benefit the users as the infrastructures are susceptible to intrusions and undesired inputs.	-all recommendation are forwarded based on the observation on selected sites. Nevertheless, they can be inferred for similar projects or developments.	-visual recommendation are prepared as a rough indicators as to how the technological infrastructures reorganized partially through the development.

2.4.4.2. Infrastructure for Urban development that Answers to Social Needs

The research is designed to make explanation as to why carrying out planning different zones like Living, Working and Learning in an overlapping fashion. That it is possible to reduce the infrastructure needed to implement by radically changing the usual segregated urban development. This is by first mechanizing a system that would allow the overlapping of activities. As such different texts and charts are placed to show this point throughout out the document. See 8.1.13 subchapter of this document for close understanding.

2.4.4.3. Research Design Framework

(Yin R. , 1994) Describes research design as follows by also referring to the indicated literatures: Every type of empirical research has an implicit, if not explicit, research design. In the most elementary sense, the design is the logical sequence that connects the empirical data to a study's initial research questions and, ultimately, to its conclusions. Colloquially, a research design is an action plan for getting from here to there, where here may be defined as the initial set of questions to be answered, and there is some set of conclusions (answers) about these questions. Between "here" and ''there'' may be found a number of major steps, including the collection and analysis of relevant data. As a summary definition, another textbook by (Nachmias & Nachmias, 1992) has described a research design as a plan that inferences concerning causal relations among the variables under investigation.

The research design also defines the domain of generalizability, that is, whether obtained interpretations can generalize to a larger population or to different situations. Another way of thinking about a research design is as a "blueprint' of research, dealing with at least four problems: what questions to study, what data are relevant, what data to collect, and how to analyze the results (Copenhagen Business School, 1991); (Philliber, Schwab, & Sloss, 1980).

The design frame work is designed to allow the facilitation of the research objective in indicating the importance of using housing specifically the selected sites by the residents for work, education and living. The research also indicates the advantage of such arrangement in bringing about opportunities to contribute to reducing the housing deficit in the city.

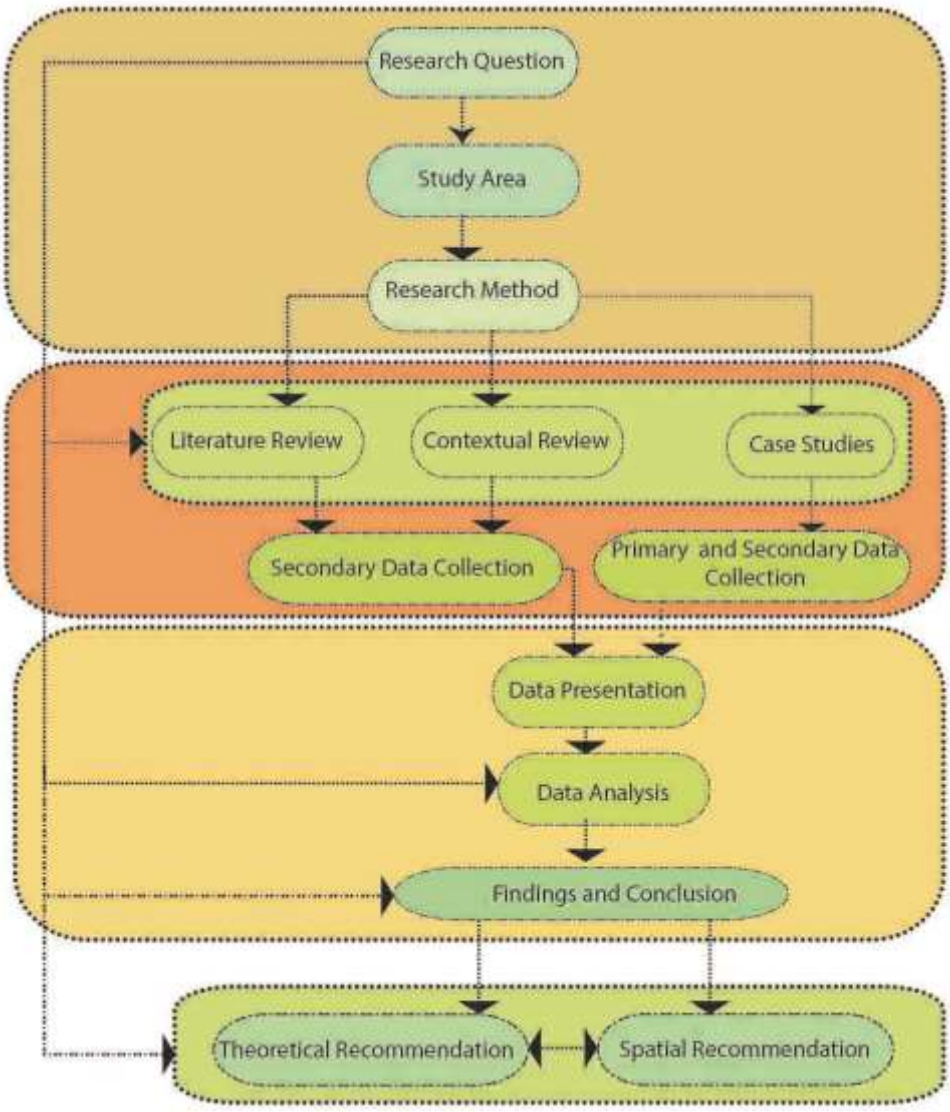


Figure 4: Research Design Frame work

2.5. Data Analysis

This researcher used both qualitative and quantitative methods. As the questionnaire presented to respondents is structured in both open and clothed ended questions, the data types resulted (produced) are characterized according to the question types. Data generated from clothed ended questions provided an opportunity to analyze data in quantitative manner while open-ended questions generated data that needed sorting out quantitative and qualitative as such the

quantitative data was analyzed with quantitative methods while qualitative data were analyzed qualitatively. To elaborate further data from archives, life stories and responses to questionnaires (close and open ended), observations, pictures and sketches are analyzed in qualitative manner. Data collected from questionnaire are analyzed by making use of both quantitative and qualitative means. Data collected from authorities and literature and contextual reviews are also analyzed both in quantitative and qualitative methods. During analysis, data is presented in comparative and descriptive fashion to continue the cross checking and triangulation process and to elaborate on the meaning of the collected data. Most data are tabulated, graphed and charted for ease of understanding during analysis. See table 1 above of this document to see the Summary of surveyed area, survey techniques, data types and data collection techniques. During data presentation, data analysis and conclusion stages of this document estimations are made out of the collected and summarized data.

As this research is a mixed methods research, it uses both quantitative and qualitative data for analysis. It is also mentioned in 2.1 subchapter of this research that mixed methods research is more than simply collecting both qualitative and quantitative data; it implies that data are integrated, related, or mixed at some stage of the research process. As mentioned above, data are gathered from primary sources and secondary sources that needed sorting out and organization. In this research analysis of the data began while sorting out the data sources or in general the concern areas of the research which are residents of the condominium sites, key informants, and technology oriented organization and innovation centers. After which qualitative and quantitative data are identified from each concern areas mentioned above. Tabulation and charts are prepared by using Microsoft office excel software for the quantitative data from the different concern areas of the research and are compared to each other. For ease of presentation some data are summarized and coded. The researcher has also worked further on summarizing and tabulating quantitative data for ease of comparison among the information for the different concern areas such as residents, key informants, technology related organizations and innovation centers. In addition to tabulation and charts the researcher used maps where data generated from primary and secondary sources are transferred to maps and used for comparison among resident's attributes or activities and locations of organizations and centers that are interests of this research. The researcher also identified indicators that are relevant to the research topics and used them as a strategy to make estimations and rates to make presentation, analysis and conclusions. Read the following literature as further explanations of the analysis methods used. The perspective of Qualitative Data Analysis is pragmatic rather than prescriptive, introducing different possibilities without advocating one particular approach. The results is a stimulating, accessible and largely discipline neutral text, which should appeal to a wide audience, most especially to arts and social science students and first-time qualitative analysts (Dey, 1993). Even if Ian Day's description of Qualitative Data Analysis is true, it gets rather tedious to analyze all information about a topic as wide as this research qualitatively. It is rather reasonable to use both analysis methods qualitative and quantitative to get advantage of both worlds.

The underlying logic to mixing is that neither qualitative nor quantitative methods are sufficient in themselves to capture the trends and details of the situation. When used in combination, both qualitative and quantitative data yield a more complete analysis, and they complement each other (Creswell, Fetters, & Ivankova, 2004). Data analysis involves summarizing the data and interpreting their meaning in a way that provides clear answers to questions that initiated the survey. Data analysis should relate the survey results to the questions and issues identified by the Statement of Objectives. It is one of the most crucial steps of a survey since the quality of the analysis can substantially affect the usefulness of the whole survey. Data analysis may be restricted to the survey data alone or it may compare the survey's estimates with results obtained from other surveys or data

sources. Often, it consists of examining tables, charts and various summary measures, such as frequency distributions and averages to summarize the data. Statistical inference may be used in order to verify hypotheses or study the relationships between characteristics, for instance, using regression, analysis of variance or chi-square tests (Statistics Canada, 2010). Once the data have been collected, captured, coded, edited and imputed, the next step is estimation (Statistics Canada, 2010).

3. CHAPTER THREE: Literature Review

Here different researches and books are reviewed in light of the researcher's objectives and questions as such the following subchapters are dedicated to discussing technological trends on urban structures and technology's influence in making the built environment seen in new and progressive manner.

It is pointed out by (Yin R. K., 1994) that to determine the questions that are most significant for a topic, and to gain some precision in formulating these questions, requires much preparation. One way is to review the literature on the topic (Cooper, 1984). Note that such a literature review is therefore a means to an end, and not-as most students think-an end in itself. Budding investigators think that the purpose of a literature review is to determine the answers about what is known on a topic; in contrast, experienced investigators review previous research to develop sharper and more insightful questions about the topic.

3.1. Appropriate Technology

In order to understand implication of technology integration in developments, it is important to study and review related literatures and developments as such this section of the document reviews literatures that have relevance in this area in general. The literatures cover importance of technology integration in a development from different perspectives that are relevant to the research.

3.1.1. Fab City

As part of literature review Fab City is considered by the researcher to discuss the principles and values depicted with in the concept. As mentioned in the introductory part of this document Fab City is a project by the Fab Foundation, Fab Lab Barcelona and IAAC, in order to create globally connected and locally productive community.

(Fab Foundation, August 8, 2015) states that today's cities are the largest producers of trash in the planet. In order to support the urban life, tons of goods have to travel thousands of kilometers, shipping containers feed almost any city in the world; At the same time millions of kilowatts travel through high tension lines over forests or underwater cables in order to satisfy the energy needs of the city life; Millions of square kilometers are used to produce tons of meat, grains, and other food supplies we need to have in our supermarkets' stock. At the same time, the knowledge of "how things are made" is no longer in cities; it has been moved away from citizens, who become only consumers, with all the social consequences derived from it. Yet cities are the greatest creation of humankind, they are now the biggest threat for the support of life on earth in the future if they continue evolving under the same principles of industrialization of the past.

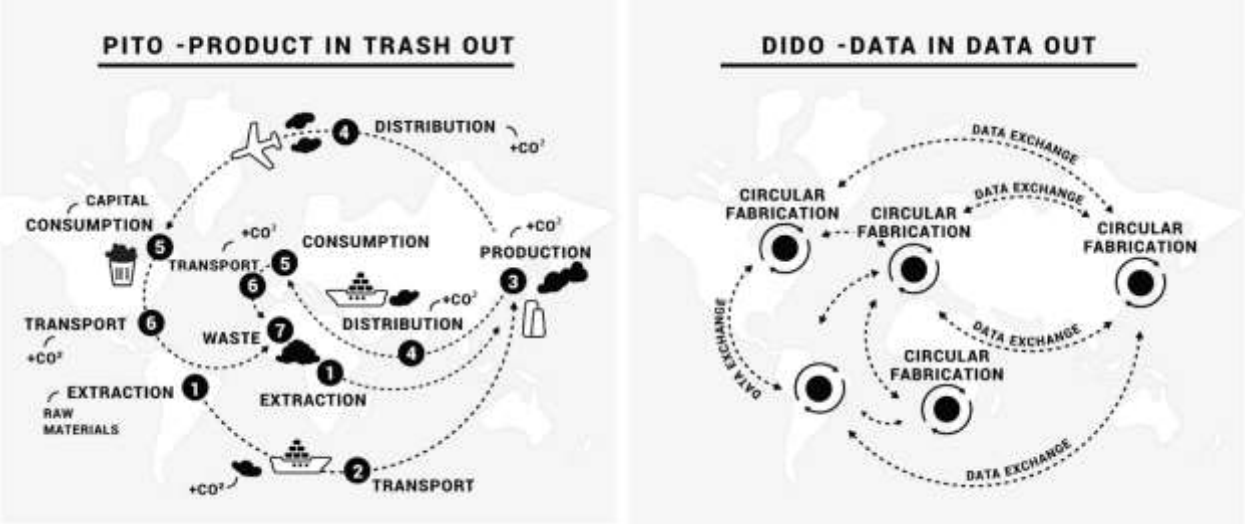


Figure 5: Pito-product in trash out, on the left and on the right Dido-data in data out.

(Source: Fab Academy, Fab City Research Lab).

A fab city[7] is a new urban model, conceptualized in 2011, for locally productive and globally connected self-sufficient cities that shift how cities source and use materials by bringing back production to distribution and smaller scales. More production occurs inside the city, neighborhoods and citizens' homes, along with recycling materials and meeting local needs through local inventiveness. In Barcelona's Poblenou district, this model is being constructed through an ever growing web of leaders, market spaces and citizens.

It is difficult to make public authorities understand that we do not want to bureaucratise fablabs…The city of Barcelona is however making big efforts, among other things with the STEM (Science, Technology, Engineering and Math), a teaching concept in the classroom based on new technologies (learning by doing) in secondary education. Imagine all these initiatives coming from the public and private sectors, companies, education (Claude, 2015)[8]. They also believe that the future of cities lays in Do It Yourself, DIY. DIY is where fabrications personalized and individuals and groups of communities are responsible for their own production and not dependent on the current consumer based mass production. In Latin America, clearly, one cannot speak of a "hobby". You have such or such DIY skills and you enhance them thanks to digital technologies. When you set up a fablabs[9] in Rio or Caracas, people come to meet a specific need or to acquire new skills that they will often use for something totally different. It's a state of mind. I can be able to build a wall, but once I am able to create the digital design and produce it, nothing keeps me from building the wall but also making a chair and everything that fits in the house (Claude, 2015). Even if there is already a fablab in Addis Ababa, it would not be inaccurate to say the entire concept of Fab City applies to developments in Addis Ababa. But it is safe to say even if it would pose difficulty to adopt the concept at list in the short term period, it is a very well experimented and tested concept in the context of the founders that it can be studied further in relation to cities in developing countries such as Addis Ababa in the long term to envision their effective developments. Yet the fablabs also advocate low tech (not highly

[7] More information on fab city can be found on this link http://fab.city/

[8] Tama's interview can be found on this link: http://www.makery.info/en/2015/03/13/tomas-diez-tout-un-ecosysteme-emerge-autour-de-la-fab-city-a-barcelone/

[9] Fablabs are Digital fabrication Laboratories and research center where students, clients and other interested people will be using. It is also a center which is connected to all Fablab academies in the world.

and entirely high tech) innovative approaches that are seen through the use of innovative and being open source as a needed quality in related development approaches. Fab labs have three main values: the commercial model and the economy; the social impact and durability; and finally research and education. (Abel, 2000) who will also be mentioned in the next 3.2 subchapter of this document states that Eco development emphasizes the capacity of people themselves to invent and generate new resources and techniques, to increase their capacity to absorb them, and to put them to social beneficial use, to take a measure of command over the economy, and to generate their own way of life. He also emphasizes "There is no such word as 'technology' that presides over all social conditions and relations; there are different technologies and attitude toward technology, some of which are indispensable to restoring the balance (between humanity and nature), others of which have contributed profoundly to its destruction. What humanity needs is not a whole sale discarding of advanced technologies, but a sifting, indeed a further development of technology along ecological principles that will contribute to a new harmonization of society and the natural world." The above two areas of literature reviews on the principles of Fab City and Chris Abel (2000) show the importance of local development that is sufficient and that do not rely on the need to physically migrate to remote areas to meet end.

3.2. Eco-culture

Chris Abel's summarized in his book (Architecture and Identity: Response to cultural and technological change) that Eco-culture as an inclusive, effective and flexible system that can be an appropriate response to cultural and technological change. Chris Abel (2000) in the following table presented different cultural types: traditional culture, colonial culture, consumer culture and eco-culture seen against different values and structures of community.

Table 5: Different architectural forms and economic and cultural development
(Source: Architecture and Identity: Response to cultural and technological change)

	Traditional Culture	*Colonial culture*	*Consumer culture*	*Eco-culture*
Technological era	Pre-industrial (craft based)	Early industrial (machine based)	Late industrial (automation and information based)	Post-industrial (computer and network based)
Cultural differentiation	Homogeneous (highly integrated and localized)	Heterogeneous (exposure to secondary cultures)	Homogeneous west is best)	Heterogeneous (based on reciprocal cultural exchange)
External communication	Limited and slow (local trades and migrations)	Global but slow (sea and overland)	Global and speedy (air and telecommunication)	Global and instantaneous (near universal network access)
Level of innovation	Tradition governs all (rate of change difficult to record)	Sporadic leap (when officially sanctioned)	Continuous but centralized (concentration of research and benefits in North)	Continuous and decentralized (global dissemination of research and benefits)
Social roles	Specialized and stable (lifelong)	Specialized but changeable (promotion and overseas postings, etc.)	Specialized but changeable (promotion, redundancy/ retraining, etc.)	Multiple roles based on changing skills and continues education / training

Decision structures	Generally hierarchic and patriarchic, with notable exceptions (i.e., Malay peasant society)	Hierarchic and patriarchic (dependent relations between colonies and metropolitan center)	Corporate and patriarchic (modifies by democratic and market led systems) dominated by short-term goals	Participatory with mix of global and local 'bottom up' structures, based on gender quality and sustainable goals
Production systems	Autonomous, self-sufficient (small surplus) and labor intensive	Centralized (large surpluses of export) with both capital and labor intensive sectors.	Centralized mass production (capital and energy intensive) for mass-consumption.	Decentralized, flexible manufacturing systems (intermediate and advanced technologies)
Settlement patterns	Rural and village-based	Urban and rural (sharp differentiation between cities and country)	Predominantly or suburban in the north and urban/rural in the south	Predominantly urban or 'exurban' based on balance public / private transportation
Built forms	Isomorphic with social form and climate	Mix of function and hybrid forms (products of cultural exchange) partly shaped by climate	Ambiguous/flexible forms independent of climate	Customized for pace, purpose and climate

He further explained "paradoxically, by comparison with current development patterns, colonial culture appears as a relatively complex global evolution, in which different cultures coexist without severe loss of character, albeit still under conditions of domination from the center. The last type, eco-culture, suggests a further and more positive evolution toward global complexity, based on complementary regional and international cultures, free from domination. It shares ecological values similar to those of traditional cultures, and while the same degree of self-sufficiency may not be achievable, it marks a significant movement in the direction of cultural diversity and equity." …The idea of appropriate technology is derived as much from a vision of a diversified society, of self-reliant and prosperous homes and communities, as it is from technology per se. Just building a few small scale technology demonstration projects will not accomplish the broader goal of a more human technology. The idea of appropriate technology challenges the existing order of things, especially the values of centralized government, institutions and industries.

3.3. Understanding the Digital Territories

The following rather insightful and forward looking literatures are reviewed by the researcher in order to see the potentials and applicability of E-Learning and E-Working or in general Digital Migration for Work and Study to developments through understanding digital territories and their meaning. The study of Digital Migration for Work and Study presents the opportunity to investigate the understanding of digital territories and their importance in urban developments. Understanding the change in perception of territory due to the expanded access to peoples through technology is important as the access to the residents of cities have great importance to them and their environment.

In recent years, new technologies have profoundly changed territories. What makes this change particularly interesting is the fact that it affects both territories in their materialities and the way they are studied and managed. Digital media is interesting in that any interaction that passes through them leaves traces that can be recorded, analyzed and visualized. This intrinsic traceability promises,

if controlled by an adequate methodology, to provide a new source of data for the study of territories. Given the abundance of these new types of data, several empirical studies have been conducted, but a theoretical reflection on the use of these data in territorial studies is still weak (Romele & Severo, 2017). (Rogers, Beyond the big data criticism: Social and political research in the digital age (2017) Explained … among the current debates is the question of the harmonization of research in political and social sciences with the digital age. How to deal with the challenges posed by the Internet and digital, including data now available online, to research. While the term *big data* is becoming increasingly popular, it seems that research, as well as the whole of what could be called the programmatic calendar (special issues of journals, calls for funding, titles of conferences, seminars, etc. . .), be guided by very specific methods and tools. For some, this phenomenon has taken the name of computational turn, which refers to the integration of computer techniques and *big data* growing, practices applied to social science research. Hey and Trefethen (2003) referred by Severo & Romele, Soft data:Test of a new definition of data for territorial studies (2015) add to the discussion that in recent years, research and public administration are confronted with a phenomenon that seems to be able to renew the way of managing and studying the territory. We refer to the deluge of new types of data generated by digital technologies, including the Internet, as a new source of information on the territory. It is also discussed by Severo & Romele, Soft data:Test of a new definition of data for territorial studies (2015) that at the same time, these data represent a reality, a desire and a need. A reality, because one of the fundamental characteristics of digital technologies is surely their power to generate traces. Boullier, The digital foam of the territories (2015) explains digital territory in his book “The digital foam of the territories” by referring two other authors as follows. When the digital seizes the territory it never does it unequivocally. A "digital policy" that is projected onto a territory can only reinforces the classical definition of the territory, which boils down to the projection of a power over a space defined by borders and appropriate as an ideology (Lussault, 2007) as referred by Boullier, The digital foam of the territories (2015). This definition already produces dimensions that will not necessarily be present in the same way depending on the strategic choices made: power, borders, ideology. The mere presence of ideology opens the dual dimension of territories referred to nation-states: not only states but also nations, that is, still "imagined communities" Anderson (1991) referred by Boullier, The digital foam of the territories (2015). Beaude (2015) in his book “Algorithmic Spatialities” explains about digital territories as follows. The digital traces are eminently spatial. They reflect the spatial dimension of the action, as much evidence of what is happening. More than space, it is besides the spatialities which interest the social sciences, that is to say not only "the characteristics of the spatial dimension of a social reality", but also "the whole of the actions created by the operators of a society "(Lussault, 2003). Because, always, we do with space (Lussault and Stock, 2010). By informing us about what was, the digital traces also inform us about what is in power. Virtuality here covers all its scope, that of the world in becoming, and not that of artificiality or unreality (Deleuze, 1968).

3.4. Factors Influencing Living Places Incorporate Homeworking (E-Working)

3.4.1. Home workers perform relatively better in an appropriately planned environment

The following paragraph is a statement made by London School of Economics (LSE) enterprise in 2013 based on the research conducted in order to study the performance of workers. Despite the fact that Home workers are more productive, they face social isolation if planning does not solve the situation.

As a result researches indicated partial home workers and mobile home workers to be more reliable groups.

Work hours are shortest among office workers: homeworkers and partial homeworkers are more likely to work in excess of their contracted hours, while mobile workers work significantly more hours in excess of their contracts than all other groups of workers. While all groups report similarly high levels of satisfaction with their work-life balance, partial homeworkers, mobile workers and office workers are significantly more likely than homeworkers to perceive that their work has a positive impact on their personal life. Homeworking and partial homeworking are linked to significantly lower levels of work-related stress than those experienced by office workers. When it comes to social isolation, a common concern associated with homeworking, partial homeworkers are less likely to report experiencing isolation than their homeworker colleagues. This and other findings suggest that, in the case of Acas, partial homeworking yields the best outcomes for employees in terms of minimizing levels of stress and well-being. Contrary to assumptions that a constant physical presence in the workplace is required for maximum job performance, the study found that performance is slightly higher for partial homeworkers and mobile workers (Beauregard, Basile, & Canonico, 2013).

74.5% of our employees state that the timeliness of their work output improves when working at home, while 67.4% state that the quality of their work improves when working at home (Cisco Systems, Inc. , 2012).

According to the UNDP, more than 1 billion people will enter the job market in less than three years, most of them from low- and lower-middle-income countries. Increases in access to the Internet have led to the emergence of a new world of work, with major international institutions suggesting that workers could frictionlessly compete in a global marketplace by way of online platforms. Economists have previously suggested that access to Internet-based marketplaces would permit a kind of “virtual migration” that offers economic benefits akin to physical migration. Policymakers expect that regions like Sub-Saharan Africa and Southeast Asia, in particular, can capitalize on this digitally-mediated work opportunity. New sources of work are especially needed as the youth-to-adult unemployment rate hits historic peaks and average wages remain significantly lower in emerging economies than in developed economies. The growth of online gig work — paid work allocated and delivered by way of internet platforms without an explicit or implicit contract for long-term employment — is seen as a relatively welcome phenomenon among economic development experts, and the world’s largest global development network is promoting its potential to aid human development. There are hopes that online gig work, and the platform that supports it, might catalyse new, sustainable employment opportunities by addressing a mismatch in the supply and demand of labor globally. Some of the world’s largest gigwork platforms have put forth their business models as a revolution in labor markets, suggesting that they can help lift people out of poverty. More broadly, it has been suggested that online gig work will have structural benefits on the global economy, such as raising labor force participation and improving productivity (Oxford Internet Institute, 2017).

Box 1: List of online gigs popular on the internet
Source: researcher's online searches

List of online jobs popular online and average earning through them:

Translator, Voice Actor, Statistical Analyst, Infographic Designer, Software Engineer, Travel Agent, Financial Manager, Writer, Graphic Designer. Other online jobs or gigs include: create wordpress themes, Become a blogger, Freelance as a social media expert, Share your knowledge and sell online courses, Sell quality photographs, Create video content, Online Survey Jobs, Simple Ad Clicking Jobs, Online GPT Jobs, Blogging,Affiliate Marketing, Online Jobs with youtube, Online Freelancing Jobs, Online Writing Jobs, Captcha Solving Jobs,Online Data Entry Jobs, ,Amazon Online Jobs, Online Tutoring Jobs,Online Transcription Jobs, Buy & Sell (Domain + Site), Social Media Jobs, Online Selling, Digital Marketing, Stock & Forex Trading.

List of websites where one can buy sell and make money:

PennySaver USA, BackPage, USA Today,USFreeAds, Gumtree, Close5, Oodle, Geebo, Craigslist, Locanto, Ads Globe, Trovit

The jobs indicated in the above can be part time, freelance or permanent standing.

Box 2: Scam Alert

There are job posts that are Scam: If the website has no contact information, If the payment sounds too good to be true, If there are complaints online about the site, If there here's a fee (Most legitimate sites won't charge you to sign up), it means the job is a scam.

Sources: Christine Durst, cofounder, RatRaceRebellion.com. Holly Hanna, founder of TheWorkAtHomeWoman.com blog, Amy Robinson, chief marketing officer, Direct Selling Association. Lois Greisman, associate director, division of marketing, FTC

3.4.2. The need for increased collaboration and sustainable growth

Increased Collaboration: Technology is creating opportunities for new forms of collaboration, changing not only where we work from, but how we work, and who we work with. The increasing need to collaborate with people in different time zones and different companies demands flexibility and agility. Complex and interdependent tasks can now be highly choreographed even when untethered from physical location. New technology platforms offer advanced knowledge-sharing capabilities that transcend territories and business silos. In this context, flexibility can leverage advanced technology to enable virtual peer-based working (Future of Work Institute, 2012)

Sustainable Growth: The phenomenon of globalization has also created concerns around resource use and the limits to economic growth. The issue of carbon is climbing the agenda of companies across the UK, and the reduction of emissions requires a rethink of physical footprint. Yet most companies still rely on commuting employees and office space, two of the biggest carbon emitters. This issue therefore necessitates the adoption of more agile ways of working that depend less on the consumption of tangible resources and more on the creation of innovative structures and processes (Future of Work Institute, 2012).

3.4.3. Home workers can benefit from the global economy

The history of online gig work is deeply embedded in the history of the Internet and international business process outsourcing. The idea that individual workers can meaningfully participate in the global economy through a combination of the Internet and outsourcing begun around the 1980s with

the concept of offshore outsourcing taking root in the modern business enterprise10.14 American companies like General Electric and American Express were early adopters, moving business processes from the United States to India.15 These early relationships of offshore outsourcing ultimately influence today's geographic diffusion of online gig work and can explain online gig work platform usage in parts of the Global South (Oxford Internet Institute, 2017).

3.5. Factors Influencing Living Places Incorporate learning from home (E-Learning)

Online education provides flexible access to content and instruction any time from any place as a result online education is growing at a significant rate. The following reviews elaborate the subject further. Online learning has become popular because of its potential for providing more flexible access to content and instruction at any time, from any place. Frequently, the motivation for online learning programs entails (1) increasing the availability of learning experiences for learners who cannot or choose not to attend traditional face-to-face offerings, (2) assembling and disseminating instructional content more cost-efficiently, and/or (3) providing access to qualified instructors to learners in places where such instructors are not available. Online learning advocates argue further that additional reasons for embracing this medium of instruction include current technology's support of a degree of interactivity, social networking, collaboration, and reflection that can enhance learning relative to normal classroom conditions (Rudestam & Schoenholtz-Read, 2010).

Online learning has been described as a "fifth generation" version of distance education "designed to capitalize on the features of the Internet and the Web" (Taylor, 2001). Taylor concluded: Previous generations of distance education are essentially a function of resource allocation parameters based on the traditional cottage industry model, whereas the fifth generation based on automated response systems has the potential not only to improve economies of scale but also to improve the pedagogical quality and responsiveness of service to students.

Online learning is one of the fastest growing trends in educational uses of technology. By the 2006–2007 academic year, 61% of US higher education institutions offered online courses (Parsad & Lewis, 2008). In fall 2008, over 4.6 million students—over one quarter of all U.S. higher education students—were taking at least one online course (Allen & Seaman,2010). In the corporate world, according to a report by the American Society for Training and Development, about 33% of training was delivered electronically in 2007, nearly triple the rate in 2000 (Paradise, 2008). Although K–12 school systems lagged behind other sectors in moving into online learning, this sector's adoption of e-learning is now proceeding rapidly. As of late 2009, 45 of the 50 states and Washington DC had at least one form of online program, such as a state virtual school offering courses to supplement conventional offerings in brick-and-mortar schools, a state-led online initiative, or a full-time online school (Watson, Gemin, Ryan, & Wicks, 2009). The largest state virtual school, the Florida Virtual School, had more than 150,000 course enrollments in 2008–2009. A number of states, including Michigan, Florida, Alabama, and Idaho, have made successful completion of an online course a requirement for earning a high school diploma. Two district surveys commissioned by the Sloan Consortium (Picciano & Seaman 2007; 2008) produced estimates that 700,000 K–12 public school students took online courses in 2005–2006, and more than a million students did so in 2007–2008: a 43% increase in just 2 years. Christensen, Horn, and Johnson (2008) predicted that by 2019, one half of all U.S. high school enrollments will be online.

[10] Some indicators of participation of individual and groups through outsourcing cases will be discussed in the contextual review of this paper.

3.6. Working Conditions for New Generations

According to the following reviews the members of the new generation seek more flexibility on their work culture. Each generation brings with it new approaches to work. Most recently, the entry of Generation Y (people who are born after 1981) into the workforce represents the first cohort who have grown up within a connected world of social platforms and sophisticated devices. They have grown in parallel with the rapid technological evolution of their time and are now intimately connected to a new online ecosystem. The social habits and behaviors of this generation differ substantially from generations before them: they have increasingly used text, email, Facebook, and Twitter to communicate instantaneously with many people at distance, and they are familiar with virtual communities and the power of collectives. Accustomed to rapid change, this generation will vent their frustration when confronted with the inflexibility of traditional businesses, or the inertia of a job that lacks upward mobility. For instance, in a recent survey by (Cisco Systems, Inc. , 2012), 45% of Generation Y employees claimed that they would accept a lower-paying job if it provided more flexibility on device choice and mobility (Future of Work Institute, 2012).

3.7. Internet and Social Media Penetration and its Influence in Work and Related Activities

The following reviews are dedicated to present the extent of technology penetration. For the research objective, it shades light on the fact that usage of internet is becoming more common and furthermore the fact that use of internet has brought economical advantage to various countries.

The internet and cell phones have infiltrated every cranny of American workplaces, and digital technology has transformed vast numbers of American jobs. Work done in the most sophisticated scientific enterprises, entirely new technology businesses, the extensive array of knowledge and media endeavours, the places where crops are grown, the factory floor, and even mom-and pop stores has been reshaped by new pathways to information and new avenues of selling goods and services. For most office workers now, life on the job means life online. Pew Research surveyed online a representative sample of adult internet users and asked those who have jobs a series of questions about the role of digital technology in their work lives. This is not a sample representative of all workers. It covers online adults who also have full- or part-time jobs in any capacity. The most recent survey data from Pew Research in late 2013 shows that 94% of jobholders shows internet users and other workers in all kinds of enterprises from technology companies to non-technology firms; from big corporations to small proprietor operations; and from those in urban areas, farms, and places in between (PEW Research Center, 2014) Around 40% of the world population has an internet connection today. In 1995, it was less than 1%. The number of internet users has increased tenfold from 1999 to 2013. The first billion was reached in 2005. The second billion in 2010. The third billion in 2014.

- **Technology penetration in Africa as presented in the African Science, Technology and Innovation Review 2013 by the Economic Commission for Africa**

3.7.1. Social Digital Media Trends

John Law and his co-authors (Law et al., 2011) argue that social digital media make possible new modes of organization, but also of analysis, of social life. Social networking and social networking

social applications, such as Facebook and Twitter, represent new spaces where social data are produced, collected and analyzed (Beer and Burrows, 2007). However, their growing notoriety in social life also leads to methodological consequences for sociological research (Savage, 2009; Rogers, 2013). For those who seek to draw social media platforms empirically, it quickly becomes clear that they do not provide us with raw data, but rather with formatted information: how data are organized on social media platforms (Marres & Gerlitz, 2015).

Box 3: Social media trends in Africa

Social media trends in Africa as presented in African Science, Technology and Innovation Review 2013 by the Economic Commission for Africa: The Internet has also provided a platform for a variety of services, of which social media has become an important tool that allows people to interact with each other much more extensively than was previously the case. Social media empowers individuals, firms and institutions to share and exchange, inform, collaborate across disciplines and borders and receive feedback from a target population in ways that were previously not possible. Africa has not been left out of this revolution, most probably due to its youth population. Social networking firms such Facebook, Google+, LinkedIn, Twitter and YouTube have seen the number of users in Africa grow rapidly. For instance, Africa's level of Facebook penetration, at 3 per cent, is lower than that of the world average, at 10.3 per cent. However, it is growing much faster than in any other region. The penetration of social media varies widely. For instance, six countries in African are ranked in the top 50 countries in the world in terms of number of users of Facebook in 2012. Unlike in other regions, more than 15 per cent of people online in Africa are currently using Facebook, compared to 11 per cent in Asia. Two other social networking websites, Twitter and YouTube, rank among the most visited websites in most African countries. However, care needs to be taken as the numbers mask the size of the population.

3.8. Internet of Things

This part of the literature review presents internet of things (IOT) for the reason that IOT explains the current cyber technology and use of information by peoples in shaping their lives. The study of digital migration for work and study is directly connected to the understanding of cyber technology and its entails. IoT is a concept where cyber technology is rather stretched to its interactive and dynamic state.

(Nahrstedt, et al., 2016) state that today's cities face many challenges due to population growth, aging population, pedestrian and vehicular traffic congestion, water usage increase, increased electricity demands, crumbling physical infrastructure of buildings, roads, water sewage, power grid, and declining health care services. Moreover, major trends indicate the global urbanization of society, and the associated pressures it brings, will continue to accelerate. One of the approaches to assist in solving some of the challenges is to deploy extensive IT technology. It has been recognized that cyber-technology plays a key role in improving quality of people's lives, strengthening business and helping government agencies serve citizens better. (Mohammed & Ahmed, 2017) Further discuss that IoT gained a great attention from researchers, since it becomes an important technology that promises a smart human being life, by allowing a communications between objects, machines and every things together with peoples. IoT represents a system which consists things in the real world, and sensors attached to or combined to these things, connected to the Internet via wired and wireless network structure. The IoT sensors can use various types of connections such as RFID, Wi Fi, Bluetooth, and ZigBee, in addition to allowing wide area connectivity using many technologies such as GSM, GPRS, 3G, and LTE. IoT-enabled things will share information about the condition of things and the surrounding environment with people, software systems and other machines. by the technology of the IoT, the world will becomes smart in every aspects, since the IoT will provides a means of smart cities, smart healthcare, smart homes and building, in addition to many important applications such as smart energy, grid, transportation, waste management and monitoring. (Zhang & Shufan,

2017)bring the discussion of smart cities as follows: Among the various notions associated with Smart Cities, one interpretation explains Smart Cities as being composed of three domains: technology, people, and institutions. The “technology” domain addresses the need to build basic infrastructure, both physical (hardware) and virtual (wireless networks), to implement information-communication technology in urban areas. The “people” domain emphasizes innovation, learning resources, and human capital that serve as catalysts to boost Smart City development. The “institution” domain indicates the importance of government support in the development of Smart Cities.

(Zhang & Shufan, 2017) **Challenges with IoT Technology in the Realization of Sustainability are:** Span, Fault Tolerance, Lack of Incentive, Adverse Effect, and Ownership of Data: Most of the literature on IoT emphasizes the significant meaning of IoT for city administrators in terms of optimized management. However, there arises the issue of the ownership of data retrieved from the sensor network. The administrator-centric mode is a common feature within the Smart Cities movement, neglecting the fact that a great amount of data is related to citizens and users. The absence of public access to data may lead to a difficulty for citizens when perceiving the benefits of a sensor network, leading to an increased difficulty in obtaining funding and public support. (Hung, 2017)Defines IoT as network of dedicated physical objects (things) that contain embedded technology to communicate and sense or interact with their internal states or the external environment. The connecting of assets, processes and personnel enables the capture of data and events from which a company can learn behavior and usage, react with preventive action, or augment or transform business processes. The IoT is a foundational capability for the creation of a digital business.

3.9. Summary of Literature Review

The FAB City is studied for the project’s quality to be used as tool of explanation for what it means to create efficient technology oriented urban lay out where waste is minimized and quality data is processed by residents. Implementation of locally productive and globally connected self-sufficient cities and principles of Trash in trash out (PITO) and Data in data out (DIDO) in urban forms are discussed. In light of Eco-Culture, the literature presents Chris Abel’s point of view in understanding the different cultures of urban structures in comparison with the different levels (strata) of urban activities and roles. Among which Eco-culture is indicated to be more effective for developing countries.

The literature review further studies how to understand the new territory or the digital territory as it is becoming more relevant than political and geographic boundaries, territories. There are appropriate (compelling) evidences like digital traces and individuals’ activities and desires that are shaping this territory. There are also studies on factors influencing living places to incorporate work and factors influencing lining places incorporate learning from home. Here facts such as the increasing need to work from home and learn from home due to the advantage gained through the internet, mobile phones and other devices. It is also presented that Digital Migration for work and study provide more advantages to those who are practicing them and evidences are shown why they should be practiced in the future of cities.

The internet in general and social media trends specifically is presented. Among different strata of cities the digital media is engaging more and more of the population and organizations. And this fact is bringing meaningful change in the lives of individuals and performance of organizations. The literature review further studies internet of things, it is discussed that communication between

machines, between persons and machines brings an effective social structure and allows effective use of resources.

By all means, the study of E-Learning and E-Working (Digital Migration for Work and Study) should be built on the understanding of the point of views of the above discussed literatures as they significantly and broadly explain what embarking on to implementation of ICT in to urban developments would entail.

4. CHAPTER FOUR: Contextual Review

4.1. E-Learning in Ethiopia

E-learning at higher education institutes is studied and reported by (Anberbir, 2015) from the Ethiopian Institute of Agricultural Research. The following texts are extracted and discussed from his research for contextual review of this research.

Ethiopian higher educations are organizing the ICT manpower, investing on ICT infrastructure and attempting to use ICT for education mainly in the area of course management system (Moodle or other Learning Management Systems), library automation (KOHA, ABCD or other library management systems), digital library (Greenstone, DSPACE etc…) and student management information systems. Most universities implemented the new ICT manpower structure with better salary scale and this helps the universities to retain IT professionals. The establishment of higher education forum by ministry of education (MoE) to exchange information and resources among universities is another important move which is helping universities to use ICT for education… A project by Ethiopian Capacity Building Program (ECBP) for designing and implementing e-learning[11] in different Ethiopian higher education institutions and Technical and Vocational Education Training (TVET) colleges is one of the best experience and start. In particular the digital campus project at Mekele University is very interesting and it can be a good lesson for other universities. The system is web-based and it can also be accessible via mobile applications. Addis Ababa Science and Technology University is also implementing Moodle learning management system…The following recommendations can be made for future actions. First, national e-learning policy and Strategy should be crafted by the government so as each university can prepare their own e-learning policy and guidelines. Then, awareness creation and training of teachers, e-learning trainings to ICT professionals, e-learning resource development and inter-university collaboration would be the next steps. The development of virtual educational and learning system and **cyber home learning system**[12] are also important to make teaching-learning effective…In general, transformation of teaching and learning through the use of ICT has to be occurred at many different levels: the government, each academic community, each institution, each department, each faculty member, and each student.

Based on discussions made by this research with the Ethiopian Education and Research Network (EthERNet), EthERNet has already established the proposed digital network of universities see section 4.2.5 of this paper for more elaboration. The institute has now connected 36 universities and it is on its way to adding 11 more universities to its network. This presents a very ideal opportunity to establish E-Learning (learning from home) for the community or digital migration for Study. It is also mentioned to the researcher by the representatives of the EthERNet that the institute does not only use servers from the Ethiotelecom but makes use of the cloud service.

4.2. Technology Affiliations in Ethiopia

It is important to study in detail the existing affiliation of the country Ethiopia in general and the city Addis Ababa in particular towards technology in terms of ICT and related areas in order to measure

[11] Tadese Amberbir's research material can be found at https://www.researchgate.net/publication/318317502
[12] This note by Tadeese Amberbir indicates the interest of other researcher on E-Learning (learning from home).

and describe the readiness of the country to implement Digital Migration for work and Study. This task is covered in this research document by reviewing governmental and non-governmental organizations that are affiliated with the subject area in the following subchapters. Different organizations in Ethiopia are now dedicated to develop the country's access to technology and they are expanding their capacities all over the country. Some of these organizations are National Science, Technology and Innovation (STI) ,the Ethiopian Telecom, the Ministry of Communication & Information Technology (MCIT), the Ministry of Science and technology (MOST), and the Ethiopian Education and Research Network (ETHERNET)[13]. See figure 69, the figure shows the location of the above technology oriented centers and other innovation organization and digital fabrication laboratories.

4.2.1. National Science, Technology and Innovation (STI)

Information is an essential resource in the socio-economic development of the country since it creates greater efficiency in the provision of services, facilitates timely decision making and it widens international communications. Areas that need further development are data communication systems such as the internet. In this regard, development of ICT that will facilitate the exchange of scientific and technological information through an integrated national information system and ensuring its sustainable use in terms of manpower, hardware, network and software will be supported.

The vision of the STI Policy is based on the national vision: "to see Ethiopia become a country where a democratic rule, good governance and social justice reigns upon the involvement and free-will of its peoples, and once extricating itself from poverty becomes a middle-income economy as of 2020-2023." Accordingly, the national STI vision of the country is: To see Ethiopia entrench the capabilities which enable rapid learning, adaptation and utilization of effective foreign technologies by the year 2022/23.

The mission of the STI policy is to create a technology transfer framework that enables the building of national capabilities in technological learning, adaptation and utilization through searching, selecting and importing effective foreign technologies in manufacturing and service providing enterprises.

4.2.2. The Ethiopian Telecom (ETC)

(Tadesse, 2004)Stated that two separate independent entities namely the Ethiopian Telecommunications Authority and the Ethiopian Telecommunications Corporation were established by proclamation No.49/1996 on November 1996. Telecom services are provided in most efficient & effective manner to customers. The corporation (1996) has enhanced the development of telecom infrastructure and quantity of services in both rural and urban areas in the most efficient and timely

[13] The sections of this research 4.2.2, 4.2.3,4.2.4 and 4.2.5 that introduced Ethio Telecom, MCIT, MOST and EthRNet are intended by the researcher to emphasize on the readiness of the country to collaborate with its community and the global community to bring forth effective way of living for the nation's citizens.

manner…As a continuation of the last five year plan and after concentrating its efforts on education, health and agriculture, the Ethiopian government has decided to focus on the improvement of telecommunication services, considering them as a key lever in the development of Ethiopia. Ethio telecom is born, on Monday 29th November 2010, from this ambition of supporting the steady growth of our country. To ensure that ethio telecom runs parallel with top telecom operators, the Ethiopian government has reached an agreement with France telecom, one of the world's leader telecommunications companies. This agreement will help ethiotelecom to improve its management capability through the transfer of world renowned know how and skills…The Ethiopian Telecommunication Agency (ETA) started its operation by giving license in four areas of services, namely, Public Switched Telecommunication Network (PSTN), Cellular Mobile, Internet and Data communication services to Ethiopian Telecommunication Corporation (ETC), which was established by Council of Ministers regulation No 47/1999 as an incumbent state owned operator. Currently, ETC is providing all types of services (PSTN, cellular Mobile, Internet and data communication services) in all parts of the country…ETC has 7.08 million subscribers, of which 1.2 Fixed, 5.9 mobile and 0.060 Internet. Mobile telephone and internet services are being rendered since 1996 and 1997 respectively…The rate of penetration of telecom service of the country is among the lowest being compared with African countries and even among Sub-Saharan African countries. (Dubale, 17-19 march 2010)[14] Mentions that the government of Ethiopia has aggressively been moving and implementing development strategies aimed at reducing the poverty prevailing in the country. In this line, telecommunication plays a key role in facilitating the poverty reduction and development strategy being implemented by the government. To this end, the government has designed strategies to expand telecommunication national network infrastructure, and other infrastructures (roads and power) as well and in order to increase socio-economic development of the country in general and telecom penetration rate in particular.

4.2.3. The Ministry of Communication and Information Technology (MCIT)

The MCIT is the principal government organ in charge of ICTs in general. It has the powers and duties to initiate policies and laws in ICT areas. The MCIT also sets and implements standards to ensure provision of quality, reliable and safe ICT services. The Ministry is, therefore, the principal policy organ concerning cyber security in general and cybercrimes in particular. Each regional state has, however, its own Communications and Information Technology Agency entrusted with implementing on the ground laws, policies and standards on ICTs adopted at the federal level (Yilma & Abraha, 2016).

The Federal Democratic Republic of Ethiopia (FDRE)'s Ministry of Communication and Information Technology (MCIT) is a government institution which spearheads the ICT development of the nation by way of developing policy instruments, designing various programs, mobilizing resources, guiding and monitoring implementation. Among the ministry's major roles, IT Park development can be cited as part of the ministry's ICT development programs. IT Park[15] provides an important resource network for new information technology based enterprises. More likely linked with universities and research promote university industry-relations and cooperation on commercialization and transfer of

[14] This information is acquired from the report by the United Nations on Multi-year expert meeting on services, development and trade: the regulatory and institutional dimension. Geneva, 17-19 march 2010

[15] Such development emphasizes sated objectives of this research, the need to upgrade the community but also contradicts in the fact that this research shows that decentralization of related infrastructures will give more access to technology and innovation for the community. The IT Park development still requires the community to travel to a point to access data instead of bringing data to the people right where they are, where they live.

new technology. It entails conducive or attractive working environment for IT companies, professionals and entrepreneurs. Various models for IT Parks exist globally, ranging from self-sufficient towns of technology that encompass residential neighborhoods[16], shopping centers, restaurants, recreational facilities, technical universities/training centers, research centers, IT manufacturing and services and often business incubators to relatively small self-contained establishments. The Ethiopian IT Park falls under this model. In addition to facilitating the emergence of IT industries, IT Parks are also intended to enable positive externalities including increased economic linkages between foreign and local industries and spillovers of knowledge and technological capabilities. To reap these benefits, policy makers have implemented target strategies from the outset such as encouraging joint ventures, as well as aimed to strengthen their local human capital to increase the absorption capacity (Federal Democratic Republic of Ethiopia).

Rapid advances that are being made in new and emerging technologies in such fields as information, telecommunications, environment, clean energy, health, materials and transportation technologies, and the increasing pace of globalization are imposing a new social and ethical responsibility on the scientific and technological community to direct applications of these new developments in ways that strengthen efforts for achieving the objectives and goals of sustainable development for nations.

Given the potential complexity of such projects and the possible scope of required investments, there is a pressing need for a synthesis of best practices and lessons learned (both from success and failure) in developing, financing and sustaining IT projects (Ethio ICT village).

4.2.4. Ministry of Science and Technology (MOST)

The ministry of Science and Technology has a mission of Coordinating, encouraging and supporting science and technology activities that realize the country's social and economic development. And has a vision to see Ethiopia entrench the capacities which enable rapid learning, adaptation and utilization of effective foreign technologies by the year 2022/23.

[16] IT parks include innovative residential neighbor hoods that are intensified with information technology communication capabilities there by enabling residents benefit from local and global knowledge and business endeavors.

Box 4: *Powers and duties of MOST*

Powers and duties of MOST defined by the Federal Democratic Republic of Ethiopia proclamation No. 691/2010

The ministry of Science and Technology shall have the following powers and duties according to definition of powers and duties of the executive organs of the Federal Democratic Republic of Ethiopia proclamation No. 691/2010.

- Prepare national science and technology research and development programs based on the country's development priorities, and upon approval by the government, provide necessary support for their implementation; follow up and evaluate same;
- In cooperation with the concerned bodies, establish a system for technology need assessment, identification, acquisition, packaging, utilization and disposal, and follow up the implementation of the same;
- Register technology transfers made in every sector, coordinate codification and technology capability accumulation efforts, and ensure successive use of same;
- Coordinate science and technology development activities and national research programs; ensure that research activities are conducted in line with the country's development needs;
- Organize science, technology and innovation database, compile information, set national standards for information management, prepare and ensure the application of science and technology innovation indicators;
- Facilitate interaction and collaboration among government and private higher education and research institutions and industries with a view to ensure research and technological development;
- Prepare and follow up the implementation of the country's long – term human resource development plans in the field of science, technology and innovation; cooperate with the concerned organs to ensure that the countries educational curricula focus on development of science and technology;
- Facilitate capacity building of public and private sector institutions and professionals involved in science and technological activities;
- Establish and implement a system for granting prizes and incentives to individuals and institutions who have contributed to the advancement of science, technology and innovations;
- Establish, coordinate and support councils that facilitate the coordination of research activities.
- Encourage and support professional associations and academies that may contribute to the development of science and technology.

Box 5: Example of Technology Related Activities by Organizations in the Country

Following its goals the ministry is performing different activities related to its objectives for example on December 27, 2017 the ministry of Science and Technology (MOST) and the Oromiya Science and Technology Development Agency (OSTDA) signed a memorandum of understanding (MOU) to build science cafes in major cities selected by the Oromiya regional government. On the event of signing the MOU, Dr. Shumete Gizaw stated that “nations in addition to allocating substantial budget for science and technology researches at higher education institutes, they perform all rounded activity to increase their people’s contribution and awareness in regards to science and technology. On this front one of the ways to cultivate science and technology in the community is to build science cafes with in the community. As such the endeavor will be reinforced and will be made sustainable. The text describing the event of MOU signing can be found at the annex section of this research document.

Figure 6: EthERNet Fiber transmission road-map
Source: Ethernet, Ethiopian education and research network

4.2.5. The Ethiopian Education and Research Network (EthERNet)

The following information is reviewed from the official website of The Ethiopian

Education and Research Network (EthERNet). EthERNet was founded in 2009 under Federal Democratic Republic of Ethiopia (FDRE), Ministry of Education for supporting the public higher education institutes. The primary purpose is to build stable, reliable, flexible, modular, and scalable network infrastructure across the country and connect those higher education institutions to the global research community.[17] EthERNet is headquartered in Addis Ababa, Ethiopia, in front of AAiT. The company has experienced employees, the majority being experienced in smart education aspect working actively on the latest technology platform. At EthERNet many people from university communities directly engaged and participate to work together, adding their knowledge and experience to the team. Up on the researcher's interview at EthERNet, it was explained by Hilina Emeru, Infrastructure Leader, that now the company connects 36 universities in the country including Addis Ababa University and is working on adding 11 more universities to its network. The center has been facilitating several education opportunities for local academicians so that they get standard education programs across the country. The center has Ethio telecom, MCIT and the Information Network Security Agency (INSA) as stakeholders.

The above 4.2.1, 4.2.2, 4.2.3 and 4.2.4 sections that introduced STI, Ethio Telecom, MCIT, MOST and EthRNet are intended by the researcher to emphasize on the readiness of the country to collaborate with its community and the global community to bring forth effective way of living for the nation's citizens.

Box 6: Effort of ministry of education in upgrading schools with technology related to ICT

The Ministry of Education of Ethiopia is working hard for the development of ICT in the education sector. It is performing different activities to support the secondary education with a variety of ICT projects. Harry (2007) confirmed that School Net project performed with the joint initiative by the Ministry of Education and UNDP is probably the most visible project in the country with a total of 181 schools equipped with a minimum of 15 networked computers per lab all connected to the Internet. In addition, the National School Net initiative, for instance, is aimed at the deployment and the exploitation of ICTs to facilitate the teaching and learning process within primary, secondary, technical and vocational schools.

Social networking tools, as part of the school net facilities serves as a means of social interaction among students and it helps students in producing, distributing, and exchanging of information and ideas within virtual environment and virtual set-up. Moreover, it serves as a virtual learning environment through connecting students with their peers and students with their teachers and there by contribute its share in supporting the Ministry of Education objectives (Tamirat Kore, 2014).

4.2.6. Information Network Security Agency (INSA)

Kinfe Micheal Yilma and Halefom Hailu Abraha (2016) describe INSA as it is a parallel organ to the Ministry of Communication and Information Technology (MCIT) with statutory powers to formulate national policies, laws and standards to ensure security of information and computer based key infrastructure and oversee its enforcement. Whilst the Ministry is bestowed with the broader mandate in connection with ICTs regulation in general, INSA is specifically dedicated to deal with information security…The need for electronic signature and electronic transaction laws has also been specifically recognized as one of the critical success factors of the PKI project. Although the government of Ethiopia has been proactive in this regard, the laws are still at draft stage. The MCIT, for instance, had drafted electronic signature and electronic transaction laws following the adoption of the strategy. In the meantime, however, the responsibility to develop the national PKI and draft electronic signature law has been relegated to INSA. MCIT and INSA have finalized the development of electronic signature law and electronic transaction law respectively and these laws are set for public consultation. See figure 69 prepared by the researcher, the figure shows the location of

[17] This information is found through the researchers interview at the office of the ETHERNET at Addis Ababa University and Ethiopian ministry of education

government technology oriented centers and other innovation organization and digital fabrication laboratories.

4.3. Mobile Banking in Ethiopia

A major benefit of Mobile banking is drawing in the "unbanked" who generally can't afford the cost of formal banking services and infrastructure. There is the potential to bank people outside the realm of traditional financial services and the mobile phone is a pervasive device that has fewer barriers to entry than most technologies and has penetrated some of the poorest economies due to the overwhelming demand for any form of telecommunications. The evolution of the system necessarily started out as a simple transaction to purchase airtime, strictly to make calls. Very soon, people in rural areas in just about every sub Saharan African country were purchasing prepaid airtime from local vendors in cities and selling it on to merchants in rural locales, who in turn either rented the use of mobile phones to rural dwellers or sold the airtime on to them at a profit (USAID Knowledge Services Center, 2007).

On a continent where informal trading is everyone's business, this was somewhat typical. But the technological innovation did not stop there. The rate of airtime exchanging hands based on a relatively few large top-ups seemed an anomaly. Consumers began to use airtime as a sort of virtual currency and airtime had become another means of exchange for goods and services, a 'wallet in your phone' (or second currency) based on the stored value of prepaid vouchers. Soon mortar-and-stone banks, traditionally accustomed to the rarefied trade of the high-end formal market, woke up to the massive opportunity this presented to deploy mobile-banking applications which extend the formal financial service system to the poor (the unbanked) without customers having to incur the onerous administrative fees of ATM machines and point of service cash transactions. With nine successful private banks in Ethiopia and the large state bank all thriving due to economic growth, Mobile banking will no doubt increase due to competition (USAID Knowledge Services Center, 2007).

4.4. Social Media and Internet Usage in Ethiopia

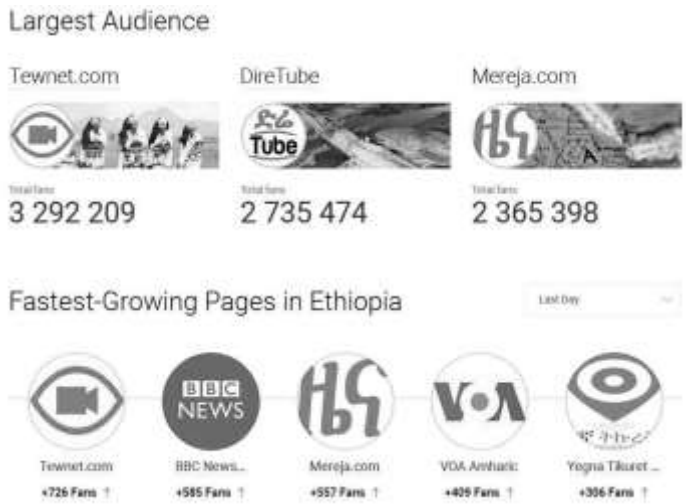


Figure 7: Facebook Pages with large size audience and pages that are growing fast.
Source: Internet Live Stats

Internet Live Stats shows that by 2016 the internet users in Ethiopia reached 4,288,023. Most of this users are reasonably residents of the City Addis Ababa. The following descriptions of social media usage in Ethiopian is limited to Facebook. The number of Ethiopians on Facebook has increased by around 100,000 in four months, according to the social media statistics portal, http://www.socialbakers.com.

The total number of Ethiopians on Facebook was 310 940 in June 2011. Currently, there are 401 160 Facebook users in the Ethiopia, which makes it number 98 in the ranking of all Facebook statistics by country. Ethiopia still has one of the least penetrations of the online population i.e. 0.46%. Facebook is one of the most dynamic, interactive and convenient new media tools that may play a role in democratic transitions.

4.5. Technology Laboratories (Innovation and Technology Laboratories) in Addis Ababa

There are innovation centers and Technology Laboratories in Addis Ababa that are building the community through business incubation and technology based education. Among this Flab Addis, Protolab EiABC, Col. John C. Robinson American Center at the National Archives and Library Agency (NALA), xHub Innovation Society, Entrepreneurship Development Centre (EDC)-Ethiopia, DOT Ethiopia and Iceadddis can be mentioned as examples. Like most developments in Addis Ababa these centers are also far from the residents. See figure 69, the figure shows the locations of government technology oriented centers and other innovation organization and digital fabrication laboratories.

As example this part of the literature presents Fablab Addis as one of the best practices to be shown in detail. Fablab is a fabrication laboratory in Addis Ababa, Addis Ababa University School of Fine Arts and design set up in collaboration with Fablab Barcelona, MIT (Massachusetts Institute of Technology), AECID (Agency of International Development Cooperation). It is a research center where students, clients and other interested people will be using. It is also a center which is connected to all Fablab academies in the world (USA, Barcelona, India, Netherlands, South Africa, ETC). The Fablab Provides education in six month higher diploma program for students commercially and on a scholarship bases. The researcher took part on the program and assisted the lab from 2011 to 2013. Furthermore the laboratory gives access to students and the public to learn and develop ideas.

Figure 8: Technology Related Activities at fablab Addis
Source: pictures are taken by the researcher and class mates of the researcher during the program

The education and activities at the lab can be categorized as follows: Principles and practices, Project management, Computer-aided design, Computer-controlled cutting, Electronics production, 3d scanning and printing, Electronics design, Molding and casting, Embedded programming, Computer-controlled machining, Input devices, Composites, Interface and application programming, Output devices, Networking and communications, Mechanical design, Machine design, Applications and implications, project development, Invention, intellectual property, and business models**.** The following pictures illustrate the activities further.

4.6. Over View on Condominium Housing Developments (IHDP)

According to the Housing Development office of Addis Ababa 274,634 houses unites are constructed and are under construction since 2004. The development of condominium houses started by building 750 model house units around Gerji in 2004. Until the end of 2016 175,000 condominium house units were transferred to residents in eleven rounds. Out of the eleven rounds during the 10th and 11th

round, total of 23,976 condominium house units are transferred to residents under the 10/90 housing provision program. During these rounds all residents registered under the 10/90 program have received houses. The remaining amount is transferred to 20/80 housing provision program. The following table shows the summery of condominium houses transferred to residents and that are under construction[18].

Table 6: Description of Condominium distribution in Addis Ababa Sub cities.
The table is created based on information gained during interview at Addis Ababa Housing development project office (November, 2017)

SUB CITY	COMMUNAL BLOCKS	NUMBER OF BLOCKS	AREA IN HA	NUMBER OF STUDIO TYPE	NUMBER OF ONE BED ROOM TYPE	NUMBER OF TWO BED ROOM TYPE	NUMBER OF THREE BED ROOM TYPE	NUMBER OF COMMERCIAL UNITS	TOTAL NUMBER O HOUSE HOLDS
ARADA	24	87	12.29	670	889	1101	243	87	2990
YEKA	261	1202	344.17	4971	13933	8639	3533	1692	32768
BOLE	260	1738	600.5	15865	15499	9641	4699	3764	49468
KIRKOS	28	138	20.33	828	1584	1093	449	418	4372
AKAKI	282	1774	634.54	20328	11705	8390	3480	1934	45837
N/SILK	179	1187	295.78	5292	14038	8254	3414	2304	33302
GULELE	13	48	5.16	307	398	571	14	35	1325
LIDETA	12	104	18.25	866	1429	1048	430	191	3965
K/KERANIO	75	326	74.46	1671	2719	4557	1072	681	10700
K/KORE	13	33	4.96	341	393	275	49	47	1105
TOTAL	1147	6637	2010.44	51139	62587	43569	17383	11153	185,832

The information in the above table makes the total population size of the residents in the IHDP to be 185,832x5=929,160. More recent information is found from Addis Ababa Housing development project office on the same matter and is presented in the following table[19].

Table 7: Summery about condominium development in Addis Ababa.
This table is created based on document acquired from Addis Ababa Housing development project office (November, 2017)

Number	**Construction year**	**Number of units**	**Remark**
1	2004 to 2010	81,266	Transferred to residents
2	2011	17,171	Transferred to Residents
3	2012	44,876	Transferred to Residents
4	2013	39,249	Transferred to Residents
5	2014	52,651	Under construction
6	2015-2016	41,421	Under construction
Total		276,634	Contracted and transferred=182,562, under construction=94,072

[18] This information is acquiring from an interview made at the Addis Ababa housing development project office public relations office
[19] The source of this section is an excel document prepared by Addis Ababa housing development project office.

The information in the above table makes the total population of residents to be 276,634x5=1,383,170. The indicated total population of Addis Ababa condominium dwellers 1,383,170 is one fourth of the total population of the city of Addis Ababa which is 5,295,069. See background study of this document under subchapter 1.1 for reference on population of Addis Ababa. This makes the Addis Ababa IHDP a more relevant area to study about housing scenarios. The information gap between table 6 and table 7 is due to the fact that table 6 is created based on constructed and transferred condominium housings (more current and updated information) while table 7 included the condominium housing that are delivered in the past. Table 6 was presented as it shows the sub city condominium distribution indicating all sub cities are furnished with the IHDP housing development.

4.7. Policy

The policy of the country regarding technological affiliations are reviewed by the researcher in the following literatures:

Development policies have to be formulated to guide the process of development in relevant areas of the economy. The national sectors significant to achievement of nation's development targets are Agriculture, Health, Trade and Industry, Human resource development, Infrastructure, Energy, Environment, and Information Communication Technology. How to create capabilities of adaptation and utilization of manufacturing and service providing enterprises by establishing and implementing a system to search ,select, import effective technologies, adapt , utilize as well as dispose ;establishing and implementing a system to use foreign direct investment (FDI) and other ways of supporting technology transfer .Strengthen technology transfer and wide use of intellectual property ,standards and other related information in support of technology transfer (FDRE, STI policy, 2012).

The strategies formulate IP system and use IP information to build national technology capability ; Establish and implement a system that ensures effective protection of indigenous genetic resources and IP assets of the nation besides bringing benefit out of them; Develop and implement the application of IPR systems at national and institutional level; Strengthen and implement copyright protection in such a way to encourage and promote creative works; Strengthen trademark protection to create a healthy and competitive environment among manufacturing and service providing enterprises (FDRE, STI policy, 2012).

4.8. Summary of Contextual Review

E-learning in Ethiopia is presented mostly through (Anberbir, 2015)'s research on E-Learning in Ethiopia. Even if E-Learning is practiced in slow manner against the great demand of the community, the Ethiopian government has laid out significant infrastructure for E-learning. The Contextual review also presents the contribution of Ethiopian education and research network center, EthERNet, in application of the infrastructure to facilitate E-Learning among the Ethiopian community and the international catchment. Technology affiliations in Ethiopia are presented through a detailed presentation and discussion of the different technology oriented organization and innovation centers that are presented in the country. Namely, Technology and Innovation (STI), the Ethiopian Telecom, the Ministry of Communication & Information Technology (MCIT), the Ministry of Science and technology (MOST), and the Ethiopian Education and Research Network (ETHERNET) are discussed for their attribute and their contribution to the Ethiopian community. There are also innovation and digital fabrication centers in Addis Ababa. These centers namely are Falab Addis, Protolab EiABC, Col.

John C. Robinson American Center at the National Archives and Library Agency (NALA), xHub Innovation Society, Entrepreneurship Development Centre (EDC)-Ethiopia, DOT Ethiopia and Iceadddis.

Mobile banking is presented in this document for its economic influence on the community due to its flexible use and high penetration extent. The review also looked in to the growth trend of internet and digital social Medias in Ethiopia. The contextual review indicates that even if Ethiopia is one of the list users of digital trends, recent evidences show that the number of users is increasing radically. The integrated housing development, IHDP, which is the general study area of the research, is implemented in all the sub cities of the city. Addis Ababa condominium (IHDP) dwellers are 1,383,170 in number. This population accounts for one fourth of the total population of the city of Addis Ababa which is 5,295,069 estimated through the 8% growth rate from the 2007 census result which was 3,387,569.

Policy is discussed in relation to technological activities in Ethiopia. The FDRE, STI policy (2012) policy covers: capacity building manufacturing and service providing enterprises, searching, selecting, importing effective technologies, adapt, use of foreign direct investment (FDI), supporting technology transfer, use of intellectual property and ETC.

5. CHAPTER FIVE: Data Presentation

This chapter mostly focuses on the selected sites Enderase, Mickey Leland and Bole Arabsa Project 15 sites. Technological related organizations and Ethiopian Commercial Bank are presented in the above Contextual Review section of this Document and further more in 5.5 subchapter of this section. The information on these organizations is also summarized and analyzed in the chapter 6 of this document under subchapter 6.5 particularly table 19 and figure 69. This part of the document is intended for presentation of data collected (1) directly from site through: observation, photographs, sketches, interviews and discussions (2) indirectly through archival data: official documents from organizations and websites. The data are presented by means of text, charts, table, and pictures. General information about the IHDP is also found during an interview for this research at the housing Development Bureau with Ato Tesfaye Woldesenbet, senior officer of condominium housing regulation and development, whom pointed out that there are Condominium housing committees who have reported to his office about technological activities at their housing, Condominium housing. These activities include usage of garbage chute for condominium blocks, usage of a single satellite dish for a condominium block at Basha Wolde Chilot and Arat Kilo condominium sites respectively. He has also mentioned that currently there is an undisclosed researcher who is currently collaborating with them to introduce biogas energy system for condominiums. Ato Tesfaye Woldesenbet also mentioned that as a regulator of development and management of condominium hosing, it is his office's responsibility to disseminate these best practices to all the other condominium developments[20].

5.1. Data Presentation for Enderase, Mickey Leland and Bole Arabsa Condominium 15 Sites

This research focuses on Enderase, Mickey Leland and Bole Arabsa condominium sites located in Yeka Sub city, kolfe Keraniyo sub city and Bole sub city respectively. The condominium sites are constructed starting from 2005. Now these three condominium sites are homes for 9838 families or 9838 x 5 = 49,190 individuals if average family size in Addis Ababa is to be taken as 5 according to CSA (2006). But based on the survey for this research conducted in 2017, it is found out that the average family size for Enderase to be 5, Mickey Leland to be 4 and Bole Arabsa Condominium project 15 to be 2. BY taking in to consideration the limited amount of households studied by this research, the research will use the average family size to be 5 according to CSA (2006) which would have been 11/3=3.66=4 according to this research's collected data. See Appendix C, D and E[21] for further study on family size and other general information collected and also 5.2.4.1, 5.3.4.1 and 5.4.4.1 sections of this research for further information of residents' profile from all the three sites.

5.2. Enderase Condominium Site

[20] This information is acquired during an interview with Ato Tesfaye Woldesenbet Senior officer at Addis Ababa Housing development Bureau.

[21] Appendix C, D and E have tabulated general information collected from the three selected sites.

Enderase condominium site is located in Addis Ababa Yeka sub city a location formerly called Wereda 16 Kabele 3. The construction of the site started in 2005 and now it is home for 88 households. The following table shows the general parameters of the site.

Table 8: Parameters of Enderase condominium site.
This table is created from information acquired from Housing development project Office during interview by the researcher.

Name of the site	**Enderase**	**Remark**
Number of communal Blocks	1	
Total Number of Blocks	2	All blocks are G+4
Area of site in Ha	0.29	
Number of Studio housing units	8	
Number of one bed room type Housing units	24	
Number of Two bed room type Housing units	36	
Number of Three bed room type Housing units	4	
Number of Commercial units	16	Hair salon, shops with hello cash service, restaurants, café, grocery
Total number of House Holds	88	
Number of contractors Involved	1	

Based on the average household size indicated by CSA(2006) the total population in this site is 88x5=440. As mentioned in the 5.1 section of this document the average family size is calculated to be 5 as such the total population in this site remains to be 440 for the purpose of this research.

5.2.1. Graphical Description of Enderase Condominium Site

In this section Enderase Condominium site is illustrated graphically as follows.

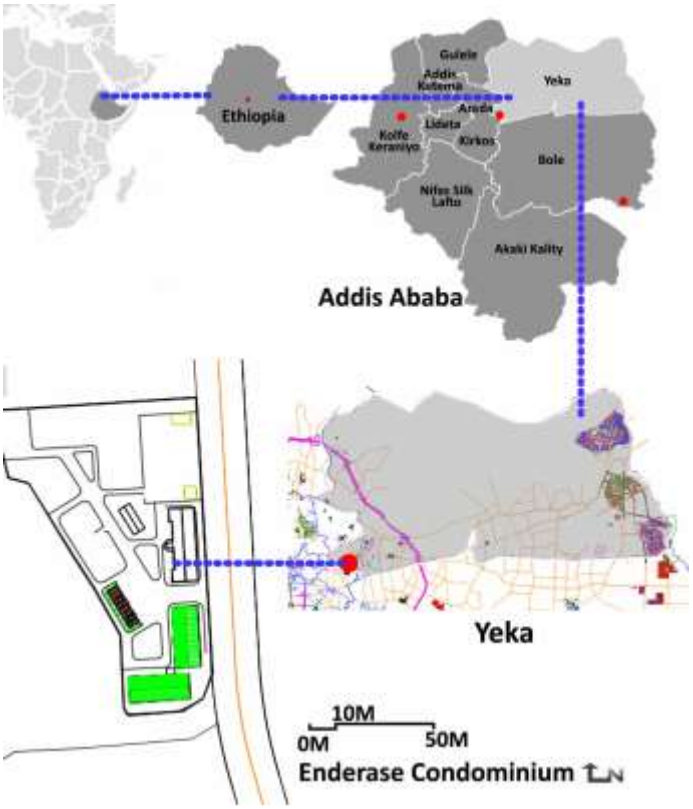
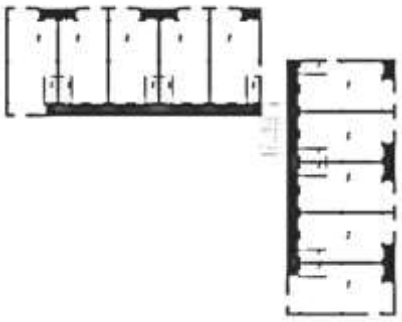
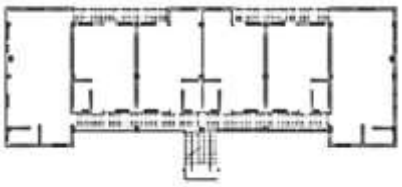


Figure 9: Location map of Enderase
Source: Own map based on information found from Addis Ababa Housing Development Project office.

Figure 10:Map showing over all layout of the site
Source: Own Map and typologies of Enderase condominium From Addis Ababa Housing Development Project office



Floor plan lay out of Typology B1 ground commercial and typical first to fourth floor respectively left to right.



Floor plan lay out of Typology B2 (B2a and B2b) ground commercial and typical first to fourth floor respectively left to right'. Source: Addis Ababa Housing Development Project office

There are only two blocks in this site both of which are mixed use. The communal block is located in an average location among the two blocks as shown in the above figure. The mixed use blocks have

two typologies in general. Refer to table 3 from subchapter 2.4.3.1 titled data and response rate validation to see the list of interviewed blocks in summery.

5.2.2. Data Presentation of Enderase Condominium Site as per the Researcher's Survey

The selected site Enderase condominium is studied following the general and specific objectives of the research listed below integrated with site observation, discussion and questioner interviewed out puts and archival data acquired. Archival data[22] is described in the methodology section of this document.

5.2.3. Appropriate Technology at Enderase Condominium Site

During the researcher's interview and discussion with Ato Dereje Assefa, the manager of Enderase condominium site committee, it is found out that there are significant upgrades initiated by the committee. These upgrades are done either in collaboration with Yeka sub city or the Enderase condominium community on its own. Primarily all housing units used to use separate satellite dishes. Through the initiation of the committee and the community, it is managed to reduce the number of satellite dishes to one per floor. That is one satellite dish for every six house hold. Ato Dereje Assefa mentioned that since the upgrade, the ugly display of the dishes on the facade and the damage they are creating on the building components has reduced radically. All house units are now equipped with electric meters that work by means of prepaid automatic card system. This infrastructure is provided by Ethiopian electric power corporation, EEPCO. While using the old electric meter, residents face penalty for payment delays. Residents also have to go to EEPCO's stations every month to make payment. As a result of this technology device, residents do not face penalty anymore and they make payment according to their own distinct schedule. All housing units are equipped with door bells that are installed uniformly. Ato Dereje Assefa pointed out also that the committee looks out for new innovative upgrades and implement them by collaborating with the community. Currently the committee office is not equipped with necessary devices such as computers and printers and that is presenting difficulty in having proper documentation and community outreach. They use internet café around the area to make brochures and posters to announce events. They would consider equipping their office with appropriate equipment to overcome future demands and become more efficient in serving the community and increase collaboration. They are also looking to new ideas as long as it is at the benefit of their community and it can be implemented within their budget or it can be subsidized by the housing development agency through the sub city. There are also shops that give services related to technology such as hello cash registration that allows customers of the shops have access to prepaid mobile phone service connected to their bank accounts.

[22] …archival methods can be thought of as a loosely coupled constellation of analytic endeavors that seek to gain insights through a systematic interrogation of the documents, texts, and other material artifacts that are produced by and about organizations. Source: Archival Research Methods by Marc J. Ventresca and John W. Mohr.
Other lectures also present: In archival research, researchers analyze data pulled from existing records, such as census data, court records, personal letters, old newspapers,
etc.(Agency records/utilization data, Existing data, Actuarial records and Legislative and Governmental documents)

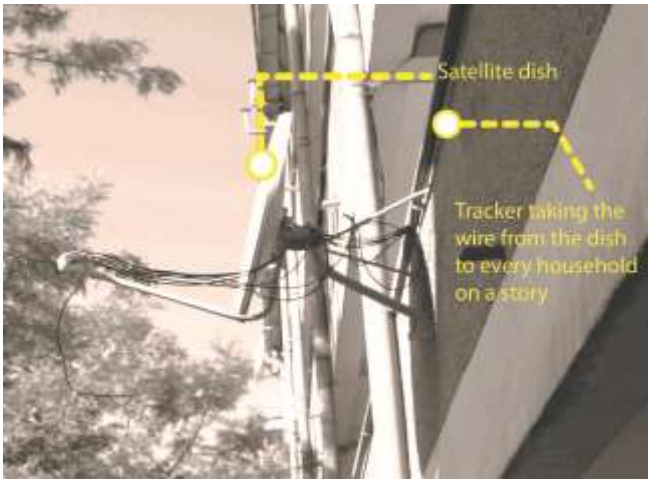


Figure 11: Satellite Dish used in common
Groups of 6 to 12 households at Enderase Condominium use one satellite dish in common
Source: Own Picture

5.2.4. Factors Leading Living Places Incorporate Work and Education

The site Enderase has two condominium blocks namely B1 and B2 and one communal block as seen on figure 10 above. Block B1 has two wings and presenting an opportunity to treat the block as two separate blocks. For the sake of this research block B1 is divided in to two as B1a and B1b. Fifteen respondents are interviewed by method of systematic sampling. One in every six households or one household on every story of the three blocks are interviewed for all the three blocks B1a, B1b and B2. The questionnaire and discussions focused on distinct issues described below. The data for this section is also presented accordingly.

5.2.4.1. Profile of Enderase Condominium Site Residents

The number of households interviewed is 15 in total. The number of individuals living in all households is 69. This means 69 individuals are discussed through the questioner directly or indirectly. To estimate the average family size based on this information, we can divide 69 by 15 which will give us 4.6 that can be rounded to 5. Please see appendix C to have more information on the combination of the family members. The following part of the data presentation mostly focuses on the representative respondent of the house hold. In all cases the respondents have directly or indirectly consulted other members of the family for major part of the questions in the questionnaire. The data collected from Enderase condominium site showed that among the respondents and their families the number of female residents is slightly higher than that of the male. From the tenure ship information gathered the number of owner occupied units is slightly higher than those that are rented. The profile study is important for the research as the implication of digital migration for work and study on male and female members and tenure ship type should be seen from equity and ownership points of views. The following figures 16 also show that 27 % of the respondents who make a monthly income 8,000 ETB to 15,000 ETB among residents whom have given information about their income. While the remaining percentage 73% did not provide information about their expenditure of gross income, the average income among the respondents who provided about their monthly income at this site is calculated to be 15,000 ETB.

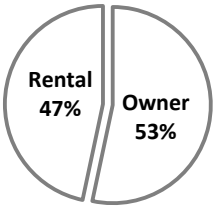


Figure 12: Tenure Type Percentage

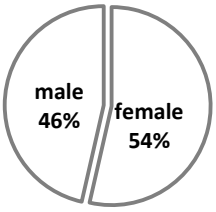


Figure 13: Male to Female Ratio on the left

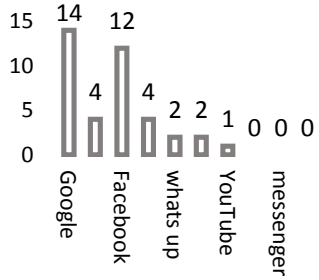


Figure 14: Use of digital sites and Applications on the internet.

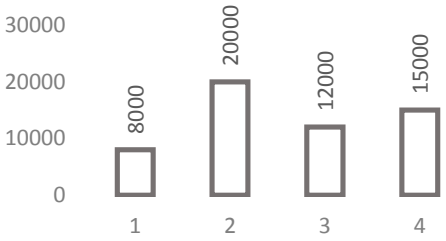


Figure 15: Income of respondents who gave information about their income in ETB

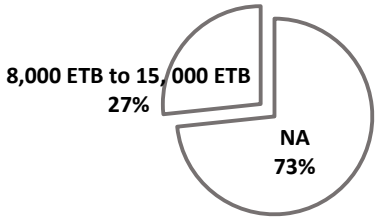


Figure 16: Percentage of income profile of residents
NA stands for Not assigned for residents who did not give information about their income.

5.2.4.2. Awareness of Residents about the Internet

All of the residents included in the data survey use mobile phones that are smart and use data connection and wireless internet services provided in the city. Figure 14 and 17 show the use of web applications by the residents that are included in the interview. The web applications indicated on figure 14 and 17 are listed by the researcher as the respondents mention them while answering the questions about their internet usage. This is to say there was no prior listing of the digital application. The researcher simply listed as the respondents mentioned the application following the open ended question presented to them. After completion of the interview, the researcher tabulated the listing. This has helped to trace repetition in order to satisfy sampling principles sated in 2.4.1 section of this document. Among the 15 respondents 14 of them use at least 1 application. This indicates 93.3% of the residents use internet. This seems a very high rate in relation to the countries low rate internet usage according to live stat reports but in the meantime the data is collected from residents in Addis Ababa condominium households at Enderase stating that at least one member in all the 14 households use the internet out of the 15 households interviewed. Among the applications the respondents mentioned the most used among the residents is Google search engine accounting and the list are twitter, messenger and Emo which no resident was using. Google in this research shall be understood as any act of Google search and g-mail service

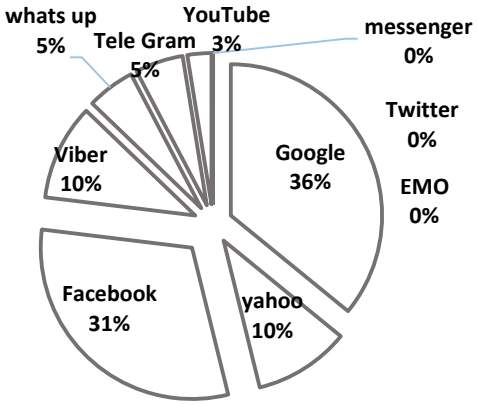


Figure 17:Percentile of web application popularity in Enderase site residents

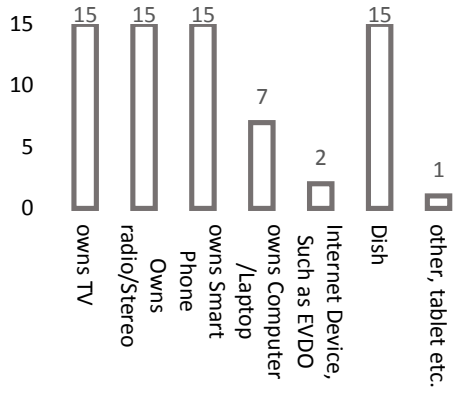


Figure 18:Use of technological devices at Enderase site

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5.2.4.3. Awareness about Technology Devices

All (100%) of the respondents from Enderase own TV, Radio or Stereo and share Satellite dish. Among the devices listed by the residents, the list type of devices owned by residents are digital devices such as tablets accounting for 6.7% of the respondents. Seven of the respondents own laptops accounting for 46.7% of the respondents while two of them have wireless internet devices like EVDO accounting for 13% of the respondents. See figure 18 above.

5.2.4.4. Ambitions of Residents and Purpose of Internet Use

Respondents reacted to this section of the questionnaire in quite various ways. As the question was open ended, they made an organic explanation of their ambitions. The following is the list of respondents' ambitions presented as qualitative information: **To run a logistic company; a franchised super market business; a sales company; to further education business; to have a very big family; to halt being employed and become self-employed; to lead a spiritual life and become part of a spiritual service company; to further education in formal communication and social media studies and; things are unpredictable and difficult to speak of my ambition at this point.**

The following are the list of their response about their reason for internet use: **To download tutorials for work and education; to save time and money; to participate in social interaction; to receive news; to communicate with colleagues at work and off work; to participate and initiate community services that help unprivileged children; to communicate with relatives living abroad (overseas); to communicate with classmates to share information; for entertainment and to spread word of god; to stay updated and widen knowledge.**

5.2.4.5. Possible Space use in Relation to Homeworking and e-learning activities.

While discussing about the space usage issue for homeworking and e-learning, respondents generally mentioned that they are single or of few family number at the moment and space is not an issue and others mentioned about using their living room with rearranging furniture or putting up a desk in the bed room. Some households are concerned about the little space they have and it is difficult for

them to share the space they have with their children for when and while the children are going to be around.

5.2.4.6. Housing Condition in Providing Suitable Environment for the Above Activities

At Enderase condominium all residents have answered 'favorable' except for some mentions of shortage of space. All house units are in good physical conditions. Walls are straight and made of blocks, well installed electricity, water and satellite dish, all doors have bells. Some residents have own access to internet through Wi-Fi while most residents use mobile internet devise. All house units are without fixed internet installation. The above information is for households that are interviewed.

5.2.4.7. Interest to Benefit from Homeworking and Learning from Home

Fourteen out of fifteen residents (63.3%) are computer literate amongst them eleven are interested to work from home (accounting for 73.3% out of the total respondents) if the infrastructures are available and if employers are in line with the idea. Twelve of them have mentioned they are interested to learn from home (E-learning) given infrastructure is available, these respondents account for 80% of the total. And they have mentioned they are already using the internet to download or browse the internet for education related endeavors. The remaining two respondents mentioned that they would prefer to interact with people physically during performing their work and those that are not interested in homeworking and E-Learning. See figure 19and 20 below.

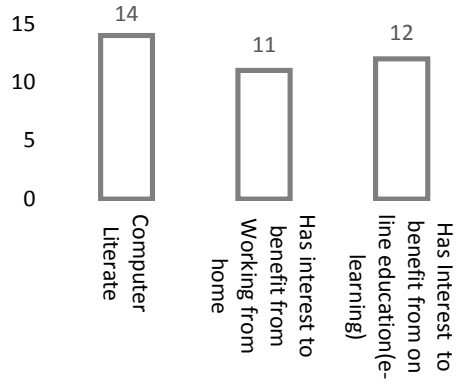


Figure 19: Computer literacy, Interest for homeworking and e-learning.

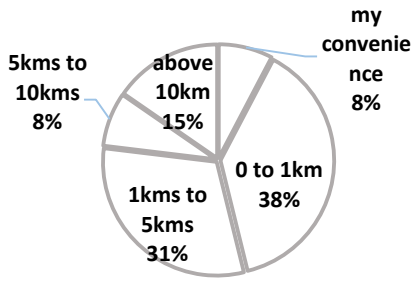


Figure 20: Respondents distance from their current jobs

5.2.4.8. Distance from Work Place Residents at Enderase

The larger amount of respondents commute 1km to 10km (31%+8%) which is 39% while 8% travel for work according to their convenience due to the nature of their work status and nature (they travel to wherever they find a job or business) and 38% of the respondents travel 0km to 1 km as shown in the figure 20 above.

5.2.5. Equity and Technology

The Enderase condominium site observation and discussions made the indication of equity due to technological advancement evident. The usage of one dish for every six households brought an opportunity of having access to information at a cheaper expense for those who do not afford to have one. Still there were some individuals who choose to use a separate dish to have other satellite programs other than the ones transmitted through the dishes used in group. It was also identified residents believe that having access to the internet through their smart phones brought information

access to their lives they would not have otherwise. Such capability of access to information has made them proactive in their community at large. The following case story of W/ro Enanu Sintayehu presents more detail about this fact.

5.2.5.1. Enanu Sintayehu's Case Story

Enanu Sintayehu Lives on block B1b[23] with other three family members. Enanu Works at an NGO organization named UNECA as a transit logistic manager. Enanu has two degrees and leading a very happy life with a new baby on board. The company where she works at uses software applications whatsup and Telegram for formal work communication. Enanu says since she can access the applications via her phone, she gets instant update about what is going on in the company and she gets an idea how to be proactive in order to contribute more in her work. Furthermore Enanu gets access to information about various community activities through Facebook, Viber and other social Medias. She explains that such situation ultimately allows her to actively participate in the community to help and get help. One of the community activities Enanu participates in is the ONE PACK FOR ONE CHILED initiative where she and other tens of thousands of members help children that are at a disadvantage due to financial or other problems. The picture below shows her in a T-shirt of the initiative on one of the events where the members gather to raise awareness and help the children. Enanu truly believes that the technological advancement that we choose to use in a positive way greatly complements our personal, work and community outreach efforts. While discussing about E-Learning and Home Working/ E-Working, Enanu mentioned she is already being engaged to work from home while she is at home. As her company uses the above mentioned Medias in addition to emails formally and since she uses (owns) wireless internet device and a laptop, she is already benefiting the advantage of having access to work from home and the condition helps her make time for her study and family and for her community interaction. She is currently studying Supply Management at Addis Ababa University and she gets the benefit of downloading learning materials.

[23] The block numbering is B1 but it is renamed as B1b due to the necessity of data sampling strategy for the research. See 2.3 section of this research document.

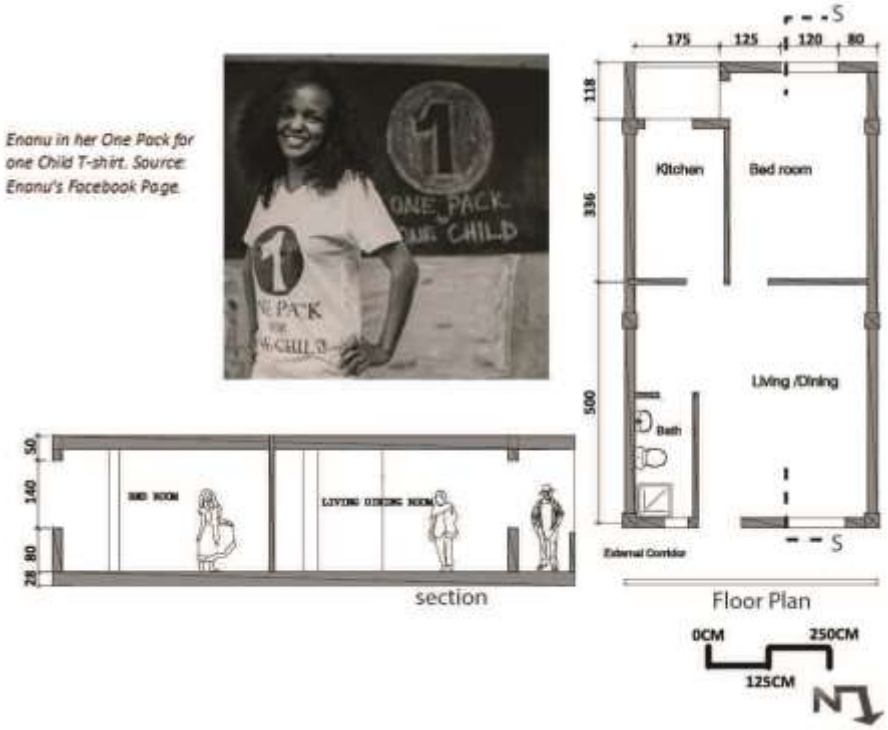


Figure 21:Enanu's unit at the Enderase Condominium Site on Block 1Ba
Source: own drawing based on site visit

Enanu's case story and the technology use at the Enderase condominium site indicate the capability of ICT's and related technologies to bring equity and unity in the community as she and her associates easily reach the needy members of the community, city, through ICT's and related technologies.

5.3. Mickey Leland Condominium Site

Mickey Leland condominium site is located in Addis Ababa Kolfe Keranio sub city, a location formerly called Wereda 25 Kabele 16. The construction of the site started in 2005 and finished in 2009. Now it is home for 4637 households. The following table shows the general parameters of the site[24].

Table 9: Parameters on Mickey Leland condominium site.
Table Created based on information acquired from Housing development project Office during interview.

Name of the site	Mickey Leland	Remark
Number of communal Blocks	27	
Total Number of Blocks	127	All blocks are G+4
Area of site in Ha	39.86	
Number of Studio housing units	662	
Number of one bed room type Housing units	698	
Number of Two bed room type Housing units	2367	
Number of Three bed room type Housing units	560	
Number of Commercial units	350	
Total number of House Holds	4637	
Number of contractors Involve	80	

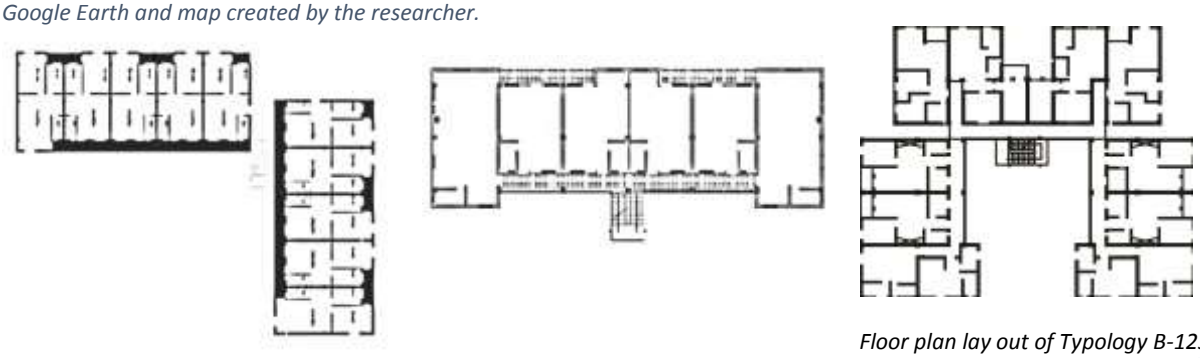
[24] This information is acquired during the interview made by the researcher at the Addis Ababa housing development office

Based on the average household size indicated by CSA(2006) the total population in this site is 4,637x5=23,185. As shown in the 5.1 section of this document the average family size is calculated to be 4 but taking in to consideration the limited amount of households studied the average family size will be referred to the CSA (2006) and the population size will remain 23,185 for the purpose of this research.

5.3.1. Graphical Description of Mickey Leland Condominium Site

In this section Mickey Leland Condominium site is illustrated graphically as follows:

Figure 22: Location map of Mickey Leland Condominium
Source: Addis Ababa Housing Development Project office.
The map shows Ethiopia, Addis Ababa and Mickey Leland condominium site left to right respectively. Source: picture from Google Earth and map created by the researcher.



Floor plan lay out of Typology B-123

Floor plan lay out of Typology B-9. Source: Addis Ababa Housing Development Project office

Floor plan lay out of Typology B- 117. Source: Addis Ababa Housing Development Project office

typical first to fourth floor. Source: Addis Ababa Housing Development Project office

Figure 23: Typologies of Mickey Leland condominium site
Source: Addis Ababa Housing Development Project office.

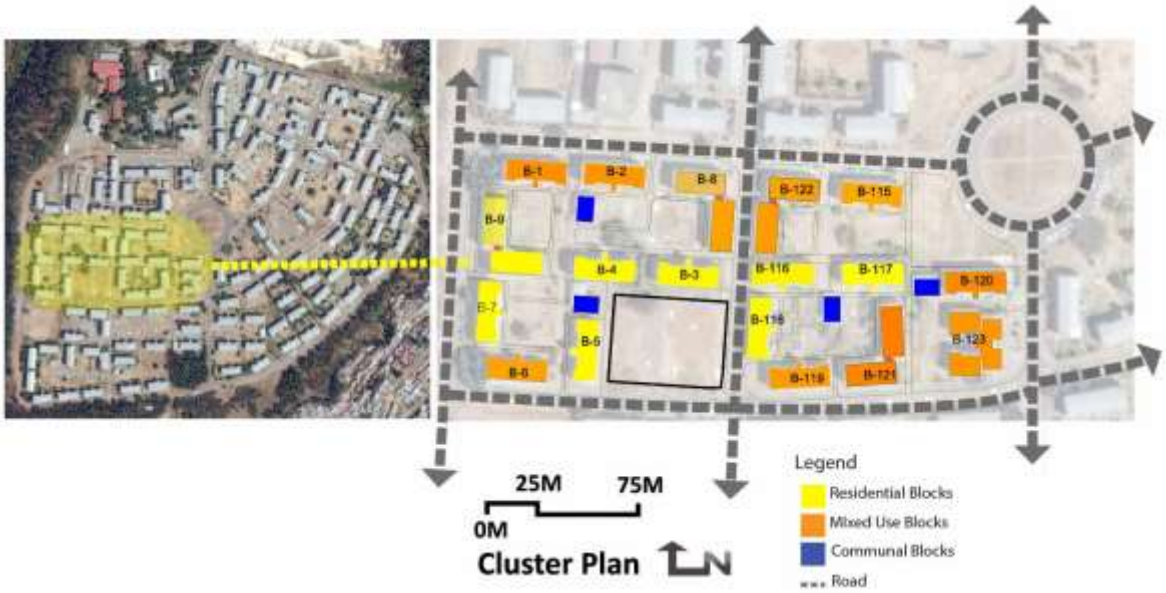


Figure 24: Map of selected area and typologies of Mickey Leland condominium site
Source: Owen map based on Google map

Among the residential bocks and mixed use blocks, the communal blocks are distributed evenly as shown in the figure 24 above. The residential and mixed use blocks have three typologies in general. Variations are indicated at some blocks where the blocks are moderately adapted to landscape (slope) conditions. Refer to table 3 from subchapter 2.4.3.2 titled data and response rate validation to see the list of interviewed blocks in summery.

5.3.2. Data Presentation of Mickey Leland Condominium Site as per the Researcher's Survey

The selected site Mickey Leland condominium is studied following the specific objectives of the research listed below integrated with site observation, discussion and questioner interview out puts: **Appropriate technologies for development; factors leading living spaces incorporate work and education; equity and technology; ambition and purpose of internet use**.

5.3.3. Appropriate Technologies at Mickey Leland Condominium Site

At Mickey Leland condominium site there are three internet shops servicing the community. Users from age of 10 to 65 visit the shop for purposes such as educational reasons (to download or prepare materials for school assignments), contact relatives, friends and collogues and for entertainment. The shop keeper at one of the shops says slow internet connection is

Figure 25: Internet Shops at Mickey Leland, Interior of one of the shops on the left and exterior view at the two shops
Source: The picture is taken by the researcher while doors are still open at 10:00PM.

creating difficulty to meet the customers' needs. Students from elementary and high school who do not have access to internet elsewhere come to the shop to get assistance as most of them do not necessary know how to use software applications such as power point and Microsoft office word. The students pay up to 8ETB per page to get their assignments processed on the internet, typed, organized and printed. The pictures below show the shops open until late in the evening, 10:00PM. The close access to internet service and computers to those who do not have computers and laptops brings advantage that will help them perform as good as their peers who have better access to the services at home. As such this can be pointed out as one of the ways access to technology can bring about equity. Yet the current service at Mickey Leland is expensive for the customers.

5.3.4. Factors Leading Living Places Incorporate Work and Education

The questionnaire and discussions focused on distinct issues are described below. The data for this section is also presented accordingly.

5.3.4.1. Profile of Residents Mickey Leland Condominium Site

The number of households interviewed is 15 in total. The number of individual living in the households is 60. This means 60 individuals are discussed through the questioner directly or indirectly. To estimate the average family size based on this information, we can divide 60 by 15 which will give us 4. Please see appendix D to have more information on the combination of the family members. The following part of the data presentation mostly focuses on the representative respondent of the household. In all cases, the respondent has directly or indirectly consulted other members of the family for major part of the questions in the questionnaire. The data collected from Mickey Leland condominium site showed that among the respondents and their families the number of female residents is slightly higher than that of the male. See figure 27 below. From the tenure ship information gathered, the number of owner occupied units is significantly lower than those that are rented. Like the respondents in Enderase number of female is slightly higher than those of the male members of the surveyed homes. Unlike Enderase most of the surveyed homes are rented that is in four to one ratio. The profile study is important for the research as the implication of digital migration for work and study on male and female members and tenure ship type should be seen from equity and ownership points of views. See the following figures 26 and 27. Resident's income profile is also described in the figure 30. 33% respondents have a monthly income of 10,000 ETB to 19,000 ETB, 47 % of the respondents have a monthly income of 5000 to 10, 0000 ETB while 33% of the residents have a monthly income that is below 5000 ETB as per the respondents' feedback on the questionnaire. The average income among the respondents who provided their monthly income at this site is calculated to be 9,278 ETB.

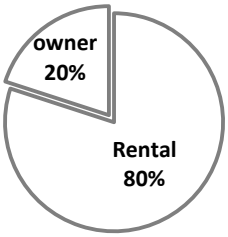


Figure 26: Tenure type percentage on the right.

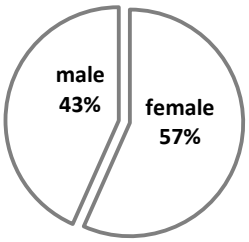


Figure 27: Male to Female ratio on the left.

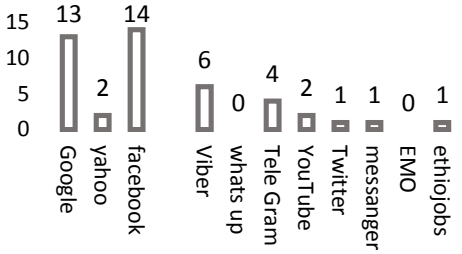


Figure 28: Sites and Applications use on the internet.

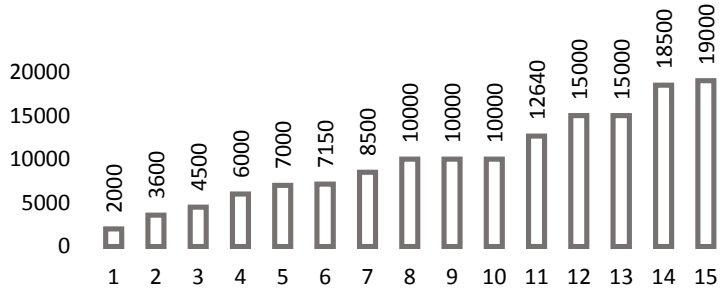


Figure 29: Monthly Income of each respondents at Mickey Leland in ETB

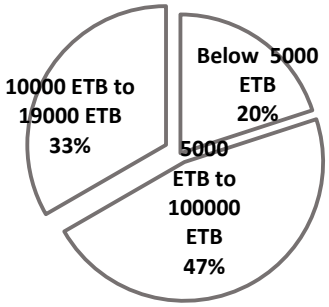


Figure 30: Percentile monthly Income Profile of Respondents at Michey Leland in ETB

5.3.4.2. Awareness of Residents about the Internet

Thirteen out of the fifteen respondents are computer literate accounting for 86.7 % of the respondents as shown in the figures 33 of section 5.3.4.7 below. Figures 28 and 31 above show the usage of web applications by the respondents. The list of the application was not presented to the respondents prior or during the interview. The list is generated by the respondents during interview at all the three sites: Enderase, Mickey Leland and Bole Arabsa Project 15 Condominium sites. Among the web application, the most popularly used applications are the Google and Facebook. Based on the above information, internet use proportion among residents is 93.3%. 14 respondents use at least one application on the internet among the fifteen respondents.

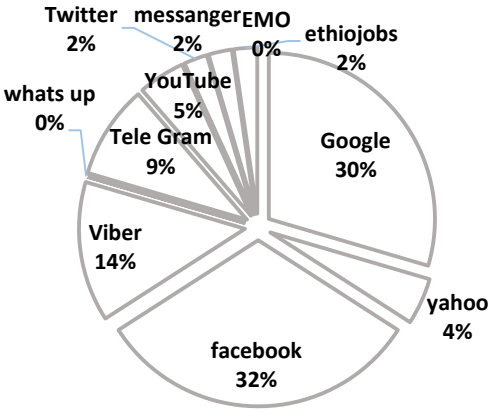


Figure 31: Web Application popularity in Mickey Leland site Residents.

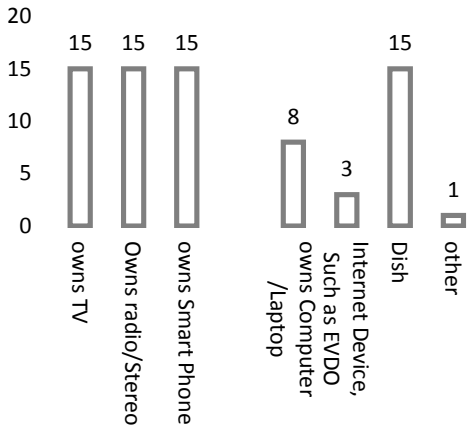


Figure 32: Use of Technology Devices. [25]

Google and Facebook, each take the 30% and 32 % share while compared with other applications as shown on figure 31 above.

5.3.4.3. Awareness about Technology Devices

All (100%) of the respondents from Mickey Leland own TV, Radio or Stereo, Smart Phone and Satellite Dish. Among the devices listed by the residents, the list type of devices owned by residents are digital devices such as tablets accounting for 6.5% of the respondents which are 1 out of 15. Eight of the respondents own laptops accounting for 53.3% of the respondents while three of them have wireless internet devices like EVDO accounting for 20% of the respondents. The figure 32 above shows usage of devices in the households of the respondents. The numbers in the figure indicate the number of respondents that own the respective devices.

5.3.4.4. Ambition of Residents

Like the Enderase condominium residents, the respondents from Mickey Leland reacted to this section of the questionnaire in quite various ways. As the question was open ended, they made an organic explanation of their ambitions. The following is the complete list of their ambitions:

My children need to download tutorials and other learning materials all the time. I want to have a broad band internet service at my home; To be a successful business person in tech; To be a preacher and give service in evangelic church ; To be a creative economist ; To be a good family person ; I want to be an expert in expanded immunization (EPI) and disease surveillance; I want to expand my business in export and import business; I want to expand my spa business; To have different business; To start a successful youth and children support system; To further my education and become an expert urban planner.

While giving response, about reason for using the internet, Ato Aregahegn Wondimu, a case from the fifteen respondents, mentioned that his job used to be outside Addis Ababa. He had to email his work out to his employers but it was difficult to keep up with it as the internet service at his environment was very slow and he couldn't upload and send out as much information as he would like and he had

[25] The other bar on the shown figure represents devices like tablet, etc.

to terminate the job. The rest of the respondents provided the following: **To preach on digital medias, to search for jobs on ethiojobs, to download tutorials for work and education, to initiate a cause for youth and children support, for social interaction, to receive and send news, to keep up with the current life style, to communicate with colleagues at work and off work, to communicate with relatives living abroad (overseas), to save time, to communicate with classmates to share information and for entertainment.**

5.3.4.5. Possible Space Use in Relation to Homeworking and E-Learning Activities.

Like the respondents at Enderase condominium site the respondents at Mickey Leland condominium mentioned about using the living room or the bed room space. Furthermore some of them suggested to have partitions in their spaces. And still like the Enderase respondents some of them mentioned their concern about sharing their space with their children most of these cases are frequent among families with children aged below six.

5.3.4.6. Housing Condition in Providing Suitable Environment for the Above Activities

Here the housing conditions are similar to the cases in Enderase except the satellite dishes are not used in groups of six households or one satellite dish per floor. See chapter 5.2.4.6 of this document to see the housing condition of the Enderase condominium site residents.

5.3.4.7. Interest to Benefit from Homeworking and Learning from Home (E-learning) in the Housing Environment

As figure 33 below indicates, most of the respondents want to benefit from work from home (80%) and e-learning (100%) and most of them are computer literates (86.7%).

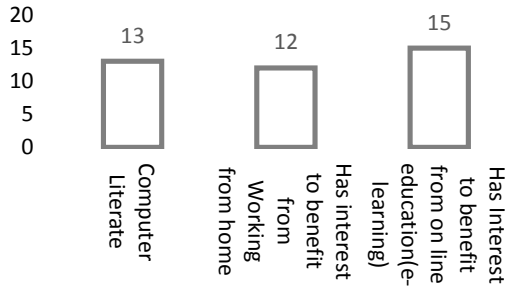


Figure 33: Interest of residents to learn from home work from home and computer literacy.

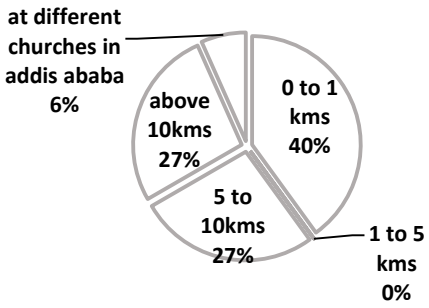
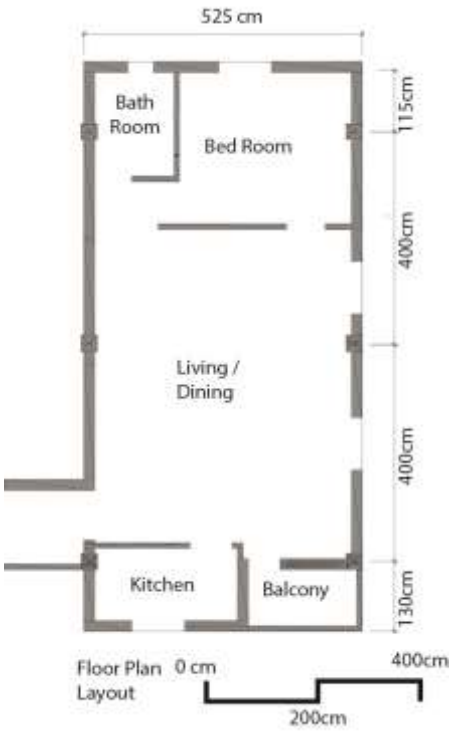


Figure 34: Respondents' distance from their current jobs. Some residents gave that they work at churches instead of location therefore described as such.

5.3.4.8. Respondents' distance from their current work place at Mickey Leland

40% of respondents commute 0km to 1km while 0% travel 1km to 5km for work and the largest group 54% of the respondents travel above 5km out of which half travel 27% as shown in figure 34 above. The figure shows the proportion of distance respondents have to commute from home to work and back. 6% of the residents travel to different churches in the city for work, their destinations are mentioned as different churches as the respondents expressed that they work at church but not the distance or the name during the interview.

5.3.5. Equity and Technology



The opportunities that can be created in communities through technology are presented by way of case story in the following section.

5.3.5.1. Ato Ali Hussen's Case Story

Figure 35: Ato Husen's House Floor Plan and Living room interior.

Ato Ali Husen used to travel around and live in regional cities for work purposes. But now he is happy he is back to Addis as his work out there is completed. Now he is living with his wife and daughter from whom he has been away from for long time. Now that he is here, he still feels he is missing out as he is traveling every morning and every evening to work that is 5kMs away from his home. The Addis Ababa road traffic makes him take longer hour to get to work and back to home. As a result he was very excited at the mention of the part of the questionnaire about Digital migration for work and study. While he has a lap top at home he does not have internet connection for it and uses his smart phone for communication with his collogues. His wife is a stay at home parent and he believes if there is a method where online education is possible, his wife would take on her education where she stopped and she *would not be at a dis advantage because* she stays at home to raise our child. The above case of Ato Ali Husen's family is also an indicator where technology introduction to housing can bring about equity in the community where female members of households or any other member who has to stay at home can have equal access to education and work.

5.4. Bole Arabsa Project 15 Condominium Site

Bole Arabsa condominium site is located in Addis Ababa Bole sub city. The construction of the site started in 2005. Now it is home for 5193 households. Bole Arabsa Site has three different condominium sites namely Gebriel condominium, Kirkos Condominium and Project 15 condominium. All of these three sites are large sites and are administered separately both during construction and committee office after they are inhabited. This research focusses on the third site Bole Arabsa Project 15. The following table shows the general parameters of the site[3].

Table 10: Parameters of Bole Arabsa Project 15 Condominium site
The site is also known as Bole Arabsa 1 condominium site. This Table is Created based on information acquired from Housing development project Office during interview

Name of the site	*Bole Arabsa Project 15*	*Remark*
Number of communal Blocks	16	
Total Number of Blocks	174	G+3 and G+8 Blocks
Area of site in Ha	45.4	
Number of Studio housing units	3168	
Number of one bed room type Housing units	913	
Number of Two bed room type Housing units	399	
Number of Three bed room type Housing units	379	
Number of Commercial units	334	
Total number of House Holds	5163	

Based on the average household size indicated by CSA (2006) the total population in this site is 5,163x5=25,815. As shown in the 5.4.4.1 section of this document, the average family size is calculated to be 2 as such the total population in this site will be 5,163x2=10,326 for the purpose of specific estimation when needed but in general it will be used in parallel with the CSA (2006) average family size calculation of the city which is 5.

5.4.1. Graphical Description of Bole Arabsa Project 15 Condominium

In this section Bole Arabsa Project 15 Condominium site is illustrated graphically as follows.

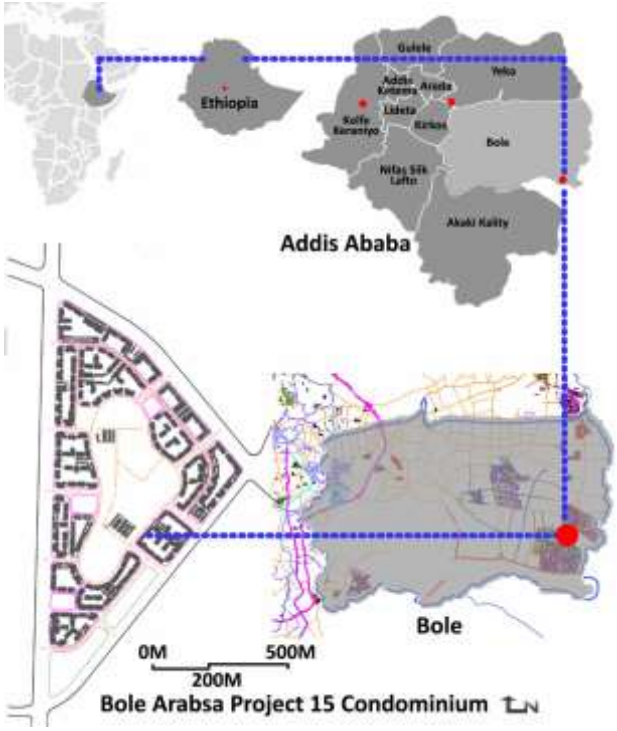


Figure 36: Location map of Bole Arabsa project 15 condominium.
Source: Addis Ababa Housing Development Project office.

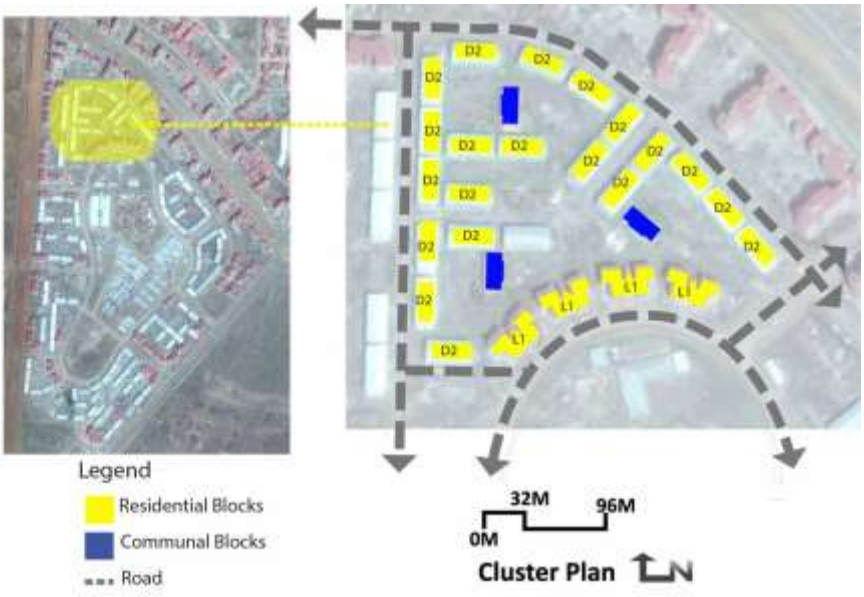
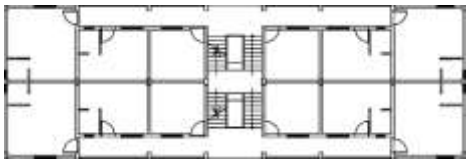


Figure 37: Bole Arabsa Project 15 Selected Cluster Plan and typologies
Source: Addis Ababa Housing Development Project office



Floor plan lay out of Typology D2

Floor plan lay out of Typology L1

Figure 38: Typologies studied at Bole Arabsa project 15 site
Source: Addis Ababa Housing Development Project office

Among the residential bocks, the communal blocks are distributed evenly as shown in the above figure. The residential blocks have two typologies in general. Refer to table 3 from subchapter 2.4.3.2 titled data and response rate validation to see the list of interviewed blocks in summery.

5.4.2. General Data Presentation of Bole Arabsa Project 15 Condominium Site

Like the other two selected sites, Enderase and Mickey Leland condominium sites, this one is also discussed in line with the following three points. **Appropriate technologies for development; Factors leading living places incorporate work and education; Equity and Technology.**

5.4.3. Appropriate Technology at Bole Arabsa Project 15 Condominium Site

This site is selected for study randomly by making use of the matrix of relationship between condominium sites and social services such as school, work places as these relationships are important to the researcher's objectives. The same reason is used for the other two sites as well. Bole Arabsa Condominium is selected for its characteristics of being the farthest from the social services. Bole Arabsa Condominium Site is not fully occupied yet even if it has been a year since the owners received their homes. All housing units did not get Electric meters yet. They are being powered only by pulling cables from a nearby power source. All sampled respondents answered rental for the question of tenure type. The respondents also discussed that they preferred to rent there because of the lower rent price which is 1000 to 1200 ETB for one unit, studio type. While all of the blocks are residential blocks, residents have turned the ground floors to commercial spaces as well as their living place. The construction process has attracted informal small scale businesses which are now being evicted from the vicinity as the construction is completed and the space they were using informally are transferred to the owners. Therefor there is relatively no innovative activity seen in the area.

5.4.4. Factors Leading Living Places Incorporate E-Working and E-Learning

The questionnaire and discussions focused on distinct issues that are described below. The data for this section is also presented accordingly.

5.4.4.1. Profile of Residents of Bale Arabsa Project 15 Condominium Site

The number of households interviewed is 6 in total. The number of individuals living in the households is 12. This means 12 individuals are discussed through the questioner directly or indirectly. To estimate the average family size based on this information, we can divide 12 by 6 which will give us 2 while still keeping in mind the average family size according to CSA (2006) is 5. Please see appendix E to have more information on the combination of the family members. The following part of the data presentation mostly focuses on the representative respondent of the household. In all cases, the respondent has directly or indirectly consulted other members of the family for major part of the questions in the questionnaire. Like the two sites, Enderase and Mickey Leland, the respondents from Bole Arabsa project 15 have slightly more female proportion than the male. Unlike the two sites, this site's households that are interviewed are all rental tenure ship. See figure 39 and 40 below. The following figures 42 and 43 also indicate among respondents who provided information about their monthly income, there is a range between 3,000 ETB to 7,5000 ETB. The average income among the respondents who provided their monthly income at this site is calculated to be 4,800 ETB.

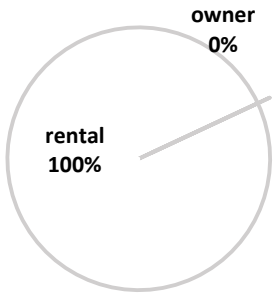


Figure 39: Tenure type percentage on the right.

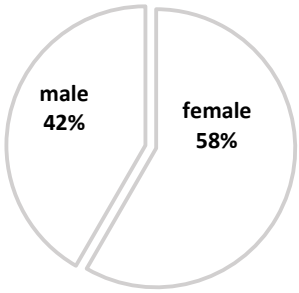


Figure 40: Male to female ration on the left.

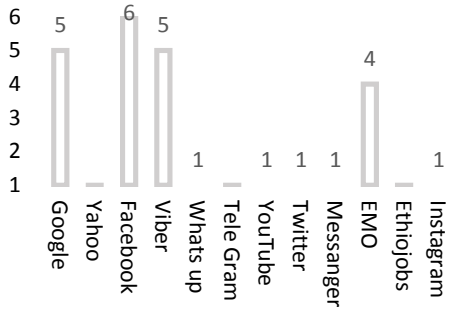


Figure 41: Sites and Applications use on the internet.

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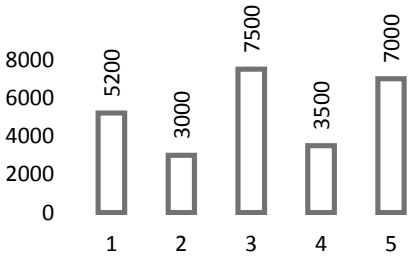


Figure 42: Income description of Bole Arabsa Project 15 Respondents who provided information about their income in ETB

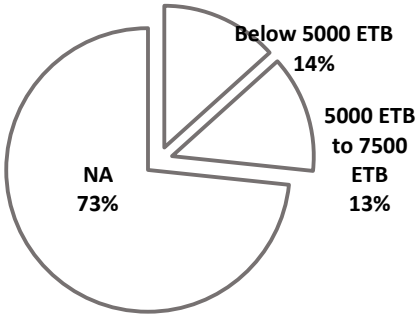


Figure 43: Percentage information about monthly income of Bole Arabsa Residents. NA stands for Not Assigned for respondents who did not provide information about their income or expenditure.

5.4.4.2. Awareness of Residents about the Internet

All respondents have access to telephone service through smartphones. Figure 44 below shows the number of respondents against their use of web applications. 5 out of the 6 respondents are computer literate accounting for 83.3 % of the respondents as shown in figure 46 under section 5.4.4.7 below. The Figure 44 shows the usage of web applications by the respondents. The list of the web application was not presented to the respondents prior or during the interview. The list is generated by the respondents during interview at all the three sites: Enderase, Mickey Leland and Bole Arabsa Project 15 Condominium sites. Among the web application, the most popularly used applications are Face Book, Google, Viber and EMO. Based on the above information internet use proportion among residents is 100%. 6 out of 6 respondents use at least one application on the internet.

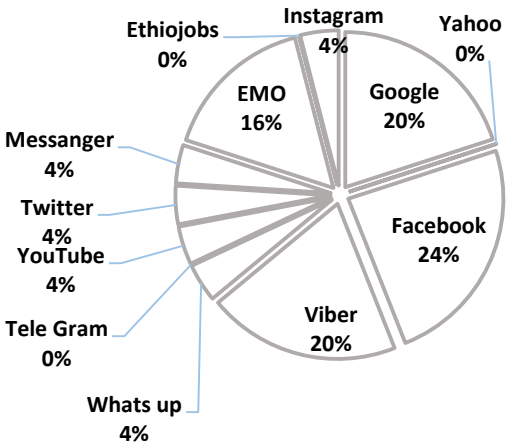


Figure 44: Web application popularity in percentile in Bole Arabsa Project 15 Respondents

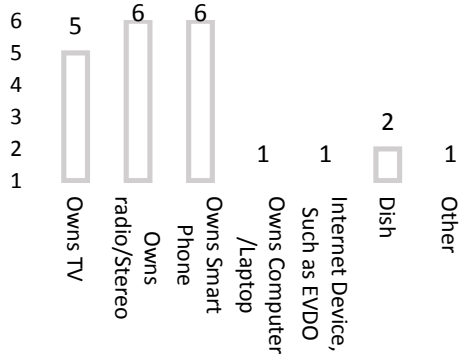


Figure 45: Use of technology Devices

5.4.4.3. Awareness about Technology Devices

All (100%) of the respondents from Bole Arabsa project 15 own Radio or Stereo and Smart Phone. 33.3% own satellite dish and 16.7% of the residents own laptop, internet devices such as EVDO, computer/laptop and tablets. Among the devices listed by the residents, the least type of devices owned by residents is digital devices such as tablets, laptops and wireless internet devices like EVDO. In this site unlike other two sites TV owners are 83.3% as on the other two sites 100% of the residents own TV. See figure 45 above. The figure shows usage of devices in the households of the respondents. The numbers in the figure indicate the number of respondents that own the respective devices.

5.4.4.4. Ambition of Residents

Ambitions of respondents from the site are listed as follows: **To start a real-estate company ; To become an interior designer; To open a restaurant ; To run a boutique business; To finish my MSc. studies at Debre Birhan and become a researcher at an NGO**

5.4.4.5. Possible Space Use in Relation to work Homeworking and E-Learning Activities.

In regards to use of space in relation to E-Working and E-Learning, the respondents mentioned they will use their living room or bed room. Some of them also mentioned that the unit they are living in currently is rental and that they can get a better space in the future.

5.4.4.6. Housing Condition in Providing Suitable Environment for the Above Activities

All units at Bole Arabsa project 15 are not fully equipped with water and electric power. The units are powered by pulling cables from a nearby power source. There is a frequent power outage and there is no land line phone service and the mobile phone network is usually weak and they have to step out of their house to get a better signal. The rest of the structural conditions of the houses are equivalent to the sites Enderase and Mickey Leland.

5.4.4.7. Interest to Benefit from Homeworking and Learning from Home (E-Learning) in the housing environment

As figures 46 and 47 below indicate all of the respondents want to benefit from work from home (100%) and e-learning (100%) and most of them are computer literates (83.3%). The figures also show that 33% of the respondents indicate that they work at their convenient distance. It is understood from the discussed with the respondents that job character of the respondents is not permanent and they go wherever they got a job or business at any time. 33% of the residents have mentioned they work at a distance above 10 Kms, this suggest that they travel to nearby cities and towns for work. By considering the fact that the transportation service conditions of the city to be ineffective all residents have mentioned their distress in traveling anywhere for any activity.

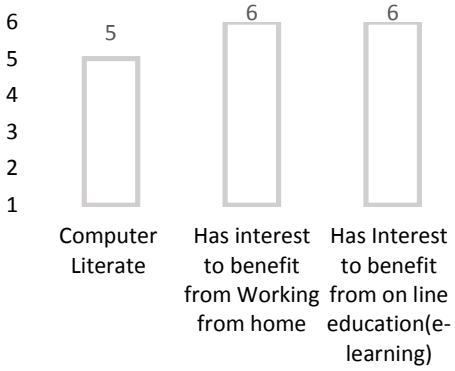


Figure 46: Interest to work from home, learn from home and computer literacy.

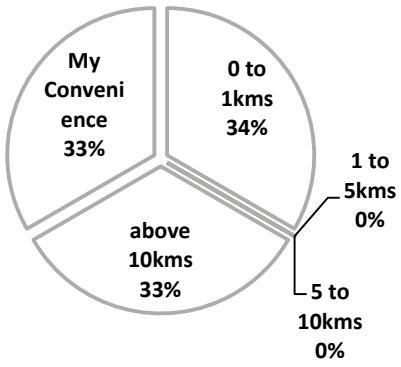


Figure 47: Respondents distance from their current jobs.

5.4.4.8. Respondents' Distance from their Work Place at Bole Arabsa Project 15

The 34% of the respondents commute 0km to 1km while 33% travel for work above 10km. The 33% of the respondents whom travel to their convenience due to the nature of their work which is not permanent at a location but dependent on opportunity at any location in the city. See figure 47 above.

5.4.5. Equity and Technology

The collected data informs the advantage the residents get from the area are the lower rate rental price or coming from a far poor conditions of situation. They are also looking towards to for when all of the houses in bole Arabsa are inhabited. One of the respondents who is a broker moved out there to facilitate the rental process for the unoccupied units and make a living. He is trying to get a meeting with all the owners. The residents use technological devices to communicate with their peers and families in other parts of the city. Even the limited access they have to information through their devices keeps them updated and in touch with the rest of the city while they are at home.

5.5. Data Presentation of Technological Oriented Organizations and innovation Centres, and other key informants.

5.5.1. Technology oriented organizations and innovative centres

The companies under consideration are already discussed in the contextual review of this research document sub chapters 4.2. See also appendix G of this document for further observation of these centers mostly about their missions and visions. In the city Addis Ababa and in general in Ethiopia there are technology oriented organizations and innovation centers among these are:

- National Science, Technology and Innovation (STI) ,the Ethiopian Telecom, the Ministry of Communication & Information Technology (MCIT), the Ministry of Science and technology (MOST), and the Ethiopian Education and Research Network (ETHERNET).
- Fablab Addis, Protolab EiABC, Col. John C. Robinson American Center at the National Archives and Library Agency (NALA), xHub Innovation Society, Entrepreneurship Development Centre (EDC)-Ethiopia, DOT Ethiopia and Iceadddis.

See also table 19 and figure 69 of subchapter 6.5 of data analysis for the tabulated and summarized information on the different organizations in Ethiopia concerned with technology and their possible influence on housing development in line with the research objectives and questions.

The following paragraphs further discuss these organizations in detail mostly in line with their missions and visions. The Ethernet organization states in addition to increasing quality of education, through our network infrastructure, we support the community to use digital technology and invest on human capacity. We have a solution for the communities as well as we share knowledge, empower them and connect to the rest of the world. This mention of community includes residents of the Addis Ababa condominium housing and this means that with proves and analysis made in this study, it is possible for the condominium community to access the network that is already created by the ETHERNET organization that has already connected several of universities in Ethiopia and has already established an e-learning education facility for the universities, see figure 6 under contextual

review of this document. This particularly is important as it indicates the possibility of implementing e-learning without the need of the internet. MOST has a vision to see Ethiopia entrench the capacities which enable rapid learning, adaptation and utilization of effective foreign technologies by the year 2022/23. By all means the objective of this research goes hand in hand with this vision as the research intended and showed how to create an alternative way of learning for the community. Mission of MOST is also one that proves the demand for this researches findings and recommendation as their mission reads as follows: Coordinating, encouraging and supporting science and technology activities that realize the country's social and economic development. The process and implementation of this research will open doors for all residents to have an opportunity to participate in innovation. INSA plays a security role and in that line has a vision to realize a cyber-security system that has a word class standard and that can play high role in the development of the country. This means during wide access to the internet the community will have security that will make the community feel safe from the negative outputs of the internet.

To add the Commercial bank of Ethiopia (CBE) to the list among its other competitors they have a vision to become a world class commercial bank by the year 2002. See the general discussion the researcher made with representatives of CBE on appendix G of this research document. It is mentioned in literature review of this research that individuals have the capacity to engage in global economy given the opportunity of using the digital infrastructure through online gigs and out sousing censorious. This statement is based on the text by Oxford Internet Institute, University of Oxford, 2017. See 3.4.1 Subchapter of this document. In this regard, in the discussion mentioned above that was made by the researcher with representatives of CBE and that can be found in the appendix G of this research document, the bank representatives mention that the national ID card that will grant residents of the city social security numbers that will ultimately help them take part in with or without living their country or their homes. The representatives say that the national ID cards are being organized by INSA and CBE is always looking out to sponsor the process as the completion of the task will make their business grow and help to meet the goals of the bank.

The STI presents it vision as follows: vision of the STI Policy is based on the national vision: “to see Ethiopia become a country where a democratic rule, good governance and social justice reigns upon the involvement and free-will of its peoples, and once extricating itself from poverty becomes a middle-income economy as of 2020-2023.” Accordingly, the national STI vision of the country is: To see Ethiopia entrench the capabilities which enable rapid learning, adaptation and utilization of effective foreign technologies by the year 2022/23. Here are the strong points mentioned: extracting poverty, rapid learning adaptation and utilization of effective foreign technologies. Therefore all of these companies have policies, visions, missions that go hand in hand with the researches findings insuring the appropriateness of the research process and objective. Figure 69 shows the location of technological organizations in Addis Ababa in relation to IHDP housing developments in the city.

5.5.2. Key informants

5.5.2.1. Housing development bureau and the Addis Ababa Mayor’s office

Table 11: summary of discussion with key informants
Key informants considered for this table are from housing development bureau and the Addis Ababa mayor’s office

Housing development bureau and the Addis Ababa mayor’s office communications and public relations office

New Idea introduction to the development	the already existing innovative practices on the sites	communication with the condominium community
Different researchers are bringing in their research projects and we are funding them and disseminating the out puts to all areas of the condominium. Furthermore we are looking in to all the sites that are already having innovations and we are also disseminating those.	the use of dishes in groups, garbage chutes, agro stone, there is also a researcher who is working on Bio gas introduction for the sites and we are funding the research project	We have periodical meeting with all representatives of the condominium committee and on the events we give out prizes for the sites with good governance and exemplary activities. There by disseminating the new ideas among them from us and form them to each other.

In addition to the information on the above table, discussion made with condominium housing committees is presented in 5.2.3 section of this document.

5.5.2.2. Key informants: commercial bank of Ethiopia and Ethio Telecom

To see the information gathered from key informant from commercial bank of Ethiopia (CBE) and the ethiotelecom see appendix G of this document. To point out the points needed at this point: the commercial bank of in addition to giving banking services to the community is extending sponsorship opportunity to Ethiopia Information network security agency (INSA). Ethio Telecom serves as enabler but not information provider on its own. See Appendix G for more detailed information.

5.6. Summary of Quantitative and Qualitative Data of the Three Sites

This section of the document summarizes the quantitative and qualitative data presented in the above subchapters for all the three sites and information gathered about the technology oriented organizations and commercial bank of Ethiopia are presented. This data presentation is complete with the data located in appendix C, D and E of this document. Here data codding is also applied for further use during data analysis and discussion. The following table shows the codes used.

Table 12 , Data Codding

BAP15	Bole Arabsa Project 15 Condominium Site
CL	Computer Literate
CLO	Computer or Laptop Owners
DLW	Desire to Learn From Home
DWH	Desire to work from home
ERC	Enderase Condominium Site
ESI	Entertainment and social interaction
HH	Household
HHCSA	According to CSA Average HH Size
HHI	Household Interviewed
HHR	According to Research Average HH Size
LH	Learn from home
WH	Work from home
IU	Internet Use
max	Maximum

min	Minimum
MLC	Mickey Leland Condominium Site
Rental	R
RI	Representative interviewee
RSO	Owns radio or Stereo
SO	Self-Owned
TBO	Tablet Owners
SP	Smart Phone
TP	Total Population
UDSM	Use digita social media
WD	Distance From Work Place
WID	Wireless Internet Devise

During analysis of closed ended questions on the questionnaire, numbers and symbols are assigned for the answers for example for no and yes answers a Y and N each having a value of 1 for computer analysis. See appendix C, D and E.

5.6.1. Summary of Quantitative data presentation for all the three sites

Here Summery of quantitative data for all the three sites is presented in the following table. Refer to the above table 12 to decipher the codes used in the table. This data presentation is complete with the data located in appendix C, D and E of this document.

Table 13, Summery of Quantitative Data for all the Three Sites

		Enderase Condominium Site	**Mickey Leland Condominium Site**	**Bole Arabsa Project 15 Condominium Site**	
TP in HHI		65	60	12	
Number of RI		15	15	6	
HHR		65/15=5	60/15=4	12/6=2	
TP		88x5=440 (HHCSA)	4637x5=23185 (HHCA)	5168x5=25815 (HHCA)	
		88x5=440(HHR)	4637x4=18548 (HHR)	5168x2=10325 (HHR)	
Tenure Type		SO=53%	SO=20%	SO=0%	
		R=47%	R=80%	R=100%	
IU		93.3%	93.3%	100%	
WID		6.7%	20%	16.7%	
CLO		46.7%	53%	16.7%	
TV, Dish and SP		100%	100%	TV	83.3%
				Dish	100%
				SP	100%
DWH		73.3%	80%	100%	
DLH		86.7%	100%	100%	
CL		93.3%	86.7%	83.3%	
WD	min	0km to 1km	0km to 1km	0km to 1km	
	mix	above 10km	Above 10km	Above 10km	

5.6.2. Summary of Qualitative Data for all the three sites

Here qualitative data for all three sites are presented in the following table.

Table 14, summery of qualitative data for all three sites

Sites	*Appropriate technology*	*Reason to use the internet*	*Equity and technology*	*Ambition of residents (Summary)*
All three	• There exists internet service in the city	• Very long distance between living place and	• Residents claim access to	• Start a business • Become self employed

sites (ERC, MLC and BAP15)	provided by Ethio Telecom. Residents with high income have better access to use different alternatives to benefit from the internet • There is high use of internet devices by the residents (dish, smart phone) • There is low rate of CLO,TBO and EVDO.	work/education • Shortage of infrastructure road , transportation to work • Lose of time and energy due to the above shortage • Residents have high awareness about the internet and technology devices use. • Residents have various ambitions that can be addressed through the opportunity to WH and LH • Availability of adequate space for the activity	technology is providing equity to their lives • Women who stopped their education to support their HH can resume their education • People who cannot afford to travel around the city for work and education can get around virtually.	• Run companies • Peruse religious endeavours that is supported by technology • Further education • Have a big family and be a good family person • Undecided / unknown • Be a successful business person n tech. • See sections 5.2.4.4, 5.3.4.4, and 5.4.4.4 for detail information.

5.6.3. Summary of data from key Informants including technological oriented organizations

Refer to appendix F, G, H and I for qualitative data summary on: **Ethio Telecom and Commercial Bank of Ethiopia (interview); List of Mission and Vision of Considered technology oriented Organizations; Housing Development Bureau and the Addis Ababa Mayor's Office Communications and Public Relations Office; Ministry of Science and Technology (MOST) and Oromiya Science and Technology Development Agency (OSTDA).**

5.6.4. General summary on data presentation of all three sites and technology oriented organizations in Addis Ababa

5.6.4.1. Summary of Enderase condominium site data presentation:

The site Enderase covers 0.29HA of land and it houses 88house holds. The two mixed use blocks on the site are broken down in two three blocks for the purpose of this research. The site has one communal block. On the site there are existing technology oriented activities that include use of satellite dish in common for multiple households that help environmental and effective resource use and contributes to aesthetical and structural advantages of the blocks. On the site there is use of automatic electric meters, door bells. The committee office is not equipped with technological devices such as computers and printers and relies on the surrounding shops for tasks that need the devices. The committee is always on the lookout for new innovative ideas that can increase the efficiency of resource usage and betters the lives on residents.

At Enderase site female residents are slightly higher than male residents while owner occupied units are also slightly higher than rented units. The resident's usage of internet rates to be 93.3%mostly through smart phones via internet data connection. Among the households there is 100% owner ship of smart phone, TV, satellite dish and radio. While there is lower rate of owner ship of laptops and desktop computers, there is even less ownership of internet devices like EVDO. The residents use seven different web applications for multiple purposes. As a result the awareness of the residents about technological devises and the internet are high. The computer literacy among the interviewed residents is with a rate of as high as 63.3%. The residents do use the internet for other purposes than entertainment such as for work, education and communication purposes. The resident's ambitions are very versatile that include starting or running different companies, to further education, becoming part of spiritual services. There were also individuals who were not certain about their

ambitions. The residents carry out their internet use in their living rooms and bed rooms while at home. Residents at Enderase showed high interest for learning and working from home by means of online fashion. Respondents travel to work from 0km to 10km of distance.

Equity is addressed at Enderase condominium site through technology indifferent ways. The common usage of satellite dish allows everyone to get access to TV service if they wish. As indicated on the case story and questionnaire summaries, residents get a chance to work have access to their work and education through the internet applications and their digital devices. By making use of technology, residents also get a chance to reach out to different causes such as children support systems and religious causes.

5.6.4.2. Summary of Mickey Leland Condominium Site Data Presentation Summary:

Mickey Leland condominium site covers 39.86HA of land and it houses 4637 households. 27 communal bocks are evenly distributed among 127 residential and mixed use blocks. There are three internet cafeterias on the site as part of the commercial units on the mixed use blocks. Like in the case of Enderase condominium site, the interviewed Mickey Leland condominium households have a combination where female residents are slightly higher than the male residents in number. The proportion of rental to owner occupied units is 80 % and 20% respectively. As per the data collected the residents use about nine different types of web applications for different purposes. The computer literacy rate among the interviewed residents is 86.7%. Internet usage rate among the households is 93.3%. Device owner ship is 100% for satellite dish, TV, smart phone and radio. While computer and desk top owner ship among the interviewed residents is lower than the above devises, the list owned devices are Tablets, EVDO and other related devices. The ambition of the residents is bit extended than residents at Enderase. The ambitions of residents at Mickey Leland can be summarized as: Desire to have a broadband internet connection at home for children of the household to have internet access to for education purpose, to be a successful business person and other areas, to be a good family person, to be a preacher, to further education and to expand business. As of for the reasons why the interviewed residents of Mickey Leland use the internet they have responded with: while work is outside Addis Ababa to communicate with colleagues, others for general work and social interaction, for religious purposes, to initiate community causes such as children youth center and etc. Residents of Mickey Leland us their bed room and living room for internet related activities. Their interest to benefit from E-working, E-learning and computers literacy is high. 80 , 100 and 86.7% respectively. Residents interviewed commute to work from 0KM to above 10KM. At Michele Leland condominium site equity is addressed by means of technology as they use the three internet centers for education, work and social interaction that paces them up to speed with other residents of the city who have internet access at home, close by or cheaper. Residents like Ato Hussen mention that the provision of internet access would give a chance for his wife an opportunity to restart her education from where she stops without also stopping on helping raise their chilled for the reason why she stopped her education in the first place.

5.6.4.3. Summary on Bole Arabsa Project 15 Condominium Site:

The site covers 45.4 Ha, has 174 total blocks of which 16 communal blocks are evenly distributed among the residential and mixed use blokes. The site houses 5193 households. According to the interviewed house holds the average family size on this site is 2 which are lower than that of Mickey Leland which is 5 and Enderase which is 4.

At the time of the interview by the researcher it has only been a year since the house units are transferred to residents. While most of the residents are on rental base, commute offices are not

organized or established yet. Most of residents on this site are residents who came to the site/ rented a house unit for advantages such as to provide informal services to construction process with restaurant and café services, some as they are brokers to deal between the new owners and new renters and some are here because of the low rent price range and worse condition at their earlier housing condition. The number of female residents is slightly higher than the male. The interviewed residents on this site use nine different web applications. Computer literacy among them is 100% while owner ship of technology devices such as Radio, smart phone is 100%. While TV is slightly lower, ownership of satellite dish, internet devices like laptops, EVDO are even lower. Ambitions of the respondents are to become a professional, business owner and further education. Space use for internet related activity is living room and bed room. Respondents commute to work from 0km to above 10km. 100% of the respondents say they are interested to benefit from e-working and e-learning. Equity through technology on this site can be described through the fact that even if residents of the site came to the site which is distant from most of the city centers they still communicate for work and other social interaction with their peers and relatives in the city or abroad.

5.6.4.4. Summary of Technology related organizations in Addis Ababa

In the city Addis Ababa there are governmental and non-governmental technology oriented centers which are responsible for the formal technology oriented developments in the city. National Science, Technology and Innovation (STI) ,the Ethiopian Telecom, the Ministry of Communication & Information Technology (MCIT), the Ministry of Science and technology (MOST), and the Ethiopian Education and Research Network (ETHERNET) are among the governmental organization while, Fablab Addis, Protolab EiABC, Col. John C. Robinson American Center at the National Archives and Library Agency (NALA), xHub Innovation Society, Entrepreneurship Development Centre (EDC)-Ethiopia, DOT Ethiopia and Iceadddis are among the governmental and non-governmental innovation centers. These facts indicate that the implementation of digital migration for work and study is within a reasonable readiness of the city to provide security, content and support. Key informants from the national commercial bank of Ethiopia, Housing Developments Bureau office Addis Ababa are interviewed and their feedbacks are listed and explained in the above subchapters 5.5.1 above.

6. CHAPTER SIX: Analysis

In line with literature studied in chapter 2.5 of this document, this chapter analyses the data from all three sites and data from key informants including the technology oriented organizations. There are a variety of strategies for quantitative and qualitative analysis. The data analysis for this research is conducted with methods of visualizing data, exploratory analysis and estimation. Different strategies provide data analysts with an organized approach to working with data; they enable the analyst to create a "logical sequence" for the use of different procedures. Among the strategies are: Visualizing the Data (Creating a visual "picture" or graphic display of the data.), Exploratory Analyses (Looking at data to identify or describe "what's going on" creating an initial starting point (baseline) for future analysis), Estimation (Using actual data values to predict a future value) (Academy for Educational Development, 2006).

In this section of the document primary data collected from the three sites and archival data gained from the secondly sources that are presented in the literature and contextual review are analysed. In order to carry out technology indicator questions' analysis, list of technology interest indicator questions are identified and subjected to the respondents' responses with only YES and NO to have a quantitative analysis of the condition. The 15 selected technology indicator questions are shown in the following table. See appendix C, D and E for full feedback of residents to the questions. Use table 12 and explanation in subchapter 5.6 to decipher the codes used.

Table 15: The 15 Technology interest indicator questions with YES or NO Feed backs

Technology interest indicator questions	CL		UDSM		UDSM for Business and Work		Purpose of using internet for other than social media						Technological devices owned														WHI		LHI	
							work		learning /tutorial		UDSM for ESI		owns TV		RSO		SPO		CLO		EVDO		Dish		TBO					
Type of responses	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N

6.1. Enderase Condominium Site Data Analysis

In this section of the research different attributes of the respondents are analysed against their technology affiliations.

6.1.1. Age of Residents and Technology Affiliation and Interest for E-Learning and Homeworking

This portion of the analysis of Enderase condominium site is presented below by cross checking different attributes of the residents with each other along with the research topics. The attributes of the residents selected for indication of technology interest include: use of internet in general, computer literacy, number of web application use, owning technology devices, interest to use the internet for other than entertainment, interest of on line education (e-learning) and interest for work from home. The last two attributes are in line with objective of the research. See table 15 in chapter 6

for more exploration on the technology indicator equations. See also the general responses and responses to the intended close ended indicator questions on Appendix C. The total number of these technology indicator questions is 15. In the list of respondents presented in the appendix C, the list of web applications are not included. See figures 48 and 49 below to see the relationship between age of the residents and their affiliation to ICT technology and their interest for e-learning and homeworking. The chart is constructed based on the age of the respondents and the number of yes answers they provided for the technology and interest to learn from home, e-learning, and homeworking.

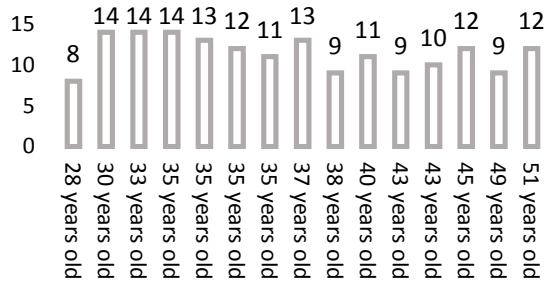


Figure 48: Age of respondents and technology indicator questions at Enderase site.

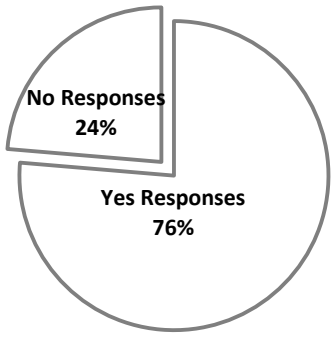


Figure 49: Relationship between YES and NO responses to technology indicator questions

The chart shows age of respondents compared to the amount of 'yes' answers they provided for close ended questions that are planned as indicators of affiliation to technology. The data analysis in this section showed, except for some slight relations at times, generally there is no direct relationship between interest of technology use and interest to get advantage of learning from home (E-Learning) and job location. According to this analysis and data presented, the respondents are interested to benefit from E-learning and E-working despite of distance from work, education or their age.

The usual assumption that technology usage decreases with age does not apply in this group of respondents at least not for the whole line of them. As seen in the chart figure 48 above between the age of 28 and 38 there is a regular descent of technology usage as the traditional assumptions but there seems to be an increase between age 38 and 51. The respondents of this site are family representatives and they have mentioned that their children who go to elementary, high schools and colleges do use the internet and ICT Technology much more than they do. During discussions, the researcher has also observed that young members of most families do assist the older member. But within the respondents themselves there is only a very slight increase in intensity of usage of technology among the younger individuals than the older individuals.

This might contradict with the points stated in the section 3.6 of this document titled “Working Conditions for New Generations”. But as the young (children) members of the family in most cases are very helpful to their parents by serving as assistances while using web applications, most of the point mentioned in section 3.6 hold true.

All in all, as shown in figure 49 above, 76% of technology interest indicator question received a YES response while only 24% indicators questions received NO. Refer to Table 15 Technology indicator

questions above and Appendix C for the technology indicator questions and responses by representative respondents. This in line with the 86.7% interest to learn from home and the 73.3% interest to work from home among respondents indicated in table 13 can suggest that there is a reasonable base line to predict that integration of E-Learning, E-Working and technology laboratories in to housing developments can benefit the residents.

6.1.2. Distance from Work, Technology Affiliation and Interest for E-Learning and E-working

In this section, the relationship between distances of work from home against interest of technology usage is analyzed. The following figure 50, 51, 52 and 53 are used for the purpose of the discussion. To construct the chart, the same 15 indicators of technology affiliations used in the previous chapter are employed.

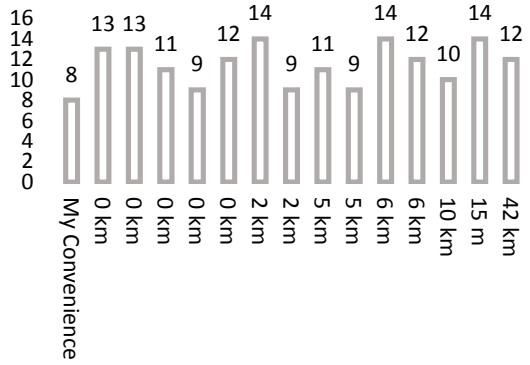


Figure 50: Job locations and technology indicator questions

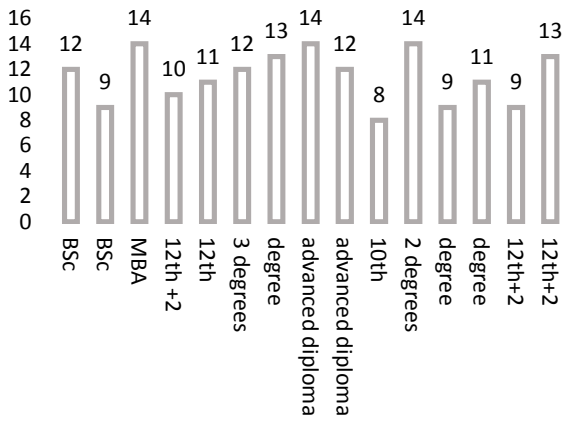


Figure 51: Education status and technology indicator questions

The figure 50 above shows Job location of respondents from Enderase and amount of yes responses to technology affiliation indicator questions from the questionnaire.[26]As it is seen in the figure, among the respondents, there seems not to be a direct or indirect relationship between interest of using technology and distance from work. Here the technology indicators did not change but studied against the distance respondents commute to work. There also seems to be no direct or indirect relationship between the technology affiliation of respondents and the distance they commute to work. But the fact that 76% of technology interest indicator question received a YES response while only 24% indicators questions received NO and also the 86.7% rate of interest to learn from home and the 73.3% rate of interest to work from home remains the same despite of age and distance from work location.

6.1.3. Status of Education, Technology Affiliation and Interest for E-Learning and E-working

On figure 51 above, it is showed that among the respondents at Enderase site, there is a very sight relationship between level of education and use of technology related to ICT. As the level of education gets higher, the more affiliation the respondents have interest in the ICT technology and interest of e-learning and homeworking. This can be seen through the fact that technology affiliation indicator questions that had YES or NO answer received slightly more YES responses among the

[26] See appendix B to have insight on the questions.

respondents with higher education. The figure 51 above shows that Education status of respondents and amount of YES Reponses to technology affiliation questionnaires.[27]

6.1.4. Tenure-ship Status, Technology Affiliation and Interest for E-Learning and E-working

Figure 52 below shows that there is no direct or indirect relationship between use of technology or interest for e-learning and work from home with the type of tenure ship the residents have.

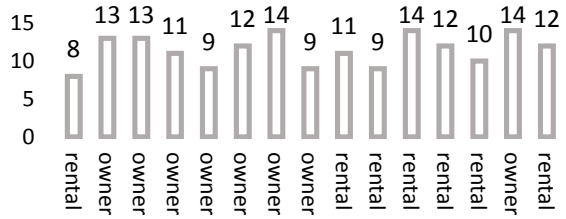


Figure 52: Tenure ship and technology affiliation.

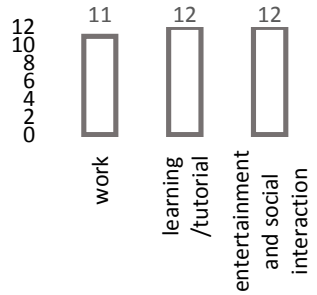


Figure 53: Interest to use the internet for other purposes than entertainment.

6.1.5. Interest of Using the Internet for other than Entertainment at Enderase

Figures 53 above show that there is an interest of using the internet for other than entertainment among the respondents of Enderase condominium site. 12 out 15 respondents use the internet for learning accounts for 80% of the representative respondents while 11 out of 15 residents use the internet for work accounting for 73.3% of the representative respondents. Still 80% of the respondents use the internet for entertainment and social interaction in parallel with work and education. It should be taken in to consideration that there are no residents who use the internet only for entertainment among the respondents in this site. Residents use social media sites to support their work through communication and informal educations such as tutorials. With 76% rate of technology affiliation, 73.3% rate of internet use for work and 86.7% rate of internet use for education, Enderase condominium site proves to be an environment that can thrive from integration of E-learning and E-Working to housing development.

6.1.6. Types of Homeworking Activities for Respondent's Combinations of Attributes

The respondents exhibited different answers to the intended questions as such this section of the document discusses, analyses, the possible activities they can perform through the assistance of E-Working.

Table 16: Specific attributes of respondents at Enderase condominium site.

[27] The technology affiliation indicator close ended questions include use of devices, interest about online education e-learning and work from home.

NUMBER	EDUCATION STATUS	SKILL	EMPLOYMENT	COMPUTER LITERATE	USES SOCIAL MEDIA	JOB LOCATION
1	BSc	Marketing	Self Employed	yes	Yes	According to my Convenience
2	BSc	Computing	Employed	yes	N0	Lafto
3	MBA	Computing	Employed	yes	Yes	2Kms
4	12+2	Cooking	Employed	yes	N0	Kotebe/Gird shola
5	12	Computing	Housewife	yes	Yes	Home
6	3 degrees	management	Employed	yes	Yes	42 km
7	Degree	Computing	Employed	yes	Yes	Mekanis
8	Advanced diploma	Computing	Housewife	yes	Yes	Home
9	Advanced diploma	Computing	Employed	yes	Yes	Megenagna
10	10	None	Housewife	yes	Yes	Home
11	2 degrees	Computing	Employed	yes	Yes	Jupiter/ kasanchis
12	Degree	Accounting	Employed	yes	Yes	Jemo
13	Degree	Computing	Employed	yes	Yes	Gerji
14	12+2	Cooking	Self Employed	N0	Yes	Enderase condominium
15	12+2	Hair Dressing	Self Employed	Yes	Yes	Enderase condominium

To see further attributes of the residents, look up appendix C of this document. From the above table, respondent number 14 and 15 have business on the ground floor of the condominium block. Respondent number 14 runs a pizzeria restaurant while respondent number 15 runs a hair salon that also gives a service of hello cash distribution to the community. Both use digital social media applications. Both have other employees at their business who also use digital social media applications. This two business owners can make use of E-Marketing for their business to keep track of their clients demands: such as scheduling, promoting services, creating credit system for their clients for easy payment through E-payment, etc. Form the same table respondent number 1 lives at Enderase condominium and has a construction machinery rental business but do not have a specific location of work. He works at any site his machines are needed. He uses digital social media application and he is computer literate. In line with E-Working, he can promote his business, keep client profile, set up a website to increase his online presence maximize his access to clients and his clients to him.

Respondent's number 5, 8 and 10 are house wives. While all of them use digital social Medias on the internet, they are not employed. Their education extends between 10^{th} grade and advanced diploma. This group of respondents spend most of their time at home providing house care for the household with plenty of time on their hands. They can change their status from unemployed to self-employed or employed without renting an office by making use of their homes through E-working method while still keeping their house care duty. The rest of the respondents from the above table are employed but are facing challenges in getting to work and back because of traffic jam issues and the like. They have different ambitions they want to achieve. Given the opportunity they can make use of the E-working method to save their time and find comfortable and flexible working environment.

6.2. Mickey Leland Condominium Site Data Analysis

In this section of the research, different attributes of the respondents are analysed against their technology affiliations.

6.2.1. Age of Resident, Technology Affiliation and Interest for E-Learning and E-working

For Mickey Leland, the same 15 technology indicators used for Enderase are used. Figure 54 and 55 below show that respondents at Mickey Leland site exhibit tendencies that are as irregular as Enderase condominium site's respondents. Except some slight indication that technology use increases with age among the respondents. Generally there is no direct relationship between interest of technology use and age and job location. According to this analysis and data presented, the respondents are interested to benefit from homeworking and e-learning despite of conditions in distance from work or education status.

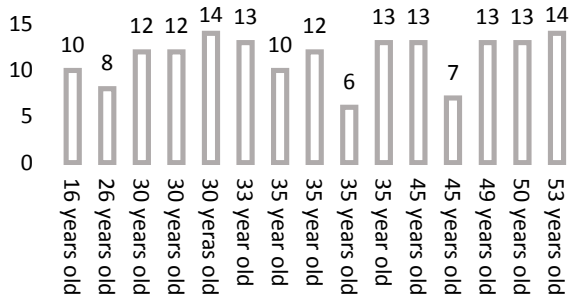


Figure 54: Age of residents and technology indicator questions at Mickey Leland site

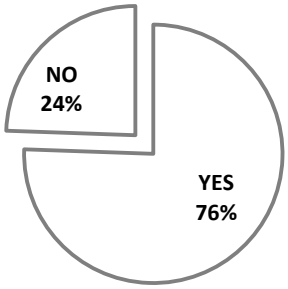


Figure 55: Technology indicators YES and NO Response Relationship

Figure 54 above shows Age of respondents compared to the amount of 'YES' answers they provided for close ended questions that are planned as indicators of affiliation to technology. Figure 55 above shows the relationship between YES and NO response to the technology affiliation indicator questions. Residents exhibited 75% rate of interest to the considered technologies in addition to the 100% rate of interest to learn from home and 80% interest to work from home they showed. Refer to Table 13 under the section 5.6.1 of this document. See also Appendix D to have insight on the general feedback of the respondents and the questions considered.

6.2.2. Distance from Work, Technology Affiliation and Interest for E-Learning and E-working

The chart in figure 56 below shows Job location (distance from work place) of respondents from Mickey Leland and amount of YES responses to technology affiliation indicator questions from the questionnaire.[28]There is no direct or indirect relationship between age of residents, distance from work and technology affiliation. Residents showed interest to learn from home or work from home despite the conditions of distance of their job location or their education status. See figures 56 and 57 below.

[28] See Appendix C to refer to the general information gathered from the respondents from Mickey Leland condominium site.

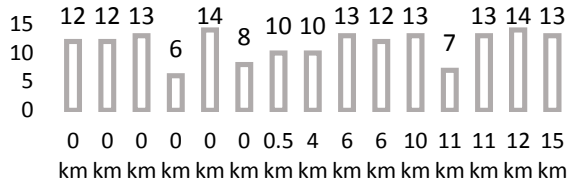


Figure 56: Distance from work and technology indicator questions

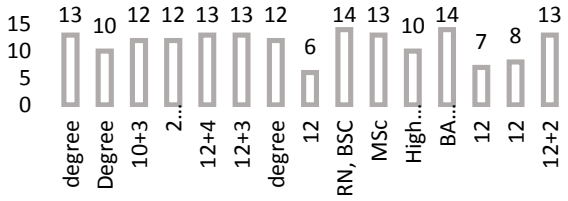


Figure 57: Education status and technology indicator questions

6.2.3. Status of Education, Technology Affiliation and Interest for E-Learning and E-working

The chart in figure 57 above shows Education status of respondents and amount of yes Reponses to technology affiliation questionnaires.

6.2.4. Tenure-ship Status, Technology Affiliation and Interest for E-Learning and E-working

Figure 58 below shows that there is no direct or indirect relationship between tenure ship and technology interest.

Figure 58: Relationship between tenure ship and technology interest

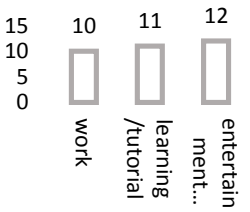


Figure 59: Relationship between tenure ship and technology interest

6.2.5. Interest of Using the Internet for other than Entertainment at Mickey Leland

Figure 59 above shows that there is an interest of using the internet for other than entertainment among the respondents of Mickey Leland condominium site. 11 out 15 respondents use the internet for learning accounting for 73.3% of the representative respondents while 10 out of 15 residents use the internet for work accounting for 66.7% of the representative respondents. Residents use social media sites to support their work through communication and informal educations such as tutorials. Still 80% of the respondents use the internet for entertainment and social interaction in parallel of using the internet for work and education. Like the respondents in Enderase site there are no respondents who use the internet for entertainment only. The 73.3% rate of internet for education and 66.6% rate of internet use for work, indicates that residents at Enderase condominium use the internet for work and education at a very high rate. As also indicated in table 13, residents of Mickey Leland exhibited desire to benefit from e-learning with 100% rate and desire to benefit from e-working with a rate of 80%. These facts make Mickey Leland site to be an environment that can thrive from integration of E-learning and E-Working to housing development.

6.2.6. Types of Homeworking activities for Respondent's Combinations of Attributes

The respondents exhibited different answers to the intended questions as such this section of the document discusses, analyses, the possible activities they can perform through the assistance of E-Working.

Table 17: Specific attributes of respondents at Mickey Leland condominium site.

NUMBER	STATUS OF EDUCATION	SKILL	EMPLOYMENT	COMPUTER LITERATE	USED SOCIAL MEDIAS	JOB LOCATION
1	degree	AutoCAD, GIS	Employed	Yes	Yes	Kolfe keranio
2	Degree	Computing	Employed	Yes	No	Birchiko
3	10+3	Morocco Bath	Self Employed	Yes	Yes	Mickey Leland
4	2 technic	mapping and hair styling	Self Employed	Yes	Yes	Mickey Leland
5	12+4	Computing	Employed	Yes	Yes	Torhayloch/5KM
6	12+3	preaching/irco	Self Employed	Yes	Yes	churches
7	degree	teaching	Employed	Yes	Yes	torhayloch
8	12	cooking	housewife	No	No	home
9	RN, BSC	Supervising	unemployed	Yes	Yes	home
10	MSc	financial service	Employed	Yes	Yes	Megenagna
11	High school student	Computing	High school student	Yes	Yes	High school student
12	BA degree	Computing	Employed	Yes	Yes	Merkato/ 8 KM
13	12	carpenter	Self Employed	Yes	Yes	piasa
14	12	shop keeping	Self Employed	No	Yes	Mickey Leland
15	12+2	Computing	Employed	Yes	Yes	piasa

As discussed in 6.1.6 subchapter of this document for Enderase respondents, respondents from Mickey Leland condominium site can make use of the E-Working opportunity in different ways as per their skill and other attributes shown in the above table. To see further attributes of the residents look up appendix D of this document.

If we take respondent number 9 and 13, we understand that number 9 is currently unemployed and number 13 is self-employed. Number 9 is a medical expert named Ato Aregahegn Wondimu who used to work from his home by giving services to a company remotely from his home by making use of the internet from internet cafes around Mickey Leland condominium site. As uploading files and access to the internet was difficult he had to quit his consulting service he was giving to the company outside

Addis Ababa. Now he is looking for other consulting services on Ethiojobs website. He can benefit from the E-working methods if infrastructures are fulfilled by keeping up with his already accustomed method of looking for companies who need his supervision remotely. He can give his service to more than one company by making use of a well-established infrastructure.

Respondent number 13 is a carpenter who goes all the way to Piasa to a workshop who are in good will allowing him to use their workshop to make furniture and make a living. Since he usually has difficulty to get to Piasa and back to his home. As the workshop he is using at paisa is not his own, he depends on the good will of the workshop owner, therefore he can benefit from the space provision of technology laboratories at Mickey Leland and promote his works on the internet and find a sustainable business endeavour through the E-working mechanism.

6.3. Bole Arabsa Condominium Site Data Analysis

In this section of the research different attributes of the respondents are analysed against their technology affiliations.

6.3.1. Age of Residents, Technology Affiliation and Interest for E-Learning and E-working

At Bole Arabsa condominium project 15 sites, unlike the other two sites Enderase and Mickey Leland, there is seems to be a slight relationship between attributes of the respondents such as age when seen against technology use and interest for e-learning and e-working. There is a relatively gradual increase in use of considered technology as age of respondents increase as seen in figure 60 below.

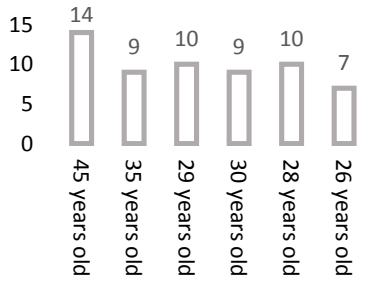


Figure 60: Age of respondents and technology indicator questions

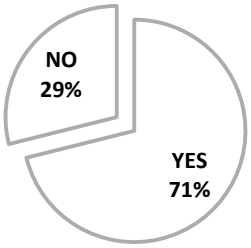


Figure 61: Percentage YES and NO answer proportion

Figure 60 above shows Age of respondents compared to the amount of 'yes' answers they provided for close ended questions that are planned as indicators of affiliation to technology.

6.3.2. Work Place, Technology Affiliation and E-Learning and Homeworking

Here Job location of respondents from Bole Arabsa and amount of yes responses to technology affiliation indicator questions from the questionnaire are used for discussion and charting.

At Bole Arabsa condominium project 15 site unlike the other two sites Enderase and Mickey Leland there is a fair relationship when location of work or distance from work seen against technology use and interest for e-learning and homeworking (e-working). Residents who go to Haya hulet and Tena Tabiya Mister travle more than 10kms while residents whose jobs are at home travel 0 to 1km and residents who gave conveninece as a response to the joblocation qustion travel according to opportunities came to them because of their temporal job character.

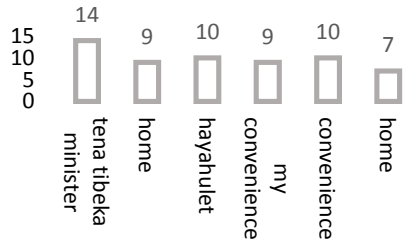


Figure 62: Job location and technology indicator questions
(Tena Tabiya Minister =above 10km, Hayahulet=above 10km, Home=0-1km and my convenience=convenience)

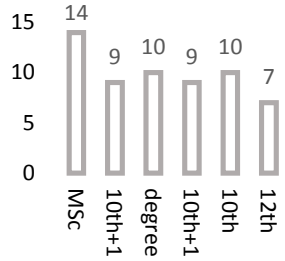


Figure 63: Education status and technology indicator questions

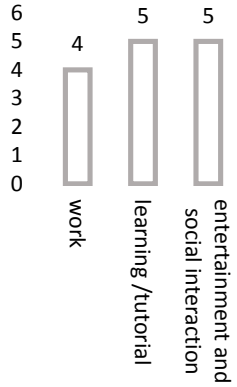


Figure 64: use of internet for other than entertainment

6.3.3. Status of Education, Technology Affiliation and Interest for E-Learning and Homeworking

At Bole Arabsa condominium project 15 site, unlike the other two sites Enderase and Mickey Leland, there is a fair relationship between technology affiliation and education status of respondent. Figure 63 above shows the same.

6.3.4. Interest of Using the Internet for other than Entertainment at Bole Arabsa Project 15

The figure 64 above shows that there is an interest of using the internet for other than entertainment among the respondents of Bole Arabsa Project 15 condominium site. 5 out 6 respondents use the internet for learning accounting for 83.3% of the representative respondents while 5 out of 15 residents use the internet for work accounting for 83.3% of the representative respondents. Residents use social media sites to support their work through communication and informal educations such as tutorials. Still 66.7% of the respondents use the internet for entertainment and social interaction in parallel with work and education. These rates indicate that residents at the site use the internet for other than entertainment and social interaction at high rates. The 100% rate of interest or desire for education and 100% rate of interest to use the internet for work, as shown in table 13 of section 5.6.1 of this document, indicate that Bole Arabsa condominium site proves to be an environment that can thrive from integration of E-learning and E-Working to housing development.

6.3.5. Home Working Activities for Respondents Combinations of Attributes

The respondents exhibited different answers to the intended questions as such this section of the document discusses, analyses, the possible activities they can perform through the assistance of E-Working.

Table 18: Specific attributes of respondents at Bole Arabsa Project 15 condominium site.

NUMBER	STATUS OF EDUCATION	SKILL	EMPLOYMENT	COMPUTER LITERATE	USES SOCIAL MEDIAS	JOB LOCATION
1	MSc	research	Employed/ngo	Yes	Yes	tena tibeka minister
2	10+1	cocking	Self Employed	Yes	Yes	home

3	degree	accounting	Employed	Yes	Yes	hayahulet
4	10+1	broker	Self Employed	Yes	Yes	my convenience
5	10	interior design, cooking	Self Employed	Yes	Yes	convenience
6	12	Shop Keeping	Self Employed	No	Yes	home

Respondent number 4 shown on the above table is a broker who lives in Bole Arabsa Project 15 site. He came to the site because the rental price is cheaper and looking to make a living by facilitating the dealing job to bring tenants to the relatively new and still not completely inhabited Bole Arabsa Project 15 Condominium site. He can make use of the E-working mechanism to maximize his client list and also further his endeavor to other housing areas as well without the need for renting another space for an office.

6.4. Comparison between the Three Sites:

Enderase Condominium, Mickey Leland Condominium and Bole Arabsa Condominium

6.4.1. Digital social media usage, interest for e-learning and home working, computer literacy

As seen on Figure 65 below, there is above 86% practice of social media usage in all the three sites Enderase, Mickey Leland and Bole Arabsa Project 15 condominium. The social media usage is 100% in bole Arabsa project 15 while it is 86.7% in the other two sites. The selection criteria of the sites were based on the location of the sites in relation to their proximity to social services such as education (elementary, high school and TVETs, colleges and universities), Governmental and non-governmental organizations. This variation between the sites can have a relationship to the characteristics of the sites in their proximity to the social services.

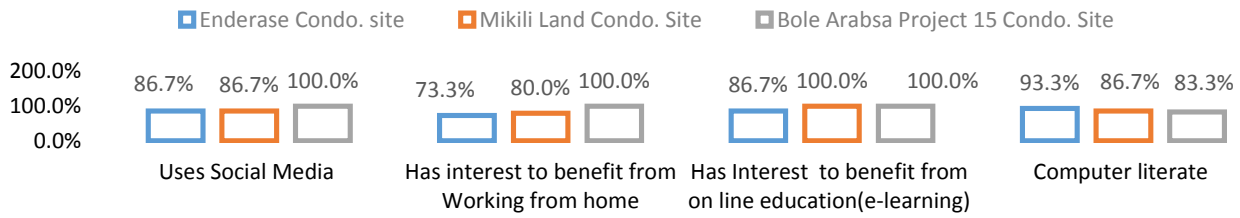


Figure 65: Interest of E-Learning and E-Working
The chart shows Comparison between the three different sites with regards to interest to learn from home and work from home and use of digital social media.

In Figure 65 above the interest for Home Working (E-Working) for the three sites Enderase, Mickey Leland and Bole Arabsa is above 73.3 % particularly the values for all three sites are 73.3%, 80.0% and 100% respectively. As mentioned above, the sites are selected for their characteristics and the variation of the values in this regard can be associated to the fact that the different three sites have different proximity to the different social services mentioned above, education (elementary, high school and TVETs, colleges and universities), Governmental and non-governmental organizations.

As mentioned in Section 2.2 site selection for survey section and figure 3 of this document, the sites are selected for sampling as a result of their different nature of proximity to social infrastructures

such as governmental and nongovernmental organizations, schools and universities. Enderase, Mickey Leland and Bole Arabsa Project 15 condominium sites are with the closest proximity, medium proximity and farthest from the social infrastructures respectively. Therefore their study presents the needed variation, cross examinations and information for insuring the intended replicable nature of the research for inference use for other similar or related developments. Accounting to the principle used for site selection, the gradual increase in digital social media use, increase in desire for e-learning and e-working and decrease in computer literacy can be explained and makes meaning to the principle used. In Figure 65 above we can see that the interest for e-learning is above 86% in general and the interest increases from left to right, that is, from Enderase to Mickey Leland and Bole Arabsa Project 15. Mickey Leland and Bole Arabsa response rate of 100% interest for e-learning. This phenomenon like the above explanation can be associated to the characteristics of the sites in proximity to the social services mentioned above.

6.4.2. Technology device usage

As shown in on Chart 66 below technology device usage is high for TV, Dish, radio/stereo, smart phone while it is relatively low for computer and laptop owner ship among the three sites. There is very low ownership of wireless internet devices such as EVDO and tablet, etc.

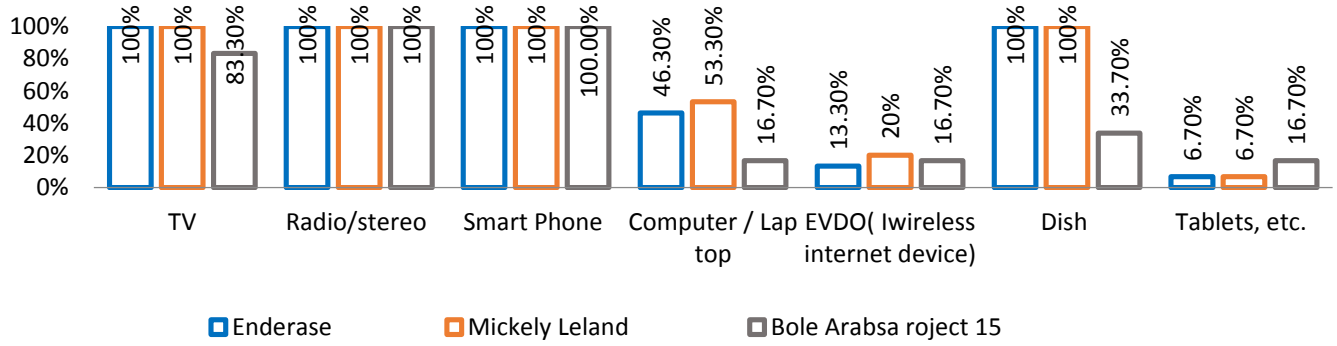


Figure 66: Technology device ownership among the three sites

6.4.3. Internet Consumption by all Three Sites' Residents for Work, Education, Social Interaction and Entertainment

Respondents use the internet for many purposes such as work, learning and social Medias as shown on Figure 67 below. Residents of all three sites use the internet for both **work and study related activities** and **social interaction and entertainment**.

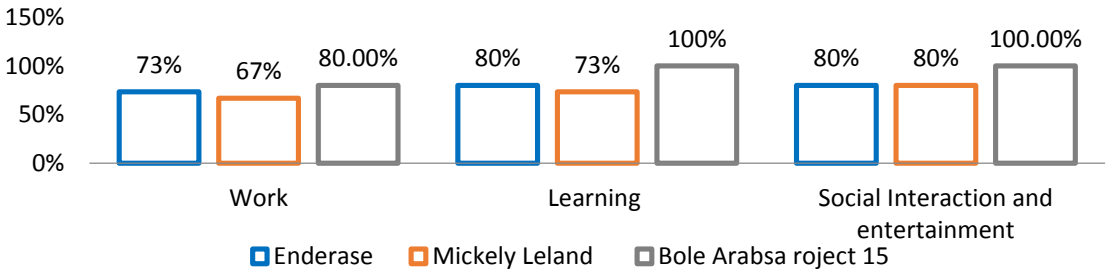


Figure 67: purpose of internet use among the respondents of three sites

The indicated high rate of internet usage is due to the fact that all residents use the internet for formal and informal education to update their awareness and skill about the different work line and education they are on.

6.4.4. Distance from work place

As seen on Figure 65 above, computer literacy is the same as or above 83.3% in all the three case sites. But the intensity of computer literacy reduces as we go from left to right unlike the other three phenomenon shown above. Computer literacy among the respondents is 93.3% in Enderase and 86.7% in Mickey Leland and 83.3% in Bole Arabsa. This again can be associated to the characteristics of the sites which is proximity to social services mentioned above from which Bole Arabsa project 15 is the farthest from and Enderase is the closest to while mickey Leland has the medium proximity.

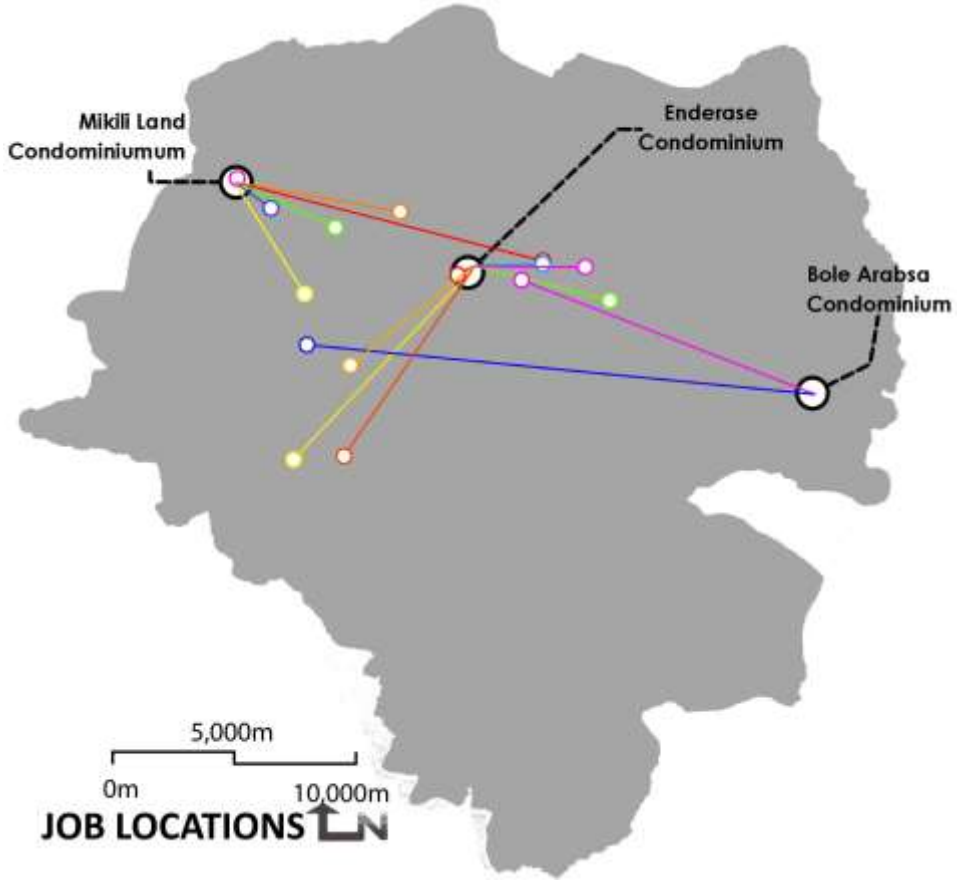


Figure 68: Location of jobs
Source: Own Map
The map shows the job Locations of residents of the three sites. For respondents who named the locationof thier jobs and for the jobs that are in Addis Ababa.

The above map shows job location of respondents from all three sites. The map does not include respondents who work with in their respective sites and respondents who did not describe their job location. And a respondent who **works out side of Addis Ababa** from Enderase condominium site and another respondent **who studies outside of Addis Ababa** from Bole Arabsa Project 15 Condominium site are not included on the map.

6.4.5. Gross Monthly Income Comparison among the Three Sites

The list monthly income generators are respondents from Bole Arabsa Project 15 site which is between 2,000 ETB and 19,000 ETB with an average of 4,800 ETB. The average monthly income generators are respondents from Mickey Leland which ranges from 5000 ETB to 15,000 ETB with an

average of 9,278 ETB. The high monthly income generators are respondents from Enderase with monthly income between 8,000 ETB and 15,000 ETB with an average of 13,750 ETB. See the figures provided in sections 5.2.4.1, 5.3.4.1 and 5.4.4.1 that describe Enderase, Mickey Leland and Bole Arabsa Project 15 condominium sites. This increase of monthly income is correspondent to the distance of the condominium site from the existing services of the city (distance from the center of the city) as shown figure 3 of this document. The reverse correspondence (indirect relationship) between the average income of the residents at the three sites and their proximity to the center (services) of the city proves the primary site selection method to be appropriate. The same fact also explains the importance of distributing education and work evenly among the residents of the city however far they are from the center of the city due to their low income status by making use of ICT and related supportive infrastructure. Such activity will bring equity residents of the city irrespective of their income (financial) status.

6.5. Analysis of Technology Oriented Centres and other Organizations

The companies under consideration are already discussed in the contextual review of this research document. The organizations are: National Science, Technology and Innovation (STI), the Ethiopian Telecom, the Ministry of Communication & Information Technology (MCIT), the Ministry of Science and technology (MOST), and the Ethiopian Education and Research Network (ETHERNET). The list of their visions and mission are presented in Appendix G of this document. See also figure 69 below for summarized observation of locations of these centers in relation to housing developments (IHDP) in Addis Ababa. The following table shows the different organizations in Ethiopia concerned with technology and their possible influence on housing development in line with the research objectives and questions.

Table 19: Technological Organizations and their possible influence in future housing development

	Primary purpose	***Possible future meaning to housing developments if planned to be involved in planning and implementation of housing developments***
EthERNet	Provision of Education and research network.	Two of the focuses of this research is about E-Learning (Home working) and Innovation. EthERNet functions on the fact that all universities are connected through a fiber optics cable stretched throughout the country and on a cloud based platform (connecting also other universities in the world). This indicates the potential of this network to incorporate housing developments for E-Learning (home working) conditions even this is possible even without internet service. Furthermore innovation centers rely on provision of trainings as such connecting the centers to Ethernet secures the fact.
MCIT	Initiate policies and laws in ICT for cyber security and cybercrimes	The possible involvement of MCIT on housing developments can be seen though proactive plan for stating policies for E-working, E-working and innovation activities concerning cyber security.
MOST	Documentation, facilitation and creation of technology based activities in Ethiopia	Here most can be seen as a potential to state, generate and implement the general scheme and realization of the research areas: E-Learning, E-working and innovation.
INSA	National policies, laws and standards to ensure security of information and computer based key infrastructure and oversee its enforcement. For example, national PKI and draft electronic signature law has been relegated to INSA. National ID card is also being develop by INSA .	INSA functions parallel with MCIT in provision of Cyber security.
STI	Capacity build national manufacturing and service providing enterprises in technological learning, adaptation and utilization of effective foreign technologies.	Considering the development of housing in Addis Ababa incorporating E-working, E-working and innovation, capacity building in technological learning, adaptation and utilization of effective foreign technologies is very important.

ETC	Development and provision of telecom infrastructure	Implementation and provision of infrastructure to housing developments in line with the research objectives.
Innovation centers in Ethiopia	FABLAB ADDIs, Protolab, xHUB, EdE, Engineering Excellence for Ethipia, ICEaddis and other similar centers	This centers' basic purpose is to innovate and incorporate the community in their activity however commercial and profit oriented some of them are, their function goes hand in hand with the innovation objective of this research as such taking this centers as best practice and learn from them or even incorporating them during planning brings an easy implementation of the concept in housing developments (innovation).

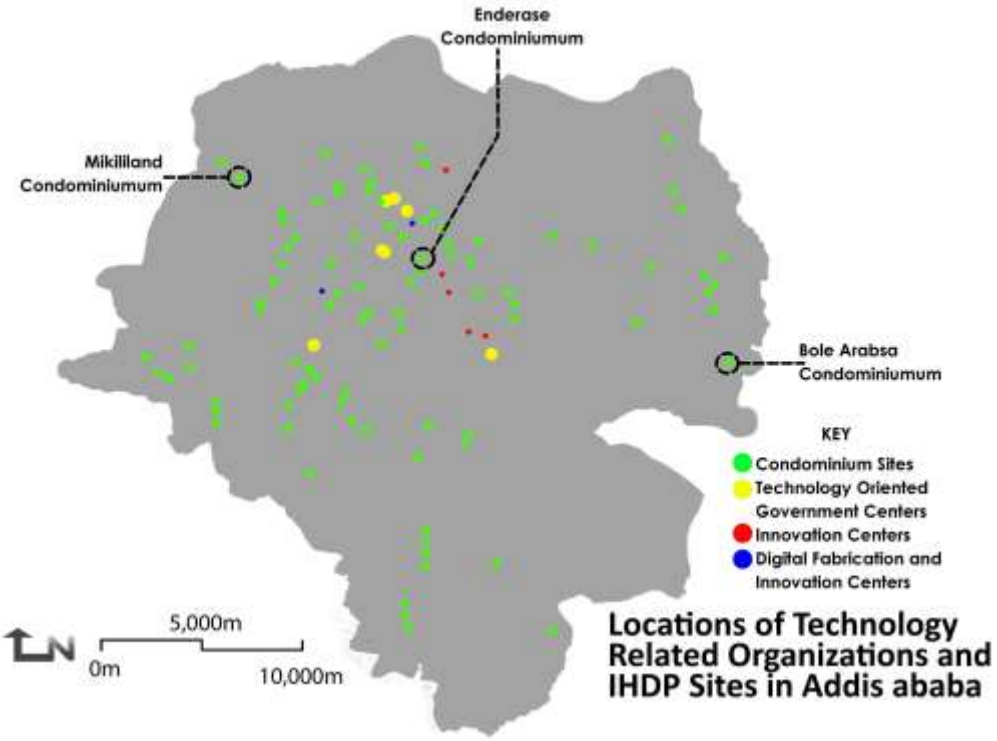


Figure 69: Location of Condominiums, Technology Oriented Government and Private Organizations
Source: Own map

As figure 69 above shows, the technology related organizations are located relatively to the center of the city like other offices and services shown on figure 3 of this document. The location pattern of these centers in relation to the three selected sites is also similar to other offices and services in the center. This is to say the centers are far from sites Bole Arabsa and Mickey Leland and Bole Arabsa Project 15 condominium Sites where they are relatively closer to Enderase condominium sites.

6.6. General summery of data analysis at the three sites

Among the representative residents of Enderase condominium site there is different condition like variation in job location, tenure type, education status, age. And partly the analysis in the subchapter is made to see if these conditions are making differences with their interest (intensity of use) of the considered technology. The analysis shows that there is no direct or indirect relationship between the conditions of the residents within the same site with their technology affiliation. The same result is seen for Micky Leland. Except there seems to be a slight relationship between the conditions of residents and their technology affiliation, the same can be said for residents of Be Arabsa as well.

Within the same site, conditions of residents and their technology affiliation do not show visible direct or indirect relationship. Yet the residents studied at their specific sites show high digital technology usage and showed high desire to learn from home and desire to work from home. But when all the three sites are seen together in relation to each other a considerable direct and indirect relationship is seen among the site location and the specific site's residents' digital technology affiliation. Computer literacy increases from Enderase to mickey Leland and Bole Arabsa Project 15 sites. While desire to benefit from e-learning and E-working increases from Enderase to mickey Leland and Bole Arabsa Project 15 sites, similar pattern is seen for digital social media use.

7. CHAPTER SEVEN: Findings and Conclusion

This chapter presents the general findings of the research and makes conclusions on the research in general in the following sub chapters. This section of the research document is dedicated to present all findings discovered by the researcher though out the research process.

7.1. Findings

In line with the research questions that are raised at the beginning of this research, the findings are categorized accordingly.

7.1.1. Technology types used in condominium housing developments at Enderase, Mickey Leland and Bole Arabsa project 15 sites.

7.1.1.1. Digital technology devices and internet use

As shown in on figure 66 above technology device usages is high for TV, Dish, radio/stereo, smart phone while it is relatively low for computer and laptop owner ship among the three sites. There is very low ownership of wireless internet devices such as EVDO and tablet, etc. Among the three sites respondents use up to ten different kinds of web application for work, education social interaction and entertainment as shown on figure 67.

7.1.2. Extent of technology use in condominium housing developments Enderase, Mickey Leland and Bole Arabsa project 15 sites, particularly in the area of e-learning and e-working.

7.1.2.1. Computer literacy and internet usage

Computer literacy is higher at the sites closer to the social infrastructures (offices, schools and universities) while lower in the sites far from the services. See figure 65 of this document under the subchapter 6.4 at a rate of above 86%, the condominium community has the knowhow about the internet and they use the internet for work, education, social interaction and community participation, within all sites regardless of age, status of education and gender. Respondents engage in the usage of social Medias and the internet in general to facilitate their professional, social and academic endeavors both locally and overseas. See figure 67 of this document. Furthermore residents participate on community support programs through the awareness they created or created for them not only through word of mouth or notes handed out to them in person but also through e-mails, social Medias. There is above 86% practice of social media usage in all the three sites Enderase, Mickey Leland and Bole Arabsa Project 15 condominium. The social media usage is 100% in bole Arabsa while it is 86.7% in the other two sites. The variation of usage is attributing to the distance of the respective sites from the services and centers in the city.

7.1.3. Future of housing development in Addis Ababa in terms of meeting the needs of residents in flexible living, working and schooling conditions.

Favorability for Homeworking (E-Working) and E-Learning

7.1.3.1. Interest for Homeworking and E-Learning

Among the residents of the three sites Enderase, Mickey Leland and Bole Arabsa Project 15, there is internet usage of 93.3%, 93.3% and 100% respectively and their desire to benefit to homeworking is 73.3%, 80% and 100% while their desire to learn from home is 86.7, 100% and 100% respectively. Their Computer Literacy rate is also 93.3%, 86.7% and 83.3% respectively. Nevertheless, the existing development does not have an integrated technology or data line laid out LAN or WLAN) that can support formal activities of online homeworking and e-learning. The mission and vision of all technology oriented organizations do align with the growth of the community through technology. Furthermore ethiotelecome has addressed most condominium sites with telephone sites that can be used via such as Digital Subscriber Line (DSL) and EVDO for internet connection by individuals who can afford the service. Furthermore almost all of the countries' universities are connected through an underground data cable and online education is being conducted at the university levels that can makes the bringing of e-learning to housing developments by connecting the to the infrastructure under consideration.

7.1.3.2. Global Economic Participation

Residents are using the high rate of internet and digital technology usage for learning, working at a local level. They are implementing their capacity to communicate with their relatives abroad but are not using their capacity to involve in the global economy in the general sense. It is indicated on the literature review of this document that there are jobs that can be managed by individuals at any level of education status on the global scale given that they can write and read and have readiness to partake. See box 1 (list of jobs available online globally) under 3.4.1 section of this document. There is a mention of National Identity[29] Card while discussing with CBE's representatives about opportunities of the community in increasing their economical capacity through technology. The National Identity Card is being organized by INSA at the moment and up on completion will provide the community with social security numbers that will allow them participate on international activities while living in Ethiopia.

Further opportunities of participating on the global economy is mentioned by different researchers in 3.4 subchapter of this document, the internet has become very prominent that researchers are working on identifying territory through digital traces that does not go necessary with political boundaries and borders but through the activities and desires of the people. See 3.4 section of this research document. Residents of the condominium projects are using the considered technologies to communicate with their peers locally and internationally for reasons of work, education, entertainment, or social reasons. These activities are important parts of their lives.

7.1.3.3. Space Usage

The condominium units are designed without any indication of room for homeworking or learning from home. There are suggestions by the residents of the selected condominiums Enderase, Mickey Leland and Bole Arabsa Project 15 to rearrange their living spaces to accommodate their activities if and when there will be an opportunity to benefit from learn from home (e-learning) and work from home. Specific spaces mentioned are living rooms and bedrooms. But still there is a concern about

[29] Find the discussion made with representatives of CBE in appendix F of this document.

sharing space with children of the households by some families to accommodate the new activities in their homes.

7.1.3.4. Use of the internet for other than entertainment

More over the residents do not only use the internet for their local endeavors but to communicate with their relatives abroad and expand their horizon further. The residents download tutorials in relation to their jobs in order to upgrade their skills that can be considered as informal education more over they use the internet to support their formal education in doing assignments and studying. Residents have an interest for homeworking and e-learning at a rate of higher than 73%.

7.1.3.5. Equity

It is also observed in the selected condominium sites that all residents do not have equal access to information that can easily be accessed through the internet. As a result residents without opportunity of access to the technologies are vulnerable in regards to being competent on their profession, education endeavor and other socio economic fronts. Technology Laboratories are not integrated in the condominium housing developments.

7.1.3.6. Difficulty in getting to and from work places and school

Residents of all three sites studied mentioned that they are having difficulty to get to work, school and back without wasting time and energy and suffering the consequence on their economic, social and job conditions. This is due to long distance between their work and living place and also due to the traffic condition that is persistent on being congested for long period of time. The children of the residents need to use the internet for their education so bad that they pay exaggerated amount of money to get their assignments done while actually students are supposed to do their assignments themselves.

Challenges to integrate and benefit from technologies at the housing developments in terms of Homeworking (E-Working), E-Learning and Technology Laboratories.

7.1.3.7. Infrastructure

The existing infrastructure at the condominium sites does not indicate any consideration of the existing data consumption by the residents. There is no central or house to house data (internet) lines implemented except the internet cafes and located at Mickey Leland. Despite the interest and effort of the residents to apply the positive benefits of the ICT technology to their endeavors there is no or little infrastructure that assists them to use them effectively except the smart phones they have and ethio telecom's fined services. There is no formal or structured provision of ICT and technology infrastructure in regards to the internet or technology laboratories. This is without including the ethio telcome's service through tele towers for mobile or smart phones. Yet the residents of condominiums in Addis Ababa have interest to benefit from a formally installed internet service. The residents use the internet not only for entertainment purposed but for their formal activities such as work and education.

Possibilities to shape housing developments in Addis Ababa in terms of ICT and technology laboratories.

7.1.3.8. Mission and Visions of Companies Affiliated with Technology

All of the companies mentioned in the above sections 5.5 of this document namely STI, Ethio Telecom, MCIT, MOST and EthRNet have missions and goals that are in line with the benefit of the community in security, technology related activities but are not engaged at planning level of housing developments. See table 19, Figure 69 of subchapter 6.5 and appendix G of this document. Figure 69 show the location of the above technology oriented organizations and other innovation centers.

7.1.3.9. Indications of readiness to implement Appropriate Technology

There are different technology related projects and activities that are happening in the condominium developments. Committees at different sites are introducing different technological ideas by initiation at their sites or with the cooperation with the housing development bureau. See subchapter 5.5.2 of this document to see that the committees are putting in effort and keeping their doors open for new ideas for the betterment of the community. Some of the technological implemented projects include: the use of dishes in groups, garbage chutes, agro stone material products, there is also a researcher who is working on Bio gas introduction for the sites and the housing development bureau is funding the research project. There is no indication of ICT technology integration in the planning of the condominiums except the electronic card supportive electric meters provided by the Ethiopian electric power corporation and the land line telephones. Students of the households interviewed have no access to ICT for which reason they spend up to eight ETB to get their assignments processed, organized and printed at internet cafes.

7.1.3.10. Innovation centers (Technology Laboratories) in Addis Ababa

There are innovation centers and digital fabrication laboratories in Addis Ababa that are building the community through business incubation and technology based education. Among these are Flab Addis, Protolab EiABC, Col. John C. Robinson American Center at the National Archives and Library Agency (NALA), and Iceadddis can be mentioned as examples. Like most developments in Addis Ababa these centers are also far from the residents.

7.1.3.11. Policy

Comprised in 4.7 subchapter of this document policy of FDRE, STI's policy (2012) is discussed among others. Some of the nation's development targets are Information Communication Technology, adaptation and utilization of manufacturing and service providing enterprises. It is stated that search ,select, import effective technologies, adapt , utilize as well as dispose ;establishing and implementing a system to use foreign direct investment (FDI) and other ways of supporting technology transfer are important. The adaptation of digital migration for work and study (homeworking and learning from home) goes directly hand in hand with above described policy. Digital migration for work and study requires supportive infrastructures such as laboratories in addition to internet access and educational content if the endeavor should meet the demand areas of the countries policies regarding education.

7.2. Conclusion

Residents of Enderase, Mickey Leland and Bole Arabsa have difficulty to get to schools, work places in the current situation of the city due to traffic conditions and long-distance from work. Without presence of formal data line implemented on the housing developments, residents show a high rate of desire for e-learning and e-working and at the same time they exhibit high level of computer literacy and internet usage. Residents suggested they are using their living space and bedrooms for e-learning and e-working activities. Residents claim technology they have now has brought equity to their lives and they believe further developments will maximize such conditions. The countries readiness to implement E-Learning and E-working can be seen through the presence of technology oriented organizations that are for example an infrastructure of data cable that connects almost all universities in the country is present and being used for e-learning in the country by organization such as EthERNet that organizes online education in the country. The city has technology oriented organizations and Technology laboratories that are relatively far from the housing developments but are engaging with the community in different levels. Policy in the country supports importing and adapting foreign technology and supports the utilization of technology in arias of Information Communication Technology and manufacturing and service providing enterprises.

8. CHAPTER EIGHT: Recommendation

8.1. General Recommendations

8.1.1. Benefit from E-Learning (Learning from Home)

It is important to meet the interest of residents to benefit from E-Learning (Learning from home). In this regard different researchers are mentioned both in the literature and contextual review of this research. The country has been preparing for this task, it is time now to allow residents benefit from it in such a way that they can have a better means of making their lives effective and get quality education of their interest and environment of their interest. Ethiopian education and research network (EthRNet) is now facilitating in connecting the different universities in Ethiopia and the universities in Ethiopia with universities in the world through an already established infrastructure. It is safe to say that the country is at a level of preparedness where it is possible to allow residents benefit from learning from home. The policy of the country in general supports the adaptation of technology for education, manufacturing and other related activities.

8.1.2. Benefit From E-Working (Homeworking)

Meet the interest of residents to benefit from e-working (homeworking). This has been discusses in the literature review section of this research document under section 3.5 and cross checked with the residents in the research data presentation and analysis sections. The ethio telecom has mentioned the reediness of the employees through the statistics they mentioned in the appendix F of this research. Over 8000 organizations in Ethiopia are now using the broad band internet service from ethio telecom. This suggests that there is a trend where employers are upgrading their office with ICT infrastructure. Therefore it is easy to follow suit and establish the system where residents can work from home.

8.1.3. Upgrade Housing Development

Upgrade the current homes and design the new ones with consideration of Homeworking (E-Working) and learning from home (E-Learning) facilities. This is to say incorporate logic of space usage or additional space for the activities that would come as a result of E-working and E-learning. And also upgrade the homes with ICT infrastructure and the urban layout with supportive infrastructures and services such as common laboratories to support technology related educations.

8.1.4. New Stakeholders for Housing Development

Add more stakeholders in Housing developments prominently, technology oriented institutes and ministries. The housing development in the city needs to look into incorporating concerned technology oriented bodies of the country during planning. These can be STI, Ethio Telecom, MCIT, MOST and EthRNet. This is to say housing developers need to stop making just houses but capable

environments that can secure and shape the future and allow residents take part in the national and global economy by making advantage of the ICT technology and the enabling infrastructure of the city.

8.1.5. Digital Social Media

We should not underestimate the social Medias in providing informal education that are friendly and suitable for most of the residents and business owners. From the observation and interviews, it is a fact that residents are constantly upgrading their skills and current information through the digital social Medias. The Medias present a free and flexible platform for them to get resources such as tutorials and assistance from people online. Social media and in general internet is not used by the residents of the condominiums only for entertainment but also for support system like in the case of Enanu Sintayehu and her associates' One Pack for One child Support system for the community.

8.1.6. Architectural Measures

In upgrading the development with ICT and supportive technology laboratories make sure to consider appropriate architectural measures. Harmonize the new elements properly to the existing environment and the same can be said for the new developments as well. Digital signals from APs draw users to them, if APs are situated to a location where users can get comfort and shelter, they can be cause to social and physical discomfort. Therefore, provide also proper spaces that are effective to integrate the introduction of the technologies and their consequences among with the residents' way of life.

8.1.7. Installation of Infrastructure and access to content for E-Learning and E-Working (Homeworking).

In general, it should be understood that installation that allows cost effective, proper workmanship and a quality service in speed and access to quality content should be given priority. In case of general consideration of the global internet as a threat to security and content that negatively affect culture and values of the community, it should be understood that local (national) network among Ethiopian universities is already established and it can be connected to the housing developments to establish e-learning and e-working that is locally provided both in content and regulation. This can provide an isolated network for e-learning and e-working among local universities and the housing developments. It should also be understood that residents can benefit from the global economy and education if they have access to the opportunities that are available globally, to this end local infrastructures can be installed and regulated with an effective and advanced (care) to eliminate the negative consequences mentioned above.

There can be three major areas we can consider for the installation of infrastructure for e-learning and e-working at housing development: **(1)** Using predominantly Wi-Fi connection to reduce the relatively high cost of installing cables and related workmanship issues that would arise from the intensive work in implementing the Local Area Network (LAN) with fixed Lines (FL) all over large size developments such as IHDP, condominium housing developments in Addis Ababa. Here it is possible to connect a local Access point (AP) with strong signal to the internet provider. Once the service reached the indicated AP, it is possible to assign IP address via routers and distribute the service to various internal and external APs that can exchange signal among each other and service clients (local

devises such as: laptops, tablets, phones and PCs). For clients that do not support Wi-Fi connection such as PCs, consideration of connecting them to internal access points is mandatory. **(2)** To benefit from the nationally networked universities of the country Ethiopia that are already connected (networked) through fiber optics cable via FL for E-Learning without having to need internet service, consideration of connecting Aps and clients becomes necessary. This option provides a reasonable security to the network by incurring high cost to the development and keeping limitation of service by cable such as span and workmanship related problems **(3)** A hybrid of both Wi-Fi established through wireless local area network (WLAN) and cable connection LAN that balances between quality of service and cost can be a more logical approach for the development of housing projects in incorporating e-learning and e-working.

8.1.8. Upgrade the Condominium Committees

Upgrade the condominium committees to a more structured and functional organizations or introduce a new body that can manage and up keep the functional, social and infrastructural needs of the respective sites. Ethio Telecom and CBE require institutional letters to comply to specific service requests therefore it is mandatory to institutionalize the committee of the condominiums or introduce a different body to the respective sites that can handle the need for understanding and managing the activities needed to meet with the above recommendations. In other words The Ethio Telecom and CBE services are different for individual and organization services. Since services that are renders to organizations are favorable for e-learning, e-working and supportive technology laboratories, it is better to upgrade the committee office to make use of its organization status.

8.1.9. Introduction of Technology Oriented Laboratories

The general policy of the country suggest the adoption and integration of technology, innovation and manufacturing capability in education and the community at large. Establishing technology and laboratories that are supportive to E-learning and Homeworking within the housing developments is reasonable. These supportive infrastructures should be interlinked with other local similar infrastructure and the internet that will allow them share information and skill with each other and other related centers globally[30]. Technology activities do not necessary need to be digital. Technology related activities can range from low tech endeavors to a very sophisticated stage of activities that include computing. In this document under the subchapters 3.1 and 3.2, the importance of technology oriented developments is mentioned. The fab city mentioned in the section 3.1.1, suggests an interconnected development of technology related activities that use high quality data that can allow groups and individuals have manufacturing capability and knowledge sharing. Therefore, it is the obligation of concerned bodies of the city to plan housing by incorporating such realization where residents can use their potential to its fullest and also create a system where residents can raise their children in an environment where they will grow up acquiring skills that are suitable to build them to become active members of their society. This can be done through introduction of technology laboratories that are supportive to homeworking and e-learning. This can be realized by enhancing the information or data use through the network of local similar centers or the global network by making use of the internet and the cloud. In presenting more reasons as to why to establish housing with appropriate technology, Under 3.2 section of this research, Chris Abel's

[30] See 3.1 section of this research about fabcity and fablabs

points of discussion about Eco development and technology suggests technological development trends are more ecofriendly.

See also section 3.8 to understand the level of development of cities in regards to IOT. IOT is mainly the interlinking of technological devices with each other and to human beings and institutions to bring an optimized system of living in cities. While this is a remarkable phenomenon and all residents interviewed in this research are already linked to the cloud through their smart phones via the web applications and are participating. Before indorsing to invest in the area of smart sensors and machines that communicate to people, we need to reorganize and create a sustainable development that is still an option to the community realistically. We have to approach the concept of IOT by filtering the Idea with regards to basic concerns of the community such as education and work at the level. This is to say ones IOT take effect and alter the policies of the country, unprivileged, people will be left behind and that can be a Dior consequence to most of the community that do not afford to keep up by purchasing devices instead are looking to fulfill their basic needs for education and work. Consider the ambitions of the residents in furnishing the technology laboratories that can support homeworking and e-learning.

8.1.10. Participation on the Global Economy

Facilitate Opportunities and Infrastructures for Residents to Participate on the Global Economy. In the section 3.4.1 it is indicated that workers have the capacity to participate on the global economy given the infrastructure and proper identity they require to be identified by global employers without needing to leave their country. While this can be discussed under e-working (homeworking), it has further implications that require service to be given to the residents by the government such as issuing of national identities and credit that bear social security information and card numbers. In the same regard, the foreign exchange policy of the country is a closed one, this is to say an individual who is a citizen of Ethiopia cannot make or accept international payment without providing a formal letter from an institutes in Ethiopia to the banks in Ethiopia. See appendix F of this research document for the discussion made with CBE.

8.1.11. Awareness Creation among Residents

The research findings indicate that residents (respondents) are mostly computer literates. They are also accustomed to the internet for their different living, working and learning activities. As formal participation on E-Learning and E-working comes with a more organized and procedural manner, respective concerned bodies of the city should create proper awareness among the residents upon implementation of E-Working (Homeworking) and E-Learning (Learning from Home). As far as global economy participation is concerned, digital communication contain scam and residents need to be aware of them. See box 2 under section 3.4.1 of this document to have more understanding how scams are recognized.

8.1.12. Policy for E-Learning (working from home) and E-Working (Homeworking)

While implementation of homeworking and home learning, there should also be a policy at the country level and contracts between the home workers and their employers to govern and keep the rights and health of the Homeworkers and E-learners and their employers. Home workers can experience social exclusion due to an enclosed work environment but if there would a large scale policy to cover the high interest of the residents to work from home, the condominium sites will comprise several numbers of individuals who will be with in the vicinity of the housing development.

In this case, an implication can be that the local environment of the condominium housing area will thrive socially and economically due to the presence of these workers and students in large number at the housing development for long periods of the day with their flexible work schedules and unlimited potentials addressed through cyber technology locally and globally.

8.1.13. Equity

The introduction of technology to housing developments brings equity among the residents of the city in access to information, job opportunities and to education. Therefore the consideration of technology integration in housing developments is important. This can benefit the stay home mothers or individuals with disability who had to stop their education and low income families who do not have computers or internet access at their homes. We can take in to consideration the case stories from all the three sites where the residents point out the facts. Sections 5.2.5.1 and 5.3.5.1 contain case stories of residents Enanu and Ali for detailed information of the fact. As shown in the sections 6.1.6, 6.2.6 and 6.3.5 different residents with different combinations of attributes such as income, distance from inner city services, etc. can make use of the E-working activity to get on with their work lives that is suitable to their conditions to keep up with their duties having similar opportunity as their peers who have a better privilege than them. As the E-Learning and E-working animates the housing areas all day long small business owners will have a good share of customers as their competitions (corporate businesses in the inner cities), they will have a relatively equal chance of making their lives better.

8.1.14. Further Implications of the research findings in developments of the city Addis Ababa

8.1.14.1. Reduction of Migration as an Advantage of Technology integration in Housing

Physical migration can be changed in to cyber migration as mentioned in the literature review of this document referencing the UNDP, more than 1 billion people will enter the job market in less than three years, most of them from low- and lower-middle-income countries. Increases in access to the Internet have led to the emergence of a new world of work, with major international institutions suggesting that workers could frictionlessly compete in a global marketplace by way of online platforms. Economists have previously suggested that access to Internet-based marketplaces would permit a kind of "**virtual migration**" that offers economic benefits akin to physical migration.

Integration of ICT in urban and settlement development can reduce urban migration. The study on Bole Arabsa project 15 condominium sites, one of the cases of this research showed 100% interest for E-Working (Homeworking) and E-Learning (Learning From home) . The characteristic of this site is that it is the most remote from social infrastructures of the city relative to the other sites Enderase and Mickey Leland condominiums. This can be an indication that the migration from other cities of Ethiopia to Addis Ababa which is increasing the population size of the city at a level where it is creating housing provision problems can be reduced if the developments of these cities can integrate Homeworking (E-Working) and E-Learning. This is by considering the fact that the migrating people can have the cities advantages while living in their original regions.

8.1.14.2. Overlapping Development of Different Zones for building more efficient City

Findings of this research show that in addition to the fact that there is still shortage of housing, there is a large problem in the day to day activities of the residents in getting to and from work and school as a result of massive traffic conjunction and long distance between the homes and workplaces and schools. The research also indicates the overlapping of the city zones that will be created through introduction of E-Learning and E-Working to housing development will ultimately unburden the economic difficulty of the city in addressing the housing deficit in the city. As a result, these should be seen as an opportunity to further development of housing, to boost the housing provision capacity of the city. By planning different zones like Living, Working and Learning in an overlapping fashion, it is possible to reduce the infrastructure needed to implement a segregated development. This is of course by first mechanizing a system that would allow the overlapping of activities. This can be realized by introducing technology devices that can be supported by implication of different policies and strategies that will facilitate the process.

By mostly adapting the current residential infrastructures to accommodate the different tasks as education and work, this can also be supported by looking in to possibilities where by it is appropriate to reduce corporate cultured building development empowerment. Also convert a portion of them, corporate buildings, to a hybrid buildings where these buildings should incorporate living and learning activity. A new hybrid development type is generally an interest of this research based on the following information. The proposed multitasking of housing will relieve load of intensive infrastructure usage in the urban fabric of the city. As portion of the community will be Home Working (E-Working) and E-Learning, there will be reduction of traffic and less need for office infrastructures and office spaces. Office or business owners are worrying about the performance and the reduced effective hours of their employees. Therefore they would be flexible on the idea of allowing their employees to work from home as long as the infrastructure needed is in place.

This will directly translates to suggesting that the government can transfer budget from building further corporate buildings in to developing more housing infrastructures that can multitask for living, education and work that are equipped with the technological infrastructures that would allow these housing developments to multitask. This will in turn help to envision a city for humans' living, working and learning in an environment that is flexible to their characters and situations. **By taking in to consideration, the affiliations of residents indicated in the researcher's literature study regarding living, learning, and work, we can further study four categories of interests: Residents who have interest using living places for work (E-Working); Residents who have interest to use their living place for study (E-learning); Residents who use their houses for both study and work; Residents who use their houses only for living.**
According to the literatures studied, residents want to use their living places for work and education, due to their interest for: **Flexibility of working conditions and hours; Reduce time wasted on transportation; Effective output when work and study from home or e-learning; For those who have family to care for better access to the family care activity and at the same time work or learn.**

The existing infrastructure situations of urban zoning (with regard to only education, work and living) against current social affiliation that is not addressed with infrastructure can theoretically be summarized with the figures 70 and 71 below.

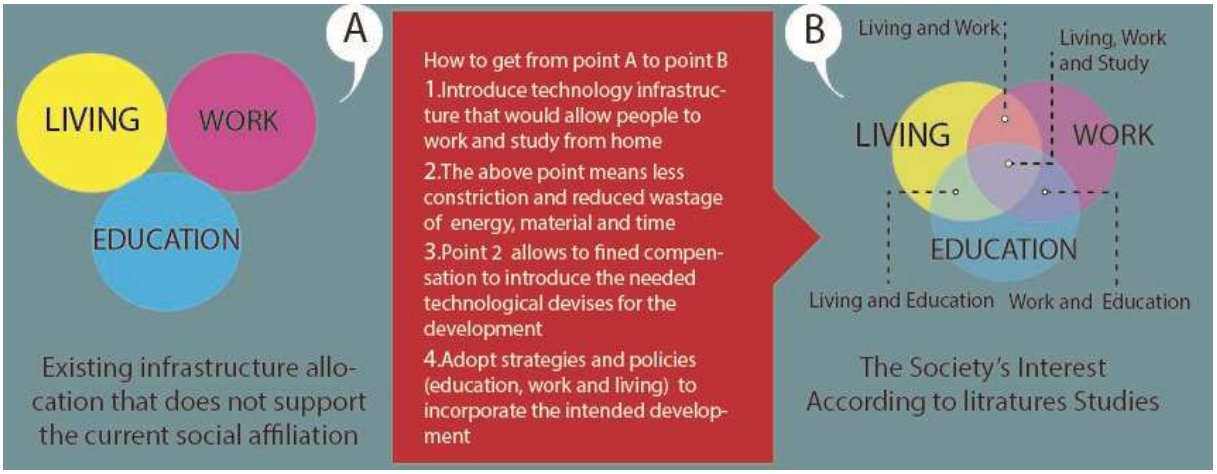


Figure 70: Current infrastructure and social interest and how to change option A to B.

The above figure shows Current infrastructure situation and the current social affiliation shown left and right respectively. The left side of the figure, shows current zones being not intersected and are separated. There by all residents have to go to all the three zones to go through their day. On the right side of the figure, all zones are intersected and show the social affiliation or interest. This kind of development is not usual. But yet, practically the figure represents the interest of residents. To change scenarios on the left side of the figure to the right side, we can consider the following measures:

1. Introduce technology infrastructure that would allow people to work and study from home or e-learning
2. If portion of a people would work and learn from home less constriction and reduced wastage of energy, material and time will be a possibility.
3. Less construction, reduction of energy waste means it is possible to fined compensation to introduce the possible proposed (implicated) development needed technological devices for the development
4. Adopt strategies and policies (education, work and living) to incorporate the intended development

Furthermore the division of work and education can be seen in the figure below

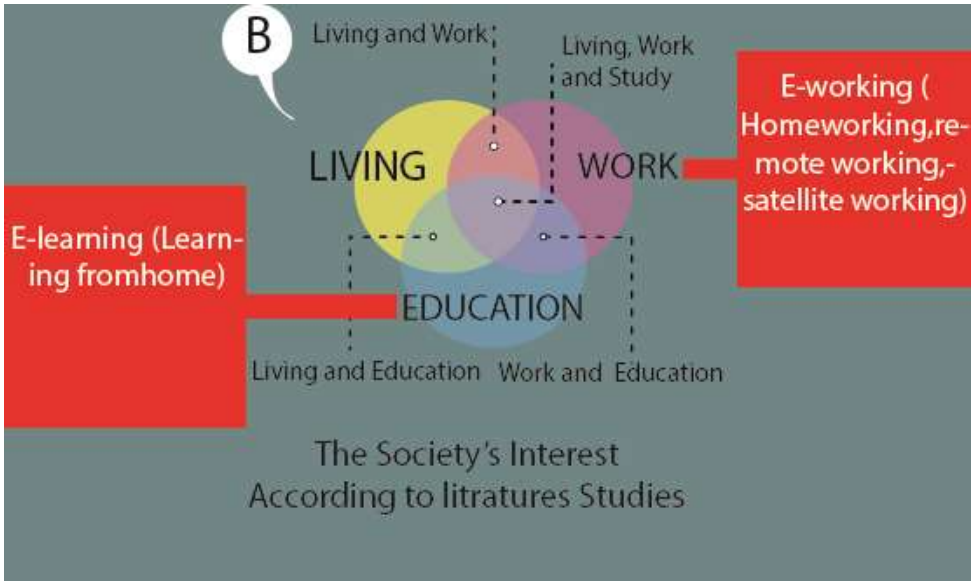


Figure 71: Division of work and education

The above Figure shows further division of work from home and education from home (e-learning).

In order to meet the interest of the people, we will have to actually construct less because the intersection of zones will maximize effective use of space and time. Energy and material (machinery) lost in transportation, pollution of environment will reduce. As the intersection means, less construction; material, time and capital will be saved. If the research shall go to suggestion of any strategy, this conclusion will mean that the technological devices needed to address the research goals can be compensated from the time and money saved in creating the hybrid buildings/ house/office/school supported by homeworking and learning from home.

8.1.15. Financing the Integration of E-Learning, E-Working and the Supportive Technology Laboratories

As shown in the data presentation of this document under subchapters showing residents profile, residents earn a mothy income that ranges between 2,000 ETB to 19,000 ETB. With majority of the residents earning above 5,000 ETB. Nevertheless 80% of residents at Mickey Leland, 100% of respondents at Bole Arabsa Project 15 site and 45% of residents at Enderase condominium are Rentals and are not occupied by the owners. Therefore the moderate income seen from the data might not provide a full evidence to suggest that residents can afford to cover the cost of the infrastructure that is required to integrate e-learning and e-working.

Therefore considering government (ministry of education and Addis Ababa Housing agency), Ethiotelecom, NGOs and employers of homeworkers for subsidy is a logical recommendation for financing the incorporation of homeworking, learning from home and supportive infrastructures. In the case of technology laboratories private developers can be considered as these laboratories can generate income if they are planed in such a way that they can give service to external bodies.

8.1.16. Further Research Required

More researches with bigger sample size should be done to have a more detailed input and analysis about the research topic. The data collection for this research is done during a very short period of time as a result small scale of sample is consumed for analysis. This is due to time and shortage of budget allocated for the research activity. Such reality has created some limitations in constructing a more defined theories and end products for predictions and estimations. Furthermore Architectural, Local Development Plans (ILDPs) and Neighborhood Designs (NHDs) that are seen through spatial understanding of the digital services should be investigated in detail.

8.2. Spatial Recommendations (illustrations) through Visual Medias

This section of the research should not be mistaken with Local Development Plan (LDP) or neighborhood Design (NHD). This subchapter is intended to provide visual illustrations that are linked to some of the particular recommendations. The visual recommendations use site plans, floor plans, three dimensional illustration, text descriptions and diagrams prepared by the researcher. The recommendation comprises illustration of spaces recommended by the residents and expansion spaces for e-learning, e-working and technology laboratories. The recommendation illustrates the use

of the communal blocks of the three sites as possible rooms for technology laboratories as the communal blocks are located in central fashions for the different groups of the condominium block clusters. The recommendation also illustrates lay out of the LAN and WLAN infrastructures that are seen both for cluster level and household unit level. Choice of devices is also included in the recommendations. List of devices recommended for households do not include smart televisions and computers but are important in cases where central facilities are not possible to be furnished with this devices (equipment).

8.2.1. Principles for Spatial Recommendations

The following principles are considered in order to layout the spatial recommendation of the research.

- This can be an extended read from section 8.1.7 of the above subchapters. Layout at level of the housing development should be considered with three options: (1) Avoid the installation of underground cables whenever possible. Use instead a Wi-Fi service system that entails WLAN and related devices required. Use a proposed municipal tower as a service resource for internet that can be brought to the site through an Access Point (AP) with a specification of outdoor Waterproof Long Range Video Wi-Fi Wireless Relay Transmitter Receiver. In the site at hand (or Ethernet connection to service provider just to this AP) and form this access point provide all other access points and devices at the site: PC, laptop, phones and tablets, smart TVs, etc. (2) Second option is to connect access points and routers to an underground municipal cable and distribute services to all other access points and devices at the site: PC, laptop, phones, tablets, Smart TVs, etc. During both options routers that assign IP address should installed before every access point. IP addresses assigned by routers provide firewalls between the local network (Network at the site) and the Internet for security. (3) Vociferation of using a hybrid of the above two options. Hybrid of both LAN and WLAN. See the figure 72 below for illustration of the above mentioned options.

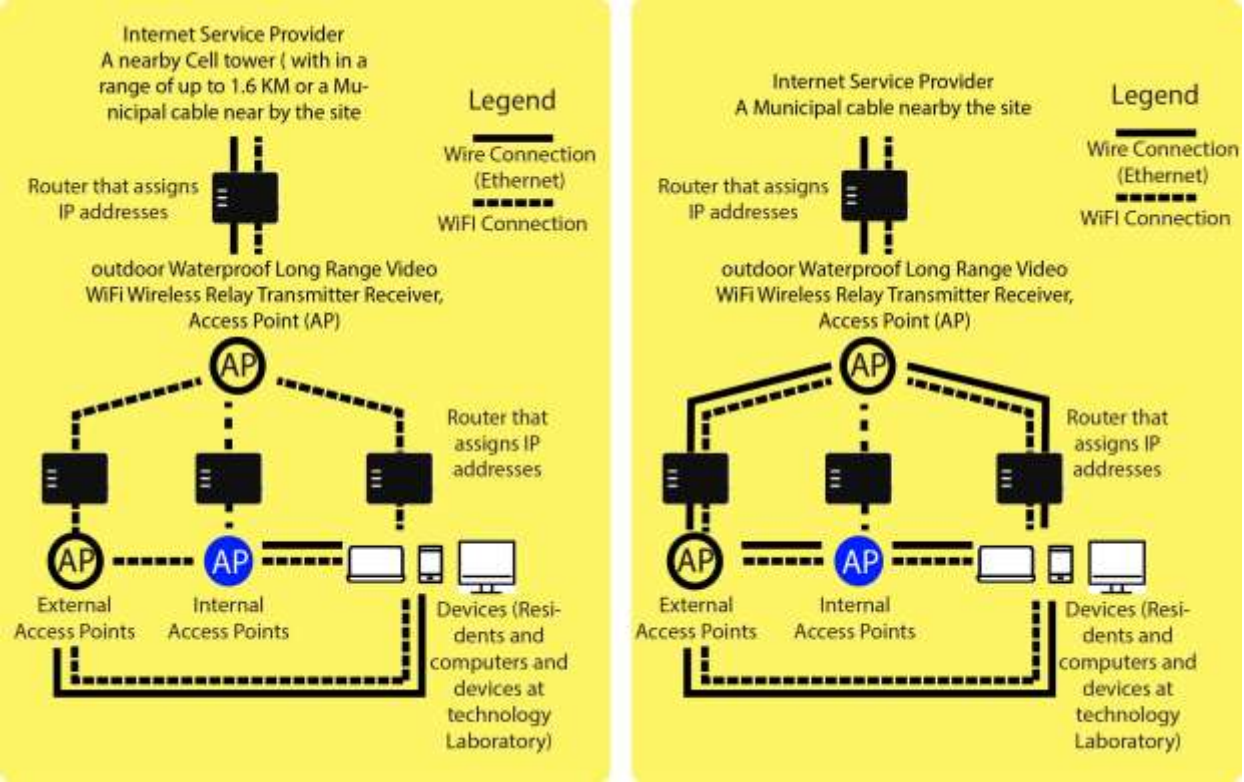


Figure 72: on the left option one with minimum use of cable connection and on the right with both cable and Wi-Fi connection installed alternatively.
Source: Owen

- Once the internet cable reaches the site, it is distributed among clusters of the site by passing through further manholes, distributers and controllers according to the specific needs of clusters of the locale bocks.
- The general lay out of the internet can be categorized in different levels:

    - External access points for clusters of blocks and outdoor functions
    - At communal blocks for central usage of common computer lab and supportive laboratory at communal block.
    - Access points at each block for that are further distributed to every household that are further divided/ distributed to local spaces of the house hold units such as bed rooms and living rooms or proposed office spaces.

- While planning the external access points, the outdoor activities of resident's should be taken in to consideration. External access points in addition to the consideration of aesthetics and human scaling, factors such as weather conditions and durability should be taken in to consideration.
- In case external access points implementation, land scape elements can be used as defining / organizing objects for arrangement. In such fashion the implementation can facilitate and complement outdoor space usage (including parking spaces) of the sites.
- In case of sites where the primary land use plan is envisioned with spaces for expansion or facilities such us youth centers, these can be seen as an opportunity to develop the supportive technology laboratories in a grand scale and central fashion among with smaller

laboratories that can be incorporated within the existing communal blocks of the condominium sites.

- All condominium sites have communal blocks that are evenly distributed among the residential and mixed use blocks. This fact makes the communal blocks ideal rooms to incorporate common computer and other supportive technology laboratories.

- In case of sites like Enderase where the existing communal blocks completely used up for different functions such as committee office, stores and kitchen, expansion is necessary to incorporate the supportive technology laboratories. Therefore in order to reduce the negative impact on reduction of outdoor spaces, it is mandatory to elevate the expanded portion of the additional development to level the ground floor space open for different outdoor activities (including parking).

- In case of sites such as Mickey Leland where primary/ existing land use is devoid of spaces left for youth centers , secondary and elementary schools, it is yet important to elevate the additional developments for supportive technology laboratories.

- Still in cases of sites like Mickey Leland it is recommendable to have central developments such as youth centers and other central facilities in addition to the technology laboratories as a result of their large area coverage and large number of population .Strategic incorporation of these developments is necessary. Take into consideration for example the poorly defined round about at Mickey Leland site and attempt to better define it and also elevate the development so ground floor is open for physical and visual access.

- Where the family size is smaller and rearrangement of spaces is enough, the extreme conditions should only be adding partition walls by careful study of the resident's space usage. Most respondent shave suggested the rearrangement of their existing spaces and structural expansion is not needed. In the rare cases of household units where the house hold size is bigger and homeworkers need additional space, it we can optionally expand the spaces with additional office space through careful study of structural, spatial and aesthetical considerations.

8.2.2. Visual Spatial Recommendation for Enderase Condominium Site

This site has two condominium blocks namely B1 and B2 for the purpose of this research broken down to B1a, B1b and B2. And has one communal block see table 2 of this document for more information. This visual decryption is made based on the findings and recommendations of this research.

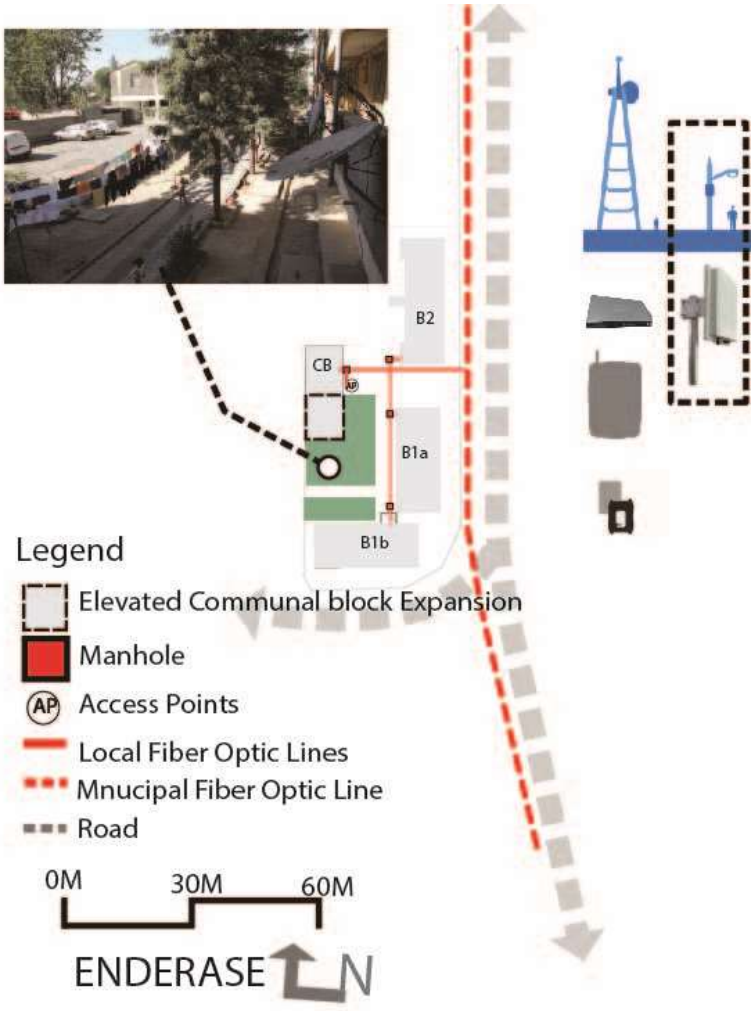


Figure 73: Fiber optics lay out proposal
The above Figure showing the fiber optics internet lay out site plan proposed for the conceptual design of Enderase condominium.

List of devices

- Towers and Cells for external access points
- Routers
- Wi-Fi devise
- Network Boosters

According to the spatial conditions of the site at hand use (1) an outdoor Waterproof Long Range Video Wi-Fi Wireless Relay Transmitter Receiver on relatively short poles for the external access points (AP). They can receive signals from public signals as far as 1.6Km or connect it to a municipal fiber optics lines nearby and you can distribute the signal form this AP to routers at specific public spaces and households. This provides a relatively good transmission as it is possible to distribute the signal by avoiding barriers. If they are scaled, they can be flexible and aesthetically appealing. They will be integrated to the neighborhood activities. Or (2) use generally wall mounted Wi-Fi devices on the corridors of the blocks or landscape elements.
Wi-Fi devise can be placed in the external landscape area by means of using structures (elements like low walls) in the landscape to cover it from rain and other environmental situations this can be used instead of poles in cases of little financial conditions.

It is important to use router that is assigned with IP address and provide a firewall between local network and the Internet. This is to provide security at all times to the users or residents of the site. As the site Enderase is a relatively small site with few number of blocks, we can use a Point to Multipoint Wireless Internet Service Provider model where we can use a single external access point that is initially connected to the internet and service all users (laptops, computers, phones, tablets, smart TVs, ETC). This AP can be places on a roof of the communal building or a relatively tall pole for better receiving and transmitting signals.

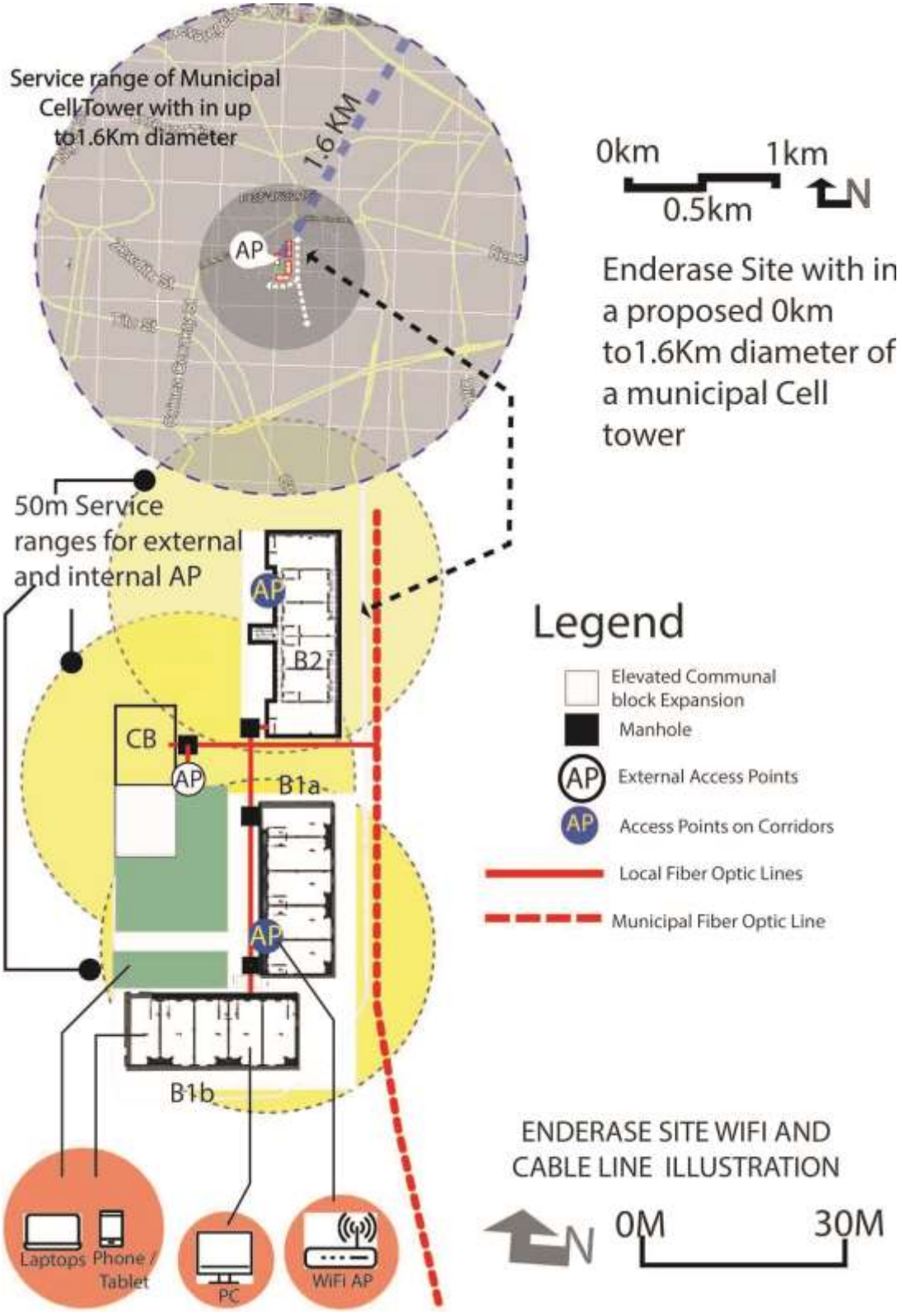


Figure 74: A map showing a proposed Cell tower service with in a diameter of 1.6 KM above. And an illustration showing Wi-Fi and a fiber optics line installation at a selected cluster of blocks at Enderase site below.

The Enderase condominium site is relatively small and compact. The outdoor space is exhausted with activities needed for the residents. In addition to that, the housing units have small sized rooms. For

the integration of homeworking and learning from home (e-learning) the residents have (1) suggested to use living room space or (2) bed room space. Moreover single families and families without children have (3) suggested converting one of their rooms for the needed functions. Yet if integration of Homeworking and learning from home is going to be considered it is only logical to design for the extremes. Families who showed concern about space. The following diagram is shows the proposed expansion plans for the development of this visual illustration. The (4) elevated expansion area for the laboratory is a needed expansion whereas the (5) expansion areas for the household units optional is considered for this visual illustration to show what can extreme measure can look like in case of expansion of spaces is needed.

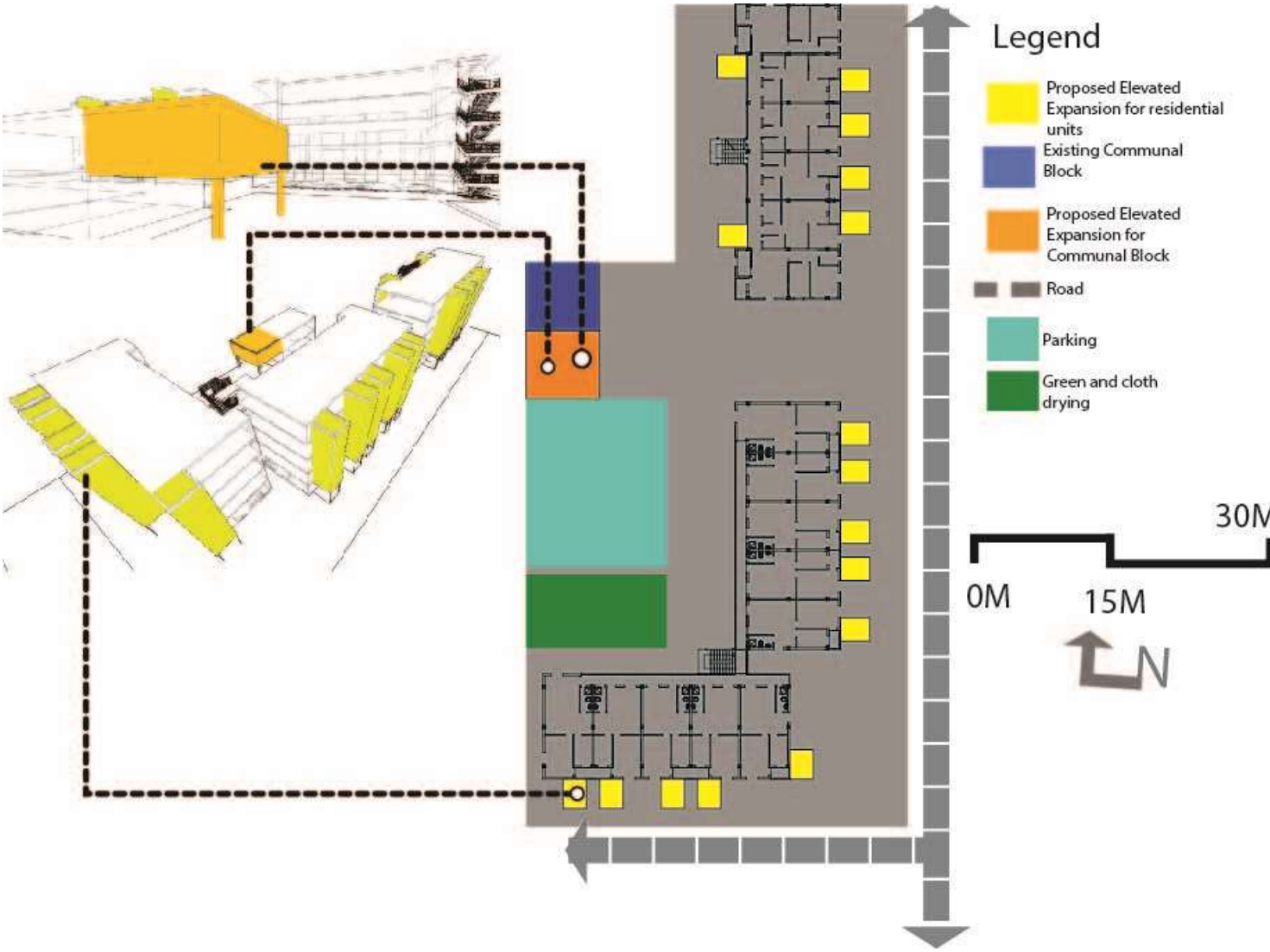


Figure 75: The expansion plan for the residential units and the communal block.

All expansion spaces are buildings elevated from the ground floor plan to leave the needed common circulation spaces open. In case of the expansion for the communal block, car parking is the already existing function. The elevated expansion to the communal building is intended for Technology laboratory that is supportive to e-learning and e-working. See 4.5 subchapter of this document to understand Supportive Technology Laboratories.

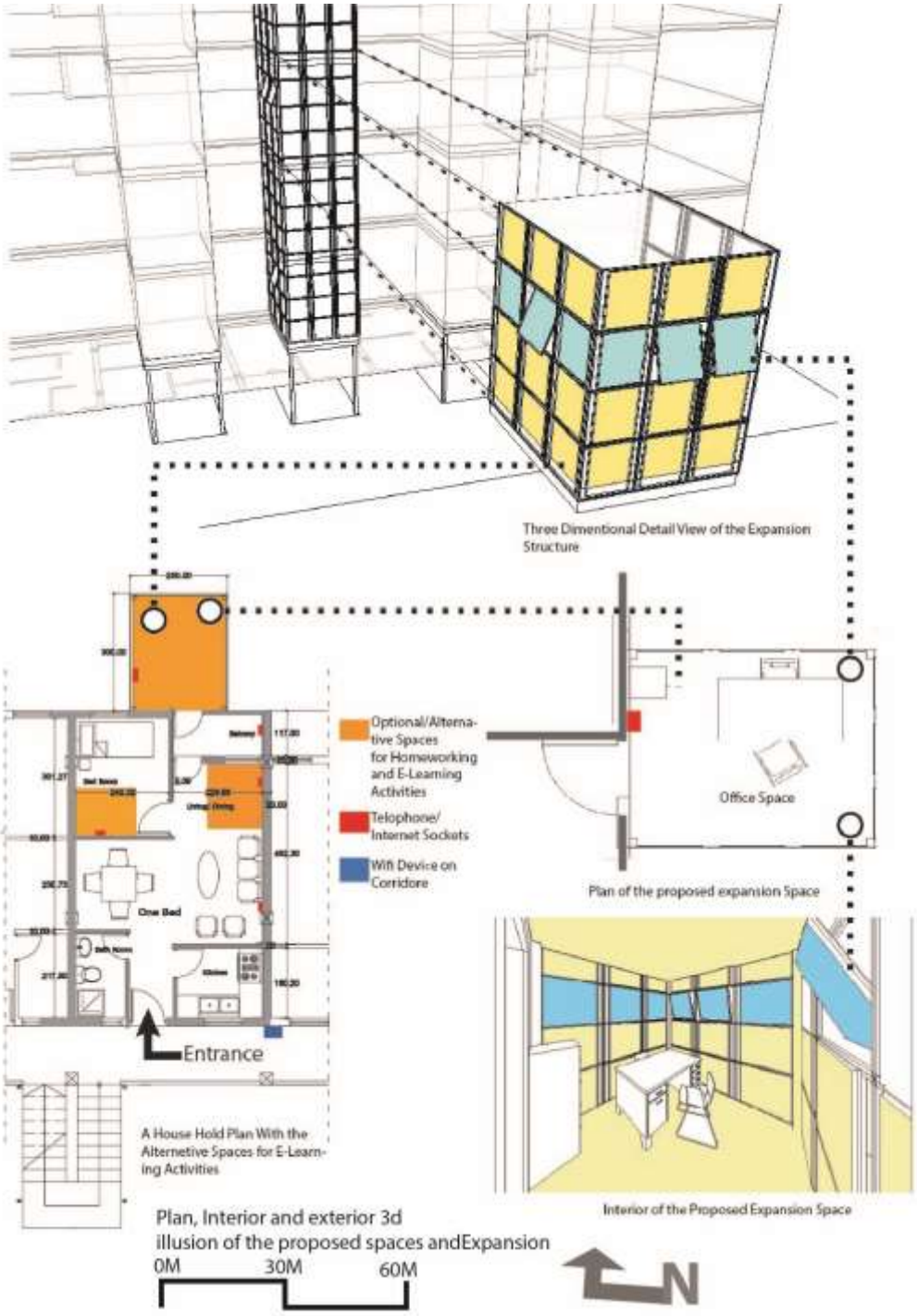


Figure 76: Plan, interior and 3D details
The above figure shows Plan Layout of a House Hold, Interior and exterior 3D Detail of the proposed Expansion Area.

8.2.3. Visual Spatial Recommendation for Mickey Leland Condominium Site

Based on the information found from the housing development project office, the site has 27 communal blocks and 127 mixed and residential blocks and the site houses 4637 households. This

following conceptual design is made based on the findings and recommendations of this research and making use of Google Earth maps to crosscheck between the secondary data from the housing development project office. Mickey Leland condominium site has only two kindergartens and no other communal service functions like elementary schools, youth centers even at the level of preparation of the land use map, plan. More services are planned on the Bole Arabsa site unlike the other two sites, Enderase and Mickey Leland condominium sites. The Enderase condominium site has a very little amount of blocks and is located closer to the inner city functions (services) that can be mentioned as a possible reason for omitting the addition of services like kindergartens, elementary schools and the like.

Since the site has a very large community, needs the mentioned services such as: more kindergarten, elementary schools, high schools, youth centers and the like. While the purpose of this conceptual design is to establish a way to incorporate internet, computer labs, services at house hold level and common service areas, and also Supportive technology laboratories at community level, it is important to consider the missing functions mentioned above as well to make the proposal more logical and effective. The following map shows the selected area for adding the needed functions that are missing on the land use map, plan, of the site Mickey Leland. The roundabout which is central to all localities of the site is recommended to place the Technology Laboratories, internet (computer labs), elementary school, high school, youth center, and other services that can be places as mixed use functions for lease. See the 4.5 subchapter of this document to understand about technology Laboratories, specifically: digital fabrication laboratories and workshops. The Mickey Leland condominium site has a large round about as seen in the figure 77 below.

Figure 77: Illustration showing proposed and existing land use for Mickey Leland on the left and Bole Arabsa Project 15 on the right
Source: own map based on google and information gathered from housing development office.

This round about is not well defined as blocks around it are haphazardly placed and are not creating a sense of place. Therefore it is more logical to pace the supportive technology laboratories and the common computer labs on an elevated block that will general make a positive addition to the site by making a proper definition to the roundabout. As seen in the figure 78 below, the proposed blocks

around the roundabout of the site need to be elevated to avoid the disconnection between the street and the randomly placed mixed use blocks around the roundabout. The proposed structures are elevated and are three stories including the open ground floor. See figure 78 blow. The figure also shows the plan lay out of a cluster showing a proposal of internet installation (layout) for a selected cluster. As the site Mickey Leland is a relatively large site with large number of blocks, we cannot cover the whole site by a Point to Multipoint Wireless Internet Service Provider model. For this site it is better to consider Mesh (Neighbor-to-neighbor Networks) service provider model that can help create a complex network between AP in the site and Clients (Laptops, computers, phones, tablets, smart TVs, ETC). External APs can be places on roofs of buildings or relatively tall poles to get Clear line of sight (LOS) for better receiving and transmitting signals.

According to the housing development project office, Bole Arabsa Project 15 Condominium Site has 16 communal blocks and 174 residential and mixed use blocks. It houses 5193 households. Unlike the two sites, Enderase and Mickey Leland condominiums, Bole Arabsa Project 15's land use map, plan incorporates five kindergartens, one elementary school and one youth center. This fact offers an opportunity to integrate the intended functions internet services (computer labs) and supportive Technology Laboratories in the existing land use plan. As such this conceptual design endeavor can be concluded by proposing the integration of internet services (computer labs) and laboratories in the proposed youth center area on the land use. See also figure 78 below to see the internet lay out proposal for blocks with in the selected cluster.

List of devices

- Towers and Cells for external access points
- Routers
- Wi-Fi device
- Network Boosters

According to the spatial conditions of the site at hand use (1) an outdoor Waterproof Long Range Video Wi-Fi Wireless Relay Transmitter Receiver on relatively short poles for the external access points (AP). They can receive signals from public signals as far as 1.6Km or connect it to a municipal fiber optics lines nearby and you can distribute the signal form this AP to routers at specific public spaces and households. This provides a relatively good transmission as it is possible to distribute the signal by avoiding barriers. If they are scaled, they can be flexible and aesthetically appealing. They will be integrated to the neighborhood activities. Or (2) use generally wall mounted Wi-Fi devices on the corridors of the blocks or landscape elements.

Wi-Fi devise can be placed in the external landscape area by means of using structures (elements like low walls) in the landscape to cover it from rain and other environmental situations this can be used instead of poles in cases of little financial conditions.

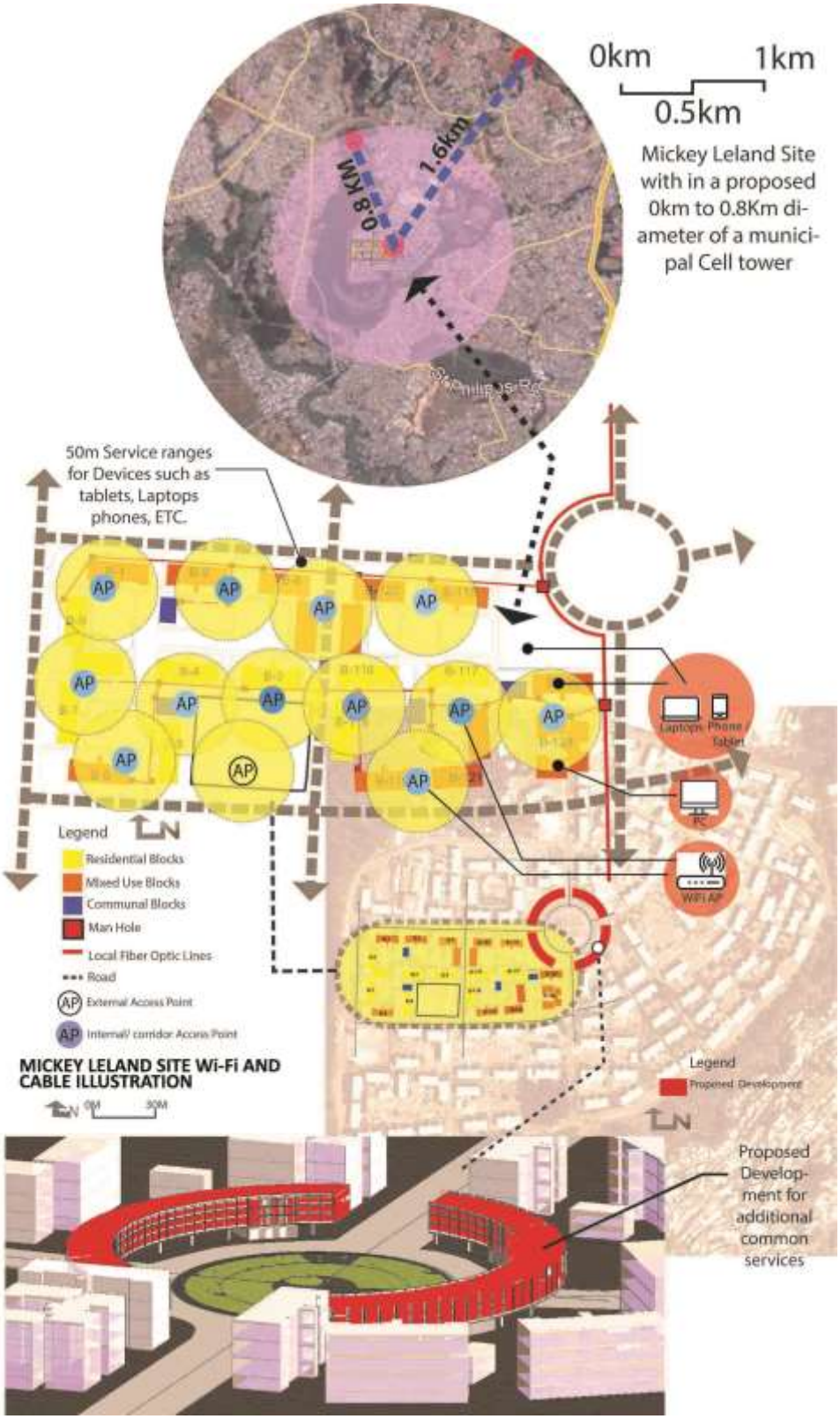
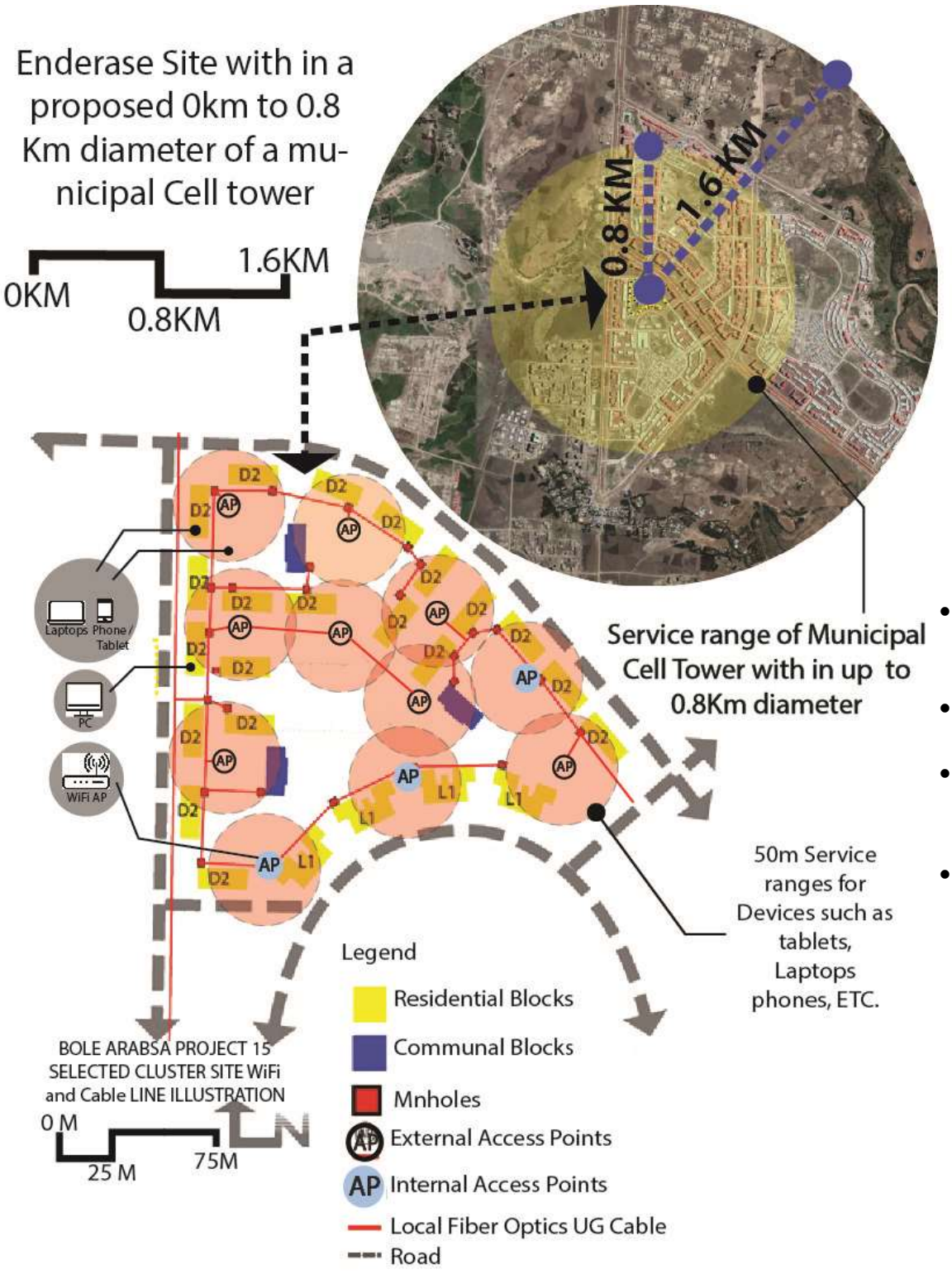


Figure 78: A map showing a proposed Cell tower service with in a diameter of 1.6 KM above. An illustration showing Wi-Fi and a fiber optics line installation at a selected cluster of blocks at Mickey Leland site in the middle and three dimensional study of proposed expansion area below.

8.2.4. Spatial Recommendation for Bole Arabsa Project 15 Site



List of devices

- Towers and Cells for exter access points
- Router
- Wi fi devise
- Network Boosters

Figure 79: A map showing a proposed Cell tower service with in a diameter of 1.6 KM above. And an illustration showing Wi-Fi and a fiber optics line installation at a selected cluster of blocks at Enderase site below.
The above figure shows Internet lay out and proposed Technology Laboratories.
The above figure shows Proposed internet lay out for blocks of selected cluster and proposed internet lab and fabrication and technology lab.

By considering use of towers at development strategy at city level, it is also convenient to use small cells as external access points. Small Cells are flexible and aesthetically appealing and they will be scaled to the neighbored hood activities. Usage of general wall mounted Wi-Fi devices on the corridors of the blocks or landscape elements is also an alternative. Wi-Fi devise can be placed in the external landscape area by means of using structures (elements like low walls) in the land scape to cover it from rain and other environmental situations. This can be used instead of cells in cases of poor financial conditions

8.2.5. Spatial Recommendation for Communal Computer Laboratories and Supportive Technology Laboratories for E-learning and E-working

Among the three studied sites Mickey Leland and Enderase sites are planed without consideration for further development expansions of youth centres, schools and other service centres. Therefore, integration of the supportive technology laboratories requires a strategic expansion of the communal blocks provided for Enderase site and for Mickey Leland. In addition to expansion of the communal blocks, the laboratories can be integrated in the indicated proposed circular elevated structure proposed on this research. See figure 77 and 78.

The programs to be considered for these centres (technology laboratories) can be analogous with the literature review on fablab Addis on subchapter 4.5 of this document. The visual description and the programs to be considered can be as follows:

The proposed laboratory may incorporate functions that will enable users to carry out the following activities that support e-learning and homeworking objectives (these programs are adopted from the Fab Academy) : **Principles and practices, Project management, Computer-aided design, Computer-controlled cutting, Electronics production, 3d scanning and printing, Electronics design, Molding and casting, Embedded programming, Computer-controlled machining, Input devices, Composites, Interface and application programming, Output devices, Networking and communications, Mechanical design, Machine design, Applications and implications, project development, Invention, intellectual property, and business models.**

The machines needed to furnish the project with can be the following in text, they are also illustrated in picture on figure 81:

(1) 3d printer (2) Laser cutter (3) Shopbot or Torchmate (CNC) (4) Modela (small - CNC) (5) Vinyl Cutter (6) 3D scanning (7) polycome with plasma TV (8) power tools and Manual tools (Jigsaw, Bandsaw, hot wire , Cutters and related other tools). see figure 80 and 81 below for illustration of the tools.

In the list above or the figure below internet devices and computers are not added but are necessary for the center. With further analysis the center can include traditional (local) craftsperson's workshop to incorporate and transform as well as preserve the context of the community through production or in general learning and making.

Figure 80: Digital, Power and Manual Tools for Technology laboratories
Source, Pictures from fab academy directory, the internet and pictures taken by the researcher

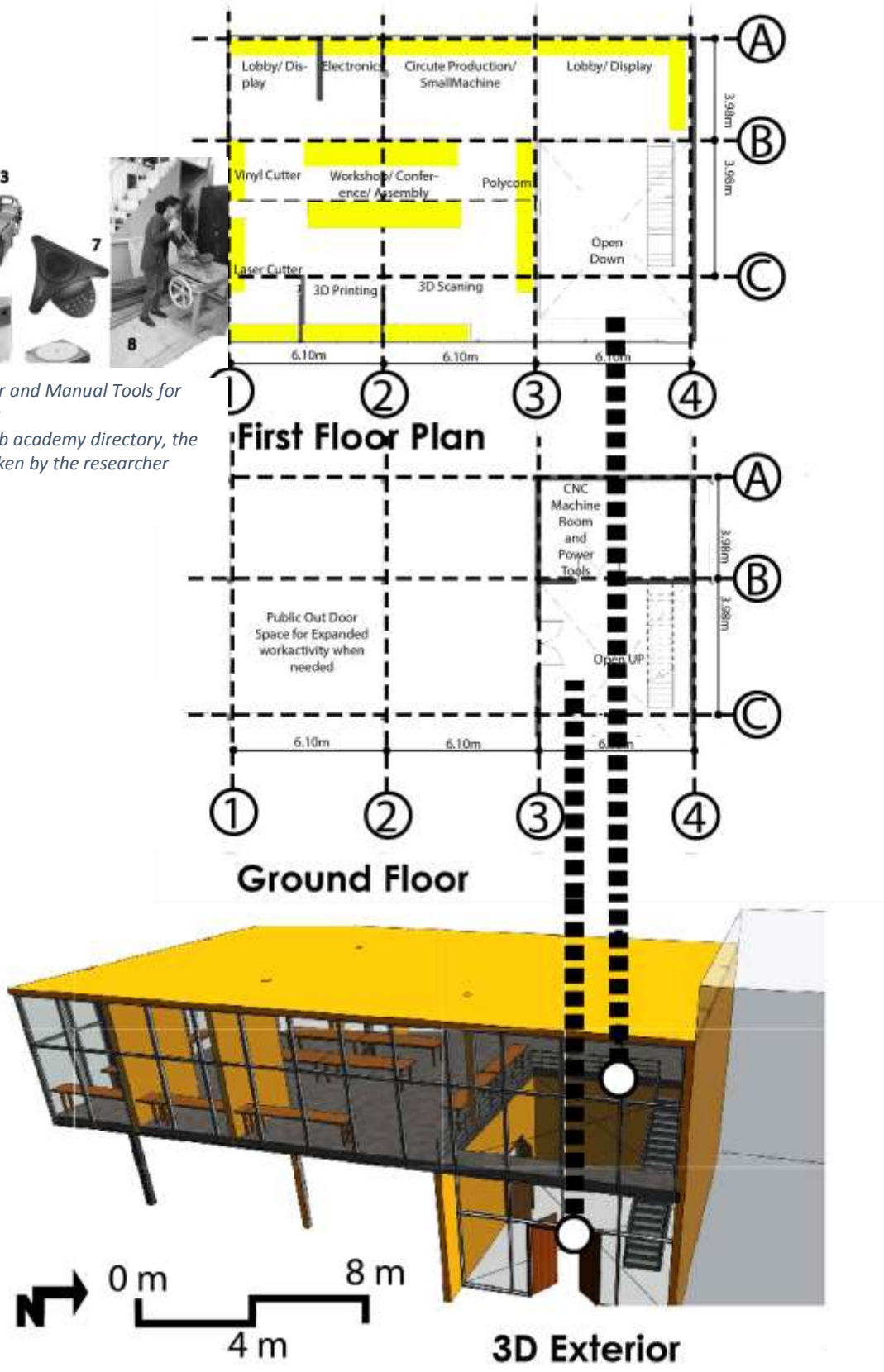


Figure 81: Supportive Technology Laboratory spatial recommendation,
Source: Own

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APPENDIX

Appendix A: Structured Closed and Open Ended Questionnaire (Key Informants)

Key Informant questionnaire for housing experts at housing development agency, bureau, etc. Completed.

_____

Date: _____Time:_____

1. **Personal Profile**

1.1. Name_____Gender_____Position_____
_____
_____.

1.2. Length of work experience at this position _____

1.3. Role in the Development of Selected Condominium Site?
_____
_____.

2. **Housing development bureau and its advantages in facilitating housing developments in the city specifically the condominium housing.**

2.1. When was the new housing agency established? _____. How is establishing the housing agency in a new and autonomous way can benefit housing development (compare and contrast with the previous housing agency)?_____
_____
_____
_____
_____.

2.2. What are the goals and visions of the housing agency?
_____
_____

2.3. Concerning technology usage in condominium housing, how do you see the condominium housing in relation to your general experience and in regards to the goals of the agency_____
_____

2.4. **Does the housing agency directly communicate with the technology infrastructure providing organizations in the city while developing or after? Yes □ No □. If yes, with what capacity and character_____ _____.if no, do you have any plan to do so in the future? Yes □ No □.**

2.5. **How do you describe the challenges households of condominiums to get to and from work and learning with regards to transportation, and other infrastructures in the city? - _____ _____.**

2.6. **Do you think provided that these housing units are upgraded with the necessary technological infrastructure, E-Learning and Home Working (E-Working) can be a solution to the challenges seen in the light of reducing traffic and maximizing learning and work hours? ?_____ _____ _____.**

2.7. **What kinds of technologies do the housing agency use to run its different functions? _____ _____.**

2.8. **How often does the agency (Plan to) upgrade its technology application and what methods does it use for upgrading? _____ _____ _____.**

2.9. **What are the policies underlining the activities of the agency?_____ _____ _____.**

Key Informant Questionnaire presented to Condominium Committees:

_____

Date: _____Time:_____

1. **Personal Profile**

   1.1. Name_____Gender_____Position_____
   _____
   _____.

   1.2. Length of work experience at this position _____

2. **What are the goals and visions of the committe?_____**
   _____.
3. **What are the services the committee give to the community of the condominium?_____**
   _____.
4. **Does the committee has the needed facilities to carry out its tasks? Yes □ No □. If yes, what are the facilities?_____**
   _____. If no, does the committee plan to upgrade the area with the needed facilities?
   _____
   _____.
5. **What are the policies underlining the activities of the committee?_____**
   _____
   _____.
6. **What kinds of technologies do the committee use to run its different functions?**
   _____
   _____.
7. **How often does the committee upgrade its technology application and what methods does it use for upgrading?**
   _____
   _____
   _____.
8. **How do you describe the interest of the residents to access education and work by means online facilities (work from home and online education)?**
   _____
   _____
   _____.
   Do you think the community of the condominium site will benefit from online education, distance education and work from home? Yes □ No □. If yes

how?_____

____.

Key Informant questionnaire presented to Telecommunication experts and managers

_____

Date: _____Time:_____

1. Personal Profile

1.1. Name_____Gender_____Position_____

_____

_____.

1.2. Length of work experience at this position _____

2. What are the goals and visions of Tellecommunication?_____

_____.

3. What is the role of Telecommunication in providing access to information to the residents of Addis Ababa?

_____

_____.

4. How do you describe the level (quality, type and magnitude) of usage of information by the residents of Addis Ababa? (work, education and social)_____

_____.

5. What are the policies underlining the activities of Tellecommunication?_____

_____

_____.

6. What kinds of technologies do telecommunication use to run its different functions?

_____

_____.

7. How often does Telecommunication (Plan to) upgrade its technology application and what methods does it use for upgrading?

_____

_____

_____.

8. How do you describe the interest of the residents to access international (global) reach in regards to education and work seen in the light of purchasing and selling services or objects by means of online method?

_____

_____

_____.

9. What kinds of services do telecommunication give to residents of the city?_____

_____.

Key Informant questionnaire presented to Ministry of Education:

Date: _____Time:_____

10. **Personal Profile**

10.1. **Name_____Gender_____Position_____**
_____
_____.

10.2. **Length of work experience at this position _____**

11. **What are the goals and visions of Ministry of education?**
_____
_____.

12. **What is the role of ministry of education in providing access to education to the residents of Addis Ababa?**
_____
_____.

13. **What are the policies underlining the activities of ministry of euction?_____**
_____
_____.

14. **What kinds of technologies do telecommunication use to run its different functions?**
_____
_____.

15. **How often does Telecommunication (Plan to) upgrade its technology application and what methods does it use for upgrading?**
_____
_____
_____.

16. **How do you describe the interest of the residents to access international (global) and local reach in regards to education by means of online method?**
_____
_____
_____.

17. **What kinds of education services (sectors) do ministry of education give to residents of the city?**
_____
_____.

18. **How do you see the plan of ministry of education in developing online education for residents of Addis Ababa?_____**
_____
_____.

Appendix B: Structured Closed and Open Ended Questionnaire (Residents)

Residents' questionnaire: Completed.

Date: _____Time:_____

1. Profile

1.1. House hold profile

Block and House number _____Tenure type _____Head of house hold_____

Period of stay_____ Family size _____(Male____Female____) Family monthly expenditure _____Food ____ House rent ____ Utilities____ School fee____ Transport____Family income _____

1.2. Personal Profile

1.2.1. Background

1.2.1.1. **Where did you come from before you started residing in the selected condominium site?_____ ____ Was the relocation convenient for you in terms of your plan for your life? Yes □ No □. If yes, how? If no, How?_____ _____ _____.**

1.2.1.2. **Are you employed? Yes □ No □ If yes, would you prefer if conditions are mate to work from home? Yes □ No □ If yes, why? -**
_____ _____

1.2.1.3. **Do you prefer your economic activity and education activity to be located within your household ? Yes □ No □ why?**
_____ _____

1.2.1.4. **What is your ambition in life and what set of skills have you developed throughout your life formally and informally? If any of your experiences are related to any kind of technological conditions and ICT, please explain further with details.**
_____ _____ _____ _____.

1.2.1.5. **Would you consider Home Working (E-Working) and E-Learning provided that the policy of the city supports and the needed infrastructure is full filled in your neighborhood? Yes □ No □ why and how?**
_____ _____.

1.2.1.6. **Summary of personal profile**

No.	Name of respondent	Relationship in the HH	Gender	Age	Education status and field of study	Interest of online education (filed of study)	Marital status	Disability	(Income / expenditure)/ month	Kind of Employment (full or part time)	Special Skills	Job location and distance from home	Transportation to work (distance from work)	Interest to work, learn, innovate from home	Remark
1															
2															
3															
4															
5															
6															

1.3. Use of Technology

1.3.1. Technology Devices

1.3.1.1. Are there any kind of technology devices in your house hold? Yes ☐ No ☐.İf yes, what kind? _____.

1.3.1.2. Are there any kinds of technology devices you can operate? Yes □ No □. If yes, what kinds and for what purpose do you use them?_____ _____ _____. If no, do you have an interest to learn how to operate them? Yes □ No □. Do people in your household or community help you operate the devices? Yes □ No □. Are there any people in your house hold who can operate technology devices? Yes □ No □. If no, why? _____if yes, who and how many?_____.

1.3.1.3. Are any of your devices connected to the internet or government/ other organization facilities or the satellite? Yes □ No □. If yes, what are the devices and how are they connected?_____ _____.

1.3.1.4. Do you get any advantage concerning your work or learning from the social Medias? Yes □ No □. If yes, what are they?_____if no, do you have any plan to get these advantages in the future? Yes □ No □.

1.3.1.5. Are there any ways your neighborhood can benefit or is benefiting from these divises?_____
_____.

1.3.2. The Internet

1.3.2.1. General internet use

1.3.2.1.1. Do you know how to use the internet? Yes □ No □. If yes, for what purposes? _____If no, do you have any one in your community who help you to benefit from the internet? Yes □ No □. If yes, who and for what purposes?_____ If no, are there members of your house hold who uses the internet? Yes □ No □.if yes, how many? – _____.

1.3.2.2. Social Media

1.3.2.2.1. Do you use social media sites on the internet? Yes □ No □. If yes, What kinds of social media sites do you use?_____
_____. Which one of the above social media sites do you frequent? _____. How many friends do you have on each of these medias?_____. If no, why?_____ and do you have an interest to take part in the future? Yes ☐ No ☐.

1.3.2.2.2. Do you run any social media pages, groups or websites? Yes □ No □.if yes, for what purposes? _____.if no, why? _____and do you have any plan to take part in the future? Yes □ No □.

1.3.2.2.3. Are you a member of any social media groups or do you follow any social media pages? Yes □ No □. If yes, which kinds and for what purposes?_____
_____. If no, why?_____ and do you have an interest to take part in this regard in the future? Yes ☐ No ☐.

1.3.2.2.4. Do you get any advantage concerning your work or learning from the social Medias? Yes □ No □. If yes, what are they?_____if no, do you have any plan to get these advantages in the future? Yes □ No □.

1.3.2.2.5. Are there any way your neighborhood can benefit or is benefiting from the social Medias? Yes □ No □.if yes, how?_____.

2. Existing situation of the housing unit

2.1. Physical situation of house ; good☐ average☐ poor☐

Criterion (straight walls, properly made ceiling, well installed windows and doors, and proper floor finishing, durability of materials used)

2.1.1. Construction material used Wall Exterior_____Interior wall(partition)_____
Windows_____Doors_____

2.2. Infrastructure

2.2.1. **1.Sanitation quality; good□ average□ poor□ absent□ 2. Electrical installation quality good□ average□ poor□ absent□ 3.phone; mobile □ land line□ absent□ 4. Internet; Wi-Fi □land line□ absent□ 5.other;**

_____

2.3. Space

2.3.1. Activity (plan, section & Elevation if it is required)

2.3.2. Meaning (space and activity)

_____

_____

_____

_____ ***(sketches provided on the following boxes showing activity and infrastructure)***

Appendix C: General Information Gathered about Residents of Endease Condominium.

No	Current living area	Length of time lived or worked in Enderase Condo.	Gender	Age	Family Size		Tenure type	Employment	Computer Literate	Special Skill	Job Location or Distance from Work	Means of Transportation	Educational Status	uses Social media	Use of social media for other than entertainment	Purpose of internet other than social media			technological devices owned					Has interest to benefit from Working from home	Has interest to benefit from on line education(e-
					female	male										work	learning	entertainment and	owns TV	Owns radio/Ster	owns Smart	owns Computer	Internet Device,	Dish	other, tablet etc		
1	Enderase Condo.	4 month	F	45	3	1	rental	Self Employed	Y	Marketing	According to my Convenience	Owns Car	BSc	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	N	Y
2	Enderase Condo.	6 Years	F	43	2	1	owner	Employed	Y	Computing	Lafto	Taxi	BSc	N	N	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	N
3	Enderase Condo.	9 Years	F	35	2	4	owner	Employed	Y	Computing	2Kms	Owns Car	MBA	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y
4	Enderase Condo.	3 years	F	43	1	3	owner	Employed	Y	Cooking	be/Gird shol	taxi	12+2	N	N	Y	N	Y	Y	Y	Y	Y	N	Y	N	Y	Y
5	Enderase Condo.	10 years	F	40	1	2	owner	housewife	Y	Computing	home	Owns Car	12	Y	Y	N	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y
6	Enderase Condo.	9 Years	M	51	4	3	owner	Employed	Y	management	42 km	Owns Car	3 degrees	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y
7	Enderase Condo.	2 years	F	35	3	1	owner	Employed	Y	Computing	mekanis	taxi	degree	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	N	N
8	Enderase Condo.	7 years	F	30	3	2	owner	housewif	Y	Computing	home	Taxi	advanced diploma	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
9	Enderase Condo.	6 Years	F	35	1	3	rental	Employed	Y	Computing	megenagna	taxi	advanced diploma	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y
10	Enderase Condo.	2 years	F	28	2	2	rental	housewife	Y	non	home	taxi	10	Y	Y	N	N	N	Y	Y	Y	N	N	Y	N	N	Y
11	Enderase Condo.	2 month	F	33	2	2	rental	Employed	Y	Computing	Jupiter/ kasanchis	taxi	2 degrees	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
12	Enderase Condo.	3 years	F	38	4	1	rental	Employed	Y	accounting	jemo	taxi	degree	Y	N	Y	N	N	Y	Y	Y	N	N	Y	N	Y	Y
13	Enderase Condo.	3years	F	35	3	2	rental	Employed	Y	Computing	gerji	taxi	degree	Y	Y	Y	Y	N	Y	Y	Y	N	N	Y	N	Y	Y
14	Enderase Condo.	4 years	F	49	4	2	owner	Self Employed	N	Cooking	enderasecondo	Owns Car	12+2	Y	Y	N	Y	Y	Y	Y	Y	N	N	Y	N	Y	N
15	Enderase Condo.	5 years	F	37	2	3	rental	Self Employed	Y	hair dressing	enderasecondo	Owns Car	12+2	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y

Key: Y=yes, N=no, F=Female, M=male

Open and close ended questionnaire are presented to all respondents

Respondent 11 is selected for life story questionnaire

Appendix D: General Information Gathered on Residents of Mickey Leland Condominium.

No	Current living area	Length of time lived or worked in Mickey Leland.	Gender	Age	Family Size		Tenure type	Employment	Commputer Literate	Special Skill	Job Location or Distance from Work	Means of Transportation	Educational Status	uses Social media	Use of social media for other than entertainment	Purpose of internet			technological devices owned							Has interest to benefit from Working from home	Has interest to benefit from on line education(e-
					female	male										other than work	learning	entertainment and social	owns TV	Owns radio/Stereo	owns Smart Phone	owns Computer	Internet Device, Such as	Dish	other		
1	Mickey Leland	2 years	F	45	2	1	rental	Employed	Y	autocad ,GIS	Kolfe keranio	taxi, ,service	degree	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y
2	Mickey Leland	10 years	F	35	2	2	owner	Employed	Y	Computing	Birchiko	Walk	Degree	N	N	Y	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y
3	Mickey Leland	4 years	M	35	3	0	rental	Self Employed	Y	Moroko Bath	Mickey Leland	Walk	10+3	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y
4	Gulele	5 years	M	30	4	2	rental	Self Employed	Y	mapping and hair styling	Mickey Leland	taxi	2 technic	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y	N	Y	Y
5	Mickey Leland	8 years	M	50	2	1	rental	Employed	Y	Computing	Torhayloch/5KM	taxi	12+4	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y
6	Mickey Leland	9 Years	M	49	2	2	owner	Self Employed	Y	preaching/irco	chuches	taxi	12+3	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y
7	Mickey Leland	7 month	M	30	3	1	rental	Employed	Y	teching	torhayloch	taxi	degree	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y
8	Mickey Leland	2 years	F	35	4	1	rental	housewife	N	coocking	home	taxi	12	N	N	N	N	N	Y	Y	Y	N	N	Y	N	Y	Y
9	Mickey Leland	4 years	M	53	2	2	owner	unemployed	Y	Supervising	home	taxi	RN, BSC	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
10	Mickey Leland	5 years	M	35	3	2	rental	Employed	Y	financial service	Megenagna	taxi	MSc	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y
11	Mickey Leland	8 month	M	16	2	2	rental	High school student	Y	Computing	High school student	taxi	High school student	Y	Y	N	Y	Y	Y	Y	Y	N	N	Y	N	N	Y
12	Micky Leland	2 years	M	30	0	2	rental	Employed	Y	Computing	Merkato/ 8 KM	Owns Car	BA degree	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
13	Mickey Leland	5 years	M	45	2	3	rental	Self Employed	Y	carpenter	piasa	taxi	12	Y	N	N	N	N	Y	Y	Y	N	N	Y	N	N	Y
14	Micky Leland	5 years	F	26	1	3	rental	Self Employed	N	shop keeping	Mickey Leland	Taxi	12	Y	Y	N	N	N	Y	Y	Y	N	N	Y	N	Y	Y
15	Mickey Leland	9years	F	33	2	2	rental	Employed	Y	Computing	piasa	taxi	12+2	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y

Key: Y=yes, N=no, F=Female, M=male

Open and close ended questionnaire are presented to all respondents

Respondent 11 is selected for life story questionnaire

Appendix E: General Information Gathered on Residents of Bole Arabsa Project 15 Condominium.

No	Current living area	Length of time lived or worked in Mikililand.	Gender	Age	Family Size		Tenure type	Employment	Computer Literate	Special Skill	Job Location or Distance from Work	Means of Transportation	Educational Status	uses Social media	Use of social media for other than entertainment	Purpose of internet other than social media			technological devices owned							Has interest to benefit from Working from home	Has Interest to benefit from on line education(e-learning)
					female	male										work	learning /tutorial	entertainment and social interaction	owns TV	Owns radio/Stereo	owns Smart Phone	owns Computer /Laptop	Internet Device, Such as E-video	Dish	other		
1	Bole Arabsa Project 15	4 month	F	45	3	1	rental	Employed /ngo	Y	research	tenatibeka	taxi, ,minibus	MSc	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2	Arabsa Project 15	month	F	35	2	0	rental	Employed	Y	cocking	home	taxi	10+1	Y	Y	N	Y	Y	Y	Y	Y	N	N	N	N	Y	Y
3	Bole Arabsa Project 15	1 Year	M	29	0	1	rental	Employed	Y	accounting	hayahulet	train, taxi	degree	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	Y	Y
4	Bole Arabsa Project 15	1 month	M	30	0	1	rental	Self Employed	Y	broker	my convenience	Train, taxi	10+1	Y	Y	Y	Y	Y	N	Y	Y	N	N	N	N	Y	Y
5	Bole Arabsa Project 15	7 month	F	28	1	0	rental	Self Employed	Y	interior design, cooking	convenience	taxi, train	10	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	Y	Y
6	Bole Arabsa Project 15	7month	F	26	1	2	rental	Self Employed	N	Shop Keeping	home	taxi, train	12	Y	Y	N	N	N	Y	Y	Y	N	N	Y	N	Y	Y
	Key: Y=yes, N=no, F=Female, M=male																										
	Open and close ended questionnaire are presented to all respondents																										
	Respondent 11 is selected for life story questionnaire																										

Appendix F: Ethio Telecom and Commercial Bank of Ethiopia (interview)

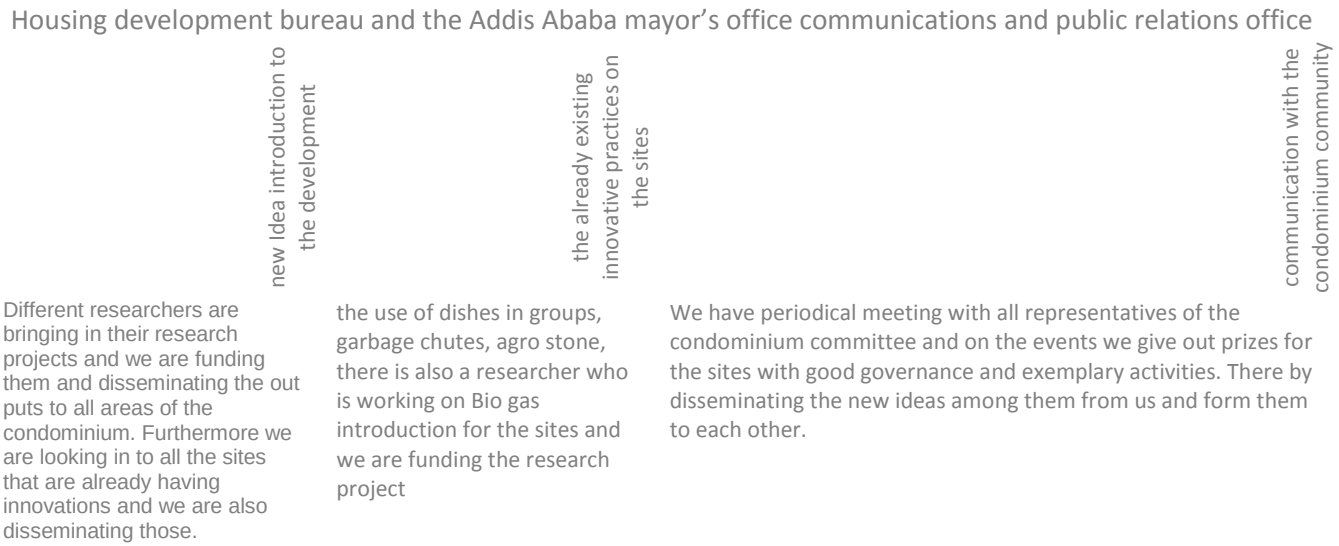
Ethio Telecom					
Vision	Mission	Role of Ethio Telecom in giving service to the community	level of information consumption by community	polices underlining the service of the Ethiotelecom	statistics about customer use
To be a world-class telecom services provider	• Connect Ethiopia through state-of-the-art telecom services • Provide high quality, innovative and affordable telecom products and services that enhance the development of our nation and ensure high customer satisfaction. • Build reputable brand known for its customers' consideration • Build its managerial capability and manpower talent that enables ethio	Ethio Telecom is enabler of information exchange but not source of information	our optical fibers give access as much as 100 GB per second	Policy issues are responsibilities of Ministry of Transport and communication (MoTAC). Ethio telecom functions under the policy proclamation No. 10/1996 while Ethiopian telecommunication Agency is under proclamation No. 281/2002	62,000,000 mobile devise users are getting service from us in Addis Ababa including the surrounding cities. This includes CDM, EVDO, etc. There are 8000 organization that are getting public IP services. These are governmental and non governmental organizations

Commercia Bank of Ethiopia				
Vision	Mission	Internet banking	Foreign currency exchange	Opinion about national ID cards
To become a world class commercial bank by the year 202	•integrity •customer satisfaction • employee satisfaction • learning organization • teamwork and •collaboration •Public trust • Value for money •decentralization • corporate citizenship	any literate person can have internet baking service from commercial bank of Ethiopia (CBE).	Any individual can have foreign currency exchange given the individual provides the necessary documents. While the policy of our country's foreign exchange is flexible on in flow of foreign currency, it is very restrict on the out flow of currency. This is due to shortage of hard currency in the country. There for with out provision of institutional confirmation one can not perform an out flow of foreign currency.	Insa is currently working on national identity cards for citizens of the country. The completion of the task will bring different opportunities to the bank and the community. Social security numbers that can be gained through the national ID card system are important for individuals to be identified globally.

Appendix G: List of Mission and Vision of technology Organizations

List of vision and Mission of Companies Under Consideration		
The Ethiopian Telecom (ETC)	Vision	To be a world-class telecom services provider
	Mission	• Connect Ethiopia through state-of-the-art telecom services • Provide high quality, innovative and affordable telecom products and services that enhance the development of our nation and ensure high customer satisfaction. • Build reputable brand known for its customers' consideration • Build its managerial capability and manpower talent that enables ethio telecom to operate at international level • Support community and environmental development
Ministry of Science and Technology (MOST)	Vision	To see Ethiopia entrench the capacities which enable rapid learning, adaptation and utilization of effective foreign technologies by the year 2022/23.
	Mission	Coordinating, encouraging and supporting science and technology activities that realize the country's social and economic development
The Ethiopian Education and Research Network (EthERNet)	Vision	We have many solutions that are up to date deliver those services on the cloud. EthERNet collaborate with international research organization to facilitate innovation and keep quality of education. Through our network infrastructure we support the community to use digital technology and invest on human capacity. We have a solutions for the community as well as we share knowledge, empower them and connect to the rest of the world
	Mission	
Information Network Security Agency (INSA)	Vision	to realize a cyber security system that has a word class standard and that can play high role in the development of the country.
	Mission	To build a cyber security system that can secure the well being of the country. To support the decisions and activities of the government by producing technical information that that are beneficial to the nation. to develop capacity of data and computing in order to insure the transformation of national high tech and security industry transformation.
Commercial Bank of Ethiopia (CBE)	Vision	To become a world class commercial bank by the year 2002
	Mission	Integrity, customer satisfaction ,employee satisfaction , learning organization, teamwork and, collaboration, Public trust , Value for money, decentralization, corporate citizenship
National Science, Technology and InnovationAgency (STI)	Vision	The vision of the STI Policy is based on the national vision: "to see Ethiopia become a country where a democratic rule, good governance and social justice reigns upon the involvement and free-will of its peoples, and once extricating itself from poverty becomes a middle-income economy as of 2020-2023." Accordingly, the national STI vision of the country is: To see Ethiopia entrench the capabilities which enable rapid learning, adaptation and utilization of effective foreign technologies by the year 2022/23
	Mission	The mission of the STI policy is to create a technology transfer framework that enables the building of national capabilities in technological learning, adaptation and utilization through searching, selecting and importing effective foreign technologies in manufacturing and service providing enterprises.
The Ministry of Communication and Information Technology (MCIT)	Vision	
	Mission	The FDRE's Ministry of Communication and Information Technology (MCIT) is a government institution which spearheads the ICT development of the nation by way of developing policy instruments, designing various programs, mobilizing resources, guiding and monitoring implementation.

Appendix H: Housing Development Bureau and the Addis Ababa Mayor's Office Communications and Public Relations Office



Appendix I: Ministry of Science and Technology (MOST) and Oromiya Science and Technology Development Agency (OSTDA)

Memorandum of understanding (MOU) signed between the ministry of Science and Technology (MOST)31 and the Oromiya Science and Technology Development Agency (OSTDA) to build science cafes in capital cities selected by the Oromiya regional government. The description as extracted from the MOST official website is placed below in Amharic32.

የኢ.ፌ.ዲ.ሪ ሳይንስና ቴክኖሎጂ ሚኒስቴር ከኦሮሚያ ሳይንስና ቴክኖሎጂ ልማት ኤጀንሲ ጋር በኦሮሚያ ብሔራዊ ክልላዊ መንግስት በተመረጡ ዋና ዋና ከተሞች የሳይንስ ካፌዎችን ለመገንባት የሚያስችል የስምምነት ሰነድ ተፈራረሙ።

በፊርማ ስነስርዓቱ ላይ የተገኙት የሳይንስና ቴክኖሎጂ ሚኒስቴር ሚኒስትር ዴኤታ ዶ/ር ሹመቴ ግዛው ‹‹ሀገራት በሳይንስና ቴክኖሎጂ ያላቸው ተጠቃሚነትና ዕድገት ለማዘመን በምርምር ማዕከላትና በከፍተኛ ትምህርት ተቋማት ላይ ከፍተኛ በጀት በመመደብ ለውጤታማነታቸው ከሚያደርጉት ጥረት ባሻገር ህዝባቸውን በሳይንስና ቴክኖሎጂ ዘርፍ ያለው ግንዛቤና ተሳትፎ እንዲያድግ ሁሉን አቀፍ እንቅስቃሴ ያደርጋሉ:: በዚህ ረገድ የሳይንስ ግንዛቤ በህብረተሰቡ ውስጥ በማዳበር ጉልህ ሚና ከሚጫወቱ ዘርፎች መካከል የሳይንስ ካፌ ዋነኛው በመሆኑ የማስፋፋቱ ስራ ተጠናክሮ ይቀጥላል›› ብለዋል።

Find the information at the following link: http://www.most.gov.et/home/-/asset_publisher/rSPvddoP6l0p/content/--9-36?inheritRedirect=false&redirect=http%3A%2F%2Fwww.most.gov.et%2Fhome%3Fp_p_id%3D101_INSTANCE_rSPvddoP6l0p%26p_p_lifecycle%3D0%26p_p_state%3Dnormal%26p_p_mode%3Dview%26p_p_col_id%3Dcolumn-2%26p_p_col_pos%3D1%26p_p_col_count%3D2

[32] The English version of the Amharic text can be found in the above subchapter 4.2.4 of this research document.