Study on Operational Performance of Low-Cost Housing in Ethiopia: The Case of Bishoftu City

Olana Tesfaye Hunde

A Thesis Submitted to the department of Civil Engineering

School of Civil Engineering and Architecture

Presented in Partial Fulfillment of the Requirement for the Degree of Master's in Civil Engineering (Specialized in Construction Engineering and Management),

Office of Graduate Studies

Adama Science and Technology University

June, 2024

Adama, Ethiopia

Study on Operational Performance of Low-Cost Housing in Ethiopia: The Case of Bishoftu City

Olana Tesfaye Hunde

Advisor: - Lemma Beressa (PhD)

A Thesis Submitted to the department of Civil Engineering
School of Civil Engineering and Architecture

Presented in Partial Fulfillment of the Requirement for the Degree of Master's in Civil Engineering (Specialized in Construction Engineering and Management),

Office of Graduate Studies

Adama Science and Technology University

June, 2024

Adama, Ethiopia

DECLARATION

I hereby declare that this Master Thesis entitled “Study on Operational Performance of Low-Cost Housing in Ethiopia: in the Case of Bishoftu City” is my original work. That is, it has not been submitted for the award of any academic degree, diploma or certificate in any other university. All sources of materials that are used for this thesis have been duly acknowledged through citation

Name of the student	Signature	Date

RECOMMENDATION

I, the advisor of this thesis, hereby certify that I have read the revised version of the thesis entitled “Study on Operational Performance of Low-Cost Housing in Ethiopia: in the Case of Bishoftu City” prepared under my guidance by Olana Tesfaye Hunde submitted in partial fulfillment of the requirements for the degree of Mater’s of Science in Civil Engineering. Therefore, I recommend the submission of revised version of the thesis to the department following the applicable procedures.

_____	_____	_____
Major Advisor	Signature	Date

APPROVAL PAGE OF THESIS

I, the advisors of the thesis entitled "Study on Operational Performance of Low-Cost Housing in Ethiopia: in the Case of Bishoftu City" and developed by Olana Tesfaye Hunde hereby certify that the recommendation and suggestions made by the board of examiners are appropriately incorporated into the final version of the thesis.

_____	_____	_____
Major Advisor	Signature	Date

We, the undersigned, members of the Board of Examiners of the thesis by Olana Tesfaye Hunde have read and evaluated the thesis entitled ''Study on Operational Performance of Low-Cost Housing in Ethiopia: in the Case of Bishoftu City" and examined the candidate during open defense. This is, therefore, to certify that the thesis is accepted for partial fulfillment of the requirement of the degree of Master of Science in Civil Engineering.

_____	_____	_____
Chairperson	Signature	Date
_____	_____	_____
Internal Examiner	Signature	Date
_____	_____	_____
Eternal Examiner	Signature	Date

Finally, approval and acceptance of the thesis is contingent upon submission of its final copy to the Office of Postgraduate Studies (OPGS) through the Department Graduate Council (DGC) and School Graduate Committee (SGC).

_____	_____	_____
Department Head	Signature	Date
_____	_____	_____
School Dean	Signature	Date
_____	_____	_____
Office of Postgraduate Studies, Dean	Signature	Date

ACKNOWLEDGEMENT

Above all, I thank the Almighty God for everything that he has done for me with the knowledge and patience needed to complete this study. My heartfelt thanks to my advisor, **Lemma Beressa (PhD)** for his critical guidance and professional comments, as well as constructive, suggestions and practical recommendations that have helped to improve the quality of my work. I would also like to express my heartfelt gratitude to everyone who helped me realise this thesis, particularly for my responders for your generosity and expert treatment in responding to my questionnaires and interviews. Finally, I would like to thank my family and friends for their motivation, love, and support throughout my work.

TABLE OF CONTENTS

DECLARATION i
RECOMMENDATION ii
APPROVAL PAGE OF THESIS iii
ACKNOWLEDGEMENT iv
LIST OF TABLE viii
LIST OF FIGURES ix
LIST OF ACRONYM/ABBREVIATION x
ABSTRACT xi
CHAPTER ONE 1
INTRODUCTION 1
1.1. Background of Study 1
1.2. Statement of the Problems 3
1.3. Research Questions 4
1.4. Objective of the Study 4
1.4.1. General Objective of the Study 4
1.4.2. Specific Objectives of the Study 4
1.5. Scope of the Study 5
1.6. Significances of the Study 5
1.7. Operational Definition Terms 6
1.8. Limitations of the Study 6
1.9. Organization/ Structure 7
CHAPTER TWO 8
RELATED LITERATURE REVIEW 8
2.1. Introduction 8
2.2. The concept and definition of low-cost housing 8
2.3. Operational Performance 10
2.4. Housing Development in Urban Areas 11
2.5. Low-cost housing Development Models and Strategies 12
2.6. The operational Performance Factors of Low-cost Housing in Urban Areas 13
2.7. Key Barriers that Affecting Operational Performance of Low-cost Housing 18
2.8. Impact of Barriers on Operational Performance of Low-cost Housing 23

2.9. Best practices and Recommendations for Improving the Operational Performance of Low-cost Housing 27
2.10. Gaps in the Literature Review 29
CHAPTER THREE 31
RESEARCH METHODOLOGY 31
3.1. Introduction 31
3.2. Study Area 31
3.3. Research Approach 32
3.4. Research Design 33
3.5. Population and Sampling Frame 34
3.6. Sampling Technique 35
3.7. Sample Size Determination 35
3.8. Data Collection Method 36
3.8.1. Interviews 36
3.8.2. Questionnaires 37
3.8.3. Site Visits 37
3.9. Data Analysis Method 38
3.10. Validity and Reliability 39
3.10.1. Validity of the Research Method 40
3.10.2. Reliability of Questionnaire 41
3.11. Ethical Consideration 44
CHAPTER FOUR 45
RESULTS AND DISCUSSIONS 45
4.1. Introduction 45
4.2. Respondent's Profile 45
4.2.1. Respondents Gender 45
4.2.2. Respondents Age 46
4.2.3. Respondents Educational Background 47
4.2.4. Respondents Occupation 48
4.3. Factors that Affecting Operational Performance of Low-Cost Housing 48
4.4. Barriers to Affect Operational Performance of Low-Cost Housing 55
4.5. Impacts of Barriers in Operational Performance of Low-Cost Housing 71

4.6. Develop Strategies for Improving Operational Performance of Low-Cost Housing 74
CHAPTER FIVE 77
CONCLUSIONS AND RECOMMENDATIONS 77
5.1. Introduction 77
5.2. Conclusion 77
5.3. Recommendations 78
REFERENCE 81
APPENDIX 88
Appendix A: Survey Questionnaire 88
Appendix B: Interview Questions 93
Appendix C: Survey Questionnaire in Amharic 94

LIST OF TABLE

Table 2. 1: The factors that affecting current operational performance of low-cost housing ...13
Table 2. 2: The barriers that affecting operational performance of low-cost housing 18
Table 2. 3: The impact of barriers in operational performance of low-cost housing 23
Table 3. 1: Guideline for assessing reliability results.....42
Table 3. 2: Result of Reliability test.....43
Table 4. 1: Frequency distribution of sample respondent's rate …….. 45
Table 4. 2: Age of the respondents.....47
Table 4. 3: Respondents' Educational background 47
Table 4. 4: Respondent's occupation.....48
Table 4. 5: Current operational performance of low-cost housing.....49
Table 4. 6: Barriers that affecting operational performance of low-cost housing.....56
Table 4. 7: Impact of barriers in operational performance of low-cost housing 71

LIST OF FIGURES

Figure 3. 1: Map of Bishoftu 32
Figure 3. 2: Research design 34
Figure 4. 1: Gender of the Respondents 46
Figure 4. 2: Moisture and mold 59
Figure 4. 3: Quality of construction workmanship 59
Figure 4. 4: Adequate sanitary system maintenance 61
Figure 4. 5: Adequate electrical system maintenance 62
Figure 4. 6: Adequate finishing maintenance 63
Figure 4. 7: Timely repairs and maintenance 63
Figure 4. 8: Parking and Fence 65
Figure 4. 9: Electrical Work Problems 65
Figure 4. 10: Sanitary System Functionality 66
Figure 4. 11: Acoustic Performance 67
Figure 4. 12: Poor Construction Workmanship 68
Figure 4. 13: Dampness and Moisture 68
Figure 4. 14: Flood Risk 69

LIST OF ACRONYM/ABBREVIATION

AH	Affordable housing
CLTs	Community Land Trusts
GDP	Growth domestic product
KPIs	Key performance indicators
RII	Relative importance index
SPSS	Statistical Package for the Social Sciences

ABSTRACT

The operational performance of low-cost housing refers to the overall effectiveness, efficiency, and quality of housing services and infrastructure in particular area of the housing industry. Operational performance includes a variety of variables that collectively contribute to the functionality and impact of low-cost housing programs within the urban setting. This study aims to analyze and assess the operational performance of low-cost housing in Bishoftu City. The specific objectives includes to evaluate the current operational performance factors, to identify the key barriers that affecting, to assess the impact of barriers and to develop strategies for improving the operational performance of low-cost housing in Bishoftu city. To attain these goals, the study used a mixed-approaches research design that combined quantitative and qualitative research methods. Data are collected using a questionnaire, interviews, and site visits. The research design was a blend of descriptive and exploratory research, with basic simple random sampling and purposive sample being used. The data analysis approaches would include descriptive and exploratory analysis techniques based on mean scores and the relative important index method. The results show that poor aesthetic design (RII value: 0.797) and inadequate room sizes in building design (RII value: 0.789) are the main design barriers that affect low-cost housing's operational performance. Construction-related barriers include mold and moisture (RII value: 0.786) and the quality of construction workmanship (RII value: 0.761). Maintenance-related barriers include adequate sanitary system maintenance (RII value: 0.773) and adequate electrical system maintenance (RII value: 0.772). Addressing these barriers is critical for improving the operational performance of low-cost housing in Bishoftu City. To implement solutions that improve the quality, safety, and livability of the city's low-cost housing developments, stakeholders such as government authorities, developers, designers, and residents must work together. The major impacts of barriers in operational performance of low-cost housing in Bishoftu City include increased maintenance costs (MV: 3.90)*; reduced thermal comfort (MV: 3.76), poor indoor air quality (MV: 3.69), reduced sustainability (MV: 3.67), and uncomfortable living conditions (MV: 3.63). Addressing these impacts includes increased maintenance costs due to poor construction and inadequate upkeep; decreased thermal comfort, which causes health problems and discomfort; poor indoor air quality, which affects respiratory health and overall well-being; reduced sustainability, which jeopardizes environmental impact and energy efficiency; and uncomfortable living conditions, which have a negative impact on mood, productivity, and quality of life.*

Key words: Performance, Operational performance, and Low-cost housing

CHAPTER ONE
INTRODUCTION

This chapter covers background information, statement of the research problem, research questions, and research objectives. It further presents the significance of the study, and scope of the study.

1.1. Background of Study

According to the Malik (2014), Ethiopia ranks 173 out of 187 countries in the world on the Human Development Index (HDI). The HDI is a composite statistic of life expectancy, education, and per capita income indicators used to rank countries. This low ranking shows the vast majority of people's poverty and difficult living conditions, as well as the critical need for improvement and development. To ameliorate the situation, several significant steps must be made. One goal is to provide Ethiopians with improved housing opportunities. The need for this can be seen across the country, both rural and urban. This need must be considered in light of the country's larger, more general challenges. The most critical of these issues are rapid population expansion, increased deforestation, and uncontrolled urbanization (Hjort & Widén, 2015b).

For nearly half a century, international development debates have focused on substandard housing in developing countries. The world is becoming more urbanized nowadays; this is an irreversible process. This has put extreme strain on the official housing delivery system worldwide. Overall, while the issue of substandard housing remains a significant challenge, it also presents opportunities for innovative solutions and collaborative action to create more inclusive, resilient, and livable cities in the developing country (Gideon, 2016).

Affordable and sustainable housing is a vital component of urban development, with a direct impact on community well-being and the entire socioeconomic environment. Within the dynamic urban setting, the pursuit of operational excellence in the low-cost housing sector is a critical component in assuring the provision of safe and suitable housing for its occupants. As a result, the study and assessment of the operational performance of low-cost housing serve as fundamental components in supporting equitable urban development and addressing housing concerns (UN-Habitat, 2019).

Low-cost housing is a serious issue in many cities. Rapid urbanization and population expansion have led to an increased need for inexpensive housing options. However, the operational performance of low-cost housing programs in the city has not been extensively reviewed. Assessing the effectiveness of low-cost housing programs is essential for identifying strengths, weaknesses, and areas for improvement. Such evaluations can help policymakers, urban planners, and stakeholders understand the impact of these initiatives on housing affordability, quality, and accessibility, as well as their socio-economic implications for residents and communities (Gideon, 2016).

Low-cost housing is a critical component of urban development because it provides inexpensive housing options for low-income individuals and families. In developing countries, the operational effectiveness of low-cost housing units is critical to occupants' well-being and quality of life. However, there is a dearth of comprehensive studies on the operational performance of low-cost housing, which impedes the establishment of effective policies and strategies for improvement (UN-Habitat, 2019).

Bishoftu City, in Ethiopia's Oromia Region, has seen a substantial inflow of population, increasing the demand for inexpensive housing alternatives. However, the operational performance of low-cost housing schemes in the city is a complex and changing terrain driven by a variety of economic, social, and regulatory issues.

In light of the urgent demand for sustainable housing solutions, the study seeks to completely examine and comprehend the existing operational performance of low-cost housing in Bishoftu City. By addressing this purpose, the study aims to identify key barriers impacting operational performance, assess the impact of these barriers on the community, and eventually offer strategies for improving the overall quality and efficacy of low-cost housing projects.

The specific goals of this research are to systematically examine crucial factors of operational effectiveness in the low-cost housing industry. The study aims to provide a comprehensive understanding of low-cost housing operations in Bishoftu City by evaluating the current situation, identifying key barriers, and assessing the impact of those barriers. The established improvement initiatives demonstrate a dedication to developing sustainable, inclusive, and

high-quality housing solutions for the city's citizens, highlighting the study's importance in contributing to urban development efforts.

Therefore, this study seeks to close this gap by concentrating on the operational performance of low-cost housing in Bishoftu City. This study aims to provide valuable insights to policymakers, housing developers, and other stakeholders by conducting a thorough analysis of factors that affecting current operational performance, identifying key barriers affecting performance, assessing the impact of operational performance barriers, and developing improvement strategies.

1.2. Statement of the Problems

One of the primary development issues of the twenty-first century is the rising pace of urbanization in developing nations, which is accompanied by a lack of suitable and cheap housing. Like most African cities, the geographical, physical, and socioeconomic condition of Ethiopian cities lags far behind the requirements necessary to the city's livelihood (Weldesilassie & Gebrehiwot, 2017).

Low-cost housing is an essential issue in developing countries since it helps meet the housing demands of low-income individuals. However, there is a dearth of complete understanding of the operational performance of low-cost housing in the city, covering characteristics such as building quality, affordability, accessibility, and sustainability (Hjort & Widén, 2015b; Weldesilassie & Gebrehiwot, 2017; Woundimagegnehu, 2009). This study seeks to fill this gap by analysing and assessing the operational performance of low-cost housing in Bishoftu City, with an emphasis on identifying the primary barriers impacting its performance and measuring the impact of those barriers on the city and its occupants. This study aims to provide significant insights and propose strategies to improve the operational performance of low-cost housing in Bishoftu City.

Low-cost housing is an important component of Ethiopian urban development, with the goal of providing inexpensive housing options for low-income individuals and families. However, there is a paucity of detailed study and analysis on the operational performance of low-cost housing projects (Awad & Musa, 2009; Mathema, 2005). The operational performance of low-cost housing refers to how effectively and efficiently these housing projects are managed and

maintained to meet the needs of their residents and fulfill the objectives of providing affordable housing solutions. By effectively managing these aspects of operational performance, low-cost housing initiatives can fulfill their mission of providing safe, decent, and affordable housing options for those in need while promoting sustainable development and community empowerment (Weldesilassie & Gebrehiwot, 2017).

This knowledge gap impedes comprehension of the effectiveness and sustainability of low-cost housing in Bishoftu City. Furthermore, the barriers impacting operational performance, as well as their impact on the housing industry, remain largely investigated. As a result, there is a need for a systematic study that evaluates factors that affecting current operational performance, identifies barriers impacting it, and assesses the impact of barriers on enhancing the operational performance of low-cost housing in Bishoftu City.

1.3. Research Questions

In relation to the research questions, this study seeks to answer the following questions:

- What are the key factors that affecting current operational performance of low-cost housing in Bishoftu City?
- What are the key barriers that affecting the operational performance of low-cost housing in Bishoftu City?
- What are the impacts of barriers in operational performance of low-cost housing in Bishoftu City?
- What strategies can be developed for improving the operational performance of low-cost housing in Bishoftu City, taking into consideration the identified key barriers and their impact on the community and its residents?

1.4. Objective of the Study

1.4.1. General Objective of the Study

The general objective of, study on operational performance of low-cost housing in Ethiopia: the case of Bishoftu city is to analyze and assess the operational performance of low-cost housing in Bishoftu city.

1.4.2. Specific Objectives of the Study

The specific objectives of the study are as follows:

- To evaluate the factors that affecting current operational performance of low-cost housing in Bishoftu City.
- To identify the key barriers that affecting operational performance of low-cost housing in Bishoftu City.
- To assess the impact of barriers in operational performance of low-cost housing in Bishoftu City.
- To develop strategies for improving the operational performance of low-cost housing in Bishoftu city.

1.5. Scope of the Study

The scope of this study is limited to low-cost housing in Bishoftu City, with a focus on the operational performance of housing units. The study would comprise an analysis of factors that affecting operational performance, identification of key barriers that affecting performance, assessment of the impact of barriers of operational performance, and the development of strategies for improvement. The study would not examine the on-going construction of low-cost housing units, but rather their day-to-day operations of housing units. The study would also not include other cities or regions than Bishoftu. Data was gathered through interviews and surveys with community's leaders and residents, site visits to low-cost housing units, and a review of relevant literature. The study was conducted over a specific time period and within the constraints of available resources.

1.6. Significances of the Study

The significance of this study stems from its potential to provide useful insights into the operational performance of low-cost housing in Bishoftu City. By evaluating the existing factors that affecting operational performance of low-cost housing, this study could provide a thorough understanding of the sector's issues. Additionally, by identifying the key barriers that affect operational performance, this study could help policymakers, developers, and other stakeholders to discover possible areas for improvement.

Furthermore, by assessing the impact of barriers of operational performance on the community and its occupants in terms of living circumstances, social and economic well-being, and general quality of life, this study could shed light on the real-world implications of low-cost

housing programs. This analysis would assist in prioritizing initiatives that have the greatest positive impact on the community in terms of barriers.

Finally, by developing strategies for enhancing the operational performance of low-cost housing in Bishoftu City the study give practical insights for stakeholders seeking to improve the operational performance of low-cost housing programs. Finally, the study's findings contributed to the establishment of more effective low-cost housing laws and practices, thereby improving the quality of life for Bishoftu City residents.

1.7. Operational Definition Terms

Operational: It contains a full explanation of the technical terms and measurements used in data collection.

Operational performance: refers to how efficiently and effectively the building's day-to-day operations and management run. It covers a variety of topics, including maintenance, resident services, and overall building performance. The purpose of optimizing operational performance is to guarantee that the building runs smoothly, serves the needs of its residents, and is cost effective.

Low-cost housing: refers to residential accommodations for persons and families with low or moderate incomes. It is housing that is reasonably adequate in standard and location, and does not cost so much that a household is unable to meet other basic needs on a long-term basis.

1.8. Limitations of the Study

Some limitations of the study on the operational performance of low-cost housing in Bishoftu City may include the research population is too large to cover in the limited time given thus sampling is required which might have an impact on the general output of the study; the study may rely on self-reported data or limited observational data which could introduce biases or inaccuracies in the assessment of operational performance; the study may have been conducted over a limited timeframe which could impact the ability to capture long-term trends or changes in operational performance; and the study may have been limited by financial or logistical constraints, which could affect the depth and scope of the research findings.

1.9. Organization/ Structure

This thesis would be organized with the following pages: cover page, title page, approval sheet, acknowledgment, table of content, list of tables, list of figures, acronyms, and abstract. The body section is divided into five chapters, each having its own set of subtopics that are connected. The first chapter provides an introductory section that includes background information, a problem description, objectives, research questions, significance, scope, operational definition, limitations, and study organization. The second chapter consisted of a literature review. The third chapter discusses research methodology, including the study area, research approach, research design, population and sampling frame, sampling techniques, sample size determination, data gathering method, data analysis method, validity and reliability, and ethical considerations.

The fourth chapter is the study's results and discussion section, which focuses on data presentation and discussion. This documented the examination of primary and secondary data using a mixed research approach. The final chapter presented the conclusion and recommendations.

CHAPTER TWO
RELATED LITERATURE REVIEW

2.1. Introduction

This chapter summarizes the research-related literature review that was conducted during the research project. These include the research theory, concepts, and ideology that exist in relation to the theoretical and empirical issues surrounding the operational performance of low-cost housing. It includes a study of literature from various scientists and authors in the field of low-cost housing, with a particular emphasis on low-cost housing projects' operational success. It discusses theoretical and conceptual findings from diverse researchers' conceptions related to addressing study aims.

2.2. The concept and definition of low-cost housing

Low-cost housing in Ethiopia refers to affordable residential units and housing developments designed to meet the basic shelter needs of low and middle-income individuals and families. These housing options are typically aimed at addressing the housing shortage in urban areas, where rapid urbanization has led to a growing demand for affordable housing. Low-cost housing in Ethiopia often involves the use of cost-effective construction materials and simplified designs to keep prices low, as well as a focus on providing essential infrastructure and services such as water supply, sanitation, electricity, and access to social amenities. The goal of low-cost housing initiatives in Ethiopia is to provide decent and affordable housing options for low-income residents while promoting inclusive urban development and addressing broader urbanization challenges (Mathema, 2005).

Low-cost housing in Ethiopia is a crucial aspect of the country's urban development strategy, given the rapid urbanization and the need to provide affordable housing for low-income residents. The Ethiopian government, along with various non-governmental organizations and private sector entities, has been working to address the housing shortage by implementing low-cost housing initiatives (Delz, 2016). Cost savings are obtained through the utilization of numerous alternate building methods and materials (Jaiganesh et al., 2016). Low Cost Housing refers to a novel concept that involves efficient budgeting and the application of techniques that lower construction costs by utilizing locally available materials, enhanced skills, and technology all without compromising the strength, performance, or lifespan of the

structure. Contrary to popular belief, low cost housing is only appropriate for substandard construction and is made of inexpensive, low-quality building materials; rather, it is accomplished through resource management, which also includes delaying or phasing in finishing work (Barot, 2021).

Low cost housing describes the process of building inexpensive housing units with low-cost components and methods. Numerous investigations have been carried out to examine various low-cost housing materials and methods that are applicable to both urban and rural settings. Examples of inexpensive building materials are monolithic domes, which are long-lasting and energy-efficient constructions, and bamboo, which is a renewable resource that is easily accessible in some areas. Successful management and completion of affordable housing projects also depend on effective cost control. The goal of low-cost housing is to give people and families access to cheap housing options for those who would not be able to afford traditional housing because of rising land and building costs (Gupta, 2021).

Low-cost housing is the provision of inexpensive and decent housing for low-income individuals and families. It is a key component of urban development and poverty alleviation, because access to secure and cheap housing is critical for improving living condition and encouraging economic stability (Weldesilassie & Gebrehiwot, 2017). Low-cost housing projects seek to address the housing needs of low-income communities by offering affordable solutions that meet basic living standards. These projects can take numerous forms, such as government-subsidized housing, community-led efforts, and public-private partnerships (Delz1, 2016).

Low-cost housing takes into account sustainability, social inclusion, and community development. It underlines the necessity of developing housing solutions that are not only affordable but also ecologically friendly, socially inclusive, and beneficial to community well-being. In general, low-cost housing is a multifaceted strategy to tackling housing difficulties encountered by low-income individuals and communities, with a focus on affordability, sustainability, and social impact (Gideon, 2016; Woundimagegnehu, 2009).

2.3. Operational Performance

Operational performance refers to the efficiency and effectiveness of an organization's day-to-day activities and processes in achieving its goals and objectives. It encompasses various aspects such as productivity, quality, cost management, customer satisfaction, and resource utilization. In the context of low-cost housing, operational performance could include the ability of housing developments to provide affordable, safe, and sustainable living conditions for residents, as well as the management and maintenance of the housing infrastructure. The purpose of optimizing operational performance is to guarantee that the building runs smoothly, serves the needs of its residents, and is cost effective. Also it is the quantifiable components of an organization's processes, such as dependability, manufacturing cycle time, and inventory turnover. Operational performance influences business performance metrics like market share and customer satisfaction. Profitability refers to a company's ability to generate profits. A profit is what remains of the revenue a business makes after paying all expenses directly related to the generating of the revenue, such as creating a product, and other expenses associated to the conduct of the business' activities (Ahmed, 2018).

Operational performance is the efficiency and effectiveness of an organization's daily activities and processes. It entails measuring and managing numerous operational parameters, including as productivity, quality, cost, and customer happiness, to ensure that the organization is performing at its best (Battesini et al., 2021). The suggested methods can be used to measure and enhance operational efficiency. Many manufacturing organizations now establish an efficiency indicator and focus on operational improvement initiatives to boost it. The specific methodologies utilized to identify best practice performance or to establish whether a particular action provides value are generally product or industry specific (Johnson, 2015).

Operational performance includes a variety of characteristics such as resource use, process execution, and attainment of strategic objectives. It entails identifying key performance indicators (KPIs) and applying them to monitor and enhance operational processes and outcomes(Zhu et al., 2017).

Effective operational performance is required to achieve organizational goals, meet customer expectations, and sustain a competitive advantage in the market. It is necessary to

continuously monitor, analyze, and improve operational processes to ensure that they are in line with the organization's overall strategy and objectives. Overall, operational performance is crucial for the success and sustainability of an organization because it generates efficiency, productivity, and customer satisfaction, while also enabling long-term growth and profitability (Neuhaus, 2015).

2.4. Housing Development in Urban Areas

One of the most pressing development issues of the twenty-first century is the rising urbanization of developing countries, which is accompanied by a lack of suitable and cheap housing. Like most African cities, Ethiopian cities' spatial, physical, and socioeconomic conditions fall far short of the basic prerequisites for the city's survival. To address the issues, the Ethiopian government is launching low-cost housing programs (Weldesilassie & Gebrehiwot, 2017).

Affordable housing is a more serious issue that cities must address if they are to continue growing and contributing to national GDP. The McKinsey urbanization report clearly states that unless affordable housing is developed in urban areas, new low-income migrants, like their predecessors, are likely to settle in slums, a socially undesirable development that strikes at the heart of developing countries' agendas of broad inclusion. Urban housing development is the process of planning, constructing, and managing residential properties in cities and metropolitan areas. It entails the construction of new housing units as well as the rehabilitation and redevelopment of existing properties to accommodate the growing demand for housing in urban areas (Nallathiga, 2017).

Urban growth, the expansion and decline of urban areas as an economic phenomenon, is intrinsically tied to the process of urbanization. Urbanization has hampered economic progress. The spatial distribution of economic activity, measured both by population, output, and income, is concentrated (Ioannides, 2014). Numerous factors, such as population growth, economic trends, governmental policies, and urban planning regulations, have an impact on the development of urban housing. The demands and preferences of urban people must be taken into account, together with the availability of land, resources, and infrastructure, by developers and city planners (Labiso, 2020).

Urban housing construction takes into account sustainability, affordability, and community integration. To create lively and inclusive urban neighborhoods, developers can combine green building principles, affordable housing options, and mixed-use complexes (Narayan, 2017).

Overall, urban housing development is critical in molding resident's quality of life, alleviating housing shortages, and adding to cities' overall economic and social vitality. To build thriving and sustainable urban communities, careful planning, engagement with many stakeholders and a long-term mindset are required.

2.5. Low-cost housing Development Models and Strategies

Low-cost housing development models and strategies are essential for addressing the affordable housing needs of urban residents. These models and techniques focus on establishing affordable housing options for low-income individuals and families, while also taking into account considerations such as sustainability, community integration, and economic viability (Hjort & Widén, 2015b). One frequent concept for low-cost housing development is to employ government subsidies and incentives to lower building costs and make housing more accessible to people. This could include tax benefits, subsidies, or low-interest loans for developers who commit to developing affordable housing units (Simon & Adam-Bradford, 2016).

Another strategy is to build mixed-income communities that include both market-rate and cheap housing. This method helps to develop varied and inclusive neighborhoods while giving housing options for residents of all income levels (Onatu & Baloyi, 2021). Furthermore, low-cost housing development models frequently promote sustainable and energy-efficient building approaches to lower long-term operating expenses for occupants. This may involve the use of green building materials, energy-efficient equipment, and renewable energy sources to save utility costs (Hjort & Widén, 2015b).

Community Land Trusts (CLTs) are a community-led solution to housing issues that can provide affordable housing for low-income households. In general, academic research on CLTs is limited, particularly in the United Kingdom; nonetheless, some claim that they can be an efficient way to manage finite resources, while others have observed that CLTs can serve as

a focal point for community resistance. Community land trusts are another unique approach for low-cost housing development in which land is held by a non-profit organization and leased to homeowners at a reasonable cost. This keeps housing costs low and ensures long-term stability for residents (Engelsman et al., 2016).

Overall, low-cost housing development concepts and initiatives seek to provide safe, decent, and inexpensive housing options for urban residents while also encouraging community integration and sustainability. Cities can use these measures to alleviate the affordable housing crisis while also building more equitable and inclusive urban neighborhoods.

2.6. The operational Performance Factors of Low-cost Housing in Urban Areas

The operational performance factors of low-cost housing have been widely used in the literature to evaluate its sustainability. A comprehensive review was carried out to determine building operational performance factors. The published literature and established low-cost housing evaluation techniques were utilized to identify the factors that affecting current operational performance of low-cost housing.as shown in Table 2.1.

Table 2. 1: The factors that affecting current operational performance of low-cost housing

The factors that affecting current operational performance of low-cost housing	Definition	Reference
Daylight	Natural light from the sun that illuminates a space during the daytime, providing brightness and warmth.	(Tierney & Tennant, 2016), (Joseph-Agyei et al., 2014)
View out	The visual connection from inside a building to the surrounding outdoor environment, which can enhance the aesthetic appeal and well-being of occupants.	(Tierney & Tennant, 2016), (Gawande et al., 2020)
Quality of Natural Lighting	The characteristics of natural light entering a space, including factors such as intensity,	(Ibem et al., 2013) (Maina & Mohammed, 2022)

	color temperature, distribution, and variability, which can impact the visual comfort and overall experience of occupants.	
High frequency lighting	Lighting system that operates at a higher frequency than standard lighting, providing more consistent and flicker-free illumination.	(Tierney & Tennant, 2016),
Internal and external lighting levels	The amount of light intensity within and around a building, affecting visibility and ambiance.	(Tierney & Tennant, 2016), (Ibem et al., 2013)
Lighting controls	Devices or systems that regulate the operation and intensity of lighting fixtures.	(Tierney & Tennant, 2016), (Joseph-Agyei et al., 2014)
Potential for natural ventilation	The ability of a building to utilize natural airflow for cooling and fresh air circulation.	(Tierney & Tennant, 2016), (Maina & Mohammed, 2022) (Aqilah et al., 2022) (Bortolini & Forcada, 2018)
Sizes of Bedrooms Spaces	Dimensions of rooms intended for sleeping purposes.	(Ibem et al., 2013) (Maina & Mohammed, 2022)
Sizes of Living Rooms Spaces	Dimensions of rooms designated for socializing and relaxation.	(Ibem et al., 2013) (Maina & Mohammed, 2022)
Sizes of dining Rooms Spaces	Dimensions of rooms specifically used for dining activities.	(Ibem et al., 2013) (Maina & Mohammed, 2022)
Sizes of Cooking and Storage Spaces	Dimensions of areas allocated for food preparation and storage.	(Ibem et al., 2013) (Maina & Mohammed, 2022)
Acoustic performance (ambient noise levels)	The level of background noise in a building environment.	(Tierney & Tennant, 2016), (Maina & Mohammed, 2022) (Rusek et al., 2022) (Effe & Wokekoro, 2021)
Acoustic performance (room reverberation time)	The time taken for sound to decay in a room after the sound source has stopped.	(Tierney & Tennant, 2016), (Maina & Mohammed, 2022)
Aesthetic appearance	The visual appeal and design characteristics	(Gawande et al., 2020)

of Building	of a structure.	(Ibem et al., 2013) (Maina & Mohammed, 2022)
Design of Bath and Toilet facilities	Layout and features of bathroom and toilet areas in a building.	(Ibem et al., 2013) (Effe & Wokekoro, 2021)
Design of building in relation to occupant's way of life	How the building design accommodates the lifestyle and needs of its occupants.	(Ibem et al., 2013) (Effe & Wokekoro, 2021)
leakage detection	Systems or methods in place to identify and address water leaks in a building.	(Tierney & Tennant, 2016), (Roshan et al., 2017)
Functionality of sanitary system	The effectiveness and efficiency of plumbing and waste disposal systems in a building.	(Tierney & Tennant, 2016), (Joseph-Agyei et al., 2014) (Effe & Wokekoro, 2021)
Flood risk or water run off	Assessment of the likelihood of flooding or water accumulation on the property.	(Tierney & Tennant, 2016), (Gawande et al., 2020)
Type of materials used in the construction	The materials chosen for building construction, impacting durability, sustainability, and aesthetics.	(Maina & Mohammed, 2022) (Reid, 2023)
Fire safety and protection	Measures in place to prevent, detect, and contain fires within a building.	(Gawande et al., 2020) (Ibem et al., 2013) (Effe & Wokekoro, 2021)
Protection against dampness in the Building	Strategies to prevent moisture infiltration and dampness issues within the structure.	(Gawande et al., 2020) (Ibem et al., 2013)
Protection against insects and dangerous animals	Preventive measures to keep pests and wildlife out of the building.	(Gawande et al., 2020) (Ibem et al., 2013)
Ventilation rates	The amount of fresh air exchanged within a building per unit time.	(Tierney & Tennant, 2016), (Maina & Mohammed, 2022) (Aqilah et al., 2022)
Internal air pollution	Contamination of indoor air by pollutants from sources such as cooking, cleaning	(Tierney & Tennant, 2016), (Prabatha et al., 2018)

	products, or building materials.	
Thermal comfort	The ability of a building to maintain a comfortable temperature range for occupants.	(Tierney & Tennant, 2016), (Ibem et al., 2013) (Aqilah et al., 2022) (Bortolini & Forcada, 2018)
Maintenance cost of the building	The expenses associated with upkeep, repairs, and regular maintenance of the property.	(Ibem et al., 2013) (Prabatha et al., 2018)
Sustainable power supply in the Building	Use of renewable energy sources or energy-efficient systems to power the building.	(Ibem et al., 2013) (Effe & Wokekoro, 2021) (Maina & Mohammed, 2022) (Bortolini & Forcada, 2018)
Sustainable water supply in the Building	Implementation of water-saving measures and sustainable water sources for the building's needs.	(Tierney & Tennant, 2016), (Gawande et al., 2020) (Ibem et al., 2013) (Maina & Mohammed, 2022)
Building security	Measures to protect the building and its occupants from unauthorized access or threats.	(Joseph-Agyei et al., 2014) (Gawande et al., 2020) (Ibem et al., 2013) (Maina & Mohammed, 2022) (Effe & Wokekoro, 2021)
Location of building (Access to shops /market centers)	Proximity to commercial areas for convenient access to goods and services.	(Ibem et al., 2013) (Maina & Mohammed, 2022) (Effe & Wokekoro, 2021)
Safer parking	Designated parking areas that are secure and well-lit for vehicle safety.	(Tierney & Tennant, 2016), (Gawande et al., 2020) (Effe & Wokekoro, 2021)

Source**:** Authors compiled through literature

The operational performance of low-cost housing in urban settings refers to how well these developments are maintained, managed, and livable overall. This encompasses variables such

as the quality of construction, the efficiency of building systems, the effectiveness of property administration, and the resident's satisfaction (Weldesilassie & Gebrehiwot, 2017).

According to Tilabi & Takala (2017), The article examines the performance of affordable housing (AH) initiatives in Wuhan, China. This research is based on the principles of sustainable development, which emphasizes long-term benefits over short-term gains. An AH project is effective when all stakeholders' needs are identified and met concurrently, even if their choices differ. There are three major players in AH projects: the government and municipalities, companies that supply AH services and customers who use AH services. To evaluate each stakeholder, various tools are used: The analytical hierarchy process (AHP) is used to assess the priorities of the government and municipalities. The Sense and Respond approach is used to evaluate the performance of companies that provide AH services. Finally, statistical methodologies are employed to evaluate customer satisfaction in the AH project.

To guarantee that low-cost housing operates efficiently, developers and stakeholders must emphasize ongoing property care and upkeep. This includes frequent inspections, repairs, and modifications to ensure that the housing remains safe, functional, and appealing to residents (Nallathiga, 2017). Effective property management is also critical to the operational success of low-cost housing. To maintain a pleasant living environment, it is necessary to establish clear communication channels with residents, respond to their complaints in a timely manner, and enforce community rules and regulations to maintain positive living environment (Dhiraj B Tapkir, Nikhil R Mohire, Pratik N Zurunge, Siddharth R Sonsale, 2016).

Furthermore, The efficiency of building systems such as heating, cooling, and water supply has a considerable impact on the operational performance of low-cost homes. Energy-efficient and sustainable building strategies can assist residents cut utility expenses and contribute to the housing development's long-term profitability (Harputlugil, 2017). Finally, resident satisfaction is an important indicator of low-cost housing's operational efficiency. By conducting regular surveys and collecting input from residents, developers and property managers can identify areas of improvement and ensure that the housing meets the needs and expectations of its occupants (Grzeskowiak et al., 2014).

As a result, concentrating on the operational performance of low-cost housing in urban locations is critical to developing long-term, high-quality housing solutions for low-income individuals and families. Low-cost housing developments that prioritize continuing maintenance, good management, efficient building systems, and resident satisfaction can help to create dynamic and inclusive urban communities (Manomano et al., 2016).

2.7. Key Barriers that Affecting Operational Performance of Low-cost Housing

The operational performance of low-cost housing projects is influenced by a number of barriers that prevent their development and implementation. This literature review focuses on the key barriers that affect low-cost housing operational performance, with a particular emphasis on project efficiency and affordability. The published literature and recognized low-cost housing grading techniques were utilized to determine the key barriers that affect the performance operation of low-cost housing as shown in table 2.2.

Table 2. 2: The barriers that affecting operational performance of low-cost housing

The barriers that affecting operational performance of low-cost housing	Definition	Reference
Design consideration for poor ventilation	Strategies to improve airflow and air quality, such as installing mechanical ventilation systems, incorporating operable windows, and optimizing building layout for natural ventilation.	(Maina & Mohammed, 2022) (Roshan et al., 2017)
Design consideration for lack of proper Lighting	Implementing appropriate artificial lighting solutions, maximizing day lighting opportunities, and using light-colored surfaces to enhance reflectivity.	(Maina & Mohammed, 2022) (Roshan et al., 2017) (Ibem et al., 2013)
Inadequate size of different rooms of building design	Ensuring proper spatial planning and room dimensions to meet functional requirements and user needs.	(Ibem et al., 2013) (Effe & Wokekoro, 2021) (Bortolini & Forcada, 2018) (Joseph-Agyei et al., 2014)
Limited Accessibility	Incorporating features such as ramps,	(Maina & Mohammed, 2022)

design Features	elevators, wider doorways, and accessible restroom facilities to accommodate individuals with disabilities.	(Reid, 2023) (Forte & Russo, 2017) (Prabatha et al., 2018)
Adequate amenities and facilities design	Designing and providing essential amenities and facilities such as restrooms, break areas, and communal spaces to meet the needs of building occupants.	(Maina & Mohammed, 2022) (Prabatha et al., 2018) (Gawande et al., 2020)
Poor layout functionality and design	Improving the arrangement of spaces, circulation paths, and furniture layout to enhance usability and efficiency.	(Effe & Wokekoro, 2021) (Bortolini & Forcada, 2018) (Reid, 2023)
Poor aesthetics design	Addressing visual appeal through architectural elements, material selection, color schemes, and overall design coherence.	(Maina & Mohammed, 2022) (Ibem et al., 2013) (Bortolini & Forcada, 2018) (Gawande et al., 2020)
Poor design Noise pollution	Implementing sound insulation, acoustic treatments & strategic placement of noisy equipment to minimize the impact of noise within the building.	(Maina & Mohammed, 2022) (Effe & Wokekoro, 2021) (Prabatha et al., 2018)
Quality of construction workmanship	Ensuring that construction is carried out with skill, attention to detail, and adherence to quality standards.	(Joseph-Agyei et al., 2014) (Reid, 2023)
Quality of construction material	Selecting durable, high-quality materials that meet structural and performance requirements.	(Effe & Wokekoro, 2021) (Reid, 2023) (Ezennia, 2022)
Moisture and mold	Incorporating moisture barriers, proper ventilation, and moisture-resistant materials to prevent moisture intrusion and mold growth.	(Tierney & Tennant, 2016), (Roshan et al., 2017)
Adequate parking and	Providing temporary parking solutions	(Gawande et al., 2020)

access to amenities during construction	and maintaining access to essential amenities for occupants during construction activities.	
Adequate on site management	Implementing effective project management practices, coordination of subcontractors, and oversight of construction activities.	(Reid, 2023)
Lack of communication during construction	Establishing clear communication channels between stakeholders, including regular updates on progress, changes, and potential disruptions.	(Reid, 2023) (Ezennia, 2022)
Timely repairs and maintenance	Ensuring prompt response to maintenance requests and addressing issues in a timely manner to prevent further deterioration.	(Effe & Wokekoro, 2021) (Roshan et al., 2017)
Consistent quality of maintenance services	Establishing standards for maintenance procedures and ensuring that services are consistently performed at a high level.	(Maina & Mohammed, 2022) (Roshan et al., 2017)
Lack of preventive maintenance	Implementing a proactive maintenance program to identify and address potential issues before they escalate into larger problems.	(Effe & Wokekoro, 2021) (Ezennia, 2022)
Adequate electrical system maintenance	Conducting regular inspections, testing, and servicing of electrical systems to ensure safety and reliability.	(Effe & Wokekoro, 2021), (Joseph-Agyei et al., 2014)
Adequate maintenance staff or resources	Allocating sufficient personnel, tools, and resources to effectively manage maintenance activities.	(Roshan et al., 2017), (Reid, 2023)
Adequate material quality repairs and maintenance	Using appropriate materials for repairs and maintenance to ensure longevity	(Effe & Wokekoro, 2021)

	and performance.	
Adequate sanitary system maintenance	Regular cleaning, inspection, and repair of sanitary systems to prevent backups and maintain hygiene.	(Effe & Wokekoro, 2021) (Joseph-Agyei et al., 2014)
Adequate structural maintenance	Inspecting, repairing, and reinforcing structural components to ensure the integrity and safety of the building.	(Bortolini & Forcada, 2018)
Adequate finishing maintenance	Maintaining finishes such as paint, flooring, and wall coverings to preserve aesthetics and functionality.	(Roshan et al., 2017), (Ibem et al., 2013), (Gawande et al., 2020)

Source**:** Authors compiled through literature

According to Effe & Wokekoro (2021), the Physical and space-related issues, social/behavioral (security and privacy level of the housing unit), quality of public water and proximity of house to fire services, building maintenance (dilapidated drainage system with poor sewage system), public facilities and functional related (parking space and power supply), and structural design and policy have all been identified as challenges in measuring the quality of residential satisfaction in public housing estates. The study also established that poor unit spacing and related issues, poor structural design and maintenance policy, absence of quality water and fire service stations, unstable power supply and poor parking lots, insecurity and high crime rate, and poor drainage and sewage system are the challenges faced in quantifying residential satisfaction in public housing estates. However, the findings highlight that simply providing public housing estates does not ensure effective housing development, but rather meeting genuine needs and preferences for residential satisfaction with lower maintenance costs and structural standards to define quality metrics. The study found that monitoring the quality (performance) of public housing will help to address the difficulties of residential satisfaction at Federal Housing Estates in Abia State.

According to Reid (2023), indicated that addressing the barriers to the sustainable design and construction of affordable housing necessitates the implementation of socially inclusive innovation strategies accompanied by transformative actions aimed at maximizing resource efficiency and promoting environmental sustainability. Also key aspect of this transformation

is to provide adequate investment in construction professional training and skill development to allow the transition from old to modern design and construction processes.

According to Egbu et al. (2021) ; Kieti et al. (2018), According to the study, the barriers affecting the operational performance of low-cost housing are quality of construction, which means that the materials and construction methods used in low-cost housing can have an impact on its long-term durability and maintenance needs, and high-quality construction can contribute to the overall operational performance. Building system efficiency, or the efficiency of heating, cooling, water supply, and other building systems, can have an impact on residents' energy expenses as well as the housing development's overall sustainability. Effective property management, defined as clear communication, prompt response to resident concerns, and enforcement of community rules and regulations, are significant barriers to maintaining a positive living environment and assuring low-cost housing operational performance. Resident satisfaction, or tenants' contentment with their living circumstances, facilities, and management services, is an important measure of low-cost housing's operational performance. Regular inspections, repairs, and improvements are required to ensure the safety, functionality, and beauty of low-cost housing developments. Sustainability measures that incorporate energy-efficient and sustainable building practices can reduce running costs while also contributing to the long-term survival of low-cost housing. Community engagement, which involves residents in decision-making processes and solicits their opinion, can help identify areas for improvement and ensure that housing fulfills their needs and expectations. By tackling these constraints, developers and stakeholders can collaborate to improve the operational performance of low-income housing in cities.

There are several barriers affecting the operational performance of low-cost housing programs, influencing their functioning, sustainability, and overall efficacy. Understanding these limitations is critical for creating and sustaining effective low-income housing complexes. The key barriers affecting the operational performance of low-cost housing are cost and affordability, socioeconomic context, regulatory environment, infrastructure provision, community engagement, construction and building quality, service access, environmental sustainability, urban planning and design, and management and maintenance. Understanding and resolving these barriers is crucial in ensuring that low-cost housing initiatives are

operationally effective, sustainable, and beneficial to the communities they serve (Awad & Musa, 2009; UN-Habitat, 2019).

Targeted interventions and legislative reforms are required to address the major barriers to low-cost housing operational success. Streamlining approval processes, simplifying land tenure systems, and lowering bureaucratic hurdles can all help to alleviate regulatory restraints and improve project efficiency. Increasing access to financing through government subsidies, partnerships with financial institutions, or microfinance efforts can also help low-income people complete low-cost housing projects on time and affordably. Furthermore, investing in infrastructure development to support low-income housing complexes can improve their sustainability and contribute to broader urban development goals.

As a result, the key barriers affecting the operational performance of low-cost housing projects, such as legislative limits, insufficient access to funding, and a lack of infrastructure, provide substantial challenges to the successful implementation of affordable housing programs. Addressing these limitations through focused interventions and stakeholder collaboration will assist overcome these challenges and assure the availability of excellent, affordable housing options for low-income residents.

2.8. Impact of Barriers on Operational Performance of Low-cost Housing

Low-cost housing is a critical component of urban development, particularly in rapidly growing cities. However, the operational performance of low-cost housing projects in City is often hindered by various barriers. This literature review explores the impact of these barriers on the operational performance of low-cost housing projects. Published literature and established low-cost housing rating methods were used to identify major impact of barriers on performance operation of low-cost housing as shown in table 2.3.

Table 2. 3: The impact of barriers in operational performance of low-cost housing

The impact of barriers in operational performance of low-cost housing	Reference
Reduced thermal comfort	(Aqilah et al., 2022), (Gawande et al., 2020)
Poor indoor air quality	(Aqilah et al., 2022),

	(Gawande et al., 2020), (Tierney & Tennant, 2016), (Effe & Wokekoro, 2021)
Health and safety risks	(Gawande et al., 2020) (Tierney & Tennant, 2016) (Effe & Wokekoro, 2021)
Deterioration of Mental Health	(Gawande et al., 2020) (Effe & Wokekoro, 2021) (Reid, 2023)
Increased Energy Costs	(Aqilah et al., 2022) (Reid, 2023)
Noise Disturbances	(Gawande et al., 2020) , (Effe & Wokekoro, 2021), (Prabatha et al., 2018)
Decreased Productivity and Well-being	(Reid, 2023)
Uncomfortable living conditions	(Aqilah et al., 2022), (Gawande et al., 2020), (Prabatha et al., 2018)
Energy inefficiency	(Aqilah et al., 2022), (Reid, 2023), (Prabatha et al., 2018)
Reduced Sustainability	(Gawande et al., 2020), (Effe & Wokekoro, 2021)
Decreased Property Value	(Prabatha et al., 2018) (Spaan & Abraham, 2023)
Safety Concerns	(Gawande et al., 2020), (Tierney & Tennant, 2016) (Reid, 2023)
Poor Indoor Comfort	(Aqilah et al., 2022) (Gawande et al., 2020) (Reid, 2023)

Overall Quality of Life Impact	(Gawande et al., 2020), (Tierney & Tennant, 2016)
Increased maintenance Cost	(Effe & Wokekoro, 2021), (Reid, 2023)

Source**:** Authors compiled through literature

Furthermore, inadequate access to finance has been identified as a major barrier to the operational performance of low-cost housing projects. According to Gebre et al. (2019), Limited access to financing makes it difficult for developers to acquire money for low-cost housing developments, resulting in building delays and lower affordability for potential buyers. This, in turn, influences the overall operational success of low-income housing projects.

Inadequate housing provision in this municipality has its own consequences for urban dwellers. The primary implications of inadequate housing provision were recognized as affecting residents' socioeconomic lives. To address the issue of inadequate housing, relevant bodies must work to fix it. Thus, inadequate or low provision of adequate in the town was remedied by cooperation of kebele administration, municipality office, and private owner, coupled with participation of the community as a whole, but the willingness and effort of these responsible bodies were poor (Birhanu & Debalke, 2020).

The primary effects of barriers on the operational performance of low-income housing residents are housing affordability and stability: operational performance influences housing affordability and stability, which has a direct impact on low-income residents' financial well-being and security. Living condition and comfort: Effective operational performance ensures that residents have habitable, safe, and dignified living conditions, which has an impact on their physical and emotional health. Access to basic services: Operational performance has an impact on inhabitants' access to critical services such as water, sanitation, and power, which influences their daily quality of life and health. Community integration and social cohesion: High-quality low-cost housing promotes community integration, social networks, and inclusive surroundings, giving people a sense of belonging and social cohesiveness among residents. Economic empowerment: operational success opens up prospects for home-based economic activity, skill development, and entrepreneurship, all of which contribute to

residents' economic empowerment and stability. Security and tenure: operational performance influences the security of tenure, assuring residents of the long-term investment value and stability of their housing conditions (OECD, 2021; Organiztion for Economic Co-opration and Development, 2021).

The key impact of barriers of the operational performance of low-cost housing in the neighborhood is economic development: Successful low-cost housing operations help to drive local economic development, create jobs, and stimulate economic activity in the community. Social inclusion and diversity: High-performing low-cost housing complexes encourage social inclusion, diversity, and the formation of mixed-income communities, resulting in a more inclusive community fabric. Urban aesthetics and livability: Effective operational performance improves the aesthetics, livability, and overall urban quality of the neighborhood, contributing to a more lively and appealing urban environment. Environmental sustainability: Operational success encourages sustainable, environmentally friendly practices, reducing the ecological imprint of housing complexes and contributing to a healthy community. Community services and facilities: operational success assures the availability of critical community facilities and services, such as healthcare, education, and recreational amenities, which benefit the entire community. Local economic opportunities: Successful low-cost housing projects can give chances for local businesses, vendors, and service providers, thus improving economic activity within the community (FDRE, 2014).

To summarize, operational performance in low-cost housing has a significant barriers on residents quality of life while also contributing to the overall social, economic, and environmental vibrancy of the neighborhood. Low-cost housing can improve the well-being and socioeconomic fiber of the entire community by assuring good operational performance. This fosters a more inclusive and sustainable urban environment (Hjort & Widén, 2015a).

The operational performance of low-cost housing can have a major barrier impact on occupants and the surrounding community. Residents are more likely to feel content and comfortable in their houses when they are well-maintained, properly managed, and offer high-quality living conditions. This can result in a stronger feeling of community and social cohesion, as well as better mental and physical well-being for residents (Rolfe et al., 2020).

Furthermore, when low-cost housing developments are well-managed, they can help to improve the local community. Well-maintained properties can boost property prices and attract investment to the area, resulting in economic development and improved infrastructure. In contrast, poorly managed or ignored low-cost housing can contribute to blight and disinvestment in the community (Meyer, 2014).

There are various proposals for improving the operational performance of low-cost housing developments. First, overcoming legal limits through expedited approval processes and simplified land tenure systems can assist decrease project delays and increase efficiency. Second, improving developers' access to financing through government subsidies or collaborations with financial institutions can assist speed up project execution and make it more affordable for low-income households.

Barriers have a substantial impact on the operational performance of low-cost housing projects. Regulatory constraints and limited access to funding are among the major barriers to the development of low-cost housing. Addressing these barriers through targeted interventions and regulatory reforms can improve the operational performance of low-cost housing projects while also ensuring affordable housing options for low-income households.

2.9. Best practices and Recommendations for Improving the Operational Performance of Low-cost Housing

Improving the operational performance of low-cost housing developments is critical for meeting low-income residents housing needs while also encouraging sustainable urban development. This literature review examines several strategies developed in existing research to improve the operational performance of low-cost housing, with an emphasis on major suggestions and best practices.

Best practices and recommendations for enhancing the operational performance of low-cost housing include making effective use of resources and applying energy-efficient and sustainable building methods to assist minimize operational costs and environmental impacts. Setting up a proactive maintenance plan can assist prevent costly repairs and improve the lifespan of building components. Community participation and support fosters a sense of community and ownership among residents, which can lead to better property maintenance

and overall operational performance. Training and education for workers and residents can help to increase operational efficiency.

Using technology means introducing solutions like smart building systems, digital maintenance tracking, and energy monitoring tools to assist streamline operations and find areas for improvement. Collaboration with local organizations and government agencies is key to enhancing the operational effectiveness of low-cost housing. Conducting regular performance evaluations of operational performance can assist discover areas for improvement while also tracking progress over time. Implementing these best practices and recommendations can help low-cost housing providers improve operational performance, lower costs, and create a better living environment for residents (Shoubi et al., 2015).

Best practices and recommendations for improving low-cost housing operational performance are centered on identifying and advocating for successful tactics, policies, and interventions to improve the functioning, sustainability, and overall quality of low-cost housing programs. It focuses on the synthesis of evidence-based techniques, innovative solutions, and practical guidance geared to address the specific difficulties faced within the low-cost housing industry (Weldesilassie & Gebrehiwot, 2017).

Sustainable design and construction, community engagement and participation, access to essential services and infrastructure, and supportive legislative frameworks and funding models are all good ways to improve operational performance. Policy advocacy and reform, capacity building and training efforts, partnership engagement and collaboration, and user-centric design and livability enhancement are all recommended to improve operational effectiveness. Monitoring and adaptive management are performance evaluation systems that use robust monitoring mechanisms, protocols, and impact assessment tools to continuously track and adjust housing interventions based on changing needs, community feedback, and operational effectiveness (Pocock et al., 2016). The goal of reviewing and adopting these best practices and recommendations for enhancing the operational performance of low-cost housing is to raise the quality, sustainability, and community impact of housing programs, thereby creating resilient and inclusive urban development.

As a result, incorporating strategies like community participation, innovative financing mechanisms, sustainable design practices, and capacity building can greatly improve the operational performance of low-income housing developments. By implementing these best practices into affordable housing efforts, stakeholders can improve project efficiency, affordability, and sustainability, thereby meeting the housing requirements of low-income inhabitants and contributing to overall urban development objectives.

2.10. Gaps in the Literature Review

The study's research gaps could include limited existing research specifically focused on the operational performance of low-cost housing, a lack of comprehensive evaluation of the key barriers affecting operational performance of low-cost housing, a limited understanding of the impact barriers of operational performance of low-cost housing on residents and the community, and insufficient strategies for improving the operational performance of low Addressing these research gaps is critical for generating comprehensive best practices and suggestions for enhancing the operational performance of low-cost housing in Bishoftu City.

The gap of the research include limited data on key performance indicators (KPIs) relating to operating efficiency, maintenance, and resident satisfaction. There are no set criteria for measuring the operational success of low-cost housing in Ethiopia, and there is little understanding of the specific issues and limits that low-cost housing providers confront in Bishoftu City. There has been limited research on the core causes of operational inefficiency and maintenance concerns. There is a lack of quantitative data on the financial, social, and environmental costs of operational barriers, as well as a limited understanding of the long-term effects of poor operational performance on resident well-being. Insufficient research on new techniques to improve operational efficiency and sustainability in low-cost housing, as well as little involvement with stakeholders (e.g., residents, providers, policymakers) in developing and evaluating improvements strategies.

Additional research gaps include longitudinal studies (lack of longitudinal data to evaluate changes in operational performance over time) and comparative investigations. Limited comparative analysis with other cities or countries to discover best practices and lessons gained, as well as policy analysis that there is insufficient study on the influence of government policies and regulations in determining the operational performance of low-cost

housing. There is also less research on residents' lived experiences and views of operational performance.

Addressing these research gaps would help us gain a better understanding of the problems and opportunities associated with low-cost housing operations in Bishoftu City. It will also provide useful insights for establishing successful measures to improve the quality and sustainability of housing in low-income residents.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1. Introduction

The focuses of this study are to assess the operational performance of low-cost housing and develop strategies for enhancing its operational performance in Bishoftu city. This chapter describes the methodology and design utilized to perform the research. This section contains the methodology used in this thesis work and provides an overview of the research approach adopted in the study, which includes information about the research area, research approach, research design, population and sampling frame, sampling techniques, sample size determination, data collection method, the process of data analysis techniques, questionnaire reliability and validity tests, and ethical considerations. A mixed research method is appropriate as an effective research strategy for this study.

3.2. Study Area

The study area of the research focus on Bishoftu City, located in the Oromia region of Ethiopia. Bishoftu City is experiencing rapid urbanization and population growth, leading to an increase housing demand and shortage of housing for low cost housing options. Low-cost housing initiatives have been implemented in the city to address this need, but their operational performance has not been thoroughly assessed. The study would specifically target residents of low-cost housing initiatives in Bishoftu City. The spatial description of the study area graphically is presented in the Figure 3.1, as shown below within the context of the Bishoftu map.

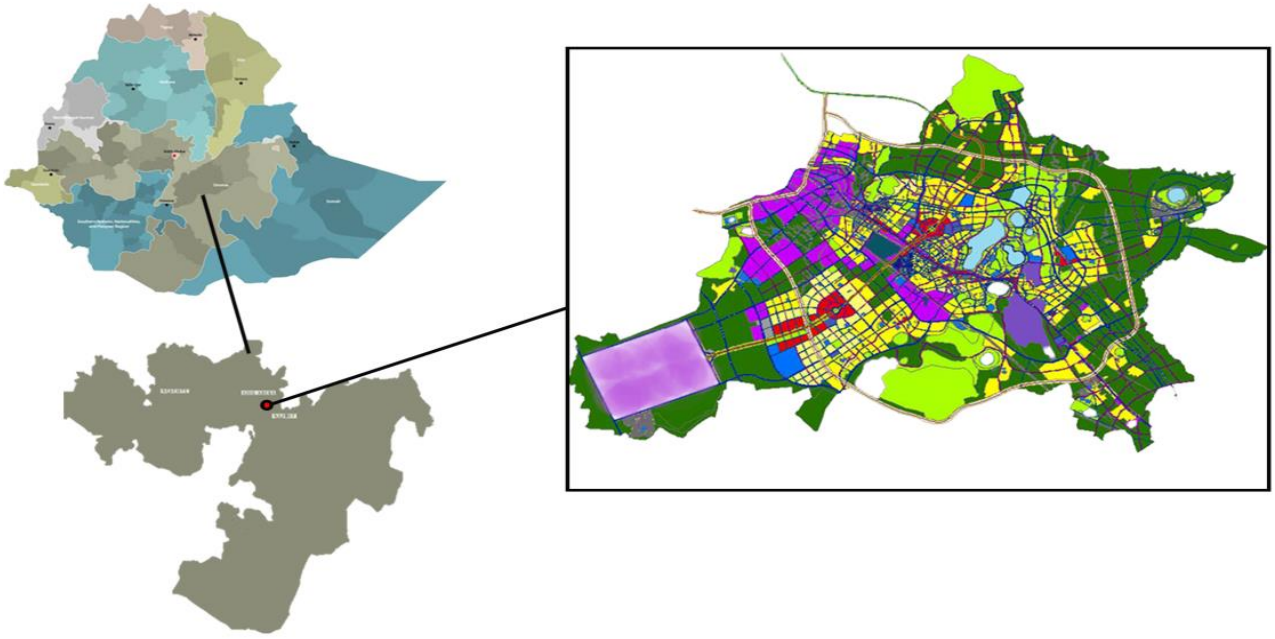

Figure 3. 1: Map of Bishoftu City

Source: Bishoftu city Municipal

3.3. Research Approach

The research approaches are plans and procedures for research that span the steps from broad assumptions to detailed methods of data collection, analysis, and interpretation. The research approach would involve a combination of qualitative and quantitative methods to gather comprehensive data on the operational performance of low-cost housing in Bishoftu City. Qualitative methods such as interviews and site visits were used to gather insights from residents. This could provide a deeper understanding of their perspectives on the current state of low-cost housing and the barriers that affecting its operational performance.

Quantitative methods such as surveys and data analysis were used to assess the current state of low-cost housing in Bishoftu City and measure its impact of barriers on the community. This would involve collecting data on key indicators such as accessibility, quality, and sustainability of low-cost housing options. The data collected through these methods was analyzed using appropriate statistical and qualitative analysis techniques to draw conclusions

and make developing for improving the operational performance of low-cost housing in Bishoftu City. Therefore, the research methodology was adopted qualitative and quantitative research approach which is a mixed research approach.

3.4. Research Design

Research design is choose the right methodology; select the most appropriate data collection methods, and devise a plan (framework) for analyzing the data. The research design was utilize a mixed-methods approach, which includes both qualitative and quantitative research methods to gather data from different sources. Based on the research objectives of the study, the research design was used a primarily descriptive and exploratory. The study aims to evaluate the current operational performance factors, identify key barriers that affecting performance, and assess the impact of barriers of operational performance, which is aligns with a descriptive research design. Additionally, the study also seeks to developing strategies for improvement, which involves exploring potential solutions and strategies, making it was an exploratory research design as well. The combination of both descriptive and exploratory research designs would allow for a comprehensive analysis of the operational performance of low-cost housing in Bishoftu City. The general design followed to this research is summarized in the Figure 3.2, as shown below.

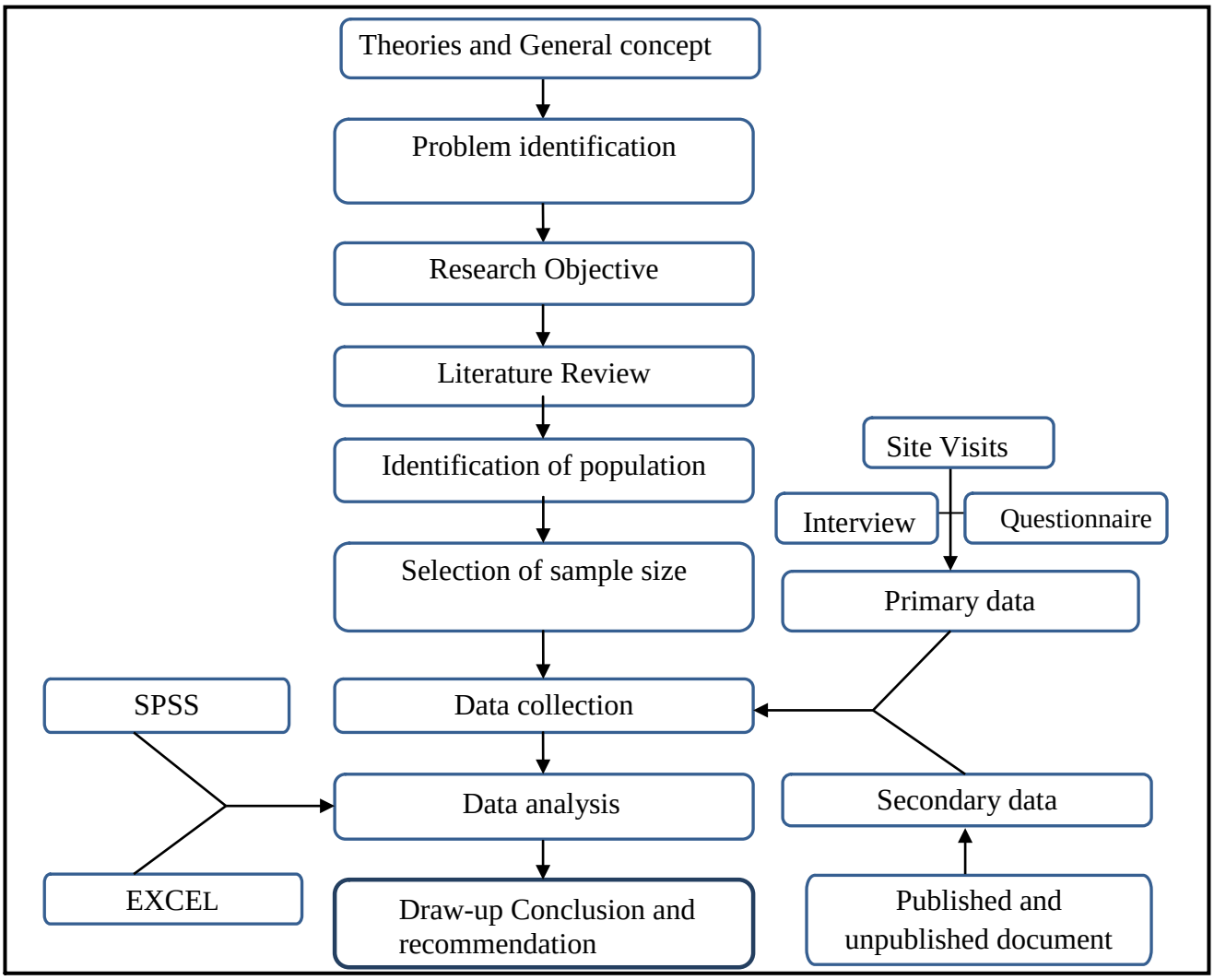

Figure 3. 2: Research design Flow Chart

Source: researcher's own research design

3.5. Population and Sampling Frame

Population refers to the entire group of individuals or objects that meet a certain set of criteria and are of interest to the researcher. The target populations for this research study were all low-cost housing in Bishoftu City.

The sampling frame is a list or description of the population from which a sample was drawn for the research study. In this research, the sampling frame of the study was including a list of all low-cost housing householders in Bishoftu City.

3.6. Sampling Technique

The most suitable sample technique for this study was a combination of simple random sampling and purposive sampling. Simple random Sampling is a probability sampling technique in which each element of the population has an equal and independent chance of being included in the sample, i.e. a sample was selected at random. It is the process of picking a sample by taking a subject that is chosen for a specific purpose rather than based on level or region. Simple random sampling is a method for selecting a smaller sample size from a larger population and using it to conduct research and make generalizations about the larger group for questionnaires.

Purposive sampling technique is a non-probability sampling technique in which researchers was used specifically to select low-cost housing units and community leaders of each low-cost housing site for interviews. This would allow the researchers to gather relevant and specific information from individuals and organizations directly involved in the operational performance of low-cost housing in the city. The criteria for selecting purposive sampling technique may include representativeness which is selecting individuals who are considered representative of a particular subgroup or population of interest for interviews.

By combining different sampling technique, the study could ensure that it captures a comprehensive range of perspectives and experiences relevant to analyzing and assessing the operational performance of low-cost housing in Bishoftu City.

3.7. Sample Size Determination

Sample size determination is the process of selecting representative units of householder for a research study. It is critical to ensure that the sample size is sufficient to produce trustworthy and accurate results for the study. The sample size of the overall sampling frame was calculated to ensure the required number of respondents (representatives). In this study, the target demographic frame includes 2868 low-cost housing householders. The data collected using this technique should be more representative and accurate.

Therefore, this research paper was considers the respondents as sample representative; the following equation 3.1 was used to determine the sample size of a simple random sampling technique from target population frame (Lombeso, 2018):

$$n = \frac{NZ^{2}Pq}{e^{2}(N-1)+Z^{2}Pq} \qquad 3.1$$

Where; n is the desired sample size, N is the size of target population, Z is the standard normal deviate usually set at 1.96 for 95% confidence level, P is a proportion of target population have a specific characteristics (if no estimate available set at 50%), q is one minus P and e is acceptable sample error.

To calculate the sample size of respondents using equation 3.1, as shown below:

$$n = \frac{NZ^{2}Pq}{e^{2}(N-1)+Z^{2}pq} = \frac{2868(1.96)^{2}(0.5)(0.5)}{(0.1)^{2}(2868-1)+(1.96)^{2}(0.5)(0.5)} \approx 93$$

Therefore, the sample size is selected 93 respondents.

3.8. Data Collection Method

This research was conducted using a variety of data collection approaches. Both primary and secondary data have been obtained. The researcher collects primary data from the respondents using self-administered questionnaires, interviews, and site visits.

The researcher acquires secondary data types by gathering information from published and unpublished papers, maps, statistical data, and other relevant information obtained from many sources. This entails doing a thorough literature analysis to acquire existing knowledge and research on the operational performance of low-cost housing.

The major tools for collecting primary data from the target respondents were a questionnaire, an interview, and site visits. This study's primary data was collected using the following techniques:

3.8.1. Interviews

Key stakeholders are each site community leaders were interviewed to gain insights into the barriers that affecting the operational performance of low-cost housing in Bishoftu City. These interviews could provide valuable qualitative data on the challenges and opportunities for improving operational performance.

For the interview 8 target population purposively selected key informants: one from mandube site community leaders of low-cost housing, one from genesis site community leaders of low-cost housing, one from danbi yatu-1 site community leaders of low-cost housing, one from danbi yatu-2 site community leaders of low-cost housing, one from celeleka site community leaders of low-cost housing, one from burka hora site community leaders of low-cost housing, one from dombosko site community leaders of low-cost housing and one from dukem site community leaders of low-cost housing to answer question about issue regarding the operational performance of low-cost housing in Bishoftu City. It also provides much more detailed information than what was expected through other data collection methods, such as a list of questions surveys. Interview protocols i.e. the rules that guide the administration and implementation of the interviews was developed and followed while conducting the interviews.

3.8.2. Questionnaires

The researcher was designing and distributing questionnaires to a sample of residents of low-cost housing in Bishoftu City to gather their perspectives on the operational performance of their housing. The questionnaires were included questions about the quality of housing, access to basic services, and overall satisfaction with their living conditions.

The questionnaire comprises two sections. The first portion of the questionnaire collects information about the respondents' backgrounds. The second section of the questionnaire collects information about the factors that affecting operational performance of low-cost housing, the collects information about the key barriers that affect operational performance of low-cost housing, and the collects information about the impacts of barriers on operational performance of low-cost housing in Bishoftu City.

3.8.3. Site Visits

The researcher was visits to low-cost housing developments in Bishoftu City were conducted to assess the physical condition of the housing units, the availability of infrastructure and services, and the overall livability of the communities.

By using a combination of these data collection techniques, a comprehensive analysis of the factors that affecting operational performance, identification of key barriers that affecting

performance, assessment of the impact of barriers of operational performance, and the development of strategies for improvement of low-cost housing operational performance would be achieved.

3.9. Data Analysis Method

Considering the specific objectives of the research, the following data analysis techniques were able to take into account: The study employed descriptive statistics to examine the survey data obtained from Bishoftu City's low-income housing residents. This was involve calculating measures such as mean and standard deviation to describe the quality of housing, access to basic services, and overall satisfaction levels.

Qualitative analysis was conducted on the interview data obtained from key stakeholders. This was involved identifying themes and patterns in the qualitative data to gain insights into the barriers that affecting operational performance and opportunities for improvement.

Site visits were employed to conduct a comparative analysis of the physical condition of low-cost housing developments in Bishoftu City. This involves assessing the availability of infrastructure and services in various housing projects to find areas for improvement.

Content analysis was utilized to review and analyze relevant documents of previous studies on low-cost housing with low-cost housing in Bishoftu City. This was involved identifying key themes and strategies for improving operational performance.

Data collected from the first part of the questionnaire (respondent’s profile) that are respondents educational background, sex, age, low cost housing projects stakeholders, and current occupation were analyzed descriptively using frequency, charts and percentages.

Mean score and standard deviation technique

Data collected from the factors that affecting operational performance of low-cost housing in Bishoftu City of the questionnaire is analyzed by mean score and standard deviation technique was used to determine the average of the current operational performance factors of low-cost housing using the following a 5-point likert scale: Very Dissatisfied = 1, Dissatisfied = 2, Neutral = 3, Satisfied = 4 and Very Satisfied = 5.

Data collected from the impacts of barriers in operational performance of low-cost housing in Bishoftu City of the questionnaire was also analyzed by mean score and standard deviation technique to determine the most significant impact of barriers in operational performance of low cost housing using five likert scale: 1 = Very low impact, 2 = Low impact, 3 = Moderate impact, 4 = High impact and 5 = Very high impact.

Relative Importance Index (RII) Technique

Data collected from the key barriers that affecting operational performance of low-cost housing in Bishoftu City of the questionnaire is analyzed by relative importance index technique was used to determine the relative most significant barriers that affecting operational performance of low-cost housing using the following a 5-point likert scale: 1 = Not a barrier, 2 = Minor barrier, 3 = Moderate barrier, 4 = Significant barrier and 5 = Major barrier. Data analysis technique by RII, the equation 3.2 is used to determine the relative importance index as shown below (Joro, 2013):

$$RII = \frac{\sum W_i f_{xi}}{AN} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{AN} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad 3.2$$

Where W_i is weight given to i^{th} response; i = 1, 2, 3, 4 and 5, f_{xi} is the responses frequency, N is total number of responses, RII is relative importance indices, A is the highest weight (i.e. 5 in this case), n_5 is number of respondents for value 5, n_4 is number of respondents for value 4, n_3 is number of respondents for value 3, n_2 is number of respondents for value 2 and n_1 is number of respondents for value 1.

By utilizing these data analysis techniques, this study aims to provide a comprehensive assessment of the operational performance of low-cost housing in Bishoftu City and offer valuable strategies for improvement. Based on the findings relevant conclusions were drawn using SPSS and excel software.

3.10. Validity and Reliability

Validity and reliability are ideas used to evaluate the quality of research and indicate how well a method, technique, or test measures something. They are crucial in assuring the credibility and trustworthiness of the study's conclusions. According to Stilwell & Hoskins (2013), study

indicated that the reliability and validity are two main criteria for determining data quality control where validity presumes reliability.

3.10.1. Validity of the Research Method

Validity in research refers to the extent to which a study accurately measures what it is intended to measure, and the validity of questionnaire data is heavily influenced by respondents' capacity and desire to offer the requested information. The questionnaire was adapted from evaluated literature and similar study instruments and tailored to the current research context. Furthermore, the customized questions were pilot tested by advisors, professionals in the field, and specialists to ensure validity. Overall, the researchers hope to increase the validity of their studies by using suitable measures, controlling for confounding variables, and ensuring that their findings can be applied to other populations or contexts.

In this way, the study was structured to clearly and accurately answer the desired purpose (research question). The instrument's similarity with other operational performance of low-cost housing measurement scales, detailed reviewed literatures of the constructs/concepts identified by the variables in the two parts of the questionnaires, advisor's review and comments in the process that follow a formal statistical/scientific approach in answering the research questions ensured that the study approach and the measurement instrument fulfilled all.

Triangulation, the use of multiple data collection methods, is particularly valuable in evaluating the operational performance of low-cost housing due to the complex and multifaceted nature of this topic. By combining questionnaires, interviews, and observation, researchers could gain a more comprehensive and valid understanding of the performance of low-cost housing units. Triangulation enhances the validity of the research method by reducing bias, increasing reliability and providing a comprehensive view. To evaluate the operational performance of low-cost housing in Bishoftu City, researchers could use the following triangulation methods: questionnaires which are to collect quantitative data on occupant satisfaction, housing conditions, and maintenance issues from a large sample of residents, interviews which are to gain in-depth qualitative insights into the lived experiences of occupants, their challenges, and their suggestions for improvement and observation which are to assess the physical condition of housing units, observe maintenance practices, and

record environmental factors that may affect operational performance. By triangulating these methods, researchers could increase the validity of their findings and gain a comprehensive understanding of the operational performance of low-cost housing in Bishoftu City. This information could then be used to identify areas for improvement and develop effective policies to enhance the living conditions of low-income residents.

3.10.2. Reliability of Questionnaire

A questionnaire's dependability refers to its consistent and stable performance throughout time. A trustworthy questionnaire produced consistent answers whether distributed to the same group of people at different dates or by different researchers. To ensure questionnaire reliability, employ standardized questions, clear instructions, and a consistent format. Overall, a valid questionnaire is required to collect accurate and trustworthy data for research purposes.

Cronbach's alpha coefficient is a statistical measure that assesses the internal consistency of questionnaire reliability was tested. It indicates how closely related a set of items are as a group, and how would they measure the same underlying construct. A high Cronbach's alpha coefficient (typically above 0.7) suggests that the questionnaire is reliable and consistent in measuring what it is intended to measure. However, it is important to note that reliability is just one aspect of questionnaire validity, and other factors such as content validity and construct validity were considered.

Data collected from the respondent's profile of the questionnaire reliability is test participants personal characteristics regarding the test environment and condition of the participants can contribute to whether or not a test is effectively reliable. Simple random sampling and purposive sampling technique is that the researcher exercises for target population selection on the informant's reliability and competency. This is a relevant concern especially regarding key informants on whom much of the data quality rest.

Data collected from the factors that affecting operational performance of low-cost housing, from the key barriers that affecting operational performance of low-cost housing and from the impact of barriers in operational performance of low-cost housing of the questionnaires, internal consistency reliability is tested by Cronbach's alpha coefficient in rated on a five point likert the response scale. Reliability tested using Cronbach's alpha values for the items in each

construct. Cronbach's alpha requires only a single test administration to provide a unique estimate of the reliability.

The test of reliability, the equation 3.2 is used to determine the Cronbach's alpha as shown below (Namdeo & Rout, 2016):

$$\alpha = \left(\frac{k}{k-1}\right)\left(\frac{S_T{}^2 - \sum S_i{}^2}{S_T{}^2}\right) \quad \cdots \quad \cdots \quad \cdots \quad \cdots \quad \cdots \quad \cdots \quad \cdots \quad \cdots \quad \cdots \quad \cdots \quad \cdots \quad \cdots \quad 3.2$$

Where; α is the cronbach alpha coefficient, K is the number of items, S_i^2 is the variance of i^{th} item and S_i^2 is the variance of total score formed by summing items.

The interpretation of Cronbach's alpha is the range of Cronbach's alpha normally is between 0 and 1. Guide line provided by them to assess the reliability of any data as shown in Table 3.1.

Table 3. 1: Guideline for assessing reliability results

S. No	Range	Reliability
1	0.9 and above	Excellent
2	0.7 – 0.9	High
3	0.5 - 0.7	Moderate
4	0.5 and below	Low

Source: (Perry R. Hinton & Brownlow, 2014)

Results of Reliability Analysis

Before conducting an analysis based on the results obtained from the questionnaire, Cronbach analysis was carried out to ascertain the internal consistency of the questions using a five point Likert scale. The Cronbach Alpha test that shows the reliability of the questionnaire and the result of the reliability test that was conducted on the factors that affecting current operational performance of low-cost housing, the key barriers that affecting operational performance of low-cost housing and the impact of barriers in operational performance of low-cost housing in Bishoftu City is represented in the Table 3.2, as shown below.

Table 3. 2: Result of Reliability test

Reliability Statistics	Cronbach's Alpha	No Items
The factors that affecting current operational performance of low-cost housing	0.854	32
The key barriers that affecting operational performance of low-cost housing	0.817	23
The impact of barriers in operational performance of low-cost housing	0.853	15
Overall	0.865	70

Source: Own survey data analysis

The findings show that the 32 items in the factors that affecting operational performance of low-cost housing in Bishoftu City are connected. There is internal coherence among the elements. Because the data collected was based on five Likert-scales, Cronbach's Alpha was utilized to ensure the research's reliability, and all components were high or close to one. The aggregate Cronbach Alpha value for the 32 items is 0.854, indicating that the data is very reliable.

The findings show that the 23 the key barriers that affecting the operational performance of low-cost housing in Bishoftu City are correlated. There is internal coherence among the items. Because the data collected was based on five Likert-scales, Cronbach's Alpha was utilized to ensure the research's reliability, and all components were high or close to one. The aggregate Cronbach Alpha value for the 23 items is 0.817, indicating that the data is very reliable.

The result indicates that the 15 items in the impact of barriers in operational performance of low-cost housing in Bishoftu City are correlated. There is internal consistency between the items. Since the data collected was based on five Likert-scales; therefore to check reliability of the research Cronbach’s Alpha method was used and all the components is high or close to 1. As a matter of fact the overall Cronbach Alpha value for the 15 items is 0.853 which showed high reliability of the data. Therefore, the researchers conclude that the test and questions were reliable.

3.11. Ethical Consideration

There were several ethical concerns with this study. It is crucial to take ethical considerations like informed consent, confidentiality, and privacy into account while creating and implementing a questionnaire. The rights of the research participants and the manner in which their data was utilized were explained in detail, along with the goal of the study. Furthermore, there was no penalty for research participants who choose to decline participation or leave the study at any time. Additionally, it's critical to safeguard research participants' privacy and confidentiality by employing anonymous or pseudonymous identifiers and securely storing data. Lastly, the researcher made sure that any possible risks or harm to participants did not exceed the potential benefits of the study.

The confidentiality of the information was assured, and no participant's name is disclosed in the research. Making sure that participants don't suffer from the research's conclusions is another ethical responsibility. It is forbidden for the author to purposefully misreport results that could harm the participants.

CHAPTER FOUR
RESULTS AND DISCUSSIONS

4.1. Introduction

The study's most significant section is the results and discussion, which is organized in accordance with the research objective and presents the findings. The key findings were closely related to the analysis and assessment of the low-cost housing operational performance in Bishoftu City, and the data gathered from site visits, interviews, and survey questionnaires is examined in the context of the learning objectives.The analysis was carried out using mean score and standard, and RII method; focusing on the factors that affecting current operational performance, identification of key barriers that affecting operational performance, assessment of the impact of barriers of operational performance, and the development of strategies for improvement of low-cost housing operational performance in Bishoftu City. Accordingly, interpretations and discussions were presented on the basis of the findings. Hence, this topic seeks to discuss the implications of the findings in relation to the research objectives.

A total of 93 questionnaires which dealt with the factors that affecting operational performance, identification of key barriers that affecting operational performance, assessment of the impact of barriers of operational performance, and the development of strategies for improvement of low-cost housing operational performance in Bishoftu City were distributed to the respondents. However, only 72 questionnaires were collected and had usable responses (77.4% response rate), interview, site visits and relevant documents have been also reviewed. Considering the difficulty of collecting data in low-cost housing, a 77.4% response rate was reasonably very good.

Table 4. 1: Frequency distribution of sample respondent's rate

No of distributed questionnaire	No of returned Responses	% of returned Responses
93	72	77.4%

Source: Own survey data analysis

4.2. Respondent's Profile

4.2.1. Respondents Gender

The study sought and obtained gender details of the respondents that have been requested during the survey 62.5% were male and 37.5% were female, which is the result as shown in

Figure 4.1 below.

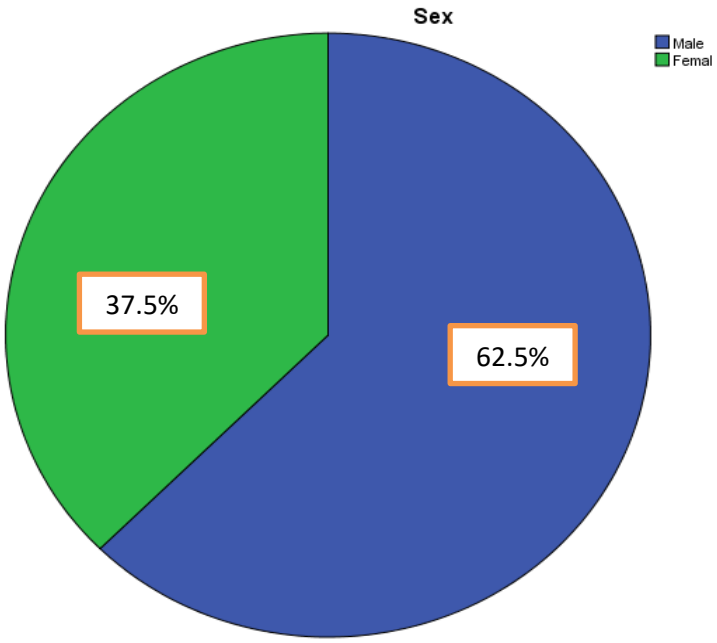

Figure 4. 1: Gender of the Respondents

Source: Own survey data analysis

The study found out that, 62.5% of the 72 respondents were men, while 37.5% were women. This suggests that both genders were fairly represented in the study, with the majority of responders being male. This is because, throughout data collection, the majority of respondents found were male.

4.2.2. Respondents Age

To come with the age of the respondents 20.8% were less than 30 years old, 56.9% were 30 - 60 years old and 22.2% were above 60 years old. This implies that the majority of the respondents were aged 30 - 60 (56.9%) and the smallest numbers of the respondents were aged less than 30 (20.8%). This shows that majority of the households were in the active age group who feel the problem of operational performance of low-cost housing and this information clearly exposed in the table 4.2 below.

Table 4. 2: Age of the respondents

Age (Years)		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 30	15	20.8	20.8	20.8
	30 – 60	41	56.9	56.9	77.8
	More than 60	16	22.2	22.2	100.0
	Total	72	100.0	100.0	

Source: Own survey data analysis

4.2.3. Respondents Educational Background

The study sought to find out the education level of respondents and the responses were analyzed as shown in Table 4.3 below.

Table 4. 3: Respondents' Educational background

Educational background		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below Diploma	18	25.0	25.0	25.0
	Diploma	19	26.4	26.4	51.4
	BSc/ BA	31	43.1	43.1	94.4
	MSc/ MA & Above	4	5.6	5.6	100.0
	Total	72	100.0	100.0	

Source: Own survey data analysis

Based on the above analysis from frequency Table 4.3, it was indicated that the highest educational level of the respondents ranges from diploma to the first degree. The majorities of the respondents 43.1% are first degree holders, the followed respondents 26.4% are Diploma holders, 25% of the respondents are below diploma and 5.6% of the respondents are second degree holders. This implied that highly educated people with high expertise and high knowledge of matters. This also helped the researcher to quickly collect data since the respondents were able to read, write and easily interpret the questionnaires. Therefore, high educated respondents were key role players in providing adequate and relevant data which determine the research result rationally and logically.

4.2.4. Respondents Occupation

The study sought to find out the current occupation of respondents and the responses were analyzed as shown in Table 4.4 below.

Table 4. 4: Respondent's occupation

	The current occupation	Frequency	Percent	Valid %	Cumulative %
Valid	Student	2	2.8	2.8	2.8
	Self-employed	26	36.1	36.1	38.9
	Employed (full-time)	30	41.7	41.7	80.6
	Unemployed	2	2.8	2.8	83.3
	Employed (part-time)	10	13.9	13.9	97.2
	Retired	2	2.8	2.8	100.0
	Total	72	100.0	100.0	

Source: Own survey data analysis

The results also showed that the majority (41.7%) of respondents were full-time employees, 36.1% were self-employed, and 13.9% were part-time employees, with very few being students, unemployed, or retirees. The results clearly reveal that the majority of respondents were middle-aged, educated, and employed in Bishoftu City.

4.3. Factors that Affecting Current Operational Performance of Low-Cost Housing

Assessment of the factors that affecting current operational performance of low-cost housing includes achievement levels for each important attribute. Consider how well the existing operational performance factors of low-cost housing supports each of the qualities. The overview evaluation was conducted using the mean score technique, with respondents asked to rate the current operational performance factors of low-cost housing in Bishoftu City. Ranking of the various current operational performances factors of low-cost housing levels according to their mean value and the interpretation of the mean values and ranked from the highest to the lowest, which are rankings of 32 common current operational performance factors of low-cost housing as per previous studies, and current operational performance factors were classified into three major parameters and ranked. This means that all the thirty two factors are

considered as factors that affecting current operational performance of low-cost housing in Bishoftu City.

The results show that all respondents agreed that the maintenance parameters were the highest factors of factors that affecting operational performance of low-cost housing in Bishoftu City with average mean value of 3.607, Construction parameters were considered the second most important factors that affecting operational performance of low-cost housing in Bishoftu City with average mean value of 3.603 & the followed by design parameters with average mean value of 3.478 which is the results of the analysis are presented in Tables 4.5, as shown below.

Table 4. 5: Factors that affecting current operational performance of low-cost housing

Factors that affecting current operational performance of low-cost housing	N	Mean	Std. Dev.	Rank
Design parameter				
Design of building in relation to occupant's way of life	72	4.03	0.855	1
Sizes of dining Rooms Spaces	72	3.76	1.028	2
Sizes of Cooking and Storage Spaces	72	3.76	1.107	3
Sizes of Living Rooms Spaces	72	3.61	1.170	4
Sizes of Bedrooms Spaces	72	3.60	1.134	5
Potential for natural ventilation	72	3.54	1.061	6
Lighting controls	72	3.53	1.113	7
Internal and external lighting levels	72	3.47	1.186	8
Aesthetic appearance of Building	72	3.42	1.253	9
Design of Bath and Toilet facilities	72	3.38	1.131	10
Acoustic performance (ambient noise levels)	72	3.36	1.225	11
Acoustic performance (room reverberation time)	72	3.35	1.235	12
Quality of Natural Lighting	72	3.29	1.093	13
Daylight	72	3.19	1.182	14
View out	72	3.19	1.218	15
High lighting	72	3.17	1.210	16
Construction parameter				

leakage detection	72	3.72	1.024	1
Protection against dampness in the Building	72	3.71	1.119	2
Functionality of sanitary system	72	3.65	1.313	3
Type of materials used in the construction	72	3.64	1.092	4
Fire safety and protection	72	3.63	1.080	5
Flood risk or water run off	72	3.49	1.245	6
Protection against insects and dangerous animals	72	3.38	1.144	7
Location of building (Access to shops /market centers)	72	3.28	1.141	8
Maintenance parameter				
Internal air pollution	72	3.81	1.134	1
Maintenance cost of the building	72	3.81	1.146	2
Sustainable water supply in the Building	72	3.69	1.252	3
Building security	72	3.64	1.166	4
Thermal comfort	72	3.63	1.156	5
Sustainable power supply in the Building	72	3.60	1.109	6
Ventilation rates	72	3.51	1.187	7
Safer parking	72	3.49	1.100	8

Source: Own survey data analysis

Hence, it could be concluded from analysis of the responses that the dominant top eight design parameter of operational performance factors of low-cost housing in Bishoftu City are design of building in relation to occupant's way of life with mean value of 4.03, **s**izes of dining rooms spaces with mean value of 3.76 and standard deviation value of 1.028, Sizes of cooking and storage spaces with mean value of 3.76 and standard deviation value of 1.107, sizes of living rooms spaces with mean value of 3.61, sizes of bedrooms spaces with mean value of 3.60, potential for natural ventilation with mean value of 3.54, lighting controls with mean value of 3.53 and internal and external lighting levels with mean value of 3.47.

It could be concluded from analysis of the responses that the dominant top five construction parameter of operational performance factors of low-cost housing in Bishoftu City are leakage detection with mean value of 3.72, protection against dampness in the building with mean

value of 3.71, functionality of sanitary system with mean value of 3.65, type of materials used in the construction with mean value of 3.64 and fire safety and protection with mean value of 3.63.

It could be concluded from analysis of the responses that the dominant top six maintenance parameter of operational performance factors of low-cost housing in Bishoftu City are internal air pollution with mean value of 3.81 and standard deviation value of 1.134, maintenance cost of the building with mean value of 3.81 and standard deviation value of 1.146, sustainable water supply in the building with mean value of 3.69, building security with mean value of 3.64, thermal comfort with mean value of 3.63 and sustainable power supply in the building with mean value of 3.60.

Design of building in relation to occupant's way of life which means Low-cost housing designs sometimes overlook the lifestyle of its occupants, leading to uncomfortable and inefficient living environments. Homes in Bishoftu City should be designed with the unique cultural and socioeconomic demands of its residents in mind. Size of dining rooms spaces which are dining rooms typically small or non-existent in low-cost housing units. Inadequate dining space can lead to cramped and uncomfortable living conditions, especially for families.

Sizes of cooking and storage spaces which are efficient and well-designed cooking and storage spaces are crucial for low-cost housing. These spaces should be optimized for functionality, accessibility, and organization to meet the needs of the occupants, taking into account their cooking habits and storage requirements. The size of the living room space is an essential design parameter that influences the comfort and social interactions within the household. It should be designed to accommodate seating, entertainment, and relaxation needs while considering the available space and budget constraints.

Sizes of bedroom spaces which are adequate bedroom sizes are important for the comfort and privacy of the occupants. The design should consider the number of residents, furniture placement, and storage needs to create functional and comfortable sleeping spaces. Potential for natural ventilation which is low-cost housing in Bishoftu City should prioritize natural ventilation to enhance indoor air quality and thermal comfort. Design parameters should

include window placement, building orientation, and airflow patterns to maximize natural ventilation while minimizing energy consumption.

Lighting controls are sometimes absent in low-cost dwellings, making it impossible to modify lighting levels based on requirements. Adjustable lighting is essential for creating a pleasant and inviting living environment. Internal and external lighting levels which are internal lighting levels are frequently inadequate, resulting in a lack of visibility and safety problems. External lighting is also crucial for providing security and establishing a sense of place.

Finally, various design parameters have substantial influences on the current operational performance factors of low-cost housing in Bishoftu City, since designs that fail to adapt to the residents way of life cause discomfort and inconvenience. Insufficient dining, kitchen, storage, and living room areas compromise functionality and well-being. Limited natural ventilation, lighting controls, and insufficient lighting levels all raise health and safety problems. To improve the operational performance factors of low-cost housing in Bishoftu City, it is crucial to address these design parameter by considering the cultural and social needs of occupants in the design process, increasing the sizes and improving the functionality of key spaces such as dining rooms, kitchens, storage areas, and living rooms, enhancing natural ventilation through proper airflow and window placement and providing adjustable lighting controls and ensuring sufficient lighting levels to create a comfortable and safe living environment.

Leakage detection, are a prevalent concern in low-cost housing, causing structural damage, mold growth, and higher energy usage. Effective leakage detection systems are critical for the early detection and repair of leaks. Protection against dampness in the building, which is dampness in the building can lead to health problems, structural damage, and mold growth. Proper construction procedures, such as waterproofing and drainage systems, are required to prevent dampness.

Functionality of sanitary system a functioning sanitary system is essential for cleanliness, health, and safety. Inadequately constructed or maintained sanitary systems can cause pollution, disease outbreaks, and unpleasant odors. The type of materials used in construction, specifically their quality and durability, has a direct impact on the operational performance of low-cost housing. Low-quality materials can cause structural issues, premature deterioration,

and high maintenance expenses. Fire safety and protection, or fire safety, is a serious concern in low-cost housing, particularly in densely populated areas. Proper fire safety measures, including as fire alarms, sprinklers, and fire-resistant materials, are critical for occupant and property protection.

All in all, the current operational performance factors of low-cost housing in Bishoftu City is also significantly influenced by a number of construction parameters are lack of effective leak detection systems leads to undetected leaks and subsequent damage, inadequate protection against dampness creates health and structural problems, poorly functioning sanitary systems pose health risks and reduce the quality of life, low-quality construction materials compromise durability and increase maintenance costs and insufficient fire safety measures endanger occupants and property. To improve the operational performance factors of low-cost housing in Bishoftu City, it is crucial to address these construction parameter by installing leak detection systems to identify and repair leaks promptly, employing proper construction techniques and materials to prevent dampness, ensuring the functionality and maintenance of sanitary systems, using high-quality construction materials to enhance durability and reduce maintenance costs and implementing comprehensive fire safety measures to protect occupants and property.

Internal air pollution is a severe health risk in low-cost housing, particularly in poorly ventilated units. Source of indoor air quality includes Cooking fumes, mold, and toilets all contribute to indoor air pollution. Maintenance costs for low-cost housing often requires excessive maintenance due to poor construction quality and a lack of regular repair. High maintenance costs can be a financial hardship on occupants, lowering the affordability of home.

Sustainable water supply in the building which is access to clean and reliable water is essential for health and well-being. Low-cost housing in Bishoftu City face challenges with sustainable water supply, especially occupants living above first floor. Building security is a major concern for low-income residents, particularly those living in densely populated neighbourhoods. Inadequate security measures can cause crime, vandalism, and fear among residents.

Thermal Comfort is crucial for occupant well-being and productivity. Low-cost housing units often lack proper insulation and ventilation, leading to extreme temperatures and discomfort. Sustainable power supply in the building access to consistent and affordable electricity is critical for modern living. Low-cost housing Bishoftu City's faces challenges in terms of sustainable power supply.

Finally, the current operational performance factors of low-cost housing in Bishoftu City is also significantly influenced by several maintenance parameter actors are poor indoor air quality poses health risks and reduces comfort, high maintenance costs can strain occupants' finances and compromise housing affordability, lack of sustainable water supply creates health and hygiene concerns, inadequate building security weakens the safety and well-being of occupants, poor thermal comfort affects occupant health, productivity, and quality of life and limited sustainable power supply hinders access to essential services and modern conveniences. To improve the operational performance factors of low-cost housing in Bishoftu City, it is important to address these maintenance parameter by implementing measures to improve indoor air quality, such as ventilation, air purification, and proper insulation; establishing regular maintenance schedules and providing resources for occupants to maintain their units; exploring sustainable water supply solutions, such as rainwater harvesting and providing cistern placement above the roof of building; enhancing building security through improved lighting, fencing, and access control systems; employing passive design strategies and energy-efficient appliances to improve thermal comfort; and investing in renewable energy sources and grid infrastructure to ensure a reliable and sustainable power supply.

According to Ibem et al. (2013), in general, building privacy, Building bedroom sizes, living room sizes, kitchen natural lighting quality, dining area size, and living/dining area air quality the state of the bedrooms' air The building's location within the housing estate Sizes of cooking and storage areas, as well as the building's initial maintenance costs, were determined to be the low-cost housing market's present operational performance problems in terms of design, construction, and maintenance-related aspects. Consequently, the study's findings are consistent with and supportive of(Ibem et al., 2013).

Tierney & Tennant (2016), found that the major current operational performance issues of low-cost housing in design, construction and maintenance related factors are: Internal and

external lighting levels, Lighting controls, Potential for natural ventilation, Internal air pollution, Thermal comfort, Ventilation rates, Acoustic performance (ambient noise levels) and Acoustic performance (room reverberation time). Therefore, once again this study finding is also coincides with (Tierney & Tennant, 2016).

Therefore, the findings already indicate that the significant operational performance factors issues of low-cost housing in Bishoftu City highlight the need for a comprehensive approach to enhance the operational performance factors of housing for low-income residents. This approach should address all three classifications of parameters: design, construction, and maintenance. Design parameters which are housing units should be designed to meet up with the specific needs and lifestyles of the occupants, taking into account factors such as cultural practices, family size, and climate. Construction parameters which are housing units should be constructed using high-quality materials and workmanship, in accordance with building codes and standards. Maintenance parameters which are housing units should be properly maintained and repaired on a regular basis to ensure their long-term durability and habitability. By addressing these issues, policymakers, housing providers, and community organizations can work together to improve the operational performance of life for low-income residents in Bishoftu City and beyond.

4.4. Barriers to Affect Operational Performance of Low-Cost Housing

The contribution of each of the variables to overall barriers was examined and ranking of the attributes in terms of their criticality as perceived by the respondents was done by use of RII five point likert-scale: (1 is Not a barrier, 2 is Minor barrier, 3 is Moderate barrier, 4 is Significant barrier and 5 is Major barrier) which was computed using equation and rankings of 23 common barriers to affect operational performance of low-cost housing as per previous studies and barriers were categorized into three major groups and were ranked. The outcome show that all respondents agreed that the design related barriers to affect operational performance of low-cost housing in Bishoftu City were the highest barriers with average RII value of 0.757, construction related barriers were considered the second most significant barriers to affect operational performance of low-cost housing in Bishoftu City with average RII value of 0.744 & the followed by maintenance related barriers with average RII value of 0.734 which is the results of the analysis are presented in Tables 4.6, as shown below.

Table 4. 6: Barriers that affecting operational performance of low-cost housing

Barriers that affecting operational performance of low-cost housing	RII	Rank
Design Related Barriers		
Poor aesthetics design	0.797	1
Inadequate size of different rooms of building design	0.789	2
Design consideration for lack of proper Lighting	0.775	3
Poor design noise pollution	0.758	4
Design consideration for poor ventilation	0.755	5
Poor layout functionality and design	0.750	6
Limited Accessibility design Features	0.739	7
Adequate amenities and facilities design	0.689	8
Construction Related Barriers		
Moisture and mold	0.786	1
Quality of construction workmanship	0.761	2
Lack of communication during construction	0.747	3
Quality of construction material	0.739	4
Adequate on site management	0.731	5
Maintenance Related Barriers		
Adequate sanitary system maintenance	0.773	1
Adequate electrical system maintenance	0.772	2
Adequate finishing maintenance	0.756	3
Timely repairs and maintenance	0.744	4
Lack of preventive maintenance	0.736	5
Adequate structural maintenance	0.733	6
Adequate maintenance staff or resources	0.717	7
Consistent quality of maintenance services	0.711	8
Adequate parking and access to amenities during construction	0.700	9
Adequate material quality repairs and maintenance	0.661	10

Source: Own survey data analysis

According to the results of the study shown above it clearly indicates that the prevailing top five most significant design related barriers to affect operational performance of low-cost housing in Bishoftu City are poor aesthetics design with the RII value of 0.797, inadequate size of different rooms of building design with the RII value of 0.789, Design consideration for lack of proper lighting with the RII value of 0.775, poor design noise pollution with the RII value of 0.758 and Design consideration for poor ventilation with the RII value of 0.755.

It clearly indicates that the dominant top five most significant construction related barriers to affect operational performance of low-cost housing in Bishoftu City are Moisture and mold with the RII value of 0.786, Quality of construction workmanship with the RII value of 0.761, Lack of communication during construction with the RII value of 0.747, Quality of construction material with the RII value of 0.739 and Adequate on site management with the RII value of 0.731.

This clearly shows that the dominant top five most significant maintenance related barriers to affect operational performance of low-cost housing in Bishoftu City are Adequate sanitary system maintenance with the RII value of 0.773, Adequate electrical system maintenance with the RII value of 0.772, Adequate finishing maintenance with the RII value of 0.756, Timely repairs and maintenance with the RII value of 0.744 and Lack of preventive maintenance with the RII value of 0.736.

Based on the identified design-related barriers, it is evident that there are significant challenges affecting the operational performance of low-cost housing in Bishoftu City. These barriers have a direct impact on the liveability and functionality of the housing units. Poor aesthetics design which is lack of aesthetic considerations in the design of low-cost housing can contribute to a sense of dissatisfaction among residents. This can affect their overall well-being and pride in their living spaces. It is while aesthetics may not have a direct impact on operational performance; they can influence occupant happiness and well-being. Poor aesthetics can lead to low morale, a lack of community pride, and lower property values.

Inadequate size of different rooms of building design which is the size of rooms in low-cost housing units is crucial for the comfort and functionality of residents. Inadequate room sizes can lead to overcrowding, lack of privacy, and limited space for essential activities. Design

consideration for lack of proper lighting which is insufficient natural lighting due to poor design considerations can have adverse effects on the mental and physical health of residents. Proper lighting is essential for creating a comfortable and safe living environment.

Poor design noise pollution which is inadequate insulation and poor design choices can result in high levels of noise pollution within low-cost housing units. This can negatively impact the quality of life for residents, affecting their ability to rest and concentrate. Design consideration for poor ventilation which is inadequate ventilation can lead to poor indoor air quality, which can have detrimental effects on residents' health. Proper ventilation is essential for maintaining a healthy living environment.

Finally, addressing these design-related barriers is crucial for improving the operational performance of low-cost housing in Bishoftu City. Solutions such as incorporating sustainable and aesthetic designs, optimizing room sizes, ensuring adequate lighting and ventilation, and implementing noise-reducing measures are essential for creating livable and functional housing units for residents. Collaboration between architects, urban planners, and policymakers is necessary to address these barriers and improve the overall quality of low-cost housing in the city.

Moisture and mold are common problems in low-cost housing due to poor construction practices and lack of proper ventilation. Moisture can lead to structural damage, mold growth, and health problems for residents, which is the graphically presents of the moisture and mold as shown in Figure 4.2.

Figure 4. 2: Moisture and mold

Source: Researcher Photo

Quality of construction workmanship poor workmanship can result in structural defects, safety hazards, and premature deterioration of the building. Low-cost housing projects often suffer from unskilled labor and lack of quality control, which is the graphically presents of the quality of construction workmanship as shown in Figure 4.3.

Figure 4. 3: Quality of construction workmanship

Source: Researcher Photo

Lack of communication during construction effective communication among stakeholders is critical for successful building projects. Lack of communication can result in delays, misunderstandings, and poor coordination and poor quality of construction. Quality of construction material the quality of construction materials has a direct impact on the building's durability and performance. Low-cost housing developments may use low-quality materials to reduce costs, jeopardizing the structure's overall stability.

Adequate on-site management which is adequate on-site management is required to ensure that construction is completed in accordance with plans and specifications. Inadequate supervision can cause errors, delays, and poor quality work.

Finally, the barriers that affecting operational performance of low-cost housing in Bishoftu City is also hindered by several construction-related barriers are moisture and mold pose health risks and structural problems due to poor construction practices and ventilation; poor workmanship compromises safety, durability, and aesthetics of the building; lack of communication leads to inefficiencies, delays, and misunderstandings during construction; low-quality construction materials reduce the lifespan and performance of the housing units; and inadequate on-site management undermines quality control and coordination. To improve the operational performance of low-cost housing in Bishoftu City, it is important to address these construction-related barriers by employing proper construction techniques and materials to prevent moisture and mold issues; ensuring high standards of workmanship through skilled labor and quality control measures; establishing clear communication channels and fostering collaboration among stakeholders, using high-quality construction materials to enhance durability and reduce maintenance costs; and providing adequate on-site management to supervise construction, ensure adherence to plans, and resolve problems promptly.

Adequate sanitary system maintenance which is poor maintenance of sanitary systems can cause to health hazards, unpleasant odors, and environmental pollution. Low-cost housing units frequently lack proper maintenance of toilets, drains, and sewage systems, which is the graphically presents of the adequate sanitary system maintenance as shown in Figure 4.4.

Figure 4. 4: Adequate sanitary system maintenance

Source: Researcher Photo

Adequate electrical system maintenance this is that malfunctions in the electrical system might endanger safety and cause problems in day-to-day living. Appliance damage, power outages, and electrical fires can result from lack of improper maintenance which is the graphically presents of the adequate electrical system maintenance as shown in Figure 4.5.

Figure 4. 5: Adequate electrical system maintenance

Source: Researcher Photo

Adequate finishing maintenance which is finishing elements, such as paint, flooring, and fixtures deteriorate over time and frequent maintenance. Neglecting finishing maintenance can impair the aesthetics, durability, and functionality of the building, it graphically illustrates the adequate finishing maintenance as demonstrated in Figure 4.6 below.

Figure 4. 6: Adequate finishing maintenance

Source: Researcher Photo

Timely repairs and maintenance which is prompt repairs and maintenance are crucial to prevent small issues from escalating into major problems. Delays in repairs can lead to further damage and increased maintenance costs, which is the graphically presents of the timely repairs and maintenance as shown in Figure 4.7.

Figure 4. 7: Timely repairs and maintenance

Source: Researcher Photo

All in all, the barriers that affecting operational performance of low-cost housing in Bishoftu City is also hindered by several maintenance-related barriers are inadequate sanitary system maintenance can lead to health and environmental risks; poor electrical system maintenance can compromise safety and disrupt daily life; neglecting finishing maintenance reduces the aesthetics, durability, and functionality of the building; delays in repairs and maintenance lead to more serious problems and increased costs; and lack of preventive maintenance results in unexpected breakdowns and reduced building lifespan. To improve the operational performance of low-cost housing in Bishoftu City, it is vital to overcome these maintenance-related constraints by creating regular maintenance schedules for sanitary systems to ensure proper functioning and hygiene; ensuring regular inspections and maintenance of electrical systems to prevent safety hazards and power outages; implementing a comprehensive finishing maintenance plan to preserve the aesthetics and functionality of the building; prioritizing timely repairs to overcome issues quickly and prevent further damage; and adopting a proactive preventive maintenance approach to identify and resolve potential problems before they become severe issues.

Based on the interview and site visits results, several significant barriers affecting the operational performance of low-cost housing in Bishoftu City have been identified. These barriers can impact the overall quality of life for residents and the sustainability of the housing developments. Let's discuss each of the identified barriers:

Parking and Fence: The absence of parking spaces and fences can lead to congestion, safety issues, and a lack of privacy for residents. This can affect the overall livability and security of the housing units, ensuring the security of the building is critical for residents' safety and peace of mind. Addressing security concerns can improve the overall quality of life in the housing developments, which is the graphically presents of the security of building which is the graphically presents of the parking and fence as shown in Figure 4.8.

Figure 4. 8: Parking and Fence

Source: Researcher Photo

Water Availability: The lack of access to clean and safe drinking water is a crucial issue that can harm resident's health and well-being. Addressing this barrier is critical to ensuring basic living standard are met. Electrical Work Problems: Issues with electrical work can pose safety risks and affect the functionality of the housing units. Proper electrical installations are critical for the comfort and safety of residents, which is the graphically presents of the electrical work problems as shown in Figure 4.9.

Figure 4. 9: Electrical Work Problems

Source: Researcher Photo

Sanitary System Functionality: A well-functioning sanitary system is essential for maintaining hygiene and preventing health risks. Any problems with the sanitary system can result to unsanitary living conditions, which is the graphically presents of the sanitary system functionality as shown in Figure 4.10.

Figure 4. 10: Sanitary System Functionality

Source: Researcher Photo

Acoustic Performance: Poor acoustic performance can lead to noise pollution, affecting residents' comfort and quality of life. Appropriate sound insulation measures should be implemented to overcome this barrier, which is the graphically presents of the acoustic performance as shown in Figure 4.11.

Figure 4. 11: Acoustic Performance

Source: Researcher Photo

Maintenance Cost: High maintenance costs can be a burden for low-income residents, affecting their ability to upkeep their homes. Cost effective maintenance solutions should be considered to ensure the longevity of the housing units. Room Size Discrepancies: Disparities in room sizes can affect the functionality and comfort of the housing units. Ensuring suitable room sizes for different various uses is essential for residents' well-being.

Poor Construction Workmanship: Low-quality construction workmanship can lead to structural issues and long-term maintenance challenges. Quality control measures should be implemented to address this barrier, which is the graphically presents of the poor construction workmanship as shown in Figure 4.12.

Figure 4. 12: Poor Construction Workmanship

Source: Researcher Photo

Dampness and Moisture: Dampness and moisture issues can cause to mold growth, structural damage, and health hazards for residents. Proper ventilation and moisture control strategies are necessary to address these issues, which is the graphically presents of the dampness and moisture as shown in Figure 4.13.

Figure 4. 13: Dampness and Moisture

Source: Researcher Photo

Flood Risk: Ground floor houses facing flood risks can pose significant safety concerns for residents. Proper drainage systems and flood mitigation strategies should be implemented to address this barrier which is the graphically presents of the flood risk as shown in Figure 4.14.

Figure 4. 14: Flood Risk

Source: Researcher Photo

Ventilation Rate: Inadequate ventilation can cause poor indoor air quality, discomfort, and health risks for residents. Improving ventilation rates is critical to producing a healthy living environment.

According to Maina & Mohammed (2022), the study indicated that in general the Design consideration for adequate ventilation, Design consideration for adequate Lighting, Limited Accessibility design Features, Adequate amenities and facilities design, Poor aesthetics design, Noise pollution, and Consistent quality of maintenance services were identified as the most significant barriers that affecting operational performance of low-cost housing in design, construction and maintenance related factors. As a result, the findings of this study are consistent and complements with (Maina & Mohammed, 2022).

According to Roshan et al. (2017), study found that the most significant barriers that affecting operational performance of low-cost housing are Design consideration for adequate ventilation, Design consideration for adequate Lighting, Timely repairs and maintenance, Consistent quality of maintenance services, Adequate maintenance staff or resources, and Adequate finishing maintenance were identified in design, construction and maintenance

related factors. Therefore, once again this study finding is coincides with (Roshan et al., 2017).

According to Gawande et al. (2020), the study indicated that the most significant barriers that affecting operational performance of low-cost housing are Adequate finishing maintenance, Adequate parking and access to amenities during construction, Poor aesthetics design, and Adequate amenities and facilities design were identified in design, construction and maintenance related factors. Therefore, once again this study finding is also coincides with (Gawande et al., 2020).

According to Ibem et al. (2013), found that the major barriers that affecting operational performance of low-cost housing are Design consideration for adequate Lighting, Adequate size of different rooms of building design, Poor aesthetics design, and Adequate finishing maintenance were identified in design, construction and maintenance related factors. Therefore, this study also roughly coincide with (Ibem et al., 2013).

According to Reid (2023), on the other hand found the major barriers that affecting operational performance of low-cost housing are Limited Accessibility design Features, Poor layout functionality and design, Quality of construction workmanship, Quality of construction material, Adequate on site management, Lack of communication during construction, and Adequate maintenance staff or resources were identified in design, construction and maintenance related factors. Therefore, this study also more or less coincide with (Reid, 2023).

Therefore, the results already indicate that the significant barriers that affecting operational performance of low-cost housing are poor aesthetics design, inadequate size of different rooms of building design, design consideration for lack of proper lighting, poor design noise pollution, design consideration for poor ventilation, moisture and mold quality of construction workmanship, lack of communication during construction, quality of construction material, adequate on site management, adequate sanitary system maintenance, adequate electrical system maintenance, adequate finishing maintenance, timely repairs and maintenance and lack of preventive maintenance. So, addressing these barriers is essential to improve the operational performance of low-cost housing in Bishoftu City. Collaborative efforts from stakeholders,

including government authorities, developers, designers, and residents, are needed to implement solutions that enhance the quality, safety, and livability of low-cost housing developments in the city. It is important to prioritize basic amenities, building quality, safety measures, and environmental considerations can contribute to creating sustainable and thriving communities in Bishoftu City.

4.5. Impacts of Barriers in Operational Performance of Low-Cost Housing

Assessment of the impacts of barriers in operational performance of low-cost housing level for each selected major attributes. This study is intended to assessing the impacts of barriers in operational performance of low-cost housing in Bishoftu City. The overview evaluation was done by utilizing mean score strategy and respondents were asked to score which impacts of barriers in operational performance of low-cost housing are considered. Ranking of the various current operational performance of low-cost housing level according to their mean value and the interpretation of the mean values and ranked from the highest to the lowest which is rankings of 15 common impacts of barriers in operational performance of low-cost housing as per previous studies and practices were ranked. This means that all the fifteen variables are considered as the impacts of barriers in operational performance of low-cost housing in Bishoftu City. The value analysis carried out on the data by mean score strategy was shown in the Table 4.7 as follow.

Table 4. 7: Impact of barriers in operational performance of low-cost housing

Impact of barriers in operational performance of low-cost housing	N	Mean	Std. Dev.	Rank
Cost of maintenance	72	3.90	1.247	1
Reduced thermal comfort	72	3.76	1.028	2
Poor indoor air quality	72	3.69	1.182	3
Reduced Sustainability	72	3.67	1.113	4
Uncomfortable living conditions	72	3.63	1.054	5
Noise Disturbances	72	3.60	1.096	6
Poor Indoor Comfort	72	3.57	1.072	7
Overall Quality of Life Impact	72	3.54	1.288	8

Health and safety risks	72	3.47	1.186	9
Energy inefficiency	72	3.43	1.136	10
Increased Energy Costs	72	3.39	1.133	11
Decreased Property Value	72	3.36	1.325	12
Safety Concerns	72	3.35	1.064	12
Decreased Productivity and Well-being	72	3.33	1.175	14
Deterioration of Mental Health	72	3.24	1.169	15

Source: Own survey data analysis

Based on the mean score technique obtained in the above Table 4.7, relatively the following points were the impacts of barriers in operational performance of low-cost housing in Bishoftu City in chronological order. Thus, top eight most significant impacts of barriers in operational performance of low-cost housing in Bishoftu City are increased maintenance costs with the mean score value of 3.90, reduced thermal comfort with the mean score value of 3.76, Poor Indoor air quality with the mean score value of 3.69, Reduced Sustainability with the mean score value of 3.67, Uncomfortable living conditions with the mean score value of 3.63, Noise Disturbances with the mean score value of 3.60, Poor Indoor Comfort with the mean score value of 3.57 and Overall Quality of Life Impact with the mean score value of 3.54.

Increased maintenance costs which are the various barriers discussed above can lead to increased maintenance costs for low-cost housing units. Poor construction workmanship, inadequate maintenance, and untimely repairs can result in frequent and costly repairs. Reduced thermal comfort which is inadequate ventilation, poor insulation, and lack of thermal comfort measures can make indoor temperatures uncomfortable. This can lead to health problems, reduced productivity, and discomfort for occupants.

Poor indoor air quality which is a moisture, mold, and lack of proper ventilation can contribute to poor indoor air quality. This can cause respiratory problems, allergies, and other health issues for occupants. Reduced sustainability which is poor construction practices, lack of energy-efficient appliances, and inadequate water management can reduce the sustainability of low-cost housing. This can lead to higher energy consumption, water wastage, and increased environmental impact.

Uncomfortable living conditions which are the combination of barriers discussed above can create uncomfortable living conditions for occupants. Poor lighting, noise disturbances, and lack of privacy can negatively impact well-being and quality of life. Noise disturbances which are noise pollution from external sources or poor soundproofing can disrupt sleep, concentration, and overall well-being. This can be a significant issue in densely populated areas.

Poor indoor comfort which is inadequate natural light, cramped spaces and lack of ergonomic design can contribute to poor indoor comfort. This can affect mood, productivity, and overall well-being. Overall quality of life impact which is the cumulative impact of the barriers discussed above can considerably reduce the overall quality of life for residents of low-cost housing in Bishoftu City. Poor living conditions, health issues, and discomfort can negatively affect physical, mental, and social well-being.

According to Aqilah et al. (2022), the study show that in general the reduced thermal comfort, poor indoor air quality, increased energy costs, uncomfortable living conditions, energy inefficiency, and poor Indoor Comfort were identified as the most significant the impact of barriers in operational performance of low-cost housing. Therefore, the finding of this study is inline and complements with (Aqilah et al., 2022).

According to Gawande et al. (2020), study indicated that the most significant impact of barriers in operational performance of low-cost housing are reduced thermal comfort, poor indoor air quality, Health and safety risks, Deterioration of Mental Health, Noise Disturbances, uncomfortable living conditions, Reduced Sustainability, Safety Concerns, poor Indoor Comfort, and Overall Quality of Life Impact were identified. Therefore, once again this study finding is consistent with (Gawande et al., 2020).

According to Tierney & Tennant (2016), the study indicated that the most significant impact of barriers in operational performance of low-cost housing are Poor indoor air quality, Health and safety risks, Safety issues and Overall Quality of Life Impact were identified. Therefore, once again this study finding is also coincides with (Tierney & Tennant, 2016).

According to Reid (2023), found that the major impact of barriers in operational performance of low-cost housing were recognized as Cost of maintenance, Poor Indoor Comfort, Safety

Concerns, Energy inefficiency, Decreased Productivity and Well-being, Increased Energy Costs, and Deterioration of Mental Health were identified. Therefore, this study also more or less coincide with (Reid, 2023).

According to Effe & Wokekoro (2021), on the other hand found the major impact of barriers in operational performance of low-cost housing are Poor indoor air quality, Deterioration of Mental Health, Health and safety hazards, Noise Disturbances, Reduced Sustainability and Cost of maintenance were identified. Therefore, this study also more or less coincide with (Effe & Wokekoro, 2021).

Thus, the results already indicate that the major impact of barriers in operational performance of low-cost housing are increased maintenance costs, reduced thermal comfort, Poor Indoor air quality, Reduced Sustainability, Uncomfortable living conditions, Noise Disturbances, Poor Indoor Comfort and Overall Quality of Life Impact. So, addressing these various barriers to operational performance in low-cost housing in Bishoftu City have significant impacts on the well-being and quality of life of occupants. These impacts include increased maintenance costs due to poor construction and inadequate upkeep; reduced thermal comfort leading to health problems and discomfort; poor indoor air quality affecting respiratory health and overall well-being; reduced sustainability compromising environmental impact and energy efficiency; uncomfortable living conditions negatively impacting mood, productivity, and quality of life; noise disturbances disrupting sleep, concentration, and overall well-being; poor indoor comfort affecting mood, productivity, and ergonomics; and overall reduction in quality of life due to the cumulative impact of these barriers. Overcoming these barriers is critical to improving the operational performance of low-cost housing in Bishoftu City and enhancing the well-being of its residents.

4.6. Develop Strategies for Improving Operational Performance of Low-Cost Housing

The researcher can develop strategies to improving operational performance of low-cost housing in Bishoftu city the following strategies: Incorporate sustainable design practices which is implement sustainable design principles in the construction of low-cost housing units to enhance energy efficiency, reduce environmental impact, and lower operational costs for residents. This can include using locally sourced materials, incorporating passive design

strategies for natural lighting and ventilation, and integrating renewable energy solutions like solar panels.

On-time maintenance which is crucial for ensuring the operational performance and longevity of the housing structures. The timely upkeep of these housing is essential to prevent the deterioration of the infrastructure and to ensure the safety and well-being of the residents. Use of quality materials in low-cost housing is essential for ensuring durability, sustainability, and user satisfaction. It is important for the incremental processes of self-managed house construction and home improvement, especially for low-income households.

Optimize space planning which is improving the layout and size of rooms in low-cost housing units to maximize space utilization and enhance livability. Consider flexible room configurations, multifunctional spaces, and efficient storage solutions to accommodate the needs of residents while maintaining a sense of comfort and privacy. Provide adequate storage space to reduce clutter and improve overall living conditions.

Enhance aesthetic appeal which is integrate aesthetic considerations into the design of low-cost housing units to create visually appealing and culturally appropriate living spaces. Incorporate elements of local architecture, landscaping, and public art to enhance the overall quality of the built environment and foster a sense of community pride among residents.

Improve natural lighting and ventilation which is prioritizing natural lighting and ventilation in the design of low-cost housing units to create healthy and comfortable living environments. Incorporate large windows, skylights, and operable vents to maximize daylighting and airflow, reducing the need for artificial lighting and mechanical ventilation systems.

Address noise pollution which is implement soundproofing measures in the construction of low-cost housing units to minimize noise pollution and create quiet living spaces for residents. Use acoustic insulation materials, double-glazed windows, and strategic building layouts to reduce noise transmission from external sources and neighboring units.

Reduced thermal comfort which is implement energy-efficient solutions such as insulation, double-glazed windows, and shading devices to regulate indoor temperatures; and provide access to heating and cooling systems that are cost-effective and environmentally friendly as

well as conduct thermal comfort assessments to identify areas that need improvement and prioritize upgrades accordingly.

Promote community engagement which is involving residents in the design process of low-cost housing projects to ensure their needs and preferences are considered. Facilitate community workshops, design charities, and feedback sessions to gather input from residents and stakeholders, fostering a sense of ownership and empowerment within the community.

Ensure quality construction and maintenance which is establish rigorous quality control measures during the construction phase of low-cost housing projects to ensure structural integrity, durability, and safety of the buildings. Implement regular maintenance programs to address wear and tear, prevent deterioration, and prolong the lifespan of the housing units.

Collaborate with stakeholders which are foster collaboration between architects, urban planners, policymakers, developers, NGOs, and community organizations to address design-related barriers and improve the operational performance of low-cost housing in Bishoftu City. Create multidisciplinary teams to work together on innovative solutions that prioritize affordability, sustainability, and livability for all residents.

By implementing these strategies, Bishoftu City can enhance the operational performance of low-cost housing units, creating sustainable, functional, and aesthetically pleasing living environments for its residents. This comprehensive strategy can result in better sustainable, comfortable, and affordable living conditions for residents.

CHAPTER FIVE
CONCLUSIONS AND RECOMMENDATIONS

5.1. Introduction

In this chapter major findings of this study were addressed and recommendations for procuring entities and future research were drawn.

5.2. Conclusion

The overall objective of this research was to analyze and assess the operational performance of low-cost housing in Bishoftu City. The specific objectives included evaluate the factors that affecting current operational performance, identify the key barriers that affecting, assess the impact of barriers and develop strategies for improving the operational performance of low-cost housing in Bishoftu city. With this in mind, the conclusion focuses on the primary conclusions derived from the data analysis. Thus, the researcher has drawn the following conclusion:

The first conclusion, operational performance on low-cost housing in Bishoftu City, to address the design-related factors by taking into account occupants' cultural and social needs during the design process, as well as increasing the sizes and functionality of key spaces such as dining rooms, kitchens, storage areas, and living rooms to create a comfortable and safe living environment.

To improve the operational performance of low cost housing in Bishoftu City construction-related factors include the installation of leakage detection systems to quickly identify and fix leaks, the use of appropriate construction techniques and materials to prevent dampness, the maintenance and functionality of sanitary systems, the use of high-quality building materials to increase durability and lower maintenance costs, and the implementation of extensive fire safety measures to protect property and occupants.

The maintenance related factors of operational performance on low-cost housing in Bishoftu city strategies to improve indoor air quality, such as ventilation, air purification, and adequate insulation, scheduling routine maintenance and giving residents the tools they need to maintain their units, investigating sustainable water supply options, like rainwater harvesting and greywater reuse, improving building security with better lighting, fencing, and access

control systems, and using passive design techniques and energy-efficient appliances to improve thermal comfort are all important ways to address these maintenance-related factors.

The second conclusion, the major barriers that affecting operational performance of low-cost housing addressing barriers is critical for improving the operational performance of low-cost housing in Bishoftu City. To implement solutions that improve the quality, safety, and livability of the city's low-cost housing developments, stakeholders such as government authorities, developers, designers, and residents must work together. Prioritizing basic amenities, building quality, safety measures, and environmental concerns can all help to create sustainable and vibrant neighborhoods in Bishoftu City.

The third conclusion, the major impact of barriers in operational performance of low-cost housing in Bishoftu City addressing several operational performance barriers in Bishoftu City's low housing has a substantial impact on residents' well-being and standard of living. The impacts include higher maintenance costs because of subpar building and inadequate maintenance; decreased thermal comfort, which causes discomfort and health issues; poor indoor air quality, which affects respiratory health and general well-being; decreased sustainability, which compromises energy efficiency and environmental impact; uncomfortable living conditions, which have a negative impact on mood, productivity, and quality of life; noise disturbances, which interfere with sleep, concentration, and general well-being; poor indoor comfort, which affects mood, productivity, and ergonomics; and a general decline in quality of life as a result of these barriers.

The fourth conclusion, the researcher can develop strategies to improving operational performance of low-cost housing by implementing the strategies, Bishoftu city can enhance the operational performance of low-cost housing units, creating sustainable, functional, and aesthetically pleasing living environments for its residents. This comprehensive strategy can result in better sustainable, comfortable, and affordable living conditions for residents.

5.3. Recommendations

A reasonable strategy is needed to improve the operational performance of the low-cost housing outcomes in Bishoftu City. With the above findings and conclusions in mind, the

following suggestions and recommendations can be made in order to improve the operational performance outcomes.

Recommendations for Government:

- Implement and enforce building codes and standards that prioritize energy efficiency, thermal comfort, and sustainability in low-cost housing developments.
- Provide financial incentives or subsidies for developers to incorporate sustainable and energy-efficient design features in low-cost housing projects.
- Establish a maintenance fund or program to support low-income residents in covering the costs of regular maintenance and repairs.
- Invest in infrastructure improvements, such as better ventilation systems and access to clean water and sanitation facilities, to enhance the overall quality of life in low-cost housing communities.
- Facilitate community engagement and participation in the design and planning of low-cost housing projects to ensure they meet the needs and preferences of residents.

Recommendations for Residents:

- Advocate for improved maintenance practices and access to affordable maintenance services to prolong the lifespan of housing units and reduce long-term costs.
- Implement energy-saving measures, such as using energy-efficient appliances and sealing gaps in windows and doors, to enhance thermal comfort and reduce utility bills.
- Participate in community initiatives aimed at improving indoor comfort, such as organizing ventilation upgrades or indoor air quality assessments.
- Engage in sustainable living practices, such as recycling, water conservation, and composting, to promote environmental sustainability within the housing community.
- Collaborate with local authorities and housing developers to address quality-of-life issues, such as safety concerns, accessibility features, and community amenities, to enhance the overall living experience in low-cost housing units.

Recommendations for Future Researchers:

- Study building performance which is conduct research on the performance of low-cost housing in Bishoftu City to identify specific factors contributing to reduced thermal comfort, maintenance costs, and overall sustainability.
- Evaluate social impacts which are investigate the social and psychological impacts of poor indoor comfort and reduced sustainability on residents of low-cost housing developments to understand the broader implications on well-being.
- Develop innovative solutions which are explored innovative building materials, construction techniques, and energy-efficient technologies tailored to the local context to improve the operational performance of low-cost housing.
- Assess policy implications which is analyze the effectiveness of existing government policies and programs related to low-cost housing and propose policy recommendations to address barriers in operational performance.

By implementing these tailored recommendations for government, residents, and future researchers can work collaboratively to address the barriers in operational performance of low-cost housing in Bishoftu City, ultimately improving living conditions and sustainability for its residents.

REFERENCE

Ahmed, H. (2018). Operational Performance And Profitability : An Empirical Study Empirical Study On The Bangladeshi Ceramic Companies. December 2015.

Aqilah, N., Rijal, H. B., & Zaki, S. A. (2022). A Review of Thermal Comfort in Residential Buildings: Comfort Threads and Energy Saving Potential. Energies, 15(23). https://doi.org/10.3390/en15239012

AWAD, Z. E., & MUSA, Y. T. (2009). lowcosthousingresearchesinBRRI (2).

Barot, P. (2021). Low Cost housing and human behaviour towards low cost housing. October.

Battesini, M., Schwengber, C., Augusto, D., & Pacheco, D. J. (2021). Key factors for operational performance in manufacturing systems : Conceptual model , systematic literature review and implications Key factors for operational performance in manufacturing systems : Conceptual model , systematic literature review and impl. Journal of Manufacturing Systems, 60(July 2023), 265–282. https://doi.org/10.1016/j.jmsy.2021.06.005

Birhanu, K., & Debalke. (2020). Challenges of Urban Housing Supply Among Low and Middle Income Civil Servants in Ethiopia; the Case of Shambu Town, Horo Guduru Wollega Zone Oromia Region, Ethiopia. Journal of Housing for the Elderly, August.

Bortolini, R., & Forcada, N. (2018). Facility managers' perceptions on building performance assessment. Frontiers of Engineering Management, 0(0), 0. https://doi.org/10.15302/j-fem-2018010

Delz, S. (2016). Ethiopia's Low-Cost Housing Program, How Concepts of Individual Home-Ownership and Housing Blocks Still Walk Abroad. ETH Zurich, 1–9. https://pdfs.semanticscholar.org/f41b/3a12a83f36aae185394cfa8900650b5781ec.pdf

Delz1, D. S. (2016). 30 th June – 1 st July 2016 , ETH Zurich. July, 1–8.

Dhiraj B Tapkir, Nikhil R Mohire, Pratik N Zurunge, Siddharth R Sonsale, A. . D. (2016). Study and Analysis of Low Cost Housing Based on Construction Techniques. International Journal of Research in Engineering and Technology, 05(05), 146–148.

https://doi.org/10.15623/ijret.2016.0505027

Effe, K. C., & Wokekoro, E. (2021). Challenges Associated With Measuring Quality Of Residential Satisfaction In Federal Housing Estates In Abia State , Nigeria. 11(2), 1–10.

Egbu, A. U., Kalu, O. A., Umunnakwe, H. C., & Nwobi, C. (2021). Factors Affecting Housing Demand and Supply in Owerri , Imo State , Nigeria. October.

Engelsman, U., Rowe, M., & Southern, A. (2016). Community Land Trusts , affordable housing and community organising in low-income neighbourhoods. October. https://doi.org/10.1080/14616718.2016.1198082

Ezennia, I. S. (2022). Insights of housing providers' on the critical barriers to sustainable affordable housing uptake in Nigeria. World Development Sustainability, 1(June), 100023. https://doi.org/10.1016/j.wds.2022.100023

FDRE. (2014). Report on Housing & Sustainable Urban Development. Ministry of Urban Development & Housing, 1–75.

Forte, F., & Russo, Y. (2017). Evaluation of User Satisfaction in Public Residential Housing-A Case Study in the Outskirts of Naples, Italy. IOP Conference Series: Materials Science and Engineering, 245(5). https://doi.org/10.1088/1757-899X/245/5/052063

Gawande, N. S., Sabihuddin, S., & Mahatme, P. S. (2020). Factors and Attributes Affecting Residents Satisfaction Towards the Quality and Amenities of Residential Building. International Research Journal of Engineering and Technology, 2834–2839. www.irjet.net

Gideon, N. (2016). Affordable housing: a case study. Property Insight, December. http://www.slideshare.net/sharonchew/affordable-housing-a-case-study-from-7th-annual-affordable-housing-projects

Grzeskowiak, S., Sirgy, M. J., & Widgery, R. (2014). Residents ' Satisfaction with Community Services : Predictors and Outcomes. January 2003.

Gupta, H. (2021). Material Used in Low Cost Housing Page | i Guide : Parul Sharma

Dissertation In Architecture Harshit Gupta Sushant School Of Art And Architecture. December 2020.

Harputlugil, T. (2017). Energy Efficient Building Design Development : A Retrospective Energy Efficient Building Design Development : June.

Hjort, B., & Widén, K. (2015a). Introduction of sustainable low-cost housing in Ethiopia – an innovation diffusion perspective. Procedia Economics and Finance, 21(15), 454–460. https://doi.org/10.1016/S2212-5671(15)00199-9

Hjort, B., & Widén, K. (2015b). Introduction of Sustainable Low-cost Housing in Ethiopia – an Innovation Diffusion Perspective. Procedia Economics and Finance, 21(August), 454–460. https://doi.org/10.1016/s2212-5671(15)00199-9

Ibem, E. O., Opoko, A. P., Adeboye, A. B., & Amole, D. (2013). Performance evaluation of residential buildings in public housing estates in Ogun State, Nigeria: Users' satisfaction perspective. Frontiers of Architectural Research, 2(2), 178–190. https://doi.org/10.1016/j.foar.2013.02.001

Ioannides, Y. M. (2014). Urban Growth. February 2005.

Jaiganesh, K., Dinesh, S., & Preetha, R. (2016). a Comprehensive Review on Low Cost Building Systems. International Research Journal of Engineering and Technology, December. www.irjet.net

Johnson, C. L. A. L. (2015). Operational Efficiency. August. https://doi.org/10.1201/b15964-5

Joro, A. S. (2013). Managing And Minimizing Wastage Of Construction Materials On Selected Public Building Projects In Addis Ababa. June.

Joseph-Agyei, D., Samuel, P., & Afram, O. (2014). Residential User Satisfaction of Real Estate Housing in Ghana. International Journal of Civil Engineering, Construction and Estate Management, 1(3), 1–21. www.gredaghana.org

Kieti, R. M., Rukwaro, R. W., & Olima, W. A. (2018). Affordable Housing in Kenya. Cytonnreport.Com, 14(1), 1677–1687.

Labiso, T. T. (2020). Urban Expansion and Its Impact on the Livelihood of Peripheral Farming Communities: The Case of Assosa Town, Benishangul Gumuz Region, Ethiopia. Business and Management Horizons, 8(2), 21. https://doi.org/10.5296/bmh.v8i2.18109

Lombeso, A. (2018). Challenges in Urban Infrastructure Service Provision: The case of water, power and road sub sector in hossana town, SNNPRS.

Maina, J., & Mohammed, I. (2022). Correlates of Residential Satisfaction in. January.

Malik, K. (2014). Human Development Report 2014 Sustaining Human Progress : Human Development Report 2014 Team Director and lead author. 28. http://hdr.undp.org/sites/default/files/hdr14-summary-en.pdf

Manomano, T., Tanga, P. T., & Tanyi, P. (2016). Housing Problems and Programs in South Africa: A Literature Review. Journal of Sociology and Social Anthropology, 7(2), 111–117. https://doi.org/10.1080/09766634.2016.11885707

Mathema, A. (2005). Ethiopia: Housing in Addis Ababa. October. https://doi.org/10.13140/RG.2.1.4948.8086

Meyer, D. F. (2014). The impact of housing and basic service delivery on low-income communities in South Africa: The case of the northern free state region. Mediterranean Journal of Social Sciences, 5(13 SPEC. ISSUE), 11–20. https://doi.org/10.5901/mjss.2014.v5n13p11

Nallathiga, R. (2017). Affordable Housing in Urban Areas : The Need , Measures and Interventions. November 2010.

Namdeo, S. K., & Rout, S. D. (2016). Calculating and interpreting Cronbach ' s alpha using Rosenberg assessment scale on paediatrician ' s attitude and p erception on self esteem. 3(6), 1371–1374.

Narayan, L. (2017). Urbanization and Development. October 2014.

Neuhaus, K. (2015). Operational performance improvement in industrial companies.

OECD. (2021). Ph5 . 1 Measures To Property Developers To Finance.

Onatu, G., & Baloyi, V. K. (2021). The Use of Mixed-Income Housing Development to Address Poverty and The Use of Mixed-Income Housing Development to Address Poverty and Inequality , Based on Delphi Empirical Approach : A Case of South Africa. November. https://doi.org/10.33422/jarss.v3i3.521

Organiztion for Economic Co-opration and Development. (2021). Hc.1.5. overview of affordable housing indicators. 1–5.

Perry R. Hinton, I. M. and, & Brownlow, C. (2014). (2014). Title:SPSS Explained.

Pocock, J., Steckler, C., & Hanzalova, B. (2016). Improving Socially Sustainable Design and Construction in Developing Countries. Procedia Engineering, 145, 288–295. https://doi.org/10.1016/j.proeng.2016.04.076

Prabatha, T., Ruparathna, R., Hewage, K., & Sadiq, R. (2018). Operational performance management of multi-unit residential buildings Tharindu Prabatha , Rajeev Ruparathna , Kasun Hewage , and. 1st International Conference on New Horizons in Green Civil Engineering (NHICE-01), April.

Reid, A. (2023). Closing the Affordable Housing Gap : Identifying the Barriers Hindering the Sustainable Design and Construction of Affordable Homes.

Rolfe, S., Garnham, L., Godwin, J., Anderson, I., Seaman, P., & Donaldson, C. (2020). Housing as a social determinant of health and wellbeing: Developing an empirically-informed realist theoretical framework. BMC Public Health, 20(1), 1–19. https://doi.org/10.1186/s12889-020-09224-0

Roshan, M., Kantilal, B. S., Gopinath, S., & Sreelakshmi, A. S. (2017). A Study of Customer Satisfaction of Residential Buildings in India. Jr. of Industrial Pollution Control, 33(S3), 1401–1404. www.icontrolpollution.com

Rusek, R., Melendez Frigola, J., & Colomer Llinas, J. (2022). Influence of occupant presence patterns on energy consumption and its relation to comfort: a case study based on sensor and crowd-sensed data. Energy, Sustainability and Society, 12(1), 1–14. https://doi.org/10.1186/s13705-022-00336-6

Shoubi, M. V., Shoubi, M. V., Bagchi, A., & Barough, A. S. (2015). Reducing the operational energy demand in buildings using building information modeling tools and sustainability approaches. Ain Shams Engineering Journal, 6(1), 41–55. https://doi.org/10.1016/j.asej.2014.09.006

Simon, D., & Adam-Bradford, A. (2016). Archaeology and Contemporary Dynamics for More Sustainable, Resilient Cities in the Peri-Urban Interface. https://doi.org/10.1007/978-3-319-28112-4_5

Spaan, M., & Abraham, Y. S. (2023). Barriers to and Enablers of Affordable Housing Construction: Insights from Construction Industry Professionals †. Engineering Proceedings, 53(1). https://doi.org/10.3390/IOCBD2023-15213

Stilwell, C., & Hoskins, R. (2013). Integrated library management systems: A review of choices made and their sustainability in South Africa. Information Development, 29(2), 154–171. https://doi.org/10.1177/0266666912454067

Tierney, G., & Tennant, S. (2016). Post occupancy evaluation (POE): A BREEAM excellent case study. Proceedings of the 32nd Annual ARCOM Conference, ARCOM 2016, 1(September), 405–414.

Tilabi, S., & Takala, J. (2017). Operational Performance of Affordable Housing Projects. 199–209.

UN-Habitat. (2019). The Global Housing Affordability Challenge: A More Comprehensive Understanding of the Housing Sector. Urban Data Digest, May, 1–8.

Weldesilassie, A. B., & Gebrehiwot, B. A. (2017). the Low Cost Housing Program in Ethiopia : Issues and Policy. March 2016.

Woundimagegnehu, T. (2009). Affordable Houses for Middle and Low Income Group in Ethiopia - Self help housing with innovative construction technology. 1–16.

Zhu, L., Johnsson, C., Mejvik, J., Varisco, M., & Schiraldi, M. (2017). Key performance indicators for manufacturing operations management in the process industry Key Performance Indicators for Manufacturing Operations Management in the Process

Industry. December. https://doi.org/10.1109/IEEM.2017.8290036

APPENDIX

Appendix A: Survey Questionnaire

Adama Science and Technology University

School of Civil Engineering and Architecture

Department of Civil Engineering

Questionnaire survey for thesis paper on the study on operational performance of low-cost housing in Ethiopia: in the case of Bishoftu City

Dear/Sir;

The purpose of this questionnaire is to collect data for the research study entitled **"study on operational performance of low-cost housing in Ethiopia: in the case of Bishoftu City"** as a fulfillment of the requirement for the Degree of Master of Science in department of Civil Engineering. Thus, your genuine, professional opinion and timely responses are vital to determine the success of this study. Please note that the information you provide will only be used for academic purpose and all the information revealed will be kept confidential. To this end, you are kindly requested to contribute your own share by filling in the questionnaires honestly and responsibly for further recommendations to improve similar works in the future. Thank you in advance for your cooperation!!!

If you need further explanation, you can contact me through the address indicated below:

Olana Tesfaye Hunde, Mobile Number: +2519-13-178923

Email: olanatesfaye21@gmail.com

General Instruction:

- No need of writing your name/address.
- To those questions with alternatives mark your response on the space provided by putting " ✓ "
- For any additional option or explanation you are kindly requested to write briefly on the space provided.

Part One: - General information about the respondents

1. The low cost housing projects stakeholders:
   a. Government and municipalities.
   b. Companies which provide low cost housing services.
   c. Customers who are using low cost housing services.
2. Sex:

   a) Male b) female
3. Age (in year):

   a) Less than 30 b) 30 -60 c) More than 60
4. Educational background:
   a. Below Diploma b. Diploma c. BSc/BA d. MSc/MA & above
5. What is your current occupation?
   a. Student c. Employed (full-time) e. Employed (part-time) g. Retired
   b. Self-employed d. Unemployed f. Other (Please specify): _____

Part Two: - Operational performance of low-cost housing

1. To what extent are you satisfied with the factors that affecting current operational performance of low-cost housing in Bishoftu City? Please indicate the current operational performance level by making on the appropriate box using the following a 5-point likert scale: Very Dissatisfied = 1, Dissatisfied = 2, Neutral = 3, Satisfied = 4 and Very Satisfied = 5.

R. No	The factors that affecting current operational performance of low-cost housing	Performance level				
		1	2	3	4	5
	Design related factors:					
1	Daylight					
2	View out					
3	Quality of Natural Lighting					
4	High lighting					
5	Internal and external lighting levels					
6	Lighting controls					
7	Potential for natural ventilation					

8	Sizes of Bedrooms Spaces					
9	Sizes of Living Rooms Spaces					
10	Sizes of dining Rooms Spaces					
11	Sizes of Cooking and Storage Spaces					
12	Acoustic performance (ambient noise levels)					
13	Acoustic performance (room reverberation time)					
14	Aesthetic appearance of Building					
15	Design of Bath and Toilet facilities					
16	Design of building in relation to occupant's way of life					
	Construction related factors:					
17	Leakage detection					
18	Functionality of sanitary system					
19	Flood risk or water run off					
20	Type of materials used in the construction					
21	Fire safety and protection					
22	Protection against dampness in the Building					
23	Protection against insects and dangerous animals					
24	Location of building (Access to shops /market centers)					
	Maintenance related factors:					
25	Ventilation rates					
26	Internal air pollution					
27	Thermal comfort					
28	Maintenance cost of the building					
29	Sustainable power supply in the Building					
30	Sustainable water supply in the Building					
31	Building security					
32	Safer parking					

2. To what extent are you influence of the following barriers to affect operational performance of low-cost housing in Bishoftu City? Please indicate the influence barriers by making on the appropriate box using the following a 5-point likert scale: 1 = Not a

barrier, 2 = Minor barrier, 3 = Moderate barrier, 4 = Significant barrier and 5 = Major barrier.

R. No	The barriers that affecting operational performance of low-cost housing	1	2	3	4	5
	Design Related Barriers					
1	Design consideration for poor ventilation					
2	Design consideration for lack of proper lighting					
3	inadequate size of different rooms of building design					
4	Limited Accessibility design Features					
5	Adequate amenities and facilities design					
6	Poor layout functionality and design					
7	Poor aesthetics design					
8	Poor design noise pollution					
	Construction Related Barriers					
9	Quality of construction workmanship					
10	Quality of construction material					
11	Construction Cost overruns					
12	Adequate on site management					
13	Lack of communication during construction					
	Maintenance Related Barriers					
14	Adequate parking & access to amenities during construction					
15	Timely repairs and maintenance					
16	Consistent quality of maintenance services					
17	Lack of preventive maintenance					
18	Adequate electrical system maintenance					
19	Adequate maintenance staff or resources					
20	Adequate material quality repairs and maintenance					
21	Adequate sanitary system maintenance					
22	Adequate structural maintenance					
23	Adequate finishing maintenance					

3. To what extent are you rating the following impacts of barriers in operational performance of low-cost housing in Bishoftu City? Please indicate the highest impacts by making on the appropriate box using the following a 5-point likert scale: 1 = Very low impact, 2 = Low impact, 3 = Moderate impact, 4 = High impact and 5 = Very high impact.

R. No	**The impact of barriers in operational performance of low-cost housing**	**1**	**2**	**3**	**4**	**5**
1	Reduced thermal comfort					
2	Poor indoor air quality					
3	Health and safety risks					
4	Deterioration of Mental Health					
5	Increased Energy Costs					
6	Noise Disturbances					
7	Decreased Productivity and Well-being					
8	Uncomfortable living conditions					
9	Energy inefficiency					
10	Reduced Sustainability					
11	Decreased Property Value					
12	Safety Concerns					
13	Poor Indoor Comfort					
14	Overall Quality of Life Impact					
15	increased maintenance costs					

Appendix B: Interview Questions

1. How would you rate the construction quality of low-cost housing projects in Bishoftu city based on your observations?
2. To what extent do you believe the infrastructure maintenance in low-cost housing areas in Bishoftu city meets the residents' needs and expectations?
3. How satisfied are you with the services provided in low-cost housing communities in Bishoftu city, such as utilities and security?
4. To what extent do you believe the design of low-cost housing building in Bishoftu city meets the occupant's way of life or residents' needs and expectations?
5. How significantly do community engagement issues impact the overall success of low-cost housing in Bishoftu city?
6. Do you think a focus on enhancing the quality control measures would significantly improve the operational performance of low-cost housing projects in Bishoftu city?

Appendix C: Survey Questionnaire in Amharic

Adama Science and Technology University

School of Civil Engineering and Architecture

Department of Civil Engineering

Questionnaire survey for thesis paper on the study on operational performance of low-cost housing in Ethiopia: in the case of Bishoftu City

ለተከበሩ፣

የዚህ መጠይቅ አላማ በሲቪል ምህንድስና ዲፓርትመንት የማስተርስ ሳይንስ ዲግሪ የሚጠይቀውን መስፈርት በማሟላት **“study on operational performance of low-cost housing in Ethiopia: in the case of Bishoftu City”** በሚል ርዕስ ለሚካሄደው የምርምር ጥናት መረጃ መሰብሰብ ነው። ስለዚህ፣ የዚህን ጥናት ስኬት ለመወሰን የእርስዎ እውነተኛ፣ ሙያዊ አስተያየት እና ወቅታዊ ምላሾች በጣም አስፈላጊ ናቸው። እባክዎን ያስተውሉ ያቀረቡት መረጃ ለአካዳሚክ ዓላማ ብቻ የሚውል ሲሆን ሁሉም የተገለፀው መረጃ በሚስጥር ይጠበቃል። ለዚህም ወደፊት ተመሳሳይ ስራዎችን ለማሻሻል ለተጨማሪ ምክሮች መጠይቆችን በቅንነት እና በኃላፊነት በመሙላት የራሳችሁን እንድታበረክቱ በትህትና እንጠይቃለን። ስለ ትብብርዎ በቅድሚያ እናመሰግናለን፣፣፣

ተጨማሪ ማብራሪያ ከፈለጉ ከታች በተጠቀሰው አድራሻ ሊያገኙኝ ይችላሉ።

አላና ተስፋዬ ሁንዴ, የሞባይል ቁጥር፣ +2519-13-178923

ኢሜል፡ olanatesfaye21@gmail.com

አጠቃላይ መመሪያ፡-

- ስምህን/ሽን/አድራሻህን/ሽን መፃፍ አያስፈልግም።
- ለነዚ ጥያቄዎች ከአማራጭ ጋር ምላሻችሁን በተሰጠው ቦታ ላይ ምልክት ያድርጉበት ፤✓፤
- ለማንኛውም ተጨማሪ አማራጭ ወይም ማብራሪያ በተዘጋጀው ቦታ ላይ በአጭሩ እንድትጽፉ በአክብሮት እንጠይቃለን።

ክፍል አንድ: - ስለ መላሾች አጠቃላይ መረጃ

1. ዝቅተኛ ዋጋ ያላቸው የቤት ፕሮጀክቶች ባለድርሻ አካላት፡-

   ሀ. መንግስት እና ማዘጋጃ ቤቶች.

   ለ. ዝቅተኛ ዋጋ ያለው የመኖሪያ ቤት አገልግሎት የሚሰጡ ኩባንያዎች.

   ሐ. ዝቅተኛ ዋጋ ያለው የመኖሪያ ቤት አገልግሎት የሚጠቀሙ ደንበኞች።

2. ጾታ:

   ሀ) ወንድ ለ) ሴት

3. ዕድሜ (በዓመት)

   ሀ) ከ 30 በታች ለ) ከ 30 -60 ሐ) ከ 60 በላይ

4. የትምህርት ደረጃ፡-

   ሀ. ከዲፕሎማ በታች ለ. ዲፕሎማ ሐ. Bsc/BA መ. MSc/MA እና በላይ

5. አሁን ያለህበት ሙያ ምንድን ነው

ሀ. ተማሪ ሐ. የተቀጠረ (የሙሉ ጊዜ) ሠ. የተቀጠረ (የትርፍ ሰዓት) ሰ. ጡረታ ወጥቷል።

ለ. በራስ ተቀጣሪ መ. ሥራ አጥ ረ. ሌላ (እባክዎ ይግለጹ):

ክፍል ሁለት: - አነስተኛ ዋጋ ያላቸው ቤቶችን ተግባራዊ አፈፃፀም

1. በቢሾፍቱ ከተማ ዝቅተኛ ዋጋ ያላቸው ቤቶች አሁን ባለው አፈጻጸም፣ሁኒታ ምን ያህል ረክተዋል? እባክዎን የሚከተለውን ባለ 5-ነጥብ የመውደድ መለኪያ በመጠቀም በተገቢው ሳጥን ላይ በማድረግ የአሁኑን የአሠራር አፈጻጸም ደረጃ ያመልክቱ፡ በጣም ያልተረካ = 1፣ ያልረካ = 2፣ ገለልተኛ = 3፣ እርካታ = 4 እና በጣም የረካ = 5።

R. No	ዝቅተኛ ዋጋ ያላቸው ቤቶች አሁን ያለው የሥራ ክንውን	Performance level				
		1	2	3	4	5
	ከንድፍ ጋር የተያያዙ ምክንያቶች					
1	የቀን ብርሃን					
2	እይታ					
3	የተፈጥሮ ብርሃን ጥራት					
4	ከፍተኛ ድግግሞሽ መብራት					
5	ውስጣዊ እና ውጫዊ የብርሃን ደረጃዎች					
6	የመብራት መቆጣጠሪያዎች					
7	ለተፈጥሮ አየር ማናፈሻ እምቅ					
8	የመኝታ ክፍሎች መጠኖች					
9	የሳሎን ክፍሎች መጠኖች					
10	የመመገቢያ ክፍሎች ቦታዎች መጠኖች					
11	የማብሰያ እና የማከማቻ ቦታዎች መጠኖች					
12	አኮስቲክ አፈጻጸም (የአካባቢ ድምፅ ደረጃዎች)					
13	አኮስቲክ አፈጻጸም (የክፍል ማስተጋባት ጊዜ)					
14	የሕንፃው ውበት ገጽታ					
15	የመታጠቢያ እና የመጸዳጃ ቤት ዲዛይን					
16	ከነዋሪው የኢኘኘር ዘይቤ ጋር በተያያዘ የግንባታ ንድፍ					
	ከግንባታ ጋር የተያያዙ ምክንያቶች፡-					
17	ዋና የፍሰት መለየት					
18	የንፅህና አጠባበቅ ስርዓት/የዉሃ መስመሮች ተግባራዊነት					
19	የጎርፍ አደጋ ወይም የውሃ መፍሰስ					
20	በግንባታው ውስጥ ጥቅም ላይ የዋሉ ቁሳቁሶች ዓይነት					

21	የእሳት ደህንነት እና ጥበቃ					
22	በህንፃው ውስጥ ካለው የእርጥበት መከላከል					
23	ከነፍሳት እና ከአደገኛ እንስሳት ጥበቃ					
24	የግንባታ ቦታ (የሱቆች / የገበያ ማእከሎች መዳረሻ)					
	ከጥገና ጋር የተያያዙ ምክንያቶች፡-					
25	የአየር ማናፈሻ መጠኖች					
26	የውስጥ የአየር ብክለት					
27	የሙቀት / የቅዚቃዚ ምቾት					
28	የህንፃው የጥገና ወጪ					
29	በህንፃው ውስጥ ዘላቂ የኃይል አቅርቦት					
30	በህንፃው ውስጥ ዘላቂ የውሃ አቅርቦት					
31	የግንባታ ደህንነት					
32	ደህንነቱ የተጠበቀ የመኪና ማቆሚያ					

2. በቢሾፍቱ ከተማ ዝቅተኛ ወጪ የሚጠይቁ ቤቶችን የስራ አፈጻጸም ላይ ተጽእኖ እንዲያደርጉ የሚከተሉት መሰናክሎች ምን ያህል ተጽእኖ እያደረጉ ነው? እባክዎን የሚከተለውን ባለ 5-ነጥብ likert ሚዛን በመጠቀም ተገቢውን ሳጥን ላይ በማድረግ የተፅዕኖ እንቅፋቶችን ያመልክቱ፡ 1 = ማገጃ(እንቅፋት) አይደለም፣ 2 = አነስተኛ ማገጃ(እንቅፋት)፣ 3 = መካከለኛ ማገጃ(እንቅፋት)፣ 4 = ጉልህ ማገጃ(እንቅፋት) እና 5 = ዋና ማገጃ(እንቅፋት)።

R. No	ዝቅተኛ ዋጋ ያላቸው ቤቶችን የሥራ አፈፃፀም ላይ ተጽዕኖ የሚያሳድሩ መሰናክሎች	**1**	**2**	**3**	**4**	**5**
	ንድፍ ተዛማጅ እንቅፋቶችን					
1	በቂ የአየር ማናፈሻ የሚሆን ንድፍ ግምት					
2	በቂ ብርሃን ለማግኘት የንድፍ ግምት					
3	የሕንፃ ዲዛይን የተለያዩ ክፍሎች በቂ መጠን					
4	ውስን የተደራሽነት ንድፍ ባህሪዎች					
5	በቂ መገልገያዎች እና መገልገያዎች ንድፍ					
6	ደካማ አቀማመጥ ተግባራዊነት እና ዲዛይን					
7	ደካማ የውበት ንድፍ					

8	የድምፅ ብክለት					
	የግንባታ ተዛማጅ እንቅፋቶች					
9	የግንባታ ስራ ጥራት					
10	የግንባታ ቁሳቁስ ጥራት					
11	እርጥበት እና ሻጋታ					
12	በቂ የመኪና ማቆሚያ እና በግንባታው ወቅት መገልገያዎችን ማግኘት					
13	በጣቢያው ላይ በቂ አስተዳደር					
14	በግንባታው ወቅት የግንኙነት እጥረት					
	ከጥገና ጋር የተያያዙ እንቅፋቶች					
15	ወቅታዊ ማስተካከያ እና ጥገና					
16	ቋሚ የጥገና አገልግሎቶች ጥራት					
17	የመከላከያ ጥገና እጥረት					
18	በቂ የኤሌክትሪክ ስርዓት ጥገና					
19	በቂ የጥገና ሰራተኞች ወይም ሀብቶች					
20	በቂ የቁሳቁስ ጥራት ጥገና እና ጥገና					
21	በቂ የንፅህና አጠባበቅሀየዉሃ ዝርጋታ ስርዓት ጥገና					
22	በቂ መዋቅራዊ ጥገና					
23	በቂ የማጠናቀቂያ(ፍኒሽንግ) ጥገና					

3. በቢሾፍቱ ከተማ ዝቅተኛ ዋጋ ያላቸው ቤቶችን በሥራ አፈጻጸም ላይ የሚያደርሱትን እንቅፋቶች ምን ያህል ተጽዕኖ እያሳደሩ ነውላ እባክዎ በሚከተለው ባለ 5-ነጥብ likert መለኪያ በመጠቀም ተገቢውን ሳጥን ላይ በማድረግ ከፍተኛውን ተጽእኖ ያመልክቱ፡ 1 = በጣም ዝቅተኛ ተጽዕኖ፣ 2 = ዝቅተኛ ተጽዕኖ፣ 3 = መካከለኛ ተጽዕኖ፣ 4 = ከፍተኛ ተጽዕኖ እና 5 = በጣም ከፍተኛ ተጽዕኖ።

R. No	**በዝቅተኛ ዋጋ የመኖሪያ ቤቶች የሥራ ክንውን ላይ እንቅፋቶች ተጽእኖ**	**1**	**2**	**3**	**4**	**5**
1	የሙቀት/ብርድ ምቾት ቀንሷል					
2	ደካማ የቤት ውስጥ የአየር ጥራት					
3	የጤና እና የደህንነት አደጋዎች					
4	የአእምሮ ጤና መበላሸት					

5	የኃይል ወጪዎች መጨመር					
6	የድምፅ ረብሻዎች					
7	የምርታማነት እና ደህንነት ቀንሷል					
8	የማይመች የኑሮ ሁኔታ					
9	የኃይል ውጤታማነት					
10	የተቀነሰ ዘላቂነት					
11	የንብረት ዋጋ ቀንሷል					
12	የደህንነት ስጋቶች					
13	ደካማ የቤት ውስጥ ምቾት					
14	አጠቃላይ የህይወት ጥራት ተፅእኖ					
15	የጥገና ወጪ					