



ADDIS ABABA UNIVERSITY
COLLEGE OF TECHNOLOGY AND BUILT ENVIRONMENT
SCHOOL OF BUILT ENVIRONMENT
DEPARTMENT OF ARCHITECTURE

THE INFLUENCE OF SPATIAL CONFIGURATION ON THE FLEXIBILITY AND
ADAPTABILITY OF APARTMENT UNITS IN PRIVATE REAL ESTATE
DEVELOPMENTS IN ADDIS ABABA

BY
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MARCH 2026
ADDIS ABABA, ETHIOPIA



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Apartment Units in Private Real Estate Developments in Addis Ababa.

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A thesis is submitted to Department of Architecture, Addis Ababa University in partial fulfillment
of the requirements for the degree of Master's in Advanced Architectural Design (MAAD)

March 2026
Addis Ababa, Ethiopia

This thesis is submitted to Addis Ababa University, College of Technology and Built Environment, School of Built Environment, Department of Architecture, in partial fulfillment of the requirements for the degree of Master's in Advanced Architectural Design (MAAD).

Title of thesis:

The Influence of Spatial Configuration to the Flexibility and Adaptability of Apartment Units in Private Real Estate Developments in Addis Ababa.

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March 2026

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Abnet Gezahegn

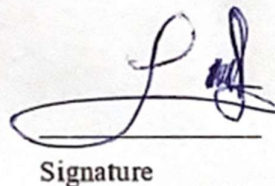
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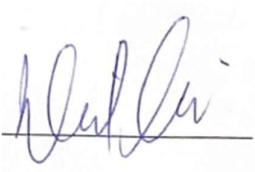

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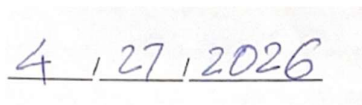
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DECLARATION

I declare that this thesis prepared for the partial fulfillment of the requirements for the degree of Masters of Advance Architectural Design is my original research work prepared independently by my effort with the close advice and guidance of my advisor. I also declare that this thesis has not been presented in any university and all sources I have used or quoted have been indicated and acknowledged through complete references.

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Abstract

Addis Ababa is experiencing rapid urbanization and population growth, which has intensified housing demand. This has led to an increase in private real estate developments, which often prioritize market competitiveness, land optimization, and cost-efficiency through standardized apartment units. This fails to meet the evolving users' needs, cultural practice long-term functionality. Most residents are dissatisfied with their rigid and standardized units and frequently make costly modifications and in some cases relocation. This study examines the influence of spatial configuration on the flexibility and adaptability of private real estate apartment units in Addis Ababa affects. The study uses convergent mixed methods combining FLEX 4.0 spatial assessment tool, on-site observation, survey of 386 residents and responses from 37 stakeholders to analyze the extent of flexibility and adaptability of the units and understand users' perception and experience. The finding reveals that most apartment units in Addis Ababa are hardly flexible. There is strong demand for flexibility by residents, however rigid layouts, fixed wall partitions, smaller room size, poor lighting and ventilation limit them to modify and adapt their space effectively. Both residents and stakeholders strongly value the importance of flexibility and adaptability. But they indicate that lack of awareness, skilled expertise and supportive regulation limit the implementation. The research demonstrated that open-plan layout, modular designs, lightweight or reconfigurable partitions and user engagement in the planning and design from the early stage significantly improve the flexibility and usability of housing. The study contributes to the existing body of knowledge on flexibility and adaptability and highlights the need for policy review, build capacity and create awareness on flexible design to enhance livability, environmental performance, long-term usability and support evolving lifestyle. This study is limited to the current private real estate developments in Addis Ababa and focuses on spatial configuration. Future research should include longitudinal post-occupancy evaluation on adaptability performance including public and government housing.

Keywords: Spatial configuration; Housing Flexibility; Housing Adaptability; Open Building; Real Estate; Addis Ababa

ACKNOWLEDGMENTS

First, I would like to express my sincere gratitude to my advisor, Abnet Gezahegn, for her mentorship, guidance and valuable feedback during the entire process of the study and writing. Her consistent support and motivation were key from the start to the completion of the study.

My sincere appreciation goes to all government offices, real estate developers, contractors and professionals who participated directly or indirectly in this research process. I would like to extend my special thanks to residents and stakeholders who dedicate their valuable time to participating in the study and share their perspectives and experience. Their candid and critical insights were fundamental in the development of the research findings.

I am especially grateful to all my friends and colleagues for their support while I was doing my research. Their valuable insights and guidance throughout the study were most important.

Finally, I am profoundly grateful to my wife Helen, and my children Aaron, Mariamawit and Emma. Their love, understanding and support have been a constant source of strength during my study.

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List of Acronyms

AI	Artificial Intelligence
BIM	Building Information Modeling
DIY	Do-It-Yourself
DV	Dependent Variables
FLEX 4.0	Flexible Housing Assessment Tool, Version 4.0
GIS	Geographic Information System
HVAC	Heating, Ventilation, and Air Conditioning
IHDP	Integrated Housing Development Program
IV	Independent Variables
KPIs	Key Performance Indicators
MoDV	Moderating Variables
MV	Mediating Variables
POE	Post-Occupancy Evaluation
POP	Post-Occupancy Performance
SPSS	Statistical Package for the Social Sciences
UCD	User-Centered Design
UIT	User-Initiated Transformations
UN	United Nations

CHAPTER ONE

1. Introduction

1.1. Background

Shelter is one of humans' basic needs. But the spatial requirements vary following changes in socio-economy, technology and environment. Housing keeps evolving and adapting to respond to such changes (Estaji, 2017). Flexibility and adaptability allow these kinds of adaptation without making major changes to a house. Flexible spatial layout supports change in family size, aging, disabled people and cultural needs (Schneider & Till, 2007). Traditional design often focuses on standardization with fixed layouts. But users' needs and lifestyles keep evolving. Study showed that flexibility contributes to housing quality and resident well-being (Hessari & Chegeni, 2022).

The population of Addis Ababa is growing at the rate of 4.44% according to a world population review(*World Population Review*, n.d.). This population growth limited urban land and affordability challenges lead to vertical housing development. Most studies on Addis Ababa real estate development focus on housing supplies, affordability and policies. There is a lack of empirical studies on the impacts of spatial configuration on the flexibility and adaptability of the apartment units. This study aims to investigate how spatial configuration contributes to the flexibility and adaptability of apartment units in Addis Ababa.

1.2. Problem Statement

By 2050 about two thirds of the world population will live in urban areas (UN, 2018). Addis Ababa is also experiencing this rapid urbanization and population growth. There is an estimated 1.2 million housing unit deficit. According to the projection between 2015 and 2025 there is additional demand of 655,800 housing units. This is much higher than the current supply (Kesto, 2021). To address this problem the government started vertical development involving the public and private sector. Since the last two decades the private developers have been increasingly involved in the real estate development to fill this gap (Yohannes & Dinku, 2024). They come into the market with different housing typologies and construction methodology.

Many real estate developers are involved in the development driven by market demand and focused on competitiveness and delivering large numbers of units. This results in standardized and rigid layout with limited flexibility and adaptability. Residents face challenges to transform their housing space to accommodate their evolving needs like change in household size, working from home, hosting guests, aging and cultural practice. This leads to residents' dissatisfaction, compromising their quality of life, making costly modifications or even relocating. This will weaken community cohesion and neighborhood stability. In addition, premature renovation or demolition of the unit reduced building lifespan, waste material that impact the economy and environment.

Despite several empirical research on various housing issues in Addis Ababa such as affordability (Yohannes & Dinku, 2018), residential satisfaction (Alemu et al., 2025), typological studies (Cherenet & Sewnet, 2012), effects of rapid urbanization and public housing development on urban form and density (Larsen et al., 2019) no empirical study has evaluated how internal spatial configuration affects flexibility and adaptability in apartment units. Studies showed that flexibility and adaptability contribute to resilient and sustainable housing (Schneider & Till, 2007; Lutolli et al., 2023). But their application is still limited in Addis Ababa's private real estate sector.

To the best of the writer's knowledge, there was no empirical research on the impacts of spatial configuration on the flexibility and adaptability of private real estate apartment units in Addis Ababa. This study aims to fill this gap by analyzing the spatial configuration of the apartment units and evaluating resident and stakeholder perception and feedback. This research seeks to contribute to the existing body of knowledge on the contribution of spatial configuration to enhance flexibility and adaptability.

1.3. Objectives

1.3.1. General Objective

The main objective of the study is to examine how spatial configuration contributes to flexibility and adaptability of apartment units in private real estate developments in Addis Ababa.

1.3.2. Specific Objectives

The specific objectives of the study are:

- To evaluate spatial flexibility extent in Addis Ababa private real estate development units.
- To analyze the influence of spatial configuration on flexibility and adaptability of the current apartment units in Addis Ababa.
- To assess residents' and stakeholders' experiences and perceptions of flexibility and adaptability
- To identify architectural design strategies that support flexibility and adaptability, based on resident feedback and best practices.

1.4. Research Questions

The research questions of the study are:

1. To what extent do spatial configurations of the current apartment units in Addis Ababa support flexibility and adaptability?
2. How do residents and stakeholders perceive the flexibility and adaptability of their apartment units in accommodating evolving needs?
3. What are the architectural and spatial design strategies that can improve the flexibility and adaptability of future apartment units?

1.5. Scope of the Study

1.5.1. Spatial Scope

This study will cover only the private real estate developments in Addis Ababa, Ethiopia. Private real estate developments were selected based on locations of the city that represent the different social and economic status of the city.

1.5.2. Thematic Scope

The study focuses on the spatial configuration of apartment units. It explores how residents and stakeholders perceive and experience the adaptability and flexibility of apartment units in relation to spatial configuration.

1.5.3. Temporal Scope

This study focuses on private apartment units built in the last two decades. This is because the most significant growth of private apartment development in Addis Ababa occurred following government's Integrated Housing Development Program (IHDP) around 2005–2006. In this period vertical development and apartments becoming the dominant form of housing. The data was collected over a four-month period, from May to August 2025.

1.6. Significance of the Study

Addis Ababa is under rapid urbanization and population growth that contributes to the increase in the housing demand in the city. More real estate developers come to the market following this high housing demand. These developers focus on the market competitiveness and number of units they supply and produce standardized and rigid units. Their units usually fail to accommodate changing social needs, different cultural practices and evolving lifestyles. Study shows that residents continuously evaluate their housing and try to modify it before considering relocation (Morris & Winter, 1975).

Flexibility and adaptability allow residents to modify their living space to accommodate their evolving social needs and cultural norms. They enhance resident satisfaction, quality of life and the unit's usability. Flexible and adaptable units reduce the need for early renovation or demolition and extend the life span of the building. This contributes to neighborhood stability, cohesion of community and reducing construction material waste (Femenias & Geromel, 2020).

The study can help to create awareness for developers on the importance of flexibility and adaptability to be more market competitive and long-term property value. Policymakers can use the findings to update urban housing policies and strategies that promote sustainability and improve housing functionality and durability. For architects and planners, the study gives insights into strategies and principles of flexibility that help to design multi-functional, culturally responsive, user centered and efficient spatial configuration in Addis Ababa real estate development.

1.7. Operational Definition

In this study the following definitions are used:

Flexibility: refers to short-term, reversibility of living space to reconfigure to accommodate functional changes through minor spatial adjustment and without structural changes.

Adaptability: refers to long-term capacity of a dwelling to accommodate major functional or spatial changes that may require design intervention.

Spatial Configuration: the arrangement and relational organization of internal spaces, structural elements and service cores that influence capacity for modification and transformation.

1.8. Organization of the Document

The study has five chapters each addressing the important aspects of the study topic.

The first chapter introduces what the whole study is about. The chapter includes background, problem statement, objectives, research questions and the significance of the study. This chapter is the guiding chapter and highlights the relevance of the study. The second chapter reviews the existing literature on flexibility and adaptability. It reviews theoretical and empirical research and develops a conceptual framework for the study. The research methodology is discussed in the third chapter. This chapter presents research methodology, sampling, data collection and analytic technique. It briefly discusses the ethical consideration of the study. The fourth chapter presents the findings of the research. It tries to relate the findings to the research question. It discusses the findings of how spatial configuration affects the flexibility and adaptability of real estate housing in Addis Ababa. Chapter five is the last chapter of the study that links the findings with the research objectives and findings. It concludes with recommendation and future direction for research on flexibility and adaptability.

CHAPTER TWO

2. Literature Review

2.1. Introduction

The number of people living in urban areas is increasing rapidly. According to the United Nations prediction about two-thirds of the world population will live in urban areas by 2050 (UN, 2018). Addis Ababa is also under rapid urbanization and population growth. This increases the pressure on the city's housing, infrastructure and available land. The housing deficit in the city is more than one million units. To address this the government started the Integrated Housing Development Program (IHDP) to construct condominiums (UN-Habitat, 2017; World Bank, 2021). Later, corporates, private real estate developers and individuals are involved with real estate development. However, these developments have challenges with affordability and flexibility.

Housing is no longer viewed only as a shelter, but a space shaped by demographics, lifestyles, technology, and culture (Schneider & Till, 2007; Schmidt & Austin, 2016). The COVID-19 pandemic reveals the limitations of conventional housing. During the pandemic, the need for adaptability in residential spaces became particularly evident as homes became spaces for work, leisure, education, physical activity, and childcare (Marius & Sten, 2023). These lessons highlighted the need for flexible and adaptable environments.

In this section, the writer tries to review the existing literature related to spatial configuration, flexibility and adaptability. It analyses the theoretical and empirical research in the spatial flexibility and adaptability of housing. Identifies the best practice, design strategies and principles that help to develop users' responsive and long-life apartment units.

2.2. Global Perspectives on Urbanization and Housing Transformation

Rapid urbanization increases the housing demand globally, particularly in the developing countries. People start to shift from single dwelling in a single house to multi dwelling in a building. This reflects the need for flexible space in the living environment that must evolve following the urban dynamic (Groak, 1992; Schneider & Till, 2007). In the urban area the economy, culture and technological changes shaped housing to be understood as a socio-spatial system (Canepa, 2017). The housing sector needs to respond to these changes to address the needs of the users. The change required different spatial configuration than the conventional one. The sector emphasizes flexibility of space to address changes in household size, work pattern and urban densification (Estaji, 2017).

Similarly, the rapid urbanization in Addis Ababa increased the housing demand. The government led the housing development to address these needs. The focus is to provide houses to fill the gap in the housing deficit. The changing economy, local culture, and technological advancement also need to be considered. These factors shape the lifestyle and work pattern of the users that need different spatial needs.

2.3. Historical Evolution of Flexibility and Adaptability in Housing

Flexibility is not new in human history. Nomadic people constructed their shelter that fit their environment and can easily move with it during seasonal migration. They have collective construction techniques that are easily adaptable to different locations they live in (Schneider & Till, 2005).

The housing demand was high following World War and Industrialization. Construction of mass housing is used as an approach to address the need. These standardized and rigid housings had issues using living space effectively. The Dom-Ino House (1914) was one of the solutions by Le Corbusier with a separate structure from the interior partition. Likewise, Mies van der Rohe experimented with Core House (1951). In his design concept of “skin and bones” he introduced open-plan layouts.

However, the key advancement in flexibility was introduced by John Habraken’s Open Building Theory (1961) that empowered residents to shape their space according to their evolving needs. He proposed separating the housing system into a support and infill system. The support includes permanent structure and services whereas infill includes user modifiable elements like interior partition and non-load bearing walls. In 1962 the British Ministry of Housing experimented with adaptable housing that could be adjusted to meet diverse resident’s needs (Magdziak, 2019).

Scholars discussed flexibility in housing. Steven Groák highlights the importance of adaptability in modern living. Schneider and Till experimented in 2007 to show that flexibility helps housing to remain socially and functionally important. The Japanese tatami-based modular design and sliding partition highlights how tradition based cultural design can support flexibility as discussed by architects Kazuhiko and Kaoru Obayashi. While Habraken emphasizes structural separation, Schneider and Till extend flexibility broader dimensions including social and political indicate that adaptability embedded in broader housing systems.

Technological advancements, changing demographics, and digital lifestyles have redefined residential needs (Zivkovic et al., 2021). Today, flexibility and adaptability are recognized as essential design qualities that enhance usability, longevity, and residents' satisfaction (Rabeneck & David, 1991; Estaji, 2017).

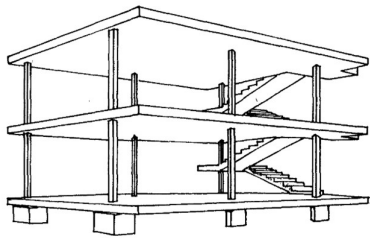


Figure 2.1 *Structure of the Domino project. Reprinted from “Adaptable Housing or Adaptable People” by Beisi, 1995*

Understanding this historical evolution of flexibility will help to the global state of flexible living and understand the current challenges faced with rapidly urbanizing cities like Addis Ababa.

2.4. Core Concepts

Although the concepts of flexibility and adaptability are often used interchangeably in housing discourse, they refer to distinct yet related aspects of residential design. Scholars define the concept of flexibility and adaptability in spatial configuration with their different perspectives.

Flexibility: *refers to a short-term and reversible ability of space to be reconfigured without major structural change that usually by users. E.g. Movable or sliding partitions, multifunctional spaces, modular furniture systems, open-plan layouts.*

Flexibility defined from the occupant, building and inclusive perspective by different scholars. Flexible housing is a kind of house that allows occupants to change their space in response to their changing social, economic, functional and technological needs (Schneider and Till 2007; Estaji 2017). Flexibility is the capacity of a building to support various physical arrangements (Groak, 1992). In the inclusive design flexibility supports different life stages and accessibility (Magdziak, 2019).

Adaptability: *refers to the ability of housing to accommodate long-term, commonly involving semi-permanent or permanent modifications that require intervention by designers or developers. Eg. include adding or removing non-load-bearing walls, relocating internal doors, reconfiguring room boundaries, and integrating secondary kitchens.*

Adaptability is the long-term response of a building to major social and technological changes (Groák, 1992). Adaptability is also considered as a long-term response of a building to support various functions without losing efficiency (Saarimaa & Pelsmakers, 2020).

Spatial Configuration: *refers to the arrangement and organization of space within a building in relation to structure elements, service zones and circulation path such as how spaces are connected, sequenced, sized, oriented, and related to circulation paths and service zones.*

Spatial configuration is the foundation of flexibility that determines how easily space can be transformed or adapted. Properly designed space configuration enhances the usability while supporting changing needs (Hessari & Chegeni, 2024). The Canada's British Columbia Building Code and Australia's adaptable housing guidelines include spatial configuration should be inclusive, ensure safety, modified at minimal cost, and support evolving family and community needs (Estaji, 2017).

2.5. Theoretical Foundations of Housing Adaptation

The human lifestyle and household composition changed over time due to factors including technology, socio-economy, and environmental conditions. This evolving change requires flexible and adaptable housing. Different theories explain how household requirements of housing change and provide the conceptual foundation of the evolving flexible and adaptable living space in the modern context.

Several theoretical frameworks explain how household requirements of housing change and provide conceptual foundation of the evolving flexible and adaptable living space.

The Life Course Theory suggests at different stages of the life of a household such as marriage, child raising, aging, socio-economic changes the housing needs also change. The housing needs to accommodate such changes without frequent relocation (Rossi & Shlay, 1982). Similarly, **Family Housing Adjustment Theory** explains how families continuously evaluate their housing if it meets their needs and cultural norms. When they found their housing failed to meet their requirements, they made housing adjustments including modification, reorganization of use or even relocation. (Morris & Winter, 1975). The Life Course Theory argues that housing needs shift with family stages while the Family Housing Adjustment Theory emphasize behavioral evaluation. Households continuously evaluate their housing if it meets their needs and cultural norms. Households make modification or relocation when it fails to meet their needs.

The Housing and Family Life Cycle Theory explains the housing needs evolve following the changes in family lifecycle (family formation, child raising and later life stage). It highlights the importance of adaptable and flexible housing to respond to these changes without frequent relocation. (Doling, 1976).

User-Initiated Transformation (UIT) Theory extends this argument with that users actively modify and adapt their dwelling over time to meet their changing lifestyle, socio-economic conditions and household needs (Tippie, 1988). The users play an active role in changing their environment to accommodate their needs. With this “Do-It-Yourself (DIY)” residents make changes including adding partitions, adjusting layouts or changing functions their own with the available resources. This theory aligns with the idea “housing is a verb” that housing is an ongoing process of updating space rather than a finished static product (Turner & Fichter, 1973). The socio-demographic factors and housing satisfaction are main drivers of residential changes such as

remodeling, extension, and changing the use of space. Both concepts reflect the fact that residents continuously modify and adapt their dwelling in response to their evolving lifestyle.

Across all those theories residents actively engage with their housing indicate the need for flexible and adaptable housing to respond to the users' changing needs. They provide a theoretical foundation to design apartment units that can respond to the changing needs of the residents. They emphasize the importance of user-centered design process to ensure housing will respond to changes over time and long-term usability.

Studies show that spatial configuration is key in enabling flexibility and adaptability. Habraken introduced open building theory that the separation of permanent structure and internal components creates a freedom to make flexible spatial configuration. Kendall and Teicher's Residential Open Building further extend Habraken's concepts of open building with practical implementation. The separation of the structure system from the interior layout finishes enables the occupant to modify their unit without affecting the whole building. This kind of approach increases the housing flexibility and better accommodates the changing needs of the occupants. Similarly, Schneider and Till's Flexible Housing Theory emphasize "incomplete building" frameworks give an open plan that enables the occupant to make changes according to their spatial need. These open plan theories are the foundation for the study.

Across all those theories residents actively engage with their housing indicate the need for flexible and adaptable housing. During the life course, User initiated transformation and the family housing adjustment theories explain what housing must to respond to the users' changing based flexibility, and lifecycle adaptation theory emphasizing long-term adaptability.

2.6. Empirical Insights on Flexibility and Adaptability in Housing

Research on housing flexibility and adaptability in relation to spatial configuration indicates integrating flexible spatial configuration and user participation enhances user satisfaction and adaptability (Alaraji & Jusan, 2015). Occupants frequently modify their spatial arrangement, modify their partition and change the finishes. In other studies, conventional apartment units usually lack the flexibility to accommodate the changing lifestyle and needs of occupants. Instead, housing should be designed with a flexible layout that supports the evolving lifestyle, behavior and change in function (Husein & Hamad, 2023; Oseland & Raw, 1991). In the resident survey conducted on the flexibility of housing over 40% expressed their dissatisfaction with the rigid layout and

functionality and about 23% were demanding to modify their spatial configuration (McCarthy, 1970). This study indicates that flexible configuration is key for residents' satisfaction.

In the study conducted on 313 apartment units focused on design strategies and long-term usability of building identified that living space size and floor plan layout are determinant to occupant ability to modify their space to accommodate their need (Femenias & Geromel, 2020). Studies in Switzerland and Rotterdam indicate that open design and spatial flexible space support diverse lifestyles and extend housing lifespan (Beisi, 1995; Raviz et al., 2015). In contrast, studies of apartment units that design for spatial efficiency and to maximize land value often undermine flexibility (Saarimaa & Pelsmakers, 2020).

2.7. Importance of Flexibility and Adaptability in Housing

Housing should be designed in such a way that it responds to the changing household structure and lifestyle. Users need to change over type following factors such as technological advancement, environmental factors and demographic shifts. Flexible spatial layout enables residents to adapt their dwellings that leads to satisfaction and higher long-term usability (Esin Altaş & Özsoy, 1998).

Enhancing User Satisfaction and Livability: flexible spatial configuration gives autonomy for the occupant to reconfigure it to accommodate their need. This improves their physiological comfort and satisfaction (Fathy, 2000). Flexible design enhances the efficient use of space and allows for multifunctional use. Involving users in the design and planning process enables the creation of a space that aligns with the daily activity and preference of the users (Schneider & Till, 2007).

Social and Demographic Relevance: Emerging social needs following the demographic changes, remote from work, change in household structure needs different spatial configuration. The study with (Saarimaa & Pelsmakers, 2020) focusses the importance of adaptability for supporting changing household and mobility constraints. But flexibility allows housing to remain relevant across life stages (Magdziak, 2019; Raviz et al., 2015). In our local context housing is more related to permanence and long-term investment. Whereas spatial needs changed over time following socio-economic shifts, technological advancement and change in lifestyle. It is essential to transform the living environment to keep the housing usability and residential satisfaction (Lutolli et al., 2023). Housing that fails to accommodate these changes led to user dissatisfaction or even obsolete.

Sustainability and Longevity: Flexible design can easily adjust to social, technology and environmental changes. This allows the housing to remain usable for extended lifetime. This benefits

both the residents and developers to have better value on their investment, Adaptability and long-term usability minimize the need for reconstruction or even demolition to minimize material waste and reduce carbon emission (Milwicz & Paślawski, 2018).

Functionality and Economic Benefit: for the users' efficient houses are ones that maximize space utilization and support their need while for the developer efficiency is the reduction of cost and making more units. From the designed view it is optimizing both the functionality and economic efficiency (Pelsmakers & Warwick, 2022). Adaptable housing reduces the need for costly renovation and helps to extend the lifespans of a building. This in the long-term benefits both the developer and users and enhances affordability (Schmidt et al., 2010).

2.8. User-Centered and Participatory Approaches in Housing Design

Involving users in housing design plays a key role in shaping their house according to their culture, economy and social need. User-Centered Design (UCD) design process helps to produce flexible housing that allows more user control, culturally appropriate, contextually relevant and sustainable (Fathy, 2000; Turner, 1977; Graham & Tipple, 1988). It ensures the outcome of more flexible and adaptive housing that promotes a sense of ownership and belonging, supporting people of all ages and abilities.

2.9. Leveraging Flexibility and Adaptability for Sustainable Housing

Flexibility and adaptability are considerably contributed to sustainability in different perspectives. Spatial flexible and adaptable design responds to changing users' needs without major renovation or demolition. It contributes to social, environmental and economic sustainability by reducing the need for early renovation or relocation (Estaji, 2017; Tipple, 1988). Sustainable buildings should not last forever, but they can easily adapt to user changes. This principle aligns with Circular Economy (CE) goals, which emphasize extending asset lifespan and minimizing waste (Le & Nguyen, 2023; Marchesi et al., 2020).

Environmental Sustainability: Flexible and adaptable layouts improve space utilization, enhance performance and extend the lifespan of a building (Lutoli et al., 2023). This reduces the need for reconstruction and demolition that contributes to environmental sustainability by reducing material and energy use and lower waste of resources. (Estaji, 2017) argues that flexible spatial configuration supports environmental resilience by accommodating changing needs and using less resources.

Social Sustainability: Residents remain in their housing when it supports their household size, changing socio-economic conditions and lifestyle. Adaptable housing contributes for residents to remain in their community and ensure community stability and bonding (Saarimaa & Pelsmakers, 2020). In the long run this supports multi-generational households that help to enhance quality of life and accommodate diverse culture and aging groups (Boström, 2012).

Economic Sustainability: Adaptable and flexible space can easily modify or rearrange to accommodate changing market demand. It allows residents to reconfigure and reuse spaces to meet the changing household conditions. This reduces the need for frequent relocation, major renovation, or demolition and reduces costs. With modest initial investment, adaptable housing reduces lifetime cost, extends building lifespan and makes the housing more economical (Rabeneck & David S., 1991; Schmidt, R. III & Austin, 2016).

2.10. Designing Principles and Strategies

There is no single method to achieve flexibility and adaptability. It is a combination of design, spatial planning, user involvement and construction techniques. Design strategies and principles enable spatial configuration that accommodates users changing needs. Major strategies are listed as follows:

Spatial Planning and Layout Strategies: Spatial configuration plays a key role in flexibility. Different strategies should be implemented in the planning and laying out stage to achieve flexible space. Strategic placement of utilities, appropriate room size and organization maximize utilization of spaces. Modular design, neutral spaces and organization of space support multi-functionality and ease changing space's function. Planned zoning and partitioning enable users to control their space utilization (Esin Altaş & Özsoy, 1998; Raviz et al., 2015). Spatial relations and access points could also affect the flexibility of space (Shahbazi et al., 2018).

Open layout, moveable partitions, multifunctional rooms maximize utilization of limited space (Fichter & Turner, 1973; Tipple, 1988; Till & Schneider, 2005; Raviz et al., 2015; Rabeneck & David S., 1991). The common architectural principles that support flexibility and adaptability are openness, modularity, stratification, polyvalence, neutrality, division and integration (Zivkovic et al., 2021).

Interior Design and Furniture: users interact with their interior space and need to fulfill their functional and aesthetic needs. Modular furniture and lightweight components give control for the user to easily reconfigure and change their space. Reconfigurable partitions and transformable furniture enable users to adapt their spaces to meet their daily or seasonal spatial needs (Canepa, 2017).

Structural and Construction Systems: Habraken's support and infill theory remain important in the construction of flexible and adaptable space. In this model the permanent component of the building separated from the modifiable internal space. Non-load bearing walls and service zones can be modified or changed to make spatial reconfiguration without the need to make major changes to the building.

Participatory and Post-Occupancy Processes: Involving users in the design stage is effective to better design space that aligns to the divers and changing needs of the user. This allows developers to get feedback and better understand user spatial needs. Making the Post Occupancy Evaluation

(POE) further assists in the improvement of spatial design to align and reflect the evolving need of users (Beisi, 1995).

2.11. Challenges in Implementing Flexible and Adaptable Housing Design

There are many challenges that limit implementing flexibility and adaptability such as economic, technical, regulatory and social (Kendall & Teicher, 2000). Those challenges are also common in the context of Addis Ababa to integrate flexibility and adaptability in the apartment units.

Technical and Construction Challenges: Rigid and standardized construction of the apartment unit is a common challenge for flexibility. Closely spaced grids and columns limit the internal reconfiguration of space. Fixed service cores including plumbing, electricity, and HVAC systems limit modification or make it technically difficult and costly. (Habraken, 1961; Schneider & Till, 2007). Lack of technical expertise and the additional cost at the initial construction phase further hinder the implementation.

Prefabricated components can be easily assembled and disabled to adjust the space (Djukanovic et al., 2025). But using these components have logistics and financial barriers particularly in the local context. This discourages developers from integrating flexibility into their projects. Instead, they prioritize efficiency and completion of their projects.

Economic and Market Challenges: Private real estate development is a profit driven business. The developers' main target is to make profit out of their project. Therefore, they focus on cost efficiency and competitiveness in the market. They often consider flexibility as extra cost than long-term added value to their project. It is considered expensive because it incurs additional investment at the initial stage, but it has life-cycle benefits (Pelsmakers & Warwick, 2022). Flexible buildings reduce renovation or modification costs, extend building lifespan and increase resilience.

Regulatory and Policy Barriers: The regulatory policies and codes usually favor standard and fixed housing. Those are easy to control, give permits and administer, but limit flexibility and make changes to the standard. The existing building codes of Ethiopia do not have specific regulation or policy to support variation for real estate development. Having supportive policy could motivate developers to consider flexibility and long-term advantage. The absence of supportive policies limits the implementation of flexibility and adaptability.

Culture and Perceptions: Different cultures have different spatial requirements. When it comes to housing preference most residents consider rooms as defined and permanent (Israelsson & Hansson, 2009). Users become resistant to change and limit their perception of flexibility and adaptability. To clarify this misunderstanding and enhance the implementation of flexibility it needs to create users’ awareness and acceptance.

Contextual Solutions: Flexibility and adaptability have diverse benefits including social-economic, cultural and environmental. To achieve it requires the involvement of all stakeholders in all the stages of the process, supportive policy and regulation. The implementation should take into consideration the local context including the social-economic, culture and environment,

Study shows that awareness, finance, and installations strongly influence the implementation of flexibility. Other factors including material standard, production and future planning have relatively less influence on implementing flexibility (Niklas Israelsson and Bengt Hansson).

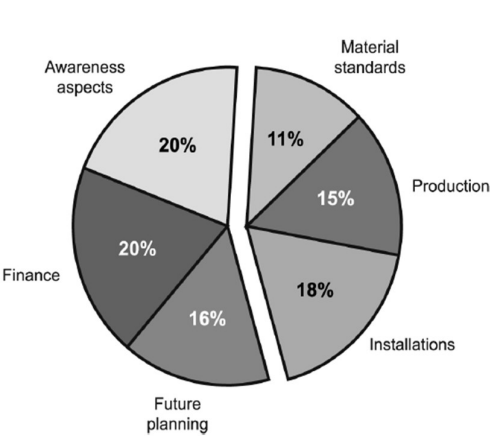


Figure 2.2 Influencing Factors from “Factors Influencing Flexibility in Buildings,” by Israelsson & Hansson, 2009

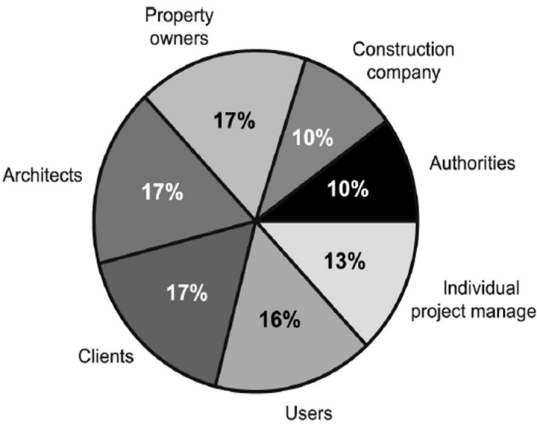


Figure 2.3 Decision Makers Affecting the Flexibility, Reprinted From “Factors Influencing Flexibility in Buildings,” by Israelsson & Hansson, 2009

2.12. Contextual Review: Housing and Real Estate Development in Addis Ababa

In Ethiopia most traditional housing reflects the cultural value and practice. They usually integrate traditional kitchens, communal spaces and multi-functional rooms. These spaces allow people to make traditional cooking, gatherings and other social activities in their house. However, contemporary apartment units usually miss those spaces. Those developments have rigid and standardized layout and do not reflect the local cultural practice. This layout limits users from modifying and reconfiguring their house according to their needs (Kesto, 2021). They find it challenging to get adequate storage, make traditional cooking, and use the space for different purposes. Due to this, they are commonly involved in post-occupancy modification like partitioning and inappropriate use of space.

While most Japanese and European housing use modular system to allow reconfiguration Addis Ababa real estate prioritize space efficiency and supply of more units leads to rigid layout. The existing policy focuses on supply and affordability of housing. Flexibility, cultural responsiveness and long-term usability are overlooked. Though flexibility and adaptability are considered as a strategy to enhance usability, sustainability and resilience globally, it is not yet in practice in the local context.

2.13. Conceptual Framework

The conceptual framework outlines how spatial configuration relates to flexibility and adaptability in the housing context. It identifies the factors that influence this relationship.

Spatial Configuration (Independent Variable): refers to the arrangement, organization, and interrelation of spaces and fixed elements within an apartment unit and its immediate structural context. Key features include the type of layout, structural system, room connections, circulation pathways, modular zoning, internal partitions, room proportion and zoning.

Flexibility and Adaptability (Dependent Variable): the ability of housing to reconfigure to accommodate the changing needs of the occupant. It is the ease of transforming spatial configuration to ensure efficient usability and resident satisfaction. It allows users to control spatial changes. These include the ease of spatial reconfiguration, responsiveness to household and lifestyle changes, multi-functional use of space and functional changeability

Mediating Variable: this refers to the Post-Occupancy Performance (POP) of the unit. It refers to how well the unit's spatial configuration performs after being occupied by the user. It reflects the users' experience and perception of using space. It is the ease of transformation and usability. How the user interacts with space and feels and perceives.

Contextual Factors: These are factors that shape the impact of spatial configuration on flexibility and adaptability. Demographics factors such as age, household size, tenure and income significantly affect flexibility. Other factors include regulatory and policy frameworks, cultural preferences and the construction system.

Conceptual Framework

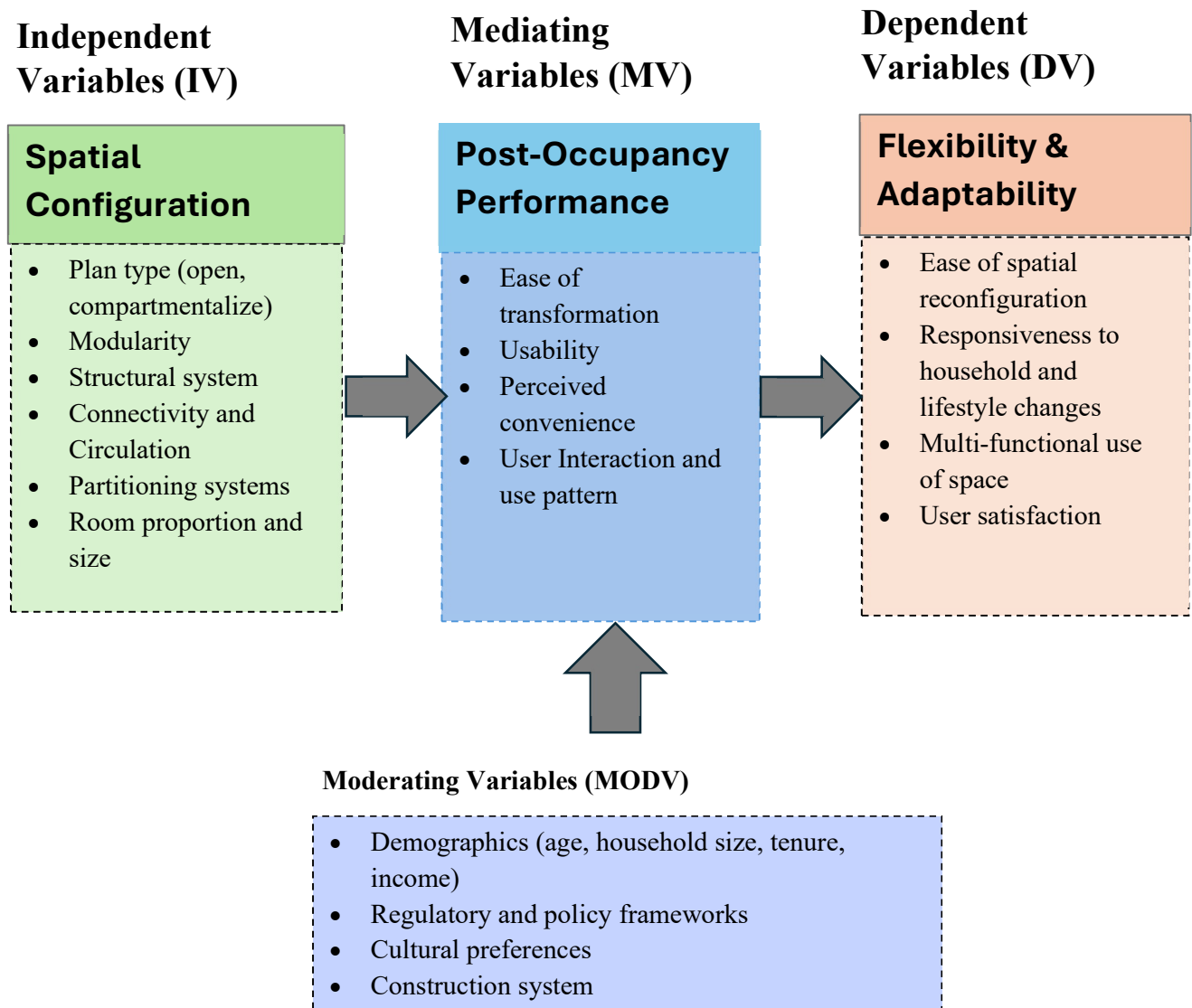


Figure 2.4 *Conceptual Framework Diagram of the Study*

2.14. Conclusion

The literature explores the contribution of spatial configuration to the flexibility and adaptability of apartment units. It examines the existing literature and theories on the impact of spatial configuration on flexibility and adaptability. It reviews the best practice and examines how flexibility contributes to livability, user satisfaction and sustainability.

The theoretical review covers the dominance theories on the flexibility adaptability in housing. The open building theories of Habrakens's open building theory is widely used in housing. His support and fill model is used widely to enable flexible and adaptable housing. Similarly, Schneider and Till distinguished between hard and soft flexibility based on if the change involves physical modification or not. On the other hand, Turner describes housing as a process rather than a product. Through the lifecycle of housing, it keeps changing and evolving.

Studies show that spatial configuration such as open layout, circulation, modular design, partitioning system, room proportion and size affect the flexibility and adaptability of the housing spatial configuration. Such design enhances the usability of the housing and users' satisfaction. Flexible and Adaptable housing contributes sustainability by extending the lifespan of the building and reducing waste of material and resources.

Adaptable design is used globally as a solution to respond to the changing users' needs, diverse socio-economic, technological and environmental changes. Modular, participatory and user-centered design can respond to these evolving requirements. But most of the real estate development in Addis Ababa still follows standardized and rigid units. These result in units with limited spatial configuration that usually fail to respond to the evolving users' need and cultural practice. The literature review revealed that flexibility and adaptability are important for enhancing sustainability, livability and user satisfaction.

This study is theoretically grounded in Open Building theory that provides the architectural basis for understanding how spatial configuration with the separation of structural support and changeable infill enables flexibility and adaptability (Habraken, 1998; Kendall & Teicher, 2000). The evaluation of spatial configuration in private real estate apartments reflects this theoretical foundation. It also pulls on flexibility theory distinguishing structural and use-based flexibility, and lifecycle adaptation theory emphasizing long-term adaptability.

CHAPTER THREE

3. Research Methodology

3.1. Introduction

This chapter presents the research design and methodology used to examine the influence of spatial configuration on flexibility and adaptability. It outlines the research design, sampling strategies and how data are collected. It also explains how data will be analyzed and the measure used to ensure data validity, reliability and ethical considerations. The study integrates spatial analysis, residents and stakeholder insights on housing flexibility.

3.2. Research Design

The study employed a convergent parallel mixed method to collect quantitative and qualitative data concurrently, analyzed separately and integrate the finding for interpretation. The study involves both measurable spatial attributes and subjunctives users and expert experience that cannot be captured with single method alone. It gives the opportunity to triangulate and better understand complex research problems that are difficult to understand using only one method. Mixed method combines both quantitative and qualitative techniques to meet the research objectives (Creswell and Creswell, 2023). The users' experience and perception of their apartment unit examined using surveys. On-site observation, expert interviews and stakeholder survey strength the findings and understanding of the extent of flexibility and adaptability. The spatial configuration of sample real estate apartment units was analyzed using the FLEX 4.0 tool.

Quantitative Components: structured survey data was used to understand residents' and stakeholders' perception, satisfaction, ease of modification and socio-demographic characteristics. FLEX 4.0 was used to evaluate the architectural flexibility of the sample apartment units using weighted indicators and generate flexibility score and classification.

Qualitative Components: to further understand the residents' and stakeholders' experience and perception of spatial flexibility and adaptability gathered insights from stakeholders through interviews, on-site observation and document reviews. Examine sample architectural drawings, policy documents and housing regulation to contextualize design constraints.

3.3. Sampling Strategies

The sampling strategies and sample size were established to identify and use for the study. The study used non-probability sampling since the aim of the study is getting in-depth and relevant insight rather than statistical generalization of the finding to the entire population. Purposive sampling ensures inclusion of divers building typologies, across different socio-economic neighborhoods and experts. Snowball sampling helped to reach residents and experts with relevant experience and insights. Purposive sampling strategy is appropriate to intentionally selected cases that help to get relevant and rich information on cases on the research problem (Creswell & Creswell, 2023). Relevant respondents for the survey and interview were identified and used. Apartment units were also selected systematically for the study based on specific criteria.

Resident Sampling: Due to absence of comprehensive database for private apartment units in Addis Ababa non-probability sampling was employed. Non-probability sampling is used in situations where a well-defined population size is unavailable or difficult to reach all the participants (Creswell & Creswell, 2023). Stratified purposive sampling ensured inclusion of variety of household types, typology, length of occupancy and socio-economic areas. Voluntary participation enabled candid and open users feedback on their experience and feelings. Snowball sampling used to include residents who have made modifications to their units to get their valuable experience and perspective.

The sample size for residents was determined based on the purpose of the study, to get sufficient and diverse representative, and practical consideration such as time and accessibility. When a full list of populations is unavailable, purposive sampling allows us to get in depth and contextual understanding that aligns with the study in architectural and urban studies (Williams, & Babbie, 2013). A total of 350 – 400 units were targeted to ensure sufficient data. As there are no accurate databases for the number of apartment units developed by private real state Cochran formula used as rough benchmark to estimate the sample size.

$$n_0 = \frac{Z^2 p(1-p)}{e^2}$$

n = Sample Size

Z = Z-value (1.96 for 95% confidence level)

P = estimated population proportion (0.5 for if unknown)

e = margin of error 5% (0.05)

$$n_0 = \frac{(1.96)^2 0.5(1 - 0.5)}{(0.05)^2}$$

$$n_0 = 384.16$$

In the study a total of 386 residents participated, and the data were collected both from the paper based and online survey.

Stakeholder Sampling: Purposive sampling methods were used to select stakeholders with direct experience in housing design, development, construction or regulation. Participants with different professional roles, relevant knowledge and years of experience in the real estate sector were identified and participated in the survey and interview. Key stakeholders including architects, developers, experts from government regulatory offices, evaluators, contractors and interior designers participated.

Data were collected from thirty-seven stakeholders with paper based and online surveys. In person interviews were conducted with selected stakeholders to learn from their experience and get feedback on the sector. The sample size was determined based on data saturation where additional interviews no longer give new themes.

Case Study Selection: To address the research equation and objectives of the research it requires identifying appropriate units, studying different typologies and construction approaches from the selected private real estates and studying their spatial configuration. Cases with the required characteristics identified and selected that are appropriate to study different spatial configuration. To select an apartment unit, criteria were developed based on location, typology and occupancy period. These criteria were used to have an insight and comparative analysis of the spatial configuration of the apartment units. In addition, the urban context and the socio-economic character of the neighborhood were considered. Based on these criteria fifteen apartment units by different private real estate developers were selected.

Building Typology: Building typology and height determine the building structure system, core system, grid structure and circulation path. The type of facade and wall system also differed based on building typology. To make a comparative analysis of how spatial configuration differs in building typology, buildings with high-rise (above 10 stories), mid-rise (6 – 10 stories) and of low-rise (3-5 stories) are selected. Including these varieties of building typologies helped to make

comparative analysis of different spatial and structural analysis and how it affects their flexibility and adaptability.

Geographical Diversity: Addis Ababa is a big city with urban fabrics of diverse cultures and socioeconomics. There are a mix of old and new, formal and informal, low-rise and high-rise housing, densely populated and relatively dense areas in the city settlements. The city has been under rapid development with the infrastructure and zoning changes especially in the last few decades. This affects the land value and building density that impact the building typology and spatial configuration. For example, in the middle of the city like the Bole area there is high land value so the developers prioritize spatial efficiency whereas the peripheral areas may have relatively relaxed space to have more flexible spatial configuration.

In this study, real estate from different sub-cities including central, intermediate and outskirts of the city were selected. This enabled us to make comparative analysis between different neighborhood characters and affect the spatial configuration of the apartment units.

Occupancy Period: One of the objectives of the study is to understand how residents interact with their space after their occupancy. This post-occupancy evaluation gives insight into how spatial configuration meets the changing needs of the occupant over time. This study focuses on residents who have lived for at least one year in the apartment units so that they feel and experience spatial configuration in relation to their changing need in time.

3.4. Location of the Study Area

There is high housing demand in Addis Ababa. Following that the number of private real estate developers in the city has increased. This study focuses on the private real estate in Addis Ababa.

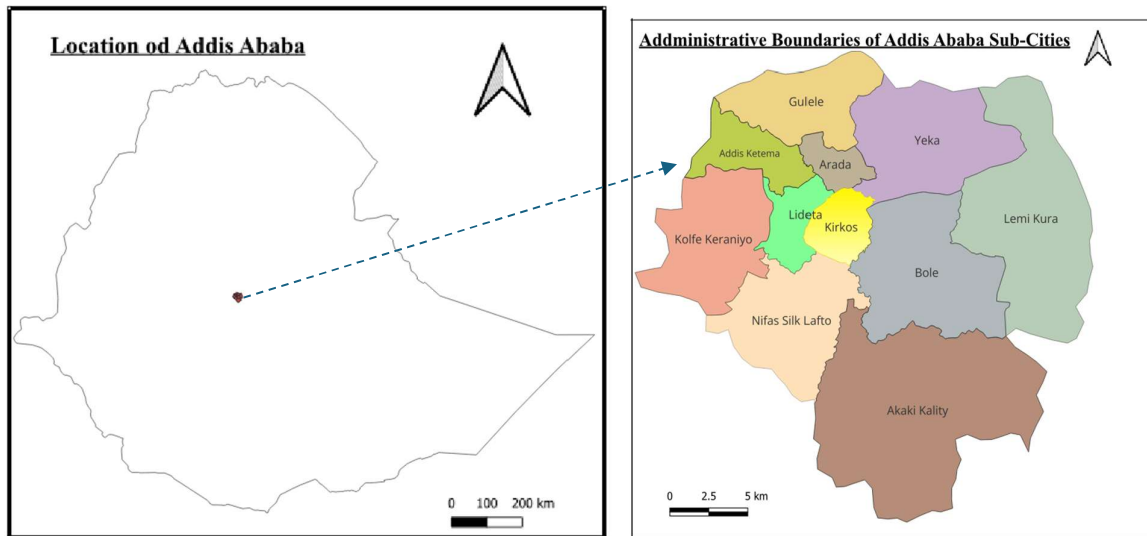


Figure 3.1 *Location Map for Addis Ababa*

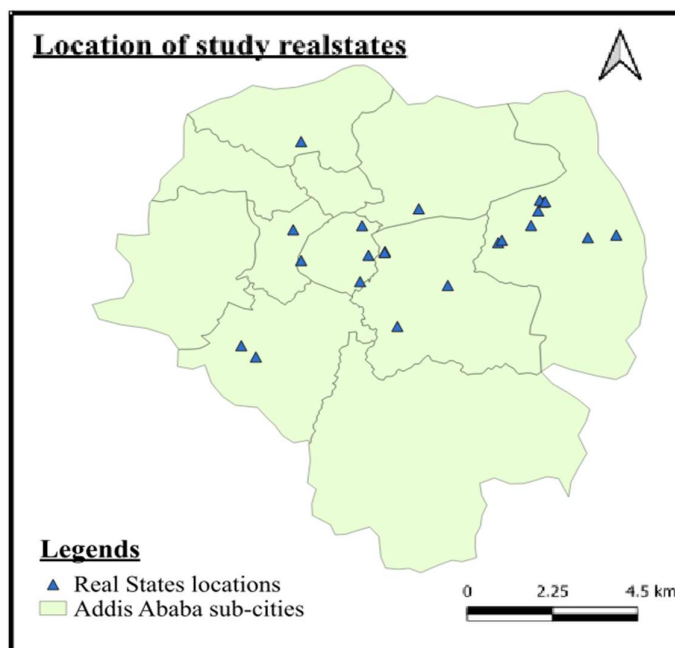


Figure 3.2 *Distribution of Real Estate in Addis Ababa*

3.5. Data Collection Method

In this study different methods of data collection tools and methods used. Data was gathered using FLEX4.0 assessment tool, surveys, semi-structured interviews and on-site observation.

Survey: Surveys are one of the methods used in the study to collect data. Based on the identified variables and indicators for the study the survey questionnaires were designed. The survey questionnaire includes Likert scale, multiple choice, open-ended and closed-ended questions that are used to examine residents' and stakeholders' perception and experience. Survey is a quantitative research approach that helps effectively collect data from the sample population that can be used to see patterns, relations, opinion or characteristics (Creswell & Creswell, 2023).

Two separate surveys were designed for residents and stakeholders. The surveys were prepared both in Amharic and English language.

Distribution Mode: The surveys were distributed to the respondents both online and paper based. The online version was prepared using Microsoft Forms platform. This approach helped to address users' preferences and accessibility.

The paper-based surveys were distributed and collected door-to-door to the sample households. Surveys were filled by household members with direct responsibility and engagement of the unit's spatial arrangement and use. The resident management team and house-owner association supported in facilitating access to the residents during the distribution and collection of the surveys.

Resident Survey: This survey focuses on examining residents lived experience and perception. The survey collected residents' demographic information, their perception, modification history, satisfaction with spatial configuration and experience on the flexibility and adaptability of their apartment unit.

Stakeholder Survey: This survey was used to collect information from different stakeholders with experience related to real estate. The survey collected information on their views, challenges, market influence, regulatory and experience on flexibility and adaptability of real estate housing.

Interview: semi-structured interviews were conducted with selected residents and stakeholders to obtain deeper insights. These further helped to explore their experience, perceptions and suggestions

on the current apartment units design challenges, design constraints and user behavior. This allowed us to collect data that cannot directly be captured in the surveys.

Document Review: Explore and analyze relevant government housing policies, regulations, building codes and literature on flexibility and adaptability. Architectural drawings from sample real estate developers were reanalyzed to assess the local situation.

On-Site Observation: On site observation of occupied and vacant apartment units conducted to see the spatial configuration of some apartment units. This also helped to observe the modification made by the occupant to their living space and actual spatial modifications.

FLEX 4.0 Tool: The FLEX 4.0 tool was developed in the Delft University technology in the Netherlands. This current version of the tool has 44 Key Performance Indicators (KPIs). For this study only 12 KPIs were identified and selected that were applicable to assess the adaptability and flexibility of apartment units.

Table 3.1 *Assessment Form Using FLEX 4.0 Flexibility Performance Indicators*

Category	Flexibility Performance Indicator	Weight	Assessment	Score
Structure	1. Available floor space of the building	4		
	2. Size of the floor buildings	3		
	3. Measurement system; modularity coordination	3		
	4. Horizontal zone division/layout	1		
	5. Shape of Columns	1		
	6. Position of facilities zones and shafts	3		
	7. Location/Shape of daylight facilities	2		
Facilities	8. Independence of user units	1		
Space	9. Multifunctional building/units	2		
	10. Disconnectible, removable, relocatable walls	4		
	11. Disconnectible connection detail inner walls	4		
	12. Possibility of suspended ceilings	2		

The tool helps to analyze floor plans with its KPI and gives a four-scaled assessment value for the flexibility performance with value 1 for Bad to 4 for the Best. Each indicator has a different weight relative to each other based on their importance. The indicator with very high importance has value 4 and those with less importance have a value 1. The score for each indicator is then calculated as the product of their weight and assessment. So, for each indicator the value will be (weight X assessment). Then the result of each score will be added to get the total flexibility score. For this study the total number of indicators is 12. Therefore, the minimum score is ($1 \times 1 \times 12 = 12$) and the maximum score will be ($4 \times 4 \times 12 = 196$).

Using the two border values a class table was created as shown in table class of flexibility score below. Apartment unit with high flexible score considered as “Excellent Flexibility” whereas apartment unit with lowest flexibility score classified as “Not Flexible at all”. This result was compared with the findings from the residents’ and stakeholders’ surveys to compare the validity of the result.

FLEX 4.0 typically groups building into classes (e.g., low, medium, high flexibility) based on the aggregate performance across categories of assigned to each criterion for scoring system. The scoring system includes KPI including spatial, structural, service flexibility, and modularity.

Table 3.2 *Class of Flexibility Scores*

Class Table Flexibility Score	Score Range
Class 1: Not flexible at all	12 - 48
Class 2: Hardly Flexible	49 - 85
Class 3: Limited flexible	86 - 122
Class 4: Very flexible	123 - 159
Class 5: Excellent flexible	160- 192

3.6. Data Analysis

Data collected using different methods were analyzed using valid techniques according to the data type. Quantitative data collected using the survey was analyzed using SPSS software. These data analyzed for frequency, percentage and their relation studied with cross tabulation.

Qualitative data collected with open-ended questions and interviews were analyzed thematically to understand the experience and perception of the residents and stakeholders on the influence of spatial configuration on flexibility and adaptability. Existing government policies, regulations and codes on housing and buildings were reviewed to examine how they influence flexibility and adaptability.

3.7. Validity and Reliability

Validity: To ensure the validity and reliability of the research design, data collection and analysis follow standardized procedures carefully. The structure and design of the questionnaire used in this study were developed with deliberate alignment to the research objectives and guided by established principles of questionnaire validity. Each Appropriate sample size was collected based on a scientifically accepted sampling method.

The questionnaires were segmented into four coherent sections: demographics and Household Information, Spatial Flexibility and Adaptability, Key Design Factors Influencing Flexibility and Adaptability, Design Strategies and Opportunities for Flexible and Adaptable Apartment Design. These are corresponding to specific research questions and objectives. This structure and each question aligning with specific elements of the research goals with clear and unbiased language ensures the collected data is both relevant and construct validity in measuring the feasibility and adaptability of spatial configuration.

Reliability: For this research, reliability is verified through an appropriate sampling process. Standardized procedure followed for the survey administration and scoring FLEX 4.0 indicator with proper documentation. Use established tools including SPSS and FLEX 4.0 strengthen reliability. The questionnaire targets residents and stakeholders in real estate developments sector, ensuring that the sample aligns with the broader population involved in housing development. Purposeful sampling techniques ensure representation across private real estate development in Addis Ababa, while a sufficiently large sample size increases statistical power and minimizes errors. Additionally, the demographic questions, such as roles and years of experience, ensure that the characteristics of the sample closely resemble the total population of real estate development in Addis Ababa.

Pilot Testing: The survey questions were carefully designed and structured to align with the research objectives and questions. Before distribution the surveys were piloted to remove any confusion and ambiguity and make them clear and refined to ensure the quality of the data collected.

Triangulation: Survey data from the residents and stakeholders survey, FLEX 4.0 result were used as a multiple source to cross-check the findings. This helped to accurate & reliable outcomes.

Transparency: The research design clearly defined the entire procedure. Detailed data collected and analysis procedure properly documented.

Ethical Consideration: Participation in the research was fully voluntary based. The purpose and benefit of the study were clearly explained to each participant. They were informed that they can leave any question or withdraw totally any point. They have also been informed that their personal data confidentiality is strictly protected, and it will be used only for academic purposes.

3.8. Limitation

Sampling Methods and Tools Used: The study employed non-probability sampling such as purposive and snow-balling sampling. Such methods may introduce potential bias. Since these methods didn't give equal chance to all members of the population, the finding can't be generalized. The FLEX 4.0 tool is used with limits to measure spatial flexibility and adaptability. The tool used expert judgement that may introduce subjectivity.

Geographical Limitation: The study is geographically limited to the Addis Ababa area. This limits the study to generalize to other locations with different contexts and conditions.

Data Availability: Most of the real estate has restricted access to their architectural drawing for confidentiality and other administrative reasons. This limited the sample size included in the architectural document analysis. To address these multiple data sources including site observations, interviews, use marketing materials, to ensure the reliability and comprehensiveness of the study.

Time Limitations: The study is conducted cross-sectional as it is limited to time. The findings are only limited to the current states of the apartment units.

CHAPTER FOUR

4. Findings, Analysis, and Discussion

4.1. Introduction

In this chapter the results of the study are presented in detail. Data gathered from the surveys, interviews, on-site observation and FLEX 4.0 documents analyzed. The residents' and stakeholders' perception and experience evaluated in alignment with the research objective and questions. The assessment result of the architectural drawings of the sample real estate presented and discussed in this chapter.

The findings are discussed in comparison with the existing literature on flexibility and adaptability of housing. The study results presented with text, tables and graphs to clearly show the relation, comparison and similarity of the result. The findings help to address the research objectives and questions and recommend future strategies.

4.2. Contextual and Demographics Profile

4.2.1. Resident Demographic Profile

The demographics of the respondents analyzed to understand the different household profiles including age, gender, income, tenure and occupation length to contextualize the result. The data helped to analyze across different groups and gave depth for the study.

Types of Apartment Units

Table 4.1 *Distribution of Apartment Units*

	Frequency	Percent	Valid Percent	Cumulative Percent
Studio	5	1.3	1.3	1.3
1-Bedroom	33	8.5	8.5	9.8
2-Bedroom	167	43.3	43.3	53.1
3-Bedroom	164	42.5	42.5	95.6
4 or More Bedroom	17	4.4	4.4	100.0
Total	386	100.0	100.0	

The result of the survey showed that out of 386 respondents 331 (85.8%) of them lived either in two- or three-bedroom apartment units. From these respondents 167 (43.3 %) lived in two bedrooms and 164 (42.5%) lived in three bed-room apartment units. The remaining 33 (8.5%) live in one bedroom, 17 (4.4%) with 4 or more bedrooms and 5 (1.3%) live in a studio. These results showed that the preferred size of apartment units are two-bedroom and three-bedroom apartment units. This could indicate that most apartment units are family-oriented, and the market emphasized the middle to upper income buyers. This also indicated that more space is preferred to accommodate changes in lifestyle or household structure.

Length of Occupancy

Table 4.2 *Length of Occupancy*

	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 1 year	61	15.8	15.9	15.9
1–2 years	143	37.0	37.2	53.1
3–5 years	117	30.3	30.5	83.6
More than 5 years	63	16.3	16.4	100.0
Total	384	99.5	100.0	
Total	386	100.0		

The above table showed 143 (37.2%) respondents lived between 1 – 2 years and 117 (30.5%) lived from 3 – 5 years. The respondents who lived less than one year are 61 (15.9%). The remaining 63 (16.4%) lived for more than five years in their current apartment units. The result showed that there is a high percentage of mobility among the residents. This mostly could be related to accommodating the changing lifestyle or household structure. Small portions of the respondents who lived longer in their current apartment show that they modified or adopted their living space to their changing needs.

Household Size

Table 4.3 *Household Size*

	Frequency	Percent	Valid Percent	Cumulative Percent
1	19	4.9	5.1	5.1
2	76	19.7	20.6	25.7
3-5	218	56.5	59.1	84.8
6 or more	56	14.5	15.2	100.0
Total	369	95.6	100.0	
Total	386	100.0		

The result for household size showed that 218 (59.1%) of the respondent household was occupied by 3 -5 family members, 76 (20.6 %) of households have 2 family members and 56 (15.2%) have six or more family members. This is typical family structure in Ethiopia that more family members live together in a household. This type of living requires different types of spatial configurations to accommodate the different spatial needs of the household members. This stresses the importance of flexible spatial configuration to accommodate diverse spatial needs in a family when more people live together in a household.

Housing Tenure

Table 4.4 *Housing Tenure*

	Frequency	Percent	Valid Percent	Cumulative Percent
Owner	196	50.8	50.9	50.9
Renter	182	47.2	47.3	98.2
Other	7	1.8	1.8	100.0
Total	385	99.7	100.0	
Total	386	100.0		

The table above shows that 196 (50.8%) of the respondents are household owners. They have better chances and autonomy to make changes to their unit to accommodate their changing needs. The renters comprise 182 (47.3%) of the respondents. Renters have limited power to modify their living space to accommodate their spatial needs. The tenure status helps to understand how the capacity of making changes influences the rate of making changes in their unit.

4.2.2. Stakeholder Characteristics

Table 4.5 *Professional Roles in the Real Estate Sector*

	Frequency	Percent	Valid Percent	Cumulative Percent
Architect	10	27.0	27.0	27.0
Developer	2	5.4	5.4	32.4
Contractor	4	10.8	10.8	43.2
Sales Professional	6	16.2	16.2	59.5
Interior Designer	2	5.4	5.4	64.9
Government Regulatory	3	8.1	8.1	73.0
Other	10	27.0	27.0	100.0
Total	37	100.0	100.0	

The study involved stakeholders from different professional roles and years of experience. These allow in depth understanding of flexibility and adaptability. A total of thirty-seven professionals

from different backgrounds with relevant experience in real estate participated in the study. The participants included architects, developers, contractors, sales professionals, interior designers, government regulatory bodies and others who worked in the real estate sector. The dominant participation of professionals with architecture background enhances the insight of the feedback with better understanding of spatial configuration, flexibility and adaptability.

Table 4.6 *Year of Experience*

	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 1 year	5	13.5	13.5	13.5
1-2 years	9	24.3	24.3	37.8
3-5 years	5	13.5	13.5	51.4
5-10 years	6	16.2	16.2	67.6
More than 10 years	12	32.4	32.4	100.0
Total	37	100.0	100.0	

A significant number of the respondents have relevant years of experience in the real estate sector. The survey result showed that 12 (32%) of the respondents have more than 10 years of experience and 6 (16%) have between 5 to 10 years of experience in the real estate sector. These senior, mid-level and young professionals shared their views, and experience gave valuable and reliable insights. Their feedback and assessment can be used as a valuable input for developing policies and strategies for future spatial configuration to flexible and adaptable apartment units.

Table 4.7 *Stakeholders familiarity with Flexibility and Adaptability*

	Frequency	Percent	Valid Percent	Cumulative Percent
Expert	2	5.4	5.4	5.4
Very Familiar	15	40.5	40.5	45.9
Moderate	12	32.4	32.4	78.4
Slightly Familiar	2	5.4	5.4	83.8
Not Familiar	6	16.2	16.2	100.0
Total	37	100.0	100.0	

The data reveal varying levels of awareness regarding flexibility and adaptability among the respondents. Among the professionals who participated in the survey 15 (40%) expressed themselves as familiar with flexibility and adaptability, 12 (32%) expressed themselves as familiar with the concept of flexibility and adaptability and 2 (5 %) of the participants identified themselves as experts. However, 6 (16 %) are not familiar and 2 (5.4%) are slightly familiar with flexibility and adaptability. The survey results indicate that there is a good level of awareness and familiarity with flexibility and adaptability. However, there is a knowledge gap among some professionals which

indicates that there is a need for training and awareness creation among professionals on flexibility and adaptability.

4.3. Extent of Spatial Flexibility and Adaptability of Apartment Units

Table 4.8 *Satisfaction with the current Apartment unit Layout among Residents*

	Frequency	Percent	Valid Percent	Cumulative Percent
Very Satisfied	67	17.4	17.4	17.4
Satisfied	119	30.8	31.0	48.4
Neutral	107	27.7	27.9	76.3
Dissatisfied	72	18.7	18.8	95.1
Very Dissatisfied	19	4.9	4.9	100.0
Total	384	99.5	100.0	
Total	386	100.0		

The result of the resident survey showed that 119 (31%) of the respondents were satisfied and 67 (17%) were very satisfied with their current apartment unit layout. However, 72 (18%) of the respondents were very dissatisfied and 19 (5%) of the respondents were dissatisfied with their current apartment unit layout. The remaining 107 (27%) of the respondents were neutral. From the response of the participants, we can see that there is a significant number of residents who are satisfied with their current apartment layout. This perception reflects residents' immediate usability and normalizes with adapting to space. There are no deeper consideration and awareness of structural limitation and long-term usability.

Table 4.9 *Residents' Perception of Accommodating Changing Household Needs*

	Frequency	Percent	Valid Percent	Cumulative Percent
Extremely Well	93	24.1	24.4	24.4
Well	117	30.3	30.7	55.1
Neutral	100	25.9	26.2	81.4
Poorly	49	12.7	12.9	94.2
Very Poorly	22	5.7	5.8	100.0
Total	381	98.7	100.0	
Total	386	100.0		

Table 4.10 *Stakeholder's Experience and Perception of Household Needs*

	Frequency	Percent	Valid Percent	Cumulative Percent
Extremely Well	2	5.4	5.6	5.6
Well	8	21.6	22.2	27.8
Neutral	3	8.1	8.3	36.1
Poorly	13	35.1	36.1	72.2
Very Poorly	10	27.0	27.8	100.0
Total	36	97.3	100.0	
Total	37	100.0		

The above two tables show the comparison and relation of residents' and stakeholders' perception of the changing household needs.

The residents' table shows that 93 (24%) of the residents think that their apartment unit layout accommodates their changing needs extremely well and 117 (30%) think it accommodates well. The remaining 100 (26%) are neutral on whether their apartment unit layout supports or not their changing needs. But the remaining 49 (13%) think their apartment unit layout poorly supports their changing needs and 22 (6%) respond that their apartment unit layout very poorly supports their changing needs.

The result from the stakeholders was different from the residents. Only 2 (5%) of the respondents think the current apartment unit's layout supports the changing needs of the residents. And 8 (22%) think the apartment unit's layout supports the changing needs of the residents well and 3 (8%) were neutral on this. The majority of the stakeholders, 13 (36%), think the apartment unit layout poorly supports and the remaining 10 (27%) think the apartment unit layout very poorly supports the changing needs of the residents.

The difference in the result reflects the difference between the residents and the experts. Residents tend to evaluate based on their immediate functionality, day-to-day experience and their ability to make minor adjustments to meet their current needs. Whereas expert assesses the general trends in the design and long-term usability of apartment units. They evaluate deeper architectural and technical factors such as structural grids, planning layouts, and service core placements. This perception gap highlights residents perceive adaptability as immediate usability, while experts identify limitations in long-term use of spatial configuration.

Modifications Made or Considered by Residents

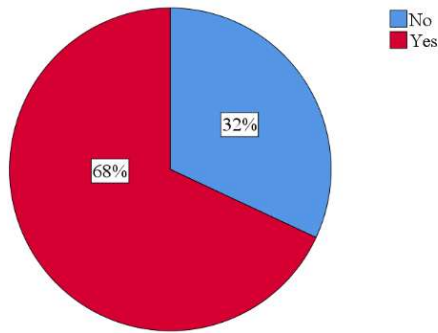


Figure 4.1 *Modifications Made or Considered by Residents*

The chart above from the collected data shows that 260 (68 %) of the respondents had modified or considered modifying their apartment units. Some of the common issues raised by the residents with their apartment unit layout include smaller room size, poor lighting and ventilation, lack of cultural responsiveness, and limited auxiliary space that could be used for laundry and storage. The kitchens did not properly address traditional kitchen needs like privacy, and proper ventilation or added secondary kitchens for cultural food preparation. The most common modifications that the residents made or considered to make on their apartment units include added partitions to create additional rooms like maids' rooms, changing the function of some spaces or rooms like repurposing balconies, creating storage space, changing bedrooms to offices.

The survey result showed that most of the apartment unit layout has poor post-occupancy performance (POP). This indicated that the current spatial configuration of the apartment units failed to accommodate their changing needs. This limits residents to use the space as they would like to and get dissatisfied. The result validates the importance of flexibility and adaptability in the apartment units.

Ease of Making Spatial Changes

Table 4.11 *Residents' Perception of Making Spatial Changes*

	Frequency	Percent	Valid Percent	Cumulative Percent
Very Easy	54	14.0	14.2	14.2
Easy	127	32.9	33.5	47.8
Neutral	92	23.8	24.3	72.0
Difficult	86	22.3	22.7	94.7
Very Difficult	20	5.2	5.3	100.0
Total	379	98.2	100.0	
Total	386	100.0		

Table 4.12 *Stakeholders' Perception of Making Spatial Changes*

	Frequency	Percent	Valid Percent	Cumulative Percent
Very easy	1	2.7	2.8	2.8
Easy	13	35.1	36.1	38.9
Neutral	7	18.9	19.4	58.3
Difficult	10	27.0	27.8	86.1
Very Difficult	5	13.5	13.9	100.0
Total	36	97.3	100.0	
Total	37	100.0		

The table compares the feedback from the residents' and stakeholders' perception on making changes to the spatial configurations of apartment units. About 181 (47%) of the residents think that it is easy or very easy to modify their apartment units. Among the respondents of the stakeholders 13 (36%) think it is easy to make changes to apartment units. In contrast 106 (28%) of the residents responded it is difficult or very difficult to make changes to their apartment units. Similarly, 15 (41%) of the stakeholders responded that it is difficult or very difficult to make changes to apartment units' layout.

Both residents and stakeholders mentioned ventilation, lighting, and rigid layout as common challenges to make modifications to accommodate the changing needs. This limits flexibility and long-term usability of the apartment units.

Willingness to Pay for Flexibility

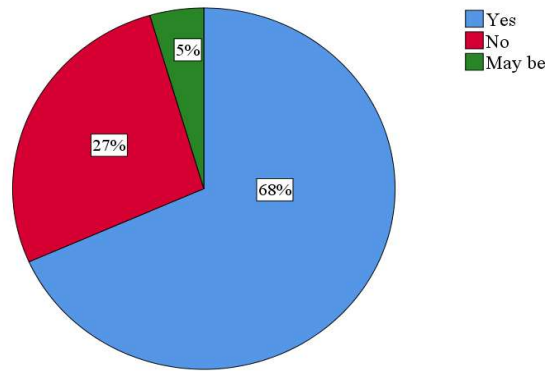


Figure 4.2 *Willingness to pay for Flexibility*

The majority of the residents, 262 (68%) are willing to pay more for apartment units that are flexible and adaptable. This shows that there is high demand for flexibility and adaptability. This is an opportunity for the developer to create a market competitiveness strategy that integrates flexibility and will add more value to the property in the long run. This finding indicates that there is a gap between the users' demand and the developers' priority.

Architectural Drawing Evaluation Using FLEX 4.0

Architectural drawings from five sample real estate were analyzed using the FLEX 4.0 assessment tool. This tool assesses the capacity of the real estate apartment unit to flexibility and adaptability. The selected real estate developments are represented as PRD-01, PRD-02, PRD-03, PRD-04 and PRD-05 for the purpose of this study. The apartment units assessed for flexibility and adaptability under structural, facility and spatial configuration category. They were assessed for each criterion and scored. The assessment result of each criterion added up to get the total score that gives their class flexibility.

Table 4.13 *Flexibility & Adaptability Assessment for PRD-01 Real Estate Apartment Unit*

Flexibility and adaptability assessment for apartment unit PRD-01 Real Estate				
Category	Flexibility Performance Indicator	Weight	Assessment	Score
Structure	1. Available floor space of building	4	2	8
	2. Size of floor buildings	3	3	9
	3. Measurement system; modularity coordination	3	1	3
	4. Horizontal zone division/layout	1	2	2
	5. Shape of Columns	1	3	3
	6. Position of facilities zones and shafts	3	2	6
	7. Location/Shape of daylight facilities	2	2	4
Facilities	8. Independence of user units	1	2	2
Space	9. Multifunctional building/units	2	2	4
	10.Disconnectible, removable, relocatable walls	4	2	8
	11.Disconnectible connection detail inner walls	4	1	4
	12.Possibility of suspended ceilings	2	3	6
Total Flexibility Score				59
Flexibility Class				2

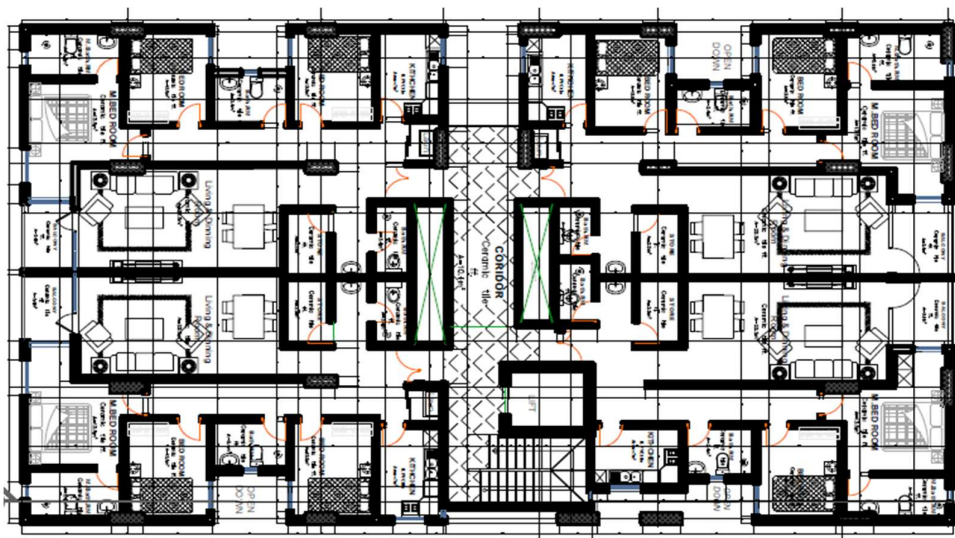


Figure 4.3 *PRD-01 Real Estate Bole Bulbula Site Floor Plan*

Table 4.14 Flexibility & Adaptability Assessment for PRD-02 Real Estate Apartment Unit

Flexibility and adaptability assessment for apartment unit PRD-02 Real Estate				
Category	Flexibility Performance Indicator	Weight	Assessment	Score
Structure	1. Available floor space of building	4	2	8
	2. Size of floor buildings	3	2	9
	3. Measurement system; modularity coordination	3	2	3
	4. Horizontal zone division/layout	1	2	2
	5. Shape of Columns	1	3	3
	6. Position of facilities zones and shafts	3	3	6
	7. Location/Shape of daylight facilities	2	3	4
Facilities	8. Independence of user units	1	2	2
Space	9. Multifunctional building/units	2	2	4
	10. Disconnectible, removable, relocatable walls	4	2	8
	11. Disconnectible connection detail inner walls	4	1	4
	12. Possibility of suspended ceilings	2	3	6
Total Flexibility Score				64
Flexibility Class				2

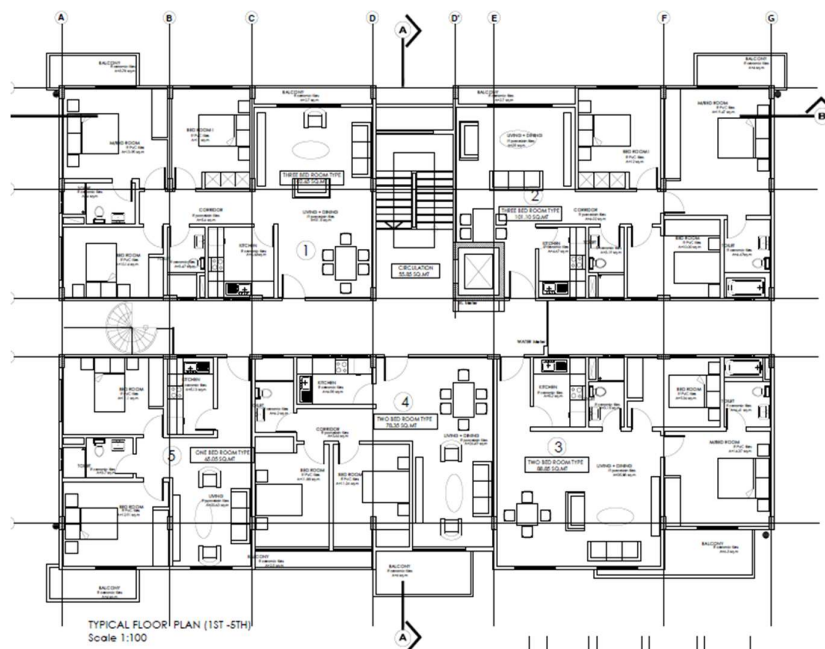


Figure 4.4. PRD-02 Real State Floor Plan

Table 4.15 *Flexibility & Adaptability Assessment for PRD-03 Real Estate Apartment Unit*

Flexibility and adaptability assessment for apartment unit PRD-03 Real Estate				
Category	Flexibility Performance Indicator	Weight	Assessment	Score
Structure	1.Available floor space of building	4	2	8
	2. Size of floor building	3	3	9
	3.Measurement system; modularity coordination	3	2	6
	4.Horizontal zone division/layout	1	2	2
	5.Shape of Columns	1	3	3
	6. Position of facilities zones and shafts	3	3	9
	7. Location/Shape of daylight facilities	2	3	6
Facilities	8. Independence of user units	1	2	2
Space	9. Multifunctional building/units	2	2	4
	10.Disconnectible, removable, relocatable walls	4	2	8
	11.Disconnectible connection detail inner walls	4	1	4
	12.Possibility of suspended ceilings	2	3	6
Total Flexibility Score				67
Flexibility Class				2



Figure 4.5 *PRD-03 Real Estate Kazanichis Floor Plan*

Table 4.16 *Flexibility and Adaptability Assessment for PRD-04 Real Estate Apartment Unit*

Flexibility and adaptability assessment for apartment unit PRD-04 Real Estate				
Category	Flexibility Performance Indicator	Weight	Assessment	Score
Structure	1. Available floor space of the building	4	2	8
	2. Size of the floor building	3	3	9
	3. Measurement system; modularity coordination	3	2	3
	4. Horizontal zone division/layout	1	2	2
	5. Shape of Columns	1	3	3
	6. Position of facilities zones and shafts	3	3	6
	7. Location/Shape of daylight facilities	2	3	4
Facilities	8. Independence of user units	1	2	2
Space	9. Multifunctional building/units	2	2	4
	10. Disconnectible, removable, relocatable walls	4	2	8
	11. Disconnectible connection detail inner walls	4	1	4
	12. Possibility of suspended ceilings	2	3	6
Total Flexibility Score				67
Flexibility Class				2

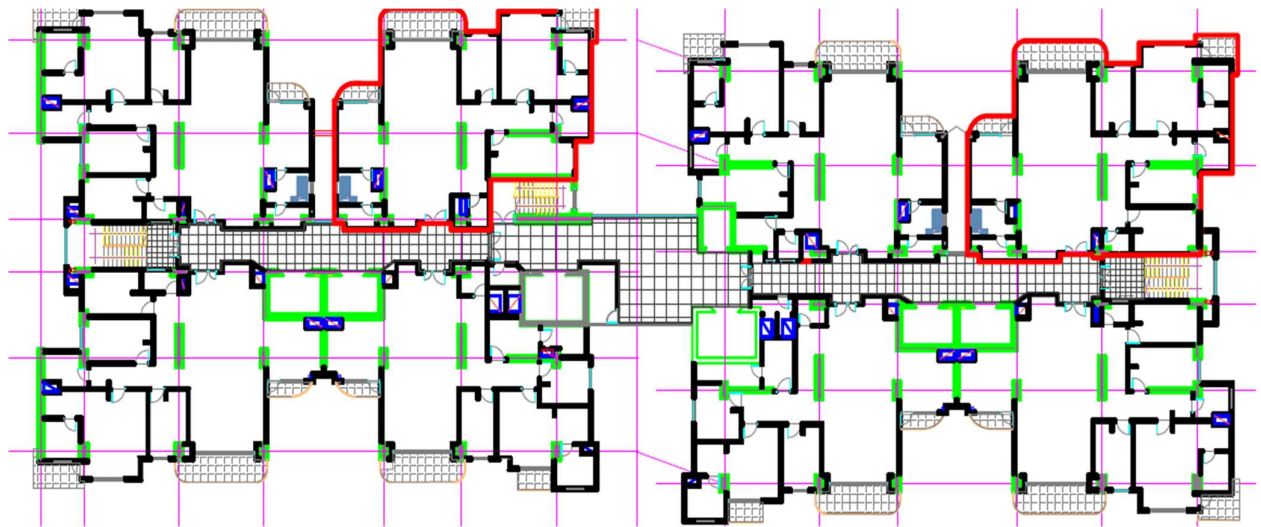


Figure 4.6 *PRD-04 Real Estate Lebu Site Floor Plan*

Table 4.17 Flexibility and Adaptability Assessment for PRD-05 Real Estate Apartment Unit

Flexibility and adaptability assessment for the apartment unit PRD-05 Real Estate				
Category	Flexibility Performance Indicator	Weight	Assessment	Score
Structure	1. Available floor space of building	4	2	8
	2. Size of floor building	3	2	9
	3. Measurement system; modularity coordination	3	2	3
	4. Horizontal zone division/layout	1	2	2
	5. Shape of Columns	1	3	3
	6. Position of facilities zones and shafts	3	2	6
	7. Location/Shape of daylight facilities	2	3	4
Facilities	8. Independence of user units	1	3	2
Space	9. Multifunctional building/units	2	2	4
	10.Disconnectible, removable, relocatable walls	4	2	8
	11.Disconnectible connection detail inner walls	4	2	4
	12. Possibility of suspended ceilings	2	3	6
Total Flexibility Score				66
Flexibility Class				2

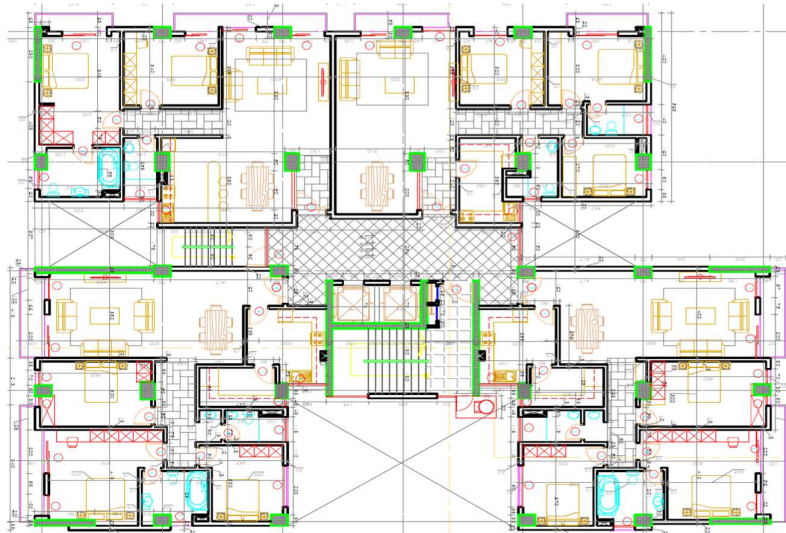


Figure 4.7 PRD-05 Real Estate Bole Site Floor Plan

FLEX 4.0 Architectural Assessment: Extent of Flexibility and Adaptability

The assessment result with FLEX 4.0 on the sample apartment units reveals that they have limited flexibility. The score for all the assessed real estate development falls under flexibility class 2. That means their apartment units are hardly flexible according to the FLEX 4.0 assessment. The average score was 64.4 which indicated hardly flexible layouts. Their design is predominantly rigid structure systems with limited room for reconfiguration and to make modification.

The assessment mainly focused on the room layout, customizability of the facilities, floor spaces, unit independence, modularity, multifunctionality and daylighting facilities. Under the assessment of facilities including daylighting and shaft placement most real estate's design score low to moderate. In structural flexibility, floor spaces, modular room layout and columns shape generally the score is low. This is due to the small room size, no clear distinction between the support and filling in the layout. The facilities are not easily customizable to adapt or modify the location or use of kitchen and bathrooms. The modular design principle was not implemented.

In general, the assessment result showed that current real estate apartment units are hardly flexible and adaptable. This is mainly due to their rigid structural grid, permanent partition walls, minimal zoning flexibility and rigid layouts preventing spatial reconfiguration. The absence of flexibility indicates that most real estate developers focused on standardized and rigid systems driven by market competitiveness and maximize the unit count than flexibility and long-term usability.

4.4. Resident and Stakeholder Perceptions of Flexibility and Adaptability

Perceived Importance of Flexibility and Adaptability in Apartment Design

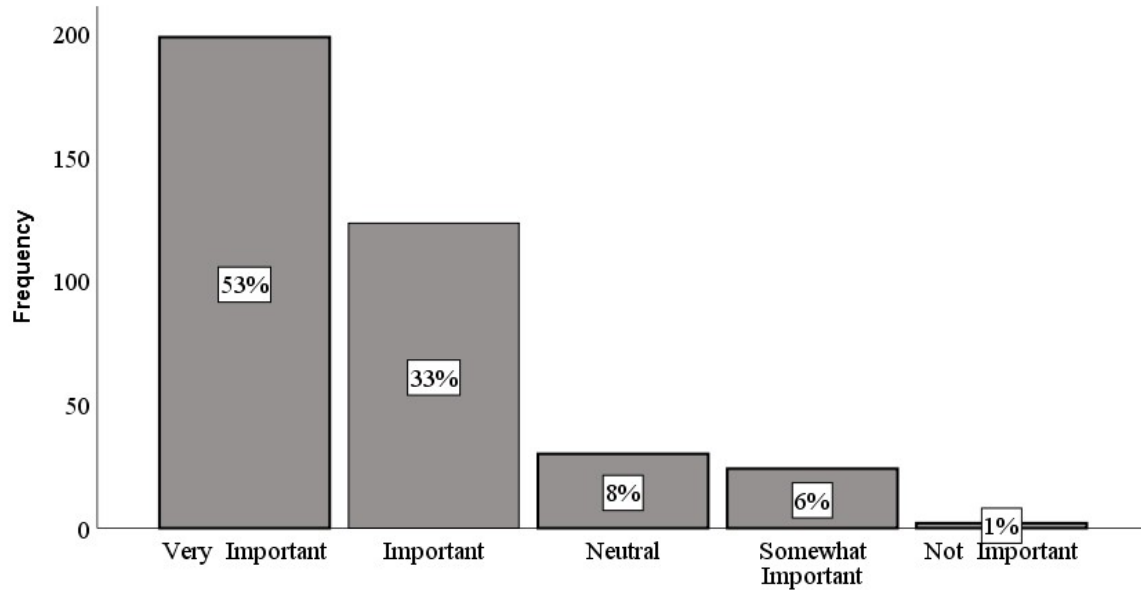


Figure 4.8 *Importance of Flexibility and Adaptability of Apartment Units according to Residents*

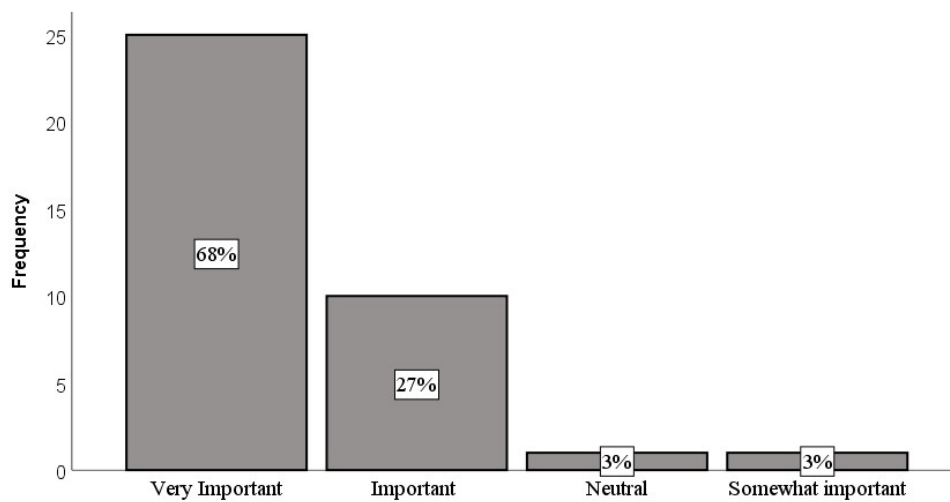


Figure 4.9 *Importance of Flexibility and Adaptability of Apartment Units according to Stakeholders*

Both residents and stakeholders strongly agreed with the importance of flexibility and adaptability. The survey result showed that 198 (52%) of the respondents believed it is very important and 123 (32%) believed that it is important to include flexible and adaptable spaces. Similarly, 25 (67%) of

the respondents believed it is very important and 10 (27%) believed in the importance of flexibility and adaptability. This indicated that flexible and adaptable spatial configurations are important to include in the apartment unit design.

Preferences for Accommodating Changing Needs

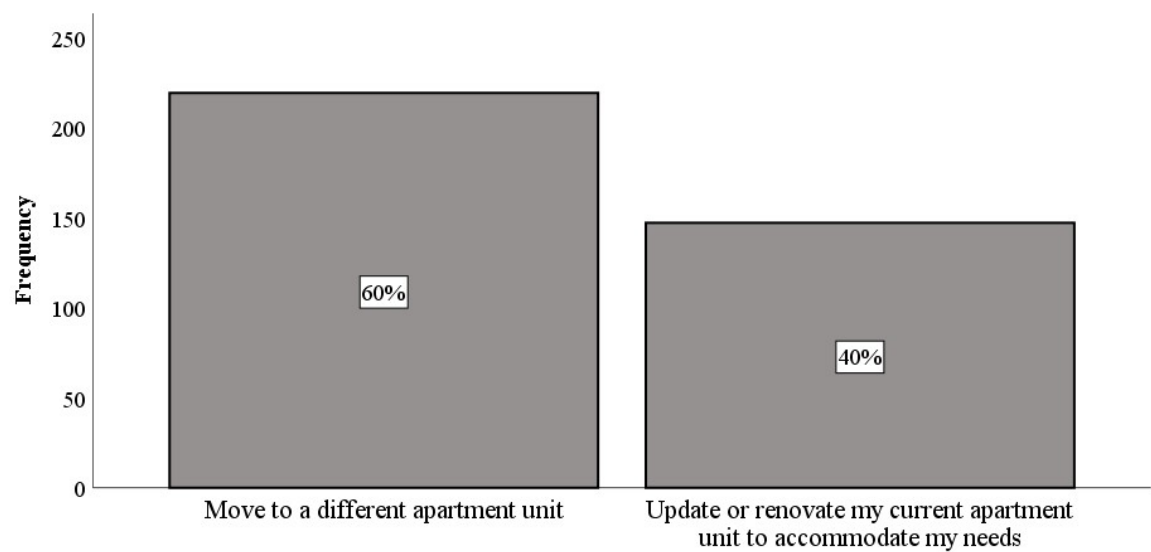


Figure 4.10 *Residents' Preferences for Accommodating Changing Needs*

Residents were asked about their preference either to move to a different apartment unit or modify their current apartment unit to accommodate their changing needs. A significant number of residents, 147 (40%) of the respondents preferred to update or modify their current apartment unit to accommodate their changing needs rather than relocating to a different place. This is mainly due to economic constraints, social attachment to the neighborhood, proximity to school and work, and limited housing options.

The result indicates that there is high preference for making modifications to accommodate the changing needs of residents. This strengthens the need for user-centered design that enables users to make post-occupancy adaptability to accommodate their evolving needs.

Cultural Responsiveness in Apartment Design

Table 4.18 *Perception of Stakeholders on Cultural Responsiveness of the Current Apartment Designs*

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	11	29.7	29.7	29.7
No	21	56.8	56.8	86.5
Not Sure	5	13.5	13.5	100.0
Total	37	100.0	100.0	

More than half 21 (56%) of the participating stakeholders think that the current apartment units didn't respond to the local cultural and religious needs. Most of the local traditions have different cooking practices and communal ways of life.

Common Ethiopian traditional cooking has odor and smoke that need proper ventilation, extra storage and some privacy. The current apartment units have limited spatial flexibility to accommodate such traditional practice of cooking, communal living, religious practice and need for extra storage space.

4.5. Spatial Planning and Design Factors Influencing Flexibility and Adaptability

Main Drivers Behind Spatial Configuration

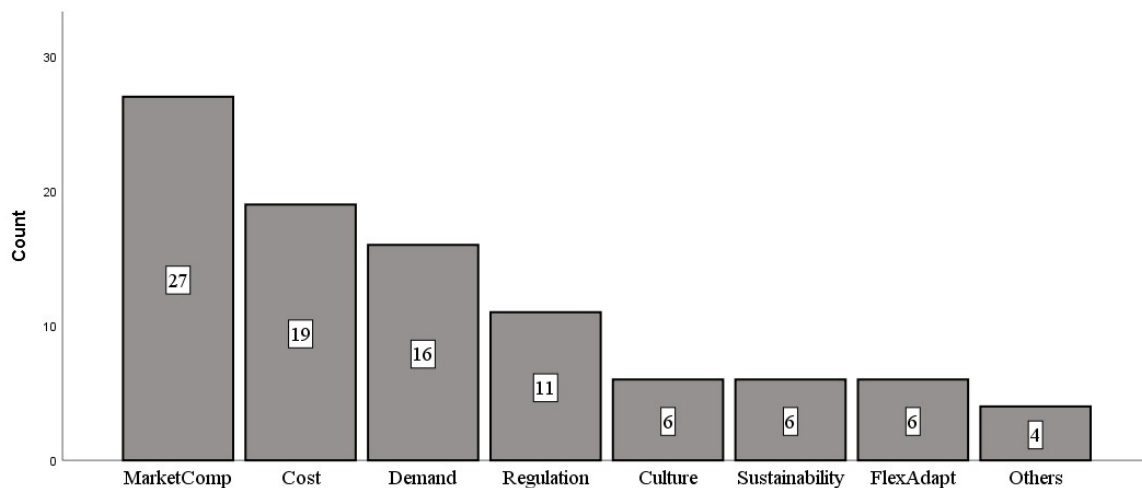


Figure 4.11 *Main Drivers Behind Spatial Configuration*

Competitiveness and cost efficiency are the main drivers in the design of apartment units. The survey response from the stakeholders indicated that market competitiveness, cost and demand are considered the main drivers for design and have been highly prioritized. Though flexibility, cultural responsiveness and sustainability are very important aspects of a design, they have very limited attention and less priority in the design of the apartment units.

The relatively low percentage for flexibility and adaptability suggests that design for change remains not a concern in the private real estate sector, underscoring the need for policy frameworks and professional practices that explicitly promote adaptable design principles.

Supporting Design Features that Enhance Flexibility and Adaptability

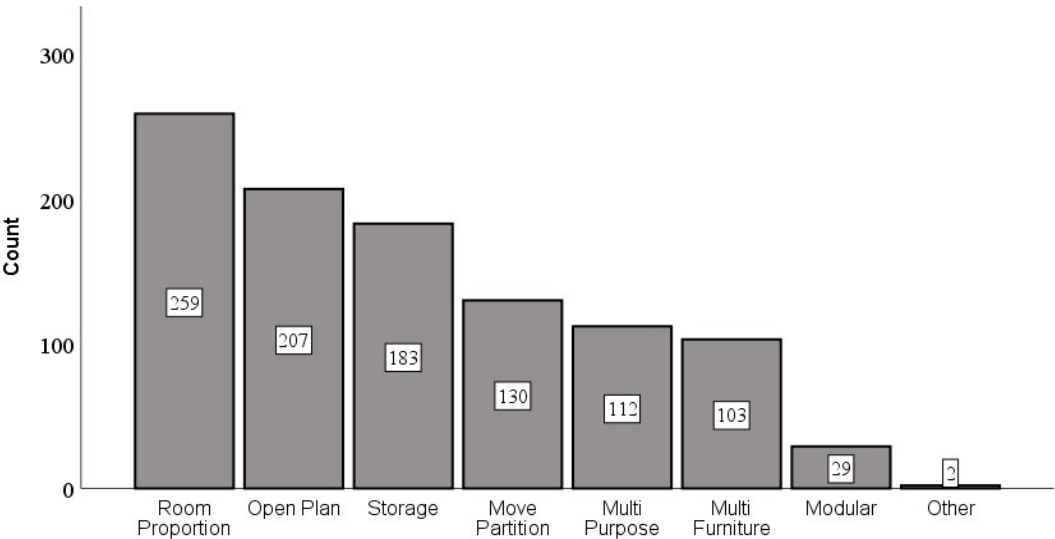


Figure 4.12 *Residents' rating on Supporting Design Features Enhancing Flexibility and Adaptability*

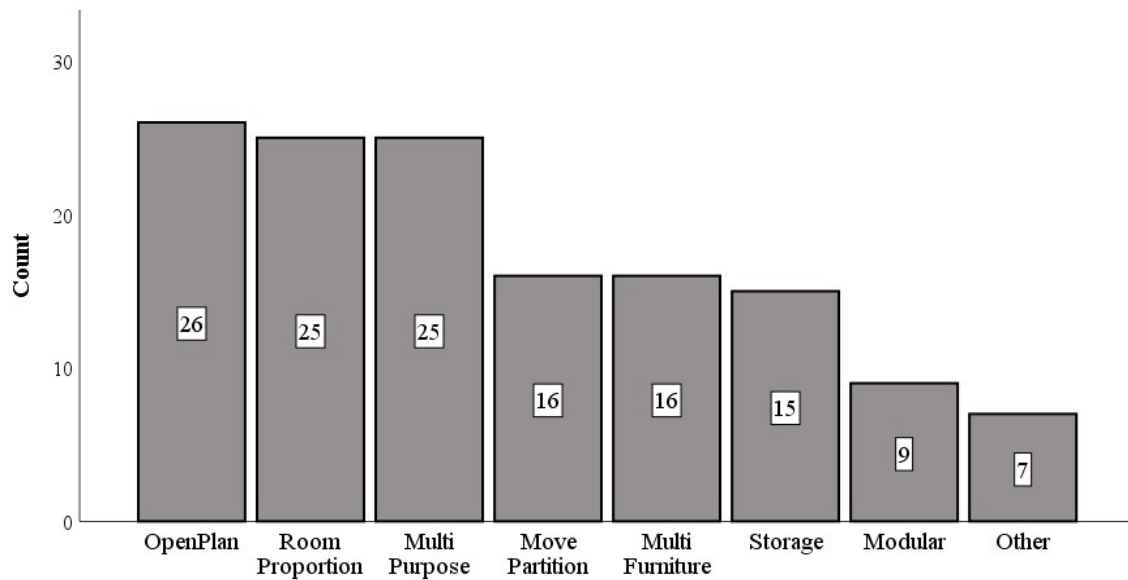


Figure 4.13 *Stakeholders' rating on Supporting Design Features Enhancing Flexibility & Adaptability*

As we can see from the above two tables, the residents and stakeholders have different priorities on the features of apartment units that support flexibility and adaptability. For the residents most selected features for flexibility are room proportion 259, open plan spaces 207, storage 183, and movable partition 130. Meanwhile, the most selected features for the stakeholders are open plan 26, room proportion 25, and multipurpose design 25. The other features that stakeholders considered important are movable partitions, multi-purpose furniture, and storage, which were selected by 16 and 15 stakeholders.

Units with proportionate rooms and clear circulation patterns are more likely to support varied use and future modification. The open plan layouts reflect a growing preference that allows for adaptable furnishing and changing household needs. However, the low mention of modular systems reveals limited awareness or availability of technically advanced flexibility in the housing market.

The close alignment between the residents' and stakeholders' perspectives indicates the shared recognition of spatial organization and openness as primary enablers of flexibility. However, stakeholders' higher recognition of multi-functional use implies a professional awareness of functional adaptability. This shows that both user experience and design intent favor open and proportionate spatial configurations.

Limiting Design Features Hindering Flexibility and Adaptability

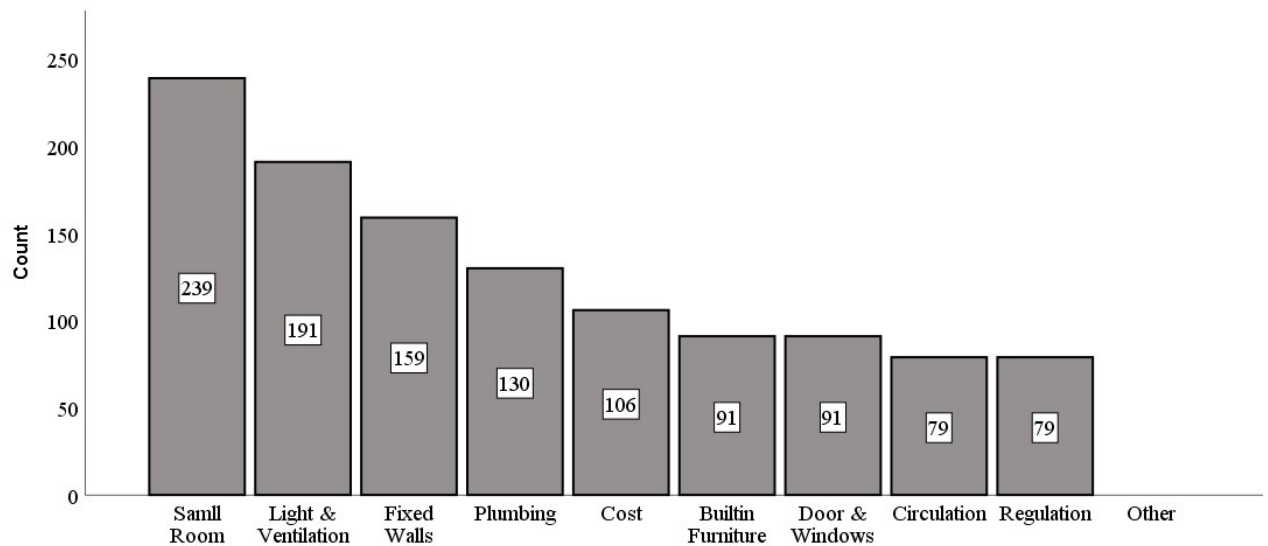


Figure 4.14 Residents Rating Limiting Design Features Hindering Flexibility and Adaptability

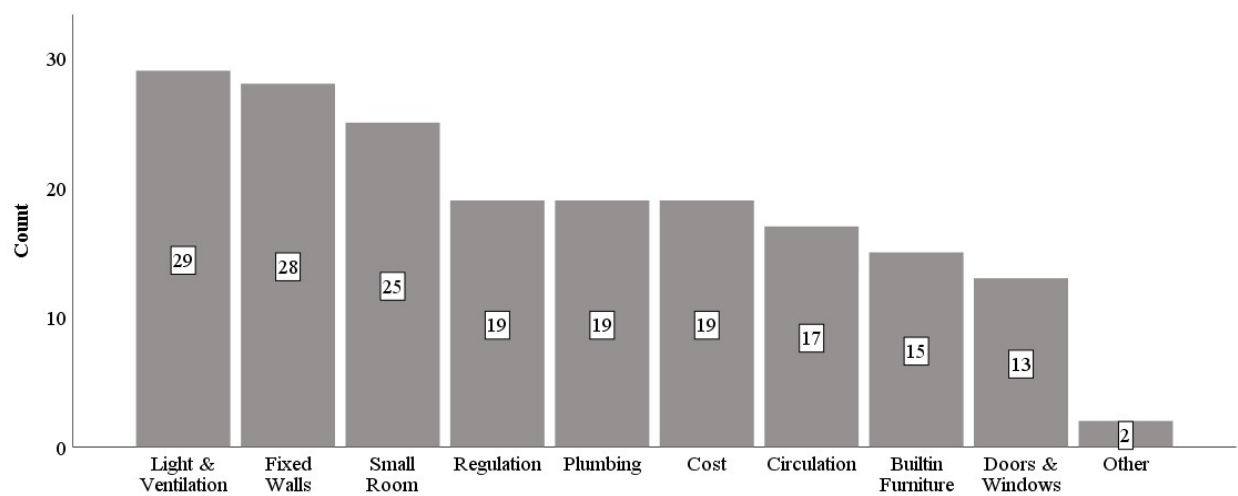


Figure 4.15 Stakeholders Rating Limiting Design Features Hindering Flexibility and Adaptability

The two tables above show the limiting features of adaptability and flexibility in apartment units. In both the residents and stakeholder surveys, we can see similarity in the limiting features. For the residents most selected limiting features for flexibility included smaller size rooms 239, access to light and ventilation 191, fixed wall 159, plumbing 159, and cost 106. Meanwhile, the most selected features for the stakeholders are light and ventilation 29, fixed wall 28, and smaller-sized room 25.

Both the residents and stakeholders indicated that structural rigidity, fixed wall partition and smaller room size predominantly limit the flexibility and adaptability of apartment units. Stakeholders also

considered regulation, cost and services cores also significantly hinder the implementation of flexibility and adaptable designs. The result indicates that architectural design and regulators have a significant role in spatial flexibility of the design.

Challenges in Integrating Flexibility and Adaptability Design

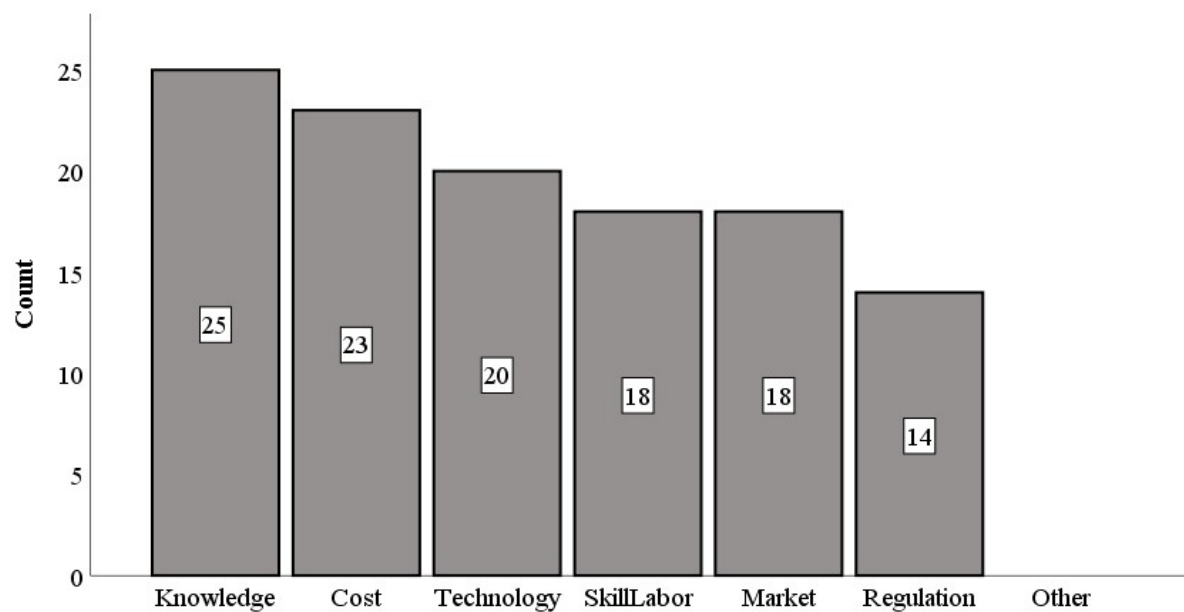


Figure 4.16 *Stakeholders Opinion on Challenges to Integrate Flexible and Adaptable in the Design*

Most stakeholders have similar opinions on the challenges to implement flexibility. According to the stakeholders, the major challenges to implement flexibility are knowledge, cost and technology. Lack of skilled expertise, regulations and market demand are also indicated as common challenges to implement flexibility.

Support for Accommodating Changing Needs and Satisfaction

Table 4.19 *Chi-Square Test for Accommodating Changing Needs and Satisfaction*

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	28.564 ^a	16	.027
Likelihood Ratio	37.103	16	.002
Linear-by-Linear Association	9.178	1	.002
N of Valid Cases	384		

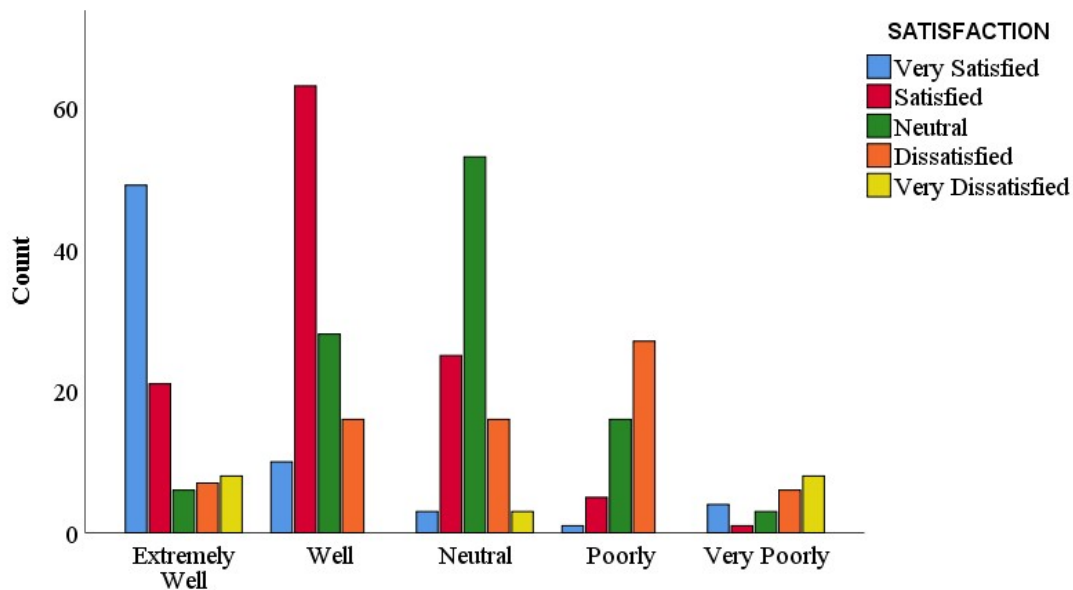


Figure 4.17 *Correlation of Perceived Support Changing Need to Satisfaction*

There is a positive correlation between users' perception of their units accommodating their changing needs and their satisfaction level. The Pearson Chi-Square result for the test was $p = 0.027$, that is less than 0.05 indicates statistically significant relationship.

The survey result showed that users who responded their apartment units supported their changing needs "Extremely Well" and "Well" were very satisfied or satisfied with their apartment units, in contrast respondents who responded their apartment units accommodate "Very Poorly" or "Poorly" their changing needs were very dissatisfied or dissatisfied with their apartment unit. This strong positive correlation indicates that user's satisfaction also depended on their ability to accommodate their changing needs.

Apartment Type and Ease of Making Changes

Table 4.20 *Chi-Square Test for Apartment Type and Ease of Making Changes*

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	35.214 ^a	16	.004
Likelihood Ratio	37.882	16	.002
Linear-by-Linear Association	11.067	1	.001
N of Valid Cases	379		

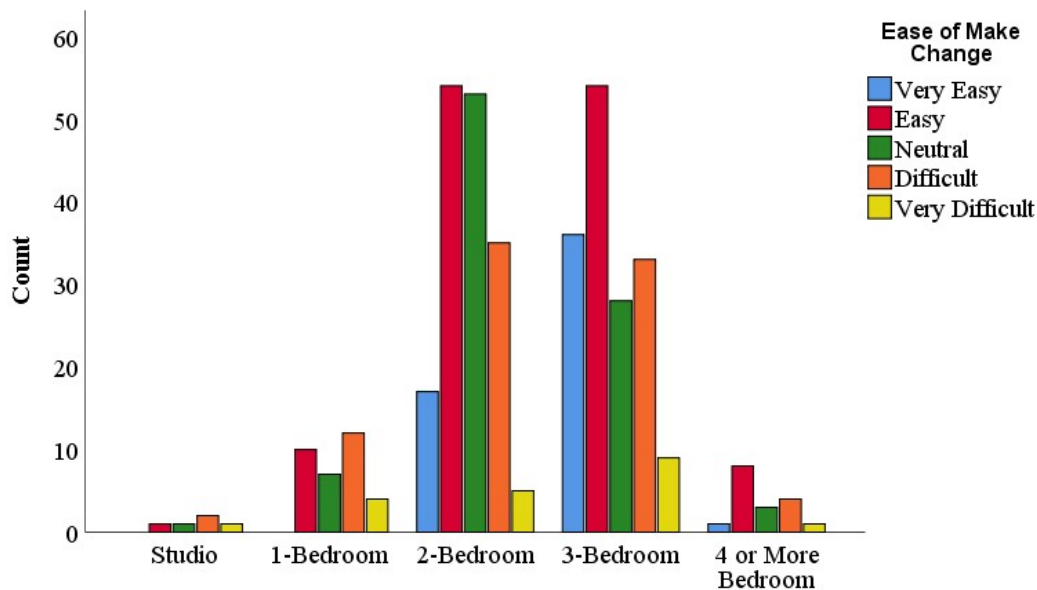


Figure 4.18 *Apartment Type and Ease of Making Changes*

From the survey results on the relation of apartment size and ease of making changes, occupants with two-bedroom and three-bedroom size apartment units think that it is easy to make changes to their apartment units. Whereas occupants with studio and one-bedroom apartment units think it is difficult to make changes to their apartment unit. The Pearson Chi-Square test result gave $p > 0.004$ that showed there is statistically significant positive relationship between apartment type and ease of making changes. This indicates that smaller room size apartment units are difficult to modify.

4.6. Summary of key findings

The key findings of the study on the flexibility and adaptability of private real estate sectors in Addis Ababa are summarized and presented in this section.

4.6.1. Architectural Performance and Flexibility Extent

Based on the FLEX 4.0 assessment results all the assessed real estate development buildings are hardly flexible. This is mainly due to their rigid structural grids, fixed wall partitions, fixed service core, smaller room size and rigid floor layouts. Spatial flexibility can be achieved by using design strategies such as open-plan layout, modular designs, customizable facilities, movable/lightweight partition walls and multifunctional spaces.

4.6.2. User Demand, Perception, and Contextual Influence

The study result showed that a very large majority of residents and stakeholders believe in the importance of flexibility. The data showed that there is strong demand for flexible apartment units that could accommodate the evolving needs of the residents. But the current spatial configuration does not respond to the social, cultural and changing lifestyle of the residents. A significant number of occupants preferred to stay in their current apartment than moving to a different location to accommodate their changing needs. The data also showed most users have modified or plan to modify their apartment unit to accommodate their needs. Most respondents expressed their willingness to pay more for flexible and adaptable apartment units. The study shows that there is significant relationship with spatial flexibility and user satisfaction.

4.6.3. Systemic Constraints and Recommended Strategies

Though both stakeholders and residents believed in the importance of flexibility and adaptability, its implementation is limited. The major constraints that hinder the integration of flexibility and adaptability are cost, limited knowledge and skill, and lack of supportive regulation. Strategies including user-centered design, creating awareness, professional training and updating the regulation enhance its implementation.

4.7. Discussion

The section analyzes the research findings with the existing literature framework to address each research question. It examines the implication of the findings to the existing architectural practice in private real estate sectors in Addis Ababa.

- ***Extent of Spatial Flexibility and Adaptability in Current Apartment Units***

The study shows that the current apartment units developed by private real estate have standardized and rigid spatial configuration. Rigid structure systems and space layouts, fixed walls and immovable service cores constraints the flexibility. This limits occupants from making modifications to accommodate their changing needs. This aligns the concept of support and fill should be separated. Flexibility requires an open-layout, modular design and flexible structure system. (Habraken, 1972; Kendall & Teicher, 2000; Schneider & Till, 2007).

- ***Resident and Stakeholder Perspectives***

Residents and stakeholders believe that the current apartment units do not meet the occupants' needs and cultural norms. Most of the residents (68%) modified or considered modifying their living spaces. This aligns with (Morris & Winter, 1975) the family housing adjustment theory that families continue to evaluate their housing. And if it fails to satisfy their changing needs and cultural norms, they keep modifying it. This also validates Tipple's user-initiated transformation (UIT) theory that residents are actively changing this housing to meet the changing lifestyle, socio-economic condition and family needs.

The limiting design features that residents commonly mentioned were fixed partition walls, smaller room size, not considering the cultural practice, fixed location of the facilities, poor lighting and ventilation. This is concerning as it limits spatial reconfiguration for functions such traditional cooking and hosting extended family which are key for the local cultural fabric. This aligns with Femenias & Geromel (2020) finding that room size and rigid structure limit users' modification.

Stakeholders listed cost, lack of supportive regulation, limited technical knowledge and skill are the major barriers limiting the integration of flexibility in the local context. The real estate developers focus on market competition, cost efficiency and maximizing space utilization. The study showed that 68 % of the residents are willing to pay more for flexibility. But this strong user demand is

overlooked by the developers. This shows the need for user-center design (UCD) and participator design approaches align with (Turner, 1977; Fathy, 2000).

- ***Influence of Spatial Configuration***

The basic structural and space layout of a building influences the spatial configuration of a building. Design elements such as open layout, structural system, modularity, connectivity and partitioning system influence the special flexibility. These features need to be integrated in the building starting from the early design phase. This aligns with the idea that flexibility needs to be integrated into the basic special and structural design on a building (Schneider & Till, 2007, Groak, 1992).

- ***Design Strategies for Enhance Flexibility***

Implementing flexible and adaptable design strategies enhances the post-occupancy performance and ease of modifications. Design strategies such as open-layouts, modular planning, lightweight demountable or movable partitions, culturally responsive design, customizable service cores enhance flexibility. These strategies support the best architectural practice to meet users' functional needs and structural limitations of a building (Schneider & Till, 2007; Leupen, 2006).

- ***Cultural and Contextual Misalignment***

The study result identified that contextual factors influence the need for flexibility. Housing design should be flexible and adaptable to be socially and culturally responsive. Household size, length of occupancy, cultural norms initiate families to keep evaluating their spatial needs. The apartment supplied units insufficiently respond to local socio-cultural practice such as traditional cooking, multi-generational living, hosting extended family. If the spatial configuration fails to meet the household's spatial need and does not respond to their cultural practice it leads to dissatisfaction and modification (Morris & Winter, 1975; Turner, 1977; Fathy, 2000).

- ***Supply-Side Constraints and Market Dynamics***

There is a gap between the current residents' flexible demand and the market supply of standardized housing supply. More users are willing to pay more for integration of flexibility in their housing, showing market opportunity in Addis Ababa. But the developers prioritize competitiveness and cost efficiency. The empirical studies indicated that market driven housing usually undervalues long-term adaptability (Kendall & Teicher, 2000; Schneider & Till, 2007). Stakeholders believed that

there is limited technical knowledge and skill and there is no supportive regulation to flexibility. To align the users' demand for flexibility with developers' market-driven priority, it needs to strengthen participatory design process and develop a supportive regulatory framework.

- ***Resident Feedback***

There is a diverse perception of residents on the concept of spatial flexibility. Feedback collected from the residents suggests that standardized and rigid apartment design do not appropriately support their changing spatial requirements and cultural needs. Common challenges mentioned by the residents included fixed partition walls, smaller room size, not culturally responsive, and lack of supporting space that could be used for storage, maids room. They also mentioned the importance of proper natural lighting, ventilation, acoustic insulation, and construction quality. These challenges identified by users align with the result from FLEX 4.0 indicating hardly flexible spaces.

Studies showed that participatory and user centered design improves flexibility, usability and users' satisfaction. Likewise, the feedback from the user survey indicated that spatial configuration contributes to flexibility, livability and user satisfaction. To better accommodate their social and cultural needs users suggested adequate room size, culturally responsive design, provision of auxiliary space for storage and maids' room, traditional kitchen with proper ventilation and privacy. Recommendations included spatial efficiency and culturally responsive kitchen designs, including closed or dual-kitchen options with proper ventilation and privacy. Multi-functional spaces, lightweight partitions, modular furniture, and customizable floor plans, adequate corridor widths were also suggested to allow adaptation and accommodate to the evolving family requirements.

Residents' feedback highlights that there is a significant gap between the standard and rigid unit supplied and their evolving lifestyle and need. Furthermore, residents express cost and technical difficulties which indicate that adaptability is not only behavioral adjustment and spatial organization but also economic.

CHAPTER FIVE

5. Conclusion and Recommendations

5.1. Introduction

This chapter is the last chapter of the study. The conclusion of the study and the recommendation based on the study findings will be presented in this chapter

5.2. Summary of the Study

This study investigated the spatial configuration of apartment units in the private real estates in Addis Ababa and how it affects their flexibility and Adaptability. In the study 386 residents and 37 stakeholders participated to share their perception and experience on flexibility. The architectural drawings from five sample real estate evaluated using FLEX 4.0 assessment tool. The current challenges and design strategies that enhance flexibility have been identified from the review of literature, onsite observation user and professional surveys and assessment tools.

The current practice of development by private real estate is driven by short-term market competitiveness, spatial and cost efficiency. Most apartment units have rigid and standardized configurations that limit their flexibility and adaptability. The users and stakeholders think that the current housing failed to accommodate the changing users' needs and cultural practice. The FLEX 4.0 assessment result also confirmed that the current apartment units have low flexibility scores.

5.3. Conclusions

The findings of this study reveal that the private real estate apartment units examined have hardly flexibility and adaptability spatial configuration according to FLEX 4.0 classification. Compartmentalized layout, rigid structural grid, non-modular layout and fixed-wall partitions significantly restrict flexibility of their spatial reconfiguration. As a result, the units often fail to accommodate residents' evolving lifestyles, changing household structure and cultural practice. These affects livability, cultural responsiveness, resilience and environmental performance of the units.

The study reveals that both stakeholders and residents believe the importance of flexibility and adaptability. However, the absence of supportive regulatory framework, limited knowledge and technical skill on spatial configuration constrains the implementation. This implies that regulatory

and capacity gaps significantly hinder the development of flexible and adaptable housing units. A significant gap exists between resident needs, developer supply and regulatory framework.

The spatial needs and modification behaviors are influenced by factors such as household structure, tenure type, occupancy length, cultural norms, construction system and existing regulatory frameworks. The resident survey reveals that significant number of residents modified or considered modifying their units. This reveals that the apartment layouts insufficiently respond to the local socio-cultural practice such as traditional cooking, multi-generational living and hosting extended family. This often results in dissatisfaction, weakening long-term usability, additional costs for residents and contributes to environmental impacts through material waste and reduced building lifecycle performance. This implies that there is a need for residents to participate from the early stage of the design and promote flexible and sustainable housing solutions.

The finding confirms that spatial configuration such as open plan layout, modularity, multifunctional space, partition system, and service core positioning significantly enhances the flexibility and adaptability of the housing units. Whereas rigid structure grid and layout, fixed layouts, permanent partitions, immovable service core and smaller room size limit spatial transformation. There is statistically significant relation between spatial configuration and user satisfaction.

Furthermore, the finding reveals that most of the residents are willing to pay more for flexible and adaptable units. This highlights there is significant gap between the residents' needs and the unit currently supplied by the developers. Despite this demand there is lack of policies that promote flexibility and adaptability. This indicates that there is a potential market for developers to exploit.

In conclusion, the study adds empirical depth to the discourse that housing should not be conceived as a fixed entity designed to accommodate a static household, rather it is a dynamic spatial system that evolves with its occupants in response to demographic changes, cultural preference, and socio-economic conditions. It demonstrates that embedding flexibility within the spatial configuration ensures the housing remains functional, sustainable, culturally responsive and resilient over time. Policies and practice should integrate strategies such as participating and user centered design approach, supportive regulation framework, improved stakeholder awareness and skill that significantly enhance flexibility and adaptability. Move beyond supply of more units that are short-term efficient to enforce design standards that prioritize long-term usability.

5.4. Recommendations

The following strategies are recommended to enhance the flexibility and adaptability of housing in real estate development.

5.4.1. Design and Construction Level Recommendations

- **Planning and Layout:** Adopt open layout and structural system with separate “support” and “infill” to create spatial configuration that can be easily reconfigured to accommodate evolving lifestyle style and social needs.
- **Architectural Design:** Introduce lightweight, movable and removable partition walls for non-load bearing components to enable users to make changes easily.
- **Lighting and Ventilation:** Ensure adequate daylighting and ventilation for better functionality and future reconfiguration.
- **Provide auxiliary flexible zones** for storage and cultural cooking.
- **Strategically Positioned Service Cores:** design service core to allow internal reconfiguration or replumbing the wet areas including kitchens and bathrooms.

5.4.2. Policy Level Recommendations

- **Update Policies and Regulation:** Review and update the policy to promote flexibility and adaptability.
- **Promote Flexibility:** introduce incentives such as tax reduction, provision of land to developers, integrating flexibility and adaptability.
- **Develop national guidelines** for designing adaptable and culturally responsive housing

5.4.3. Relevant Stakeholders Recommendations

- **Capacity Building:** Create awareness, provide capacity building training for professionals working on housing development to enhance their knowledge and skill.
- **Participatory Design Approach:** Participate residents and other stakeholders starting from the early design phase.
- **Consider lifecycle value** instead of short-term cost and space efficiency

- Conduct Post-Occupancy Evaluations (POE) to evaluate resident satisfaction and functional performance.

5.4.4. Developer Recommendations

- Modular Design: Integrate modular design and neutral rooms with non-fixed functions that allow for integration or division of spaces to accommodate multiple spatial needs.
- Offering flexible unit as a value-added competitive strategy

5.4.5. Suggestions for Future Study

This study focused on the spatial configuration for flexibility in the private real estate sectors. Future study should expand to other developers in the housing sectors to explore other dimensions of flexibility and adaptability. The futures recommendation:

- Conduct longitudinal studies to assess long-term adaptability and life-cycle performance of apartment units.
- Extend the research into government, public and cooperative housing and include other regions.
- Conduct research that quantifies the long-term cost-benefit analysis for adaptable housing versus standard housing.
- Explore technological innovations such as Building Information Modeling (BIM), AI (Artificial Intelligence) driven layout, modular construction and use of smart technologies.
- Use AI for layout optimization options and simulate spatial changes as a decision-support tool
- Study the socio-cultural dimension influencing spatial expectations and household behavior like traditional cooking, multi-generational space requirements, hosting extended family and neighborhood stability
- Create a platform to bring together stakeholders for sharing experience, best practices and developing design strategies to develop resilient, usable and flexible housing.
- Further research on modular structure, lightweight and prefabricated infill systems

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Appendices

Appendix 1: Publishable Manuscript

The Influence of Spatial Configuration to the Flexibility and Adaptability of Apartment Units in Private Real Estate Developments in Addis Ababa.

Daniel Asrat Abebe and Abnet Gezahegn

Abstract: *Rapid urbanization and population growth in Addis Ababa have intensified housing demand. This drives private real estate developers into the market with standardized and optimized units with cost-efficient apartment layout. This often results in standardized and rigid spatial configuration that inadequately accommodate evolving household needs, cultural practice, long-term usability, and resident satisfaction. This study examines the influence of spatial configuration on housing flexibility and long-term adaptability of private real estate apartment units in Addis Ababa. A convergent mixed method employed, incorporating FELX 4.0 spatial assessment framework, surveys of 386 residents and response from 37 stakeholders and on-site observation. The findings reveal that assessed units demonstrated hardly flexibility due to rigid structural grids, fixed internal partition, compartmental layouts, non-modular room configuration and immovable service core limiting spatial reconfiguration. Notably, 68% of the residents modified or considered modifying their units indicates that the spatial configuration fails to support their evolving spatial needs. Stakeholders identified absence of supportive regulatory framework, cost constraints, insufficient cultural responsiveness and limited technical expertise as major barriers to adaptable housing design. The study demonstrates that open-plan, modular designs, lightweight partition systems and early-stage user engagement significantly enhance the flexibility and usability of housing. By providing empirical evidence this research contributes to the existing body of knowledge on flexibility and adaptability. The study highlights the need for policy review, create awareness and capacity building to achieve resilient, culturally responsive and long-term residential sustainability.*

Keywords: Spatial configuration; Housing Flexibility; Housing Adaptability; Open Building; Real Estate; Addis Ababa.

Introduction: The number of people living in urban areas is increasing rapidly. According to the United Nations prediction about two-thirds of the world population will live in urban areas by 2050 (UN, 2018). Addis Ababa is experiencing similar rapid urbanization, and intensified pressure on housing supply. There is an estimated 1.2 million housing unit deficit. According to the projection between 2015 and 2025 there is additional demand of 655,800 housing units. This is much higher than the current supply (Kesto, 2021). In response both the government and public developers are moving towards compact and vertical housing development. Over the last two decades private developers have been increasingly involved in real estate development to fill this gap (Yohannes & Dinku, 2024).

Large numbers of private real estate developers are involved in the housing supply driven by market demand focusing on standardization and delivering large numbers of units. This results in design challenges particularly with spatial reconfiguration and adaptability to accommodate residents evolving demographic, cultural, socioeconomic needs.

Existing empirical research focused on various housing issues in Addis Ababa such as affordability (Yohannes & Dinku, 2018), residential satisfaction (Alemu et al., 2025), typological studies (Cherenet & Sewnet, 2012), effects of rapid urbanization and public housing development on urban form and density (Larsen et al., 2019). However, there are no empirical studies that have evaluated how internal spatial

configuration affects flexibility and adaptability in apartment units.

This study addresses this gap by investigating the contribution of spatial configuration to the flexibility and adaptability of apartment units in Addis Ababa private real estate development. It evaluates the extent of spatial flexibility in apartment units and assesses resident and stakeholder perceptions and behavior. It gives insights to stakeholders on how spatial configuration enhances flexibility and adaptability of the units. It helps to enable policies to achieve culturally responsive, resilient, long-term usable and sustainable housing.

The study aims to examine how spatial configuration of apartment units in private real estate developments in Addis Ababa influences their flexibility and adaptability using combined architectural performance evaluation and post-occupancy user evidence.

Literature Review: The human lifestyle and household composition evolve over time due to factors including technological advancement, demographic transitions and socio-economic transformation. These transformations directly influence spatial requirements, necessitating flexible and adaptable residential environments.

Flexibility in housing refers to short-term, reversible spatial changes by users without major construction, whereas adaptability involves long-term, semi-permanent modifications requiring design intervention. The spatial configuration refers to the organization

and interrelationship of structural grids, partitions, circulation, and service core. Several configuration variables influence adaptability.

Several theoretical frameworks explain how household requirements of housing change and provide conceptual foundation of the evolving flexible and adaptable living space.

The key advancement in flexibility was introduced by John Habraken's Open Building Theory (1961) that empowered residents to shape their space according to their evolving needs. He proposed separating the housing system into a support and infill system. Several theoretical frameworks explain this dynamic relationship between households and housing.

The Life Course Theory argues that housing needs shift with family stages while the Family Housing Adjustment Theory emphasize behavioral evaluation. Households continuously evaluate their housing if it meets their needs and cultural norms. Households make modification or relocation when it fails to meet their needs. User-Initiated Transformation (UIT) Theory extends this argument by emphasizing that users actively modify and adapt their dwelling over time to meet their changing lifestyle, socio-economic conditions and household needs. These theories align with the idea "housing is a verb" that housing is an ongoing process of updating space rather than a finished static product (Turner & Fichter, 1973). Adaptability usability minimizes the need for premature renovation or even demolition to minimize

material waste and reduce carbon emission (Milwicz & Pasławski, 2018).

From sustainability perspective, adaptable housing contributes to economic environmental, and social resilience. It reduces early renovation and relocation (Estaji, 2017; Tipple, 1988) and aligns with Circular Economy goals by extending asset lifespan and minimizing waste (Le & Nguyen, 2023; Marchesi et al., 2020).

Across all those theories residents actively engage with their housing indicate the need for flexible and adaptable housing. During the life course, user-initiated transformation and the family housing adjustment theories explain what housing must to respond to the users' changing needs over time and long-term usability while the open building theory explains how architectural systems can enable changes.

Flexibility allows housing to remain relevant across life stages (Magdziak, 2019; Raviz et al., 2015). In our local context housing is more related to permanence and long-term investment. Whereas spatial needs changed over time following changes in lifestyles, socio-economic shifts and technological advancement.

In the resident survey conducted on the flexibility of housing over 40% expressed their dissatisfaction with the rigid layout and functionality and about 23% were demanding to modify their spatial configuration (McCarthy, 1970). This study indicates that flexible configuration is key for residents' satisfaction.

This study is theoretically grounded in Open Building theory that provides the architectural basis for understanding how spatial configuration with the separation of structural support and changeable infill enables flexibility and adaptability (Habraken, 1998; Kendall & Teicher, 2000). The evaluation of spatial configuration in private real estate apartments reflects this theoretical foundation. It also pulls on flexibility theory distinguishing structural and use-based flexibility, and lifecycle adaptation theory emphasizing long-term adaptability.

Methodology: A convergent mixed-method design used for the study. Quantitative data were collected using surveys from residents and stakeholders and FLEX 4.0 for spatial configuration assessment. Qualitative data collected from on-site observation, document review and interviews. Both data analyzed separately and integrated during the interpretation.

The study used non-probability sampling since the aim of the study is getting in-depth and relevant insight rather than statistical generalization of the finding to the entire population. Purposive sampling is appropriate to intentionally select cases that help to get relevant and rich information on cases on the research problem (Creswell & Creswell, 2023).

The study is conducted in Addis Ababa. Data collected from 386 respondents using purposive

and snowball sampling to ensure representation of various apartment types, socioeconomic areas and occupancy period. Thirty-seven stakeholders including architects, developers, contractors, sales representatives and regulatory officers participated in the study.

The quantitative data were analyzed using SPSS software. The qualitative data analyzed thematically to understand the experience and perception of the residents and stakeholders. The FLEX 4.0 results compared with the survey responses for triangulation.

The FLEX 4.0 scoring indicated that all the assessed units are hardly flexible. The study reveals that 68% of the residents had modified or considered modifying layouts including creating maid's room, traditional cooking, changing room function, converting balconies to storage or workspace. Similarly, majority of the stakeholders indicated the units are not adequately response to the changing user needs and local culture. Both residents and stakeholders strongly value flexibility. They listed cost, absence of regulatory and lack of awareness and technical experts as limiting factors. Despite 68% of the respondents are willing to pay more for flexibility, the existing units have fixed internal partition, rigid structure grids, poor lighting and ventilation, plumbing and service core rigidity limiting flexibility and adaptability. There is significant correlation between adaptability and user satisfaction. Apartment types significantly influence ease of modification.

Limitation: The non-probability sampling limits generalizability of the study. The FLEX 4.0 assessment based partially on expert judgement. The study is conducted cross-sectional as it is limited to time and it is limited to Addis Ababa.

Discussion: All assessed apartment units are hardly flexible spatial configurations mainly due to rigid structure, fixed partition system and fixed service cores limits reconfiguration. These findings align with open building theory (Habraken, 1961). The high rate of residents modifies their units align with the theoretical framework such as User-Initiated Transformation theory UTI (Tippie, 1988). and Family Housing Adjustment Theory (Morris & Winter, 1975), indicating the users actively modify their living space when their spatial need is unmet.

Despite strong resident demand and willingness to invest in flexibility, developers prioritize short-term cost efficiency and standardize units. This reveals a significant gap between residents' needs, developer supply, and regulatory frameworks.

Conclusion: This study concludes that the private real estate units in Addis Ababa exhibit hardly flexible spatial configuration due to rigid structural configuration, standardized and compartmentalized layouts. Flexible and adaptable spatial configuration is essential to accommodate the evolving household dynamics, cultural needs, and long-term usability. Residents demonstrated strong demand and

willingness to invest in flexible housing. But there is a significant gap between user expectations and developer priorities. It requires reviewing spatial planning, contraction system and regulatory frameworks.

Recommendation: Regulatory bodies need to update the exiting policy and regulatory framework to promote adaptability by introducing incentives, making post-occupancy evaluations. Promote post-occupancy evaluation and involve users from the early design stage. Developers should adopt open plans, lightweight/removable partitions, modular, user-centered design and provide auxiliary space to enhance flexibility and incorporate cultural responsiveness.

Future research expands longitudinal adaptability performance, conduct comparative studies across housing sectors. Explores cost-benefit analysis of adaptable versus standard units. Explore emerging technologies such as BIM, construction module and AI to optimize layouts. Study sociocultural studies, household dynamics and cultural influences.

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Appendix 2: Survey Questionnaire Resident Amharic

የዳሰሳ ጥናት መጠይቅ: የኢፓርትመንት መኖሪያ ክፍሎችን ተለዋዋጭነት እና ተቀያይሪነት በአዲስ አበባ ሪል እስቴት መኖሪያ ቤቶች

ውድ የጥናቱ ተሳታፊ፤

ዳንኤል አስራት አበበ እባላለሁ፤ በአዲስ አበባ ዩኒቨርሲቲ የኢትዮጵያ አርክቴክቸር፣ የሕንፃ ግንባታ እና የከተማ ልማት ተቋም፤ የስነ-ህንፃ ዲዛይን የድኅረ-ምረቃ ተማሪ ነኝ። የዚህ መጠይቅ ዋናው ዓላማ በአዲስ አበባ የሪል እስቴት ልማት ውስጥ የኢፓርትመንት መኖሪያ ቤቶች ዲዛይን ለተለያዩ እና ተለዋዋጭ የኑሮ ዘዴዬ (Flexibility and Adaptability) አመችነት እንዴት አስተዋፅዖ እንደሚያበረክት የሚያጠና ነው። ይህ ጥናት የነዋሪዎችን ተሞክሮ እና ግንዛቤዎችን በመረዳት ለወደፊቱ የስነ-ህንፃ ንድፍ መሻሻል ጉልህ አስተዋፅዖ ያደርጋል።

ይህ የዳሰሳ ጥናት **ለማጠናቃቅ ከ10-15 ደቂቃ** በላይ አይወስድም። የእርስዎ ምላሾች ለትምህርታዊ ዓላማ ብቻ ጥቅም ላይ ይውላሉ። የሚሰበሰበው መረጃ ሁሉ ሚስጥራዊነታቸው የተጠበቀ ነው ። የጥናቱ ተሳትፎ በፈቃደኝነት ሲሆን ማንኛውንም ጥያቄ መዝለል ሆነ በማንኛውም ጊዜ ማቋረጥ ይችላሉ።

በዚህ ጥናት ውስጥ በመሳትፍ ስለሰጡት ጊዜዎ እና ድጋፍዎ እጅግ አድርጌ አመሰግናለሁ።

ከሰላምታ ጋር

ዳንኤል አስራት አበበ

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ክፍል 1: የስነ ሕዝብ እና አጠቃላይ የቤተሰብ ሁኔታ መረጃ

1. **ስም** (ፍቃደኛ ከሆኑ)፤ _____

2. **ዕድሜ፤**

- ☐ 18-24
☐ 25-34
☐ 35-44
☐ 45-54
☐ 55 እና ከዚያ በላይ

3. **ጾታ፤**

- ☐ ወንድ
☐ ሴት

4. **አሁን የሚኖሩበት የሪል እስቴት ስም፤** _____

5. **የሚኖሩበት የኢፓርትመንት መኖሪያ ቤት ምን ዓይነት ነው?**

- ☐ ስቴዲዮ
☐ ባለ 1-መኝታ ክፍል
☐ ባለ 2-መኝታ ክፍል
☐ ባለ 3-መኝታ ክፍል
☐ ባለ 4 ወይም ከዚያ በላይ መኝታ ቤት

6. የሚኖሩበት አፓርትመንት መኖሪያ ቤት ባለቤት ነዎት ወይስ ተከራይ?

- ☐ ባለቤት
- ☐ ተከራይ
- ☐ ሌላ (እባክዎ ይግለጹ): _____

7. በአሁኑ የአፓርትመንት መኖሪያ ቤት ውስጥ ለምን ያህል ጊዜ ኖረዋል?

- ☐ ከ1 ዓመት በታች
- ☐ ከ1-2 ዓመት
- ☐ ከ3-5 ዓመት
- ☐ ከ5 ዓመት በላይ

8. በሚኖሩበት የአፓርትመንት መኖሪያ ቤት ውስጥ ምን ያህል ሰዎች ይኖራሉ (የቤተሰብ መጠን)?

- ☐ 1
- ☐ 2
- ☐ 3-5
- ☐ 6 ወይም ከዚያ በላይ

9. በጣምት ወርሃዊ አማካይ ወጪዎ (ኪራይ/ሞርጌጅ፣ መገልገያዎች እና ሌሎች የኑሮ ወጪዎችን ጨምሮ) ምን ያህል ይሆናል?

- ☐ ከ10,000 ብር በታች
- ☐ ከ10,000 እስከ 25,000 ብር መካከል
- ☐ ከ25,000 እስከ 50,000 ብር መካከል
- ☐ ከ50,000 እስከ 150,000 ብር መካከል
- ☐ ከ150,000 እስከ 200,000 ብር መካከል
- ☐ ከ200,000 ብር በላይ

ክፍል 2: የአፓርትመንት መኖሪያ ክፍሎች አቅማመጥ እና ንድፍ በነዋሪዎች የአኗኗር ዘዴ ላይ ያለው ተጽዕኖ

10. የአፓርትመንትዎ መኖሪያ ክፍሎች አቅማመጥ ተለዋዋጭ ፍላጎቶችን ምን ያህል ያስተናግዳሉ? (ለምሳሌ የቤተሰብ እድገት፣ ከቤት ሆኖ ለመሥራት፣ እንግዶችን ማስተናገድ?)

(1 = እጅግ በጣም ጥሩ 2 = በመጠኑ 3 = መካከለኛ 4 = ደካማ 5 = በጣም ደካማ)

- ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

11. የአፓርትመንትዎ የመኖሪያ ክፍሎች አቅማመጥ እና ንድፍ ለመለወጥ ወይም ለማስተካከል ባላቸው አመችነት ምን ያህል ደስተኛ ኖት? (ለምሳሌ በክፍል አጠቃቀም ተለዋዋጭነት፣ የቤት እቃዎችን ማስተካከል ወይም ክፍሎችን ለብዙ አገልግሎት መጠቀም)

(1 = በጣም ደስተኛ ነኝ 2 = ደስተኛ ነኝ 3 = መካከለኛ 4 = ደስተኛ አይደለሁም 5 = በጭራሽ ደስተኛ አይደለሁም)

- ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

12. በአኗኗር ለውጥ ምክንያት በአፓርትመንትዎ መኖሪያ ክፍሎች ላይ ለውጦችን አድርገው ያውቃሉ ወይም ለውጥ ለማድረግ አስብዋል? (ለምሳሌ፣ ቤተሰብ ማደግ፣ ከቤት ሆኖ ለመስራት፣ እንግዶችን ለማሳረፍ)

- ☐ አዎን
- ☐ አይ

13. ለውጦች አድርገው ከሆነ፤ ወይም ለማድረግ ካሰቡ እባክዎን ያደረጓቸውን ወይም ለማድረግ ያሰቧቸውን ለውጦች እና ምክንያታቸውን ይግለጹ ፡-_____

14. የኢፓርትመንትዎን መኖሪያ ክፍሎች አቅማመጥ እና አጠቃቀም ላይ ለውጦችን ማድረግ ምን ያህል ቀላል ነው?
(ለምሳሌ፡ የቤት እቃዎችን ቦታ ማቀያየር፤ የክፍል አገልግሎት መለወጥ ወይም ክፍልፋዮችን መጨመር/ማንሳት)

(1 = በጣም ቀላል 2= ቀላል 3= መካከለኛ 4=አስቸጋሪ 5= በጣም አስቸጋሪ)

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

15. ለተለዋዋጭ ፍላጎቶችዎን ወይም የአኗኗር ዘይቤዎን በተሻለ ሁኔታ ለማስተናገድ ከተቻለ የትኛውን አማራጭ ይመርጣሉ?

- ☐ አሁን ያለሁበትን የኢፓርትመንት መኖሪያ ክፍሎች ፍላጎቴን እንዲያሟላ ማሻሽል ወይም ማስተካከል
- ☐ ወደ ሌላ የኢፓርትመንት መኖሪያ ቦታ መቀየር

ክፍል 3: በተለዋዋጭነት እና በተቀያይረነት ላይ ተጽእኖ የሚያሳድሩ የንድፍ ምክንያቶችን መለየት

16. የኢፓርትመንት መኖሪያ ክፍሎችን ለተለያዩ የአኗኗር ዘይቤ ፍላጎቶች የበለጠ ተለዋዋጭ እና ተስማሚ ለማድረግ የሚያግዙ የትኞቹ ናቸው? (የሚመለከተውን ሁሉ ይምረጡ)

- ☐ ክፍት/ልቅ የሆነ የክፍል ፕላን
- ☐ ተንሸራታች ወይም ተንቀሳቃሽ አካፋዮች
- ☐ ለተለያዩ አገልግሎት የሚውሉ የቤት እቃዎች (ለምሳሌ የሚታጠፉ አልጋዎች)
- ☐ አመቺ የክፍል ስፋት እና ቅርፅ
- ☐ ሁለንተናዊ ቦታዎች (ለምሳሌ፡ እንደ ቢሮ እና መኝታ ክፍል ሆኖ ሊያገለግል የሚችል ክፍል)
- ☐ ሞዱል/በፍርግርግ ላይ የተመሰረተ ንድፍ
- ☐ በቂ የዕቃ ማከማቻ ቦታ
- ☐ ሌላ (እባክዎ ይግለጹ)_____

17. የኢፓርትመንት መኖሪያ ክፍሎችን ለተለያዩ የአኗኗር ዘይቤ ተስማሚ እና ተለዋዋጭ አድርጎ ለመጠቀም የሚገድቡት የትኞቹ ናቸው? (የሚመለከተውን ሁሉ ይምረጡ)

- ☐ ቋሚ ግድግዳዎች / ክፍልፋዮች
- ☐ አነስተኛ የክፍል መጠን እና ቅርጽ
- ☐ በቂ ያልሆነ የተፈጥሮ ብርሃን ወይም አየር
- ☐ ከክፍሎች ጋር አብረው የተገነቡ የቤት ዕቃዎች (ለምሳሌ ቋሚ ቁም ሣጥኖች፤ የወጥ ቤት ደሴቶች)
- ☐ የሚከለክሉ ህጎች እና መመሪያዎች
- ☐ የፍላጎት ቦታ (ወጥ ቤት፤ መታጠቢያ ቤት)
- ☐ የበር እና የመስኮት አቀማመጥ
- ☐ የዋጋ ውድነት
- ☐ አመቺ ያልሆኑ መተላለፊያዎች እና ጠባብ ኮሪዶሮች
- ☐ ሌላ (እባክዎ ይግለጹ)_____

ክፍል 4: ለተለዋዋጭ አፓርትመንት ዲዛይን የንድፍ ስልቶች እና አማራጮች

18. ለወደፊት በአዲስ አበባ ውስጥ ለሚገነቡ የአፓርትመንት መኖሪያዎች ተቀያይሪ እና ተለዋዋጭ ክፍሎችን ማካተት ምን ያህል አስፈላጊ ነው?

(1 = በጣም አስፈላጊ 2 = አስፈላጊ 3 = መካከለኛ 4 = በመጠኑ አስፈላጊ 5 = አስፈላጊ አይደለም)

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

19. የአፓርትመንት መኖሪያ ክፍሎች ለተለያዩ ዓይነት አጠቃቀም በቀላሉ መቀየር እንዲቻል ሆኖ ለሚቀርብ ቤት ተጨማሪ ለመክፈል ፈቃደኛ ይሆናሉ?

- ☐ አዎ
☐ አይ

20. የአፓርትመንት መኖሪያ ክፍሎች ለተለያዩ አጠቃቀሞች እና ፍላጎቶች በቀላሉ ለመለወጥ ምን ምን ማሻሻያዎችን ወይም የንድፍ ለውጦችን ይመክራሉ?

ስላደረጉት አስተዋጽኦ እና ውድ ጊዜዎን ስለሰጡን በጣም አመሰግናለሁ!

Appendix 3: Survey Questionnaire Resident English

Survey Questionnaire: Spatial Configuration, Flexibility, and Adaptability in Addis Ababa Real Estate Living Spaces

Dear Participant,

My name is Daniel Asrat Abebe, a postgraduate student in Advanced Architectural Design at Addis Ababa University. I am conducting research for my thesis on how spatial design contributes to the **flexibility** and **adaptability** of apartment units within Addis Ababa real estate developments. Your valuable insights will significantly contribute to understanding user experiences and informing future architectural design.

This survey will only take approximately **10–15 minutes** to complete. All responses are **confidential** and will be used **exclusively for academic purposes**. Participation is voluntary, and you may skip any question or exit the survey at any time.

Thank you very much for your time and valuable input in this research.

Sincerely,

Daniel Asrat Abebe

 +251 911 607886 |  asratdaniel@gmail.com

Section 1: Demographics and Household Information

1. **Name (Optional):** _____

2. **Age Group:**

- ☐ 18-24
- ☐ 25-34
- ☐ 35-44
- ☐ 45-54
- ☐ 55 and above

3. **Gender:**

- ☐ Male
- ☐ Female

4. **Name of the real estate development where you currently live:** _____

5. **What type of apartment unit do you live in?**

- ☐ Studio
- ☐ 1-Bedroom
- ☐ 2-Bedroom
- ☐ 3 Bedroom
- ☐ 4 or More Bedroom

6. Do you own or rent the apartment unit?

- ☐ Owner
- ☐ Renter
- ☐ Other (please specify): _____

7. How long have you lived in your current apartment unit?

- ☐ Less than 1 year
- ☐ 1–2 years
- ☐ 3–5 years
- ☐ More than 5 years

8. How many people currently live in your apartment (household size)?

- ☐ 1
- ☐ 2
- ☐ 3–5
- ☐ 6 or More

9. What is your estimated total monthly expenditure (including rent/mortgage, utilities, and other living costs)?

- ☐ Less than 10,000 Birr
- ☐ Between 10,000 to 25,000 Birr
- ☐ Between 25,000 to 50,000 Birr
- ☐ Between 50,000 to 150,000 Birr
- ☐ Between 150,000 to 200,000 Birr
- ☐ Above 200,000 Birr

Section 2: Evaluate User Experience with Apartment Units' Spatial Flexibility and Adaptability

10. To what extent does your apartment unit's layout support your changing needs? (e.g. family growth, working from home, hosting guests)

(1 = Extremely Well 2 = Well 3 = Neutral 4 = Poorly 5 = Very Poorly)

- ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

11. How satisfied are you with your apartment unit's layout in terms of supporting various activities and uses? (e.g., repurposing rooms, flexible furniture placement, using rooms for multipurpose)

(1 = Very Satisfied 2= Satisfied 3=Neutral 4= Dissatisfied 5 =Very Dissatisfied)

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

12. Have you ever made or considered making changes to your living space due to lifestyle changes? (e.g., growing family, working from home, ghosting guests)

- ☐ Yes
- ☐ No

13. If you answered "Yes" to the above, please briefly describe the changes you made or considered, and the reasons behind them. _____

14. How easy is it to make changes to your apartment unit's layout or space usage? (e.g., rearranging furniture, changing room functions, or adding/removing partitions)

(1 = Very Easy 2= Easy 3=Neutral 4= Difficult 5 =Very Difficult)

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

15. To better accommodate your evolving needs or lifestyle, which option would you prefer, if possible?

- ☐ Move to a different apartment unit
- ☐ Update or renovate my current apartment unit to accommodate my needs

Section 3: Identifying Key Design Factors Influencing Flexibility and Adaptability

16. Which features make apartment units more flexible and adaptable to different needs or uses? (Select all that apply)

- ☐ Open-plan layout
- ☐ Sliding or movable partitions
- ☐ Multi-functional furniture (e.g. foldable beds, storage-integrated sofas)
- ☐ Room proportions (shape and size)
- ☐ Multi-purpose spaces (e.g., room that can be used as both office and bedroom)
- ☐ Modular/Grid-Based Design
- ☐ Adequate Storage Space
- ☐ Other (please specify): _____

17. Which features limit apartment units' adaptability and flexibility? (Select all that apply)

- ☐ Fixed walls/ partitions
 - ☐ Small room size and shape
 - ☐ Limited natural lighting or ventilation
 - ☐ Built-in furniture or fixtures (e.g., fixed wardrobes, kitchen islands)
 - ☐ Restrictive Rules and Regulation
 - ☐ Plumbing location (kitchen, bathrooms)
 - ☐ Door and window positions
 - ☐ Cost Constraints
 - ☐ Poorly utilized circulation areas or narrow corridors
 - ☐ Other (please specify): _____
-

Section 4: Design Strategies and Opportunities for Flexible and Adaptable Apartment Design

18. How important is it for future apartment buildings in Addis Ababa to include flexible and adaptable living spaces?

(1 = Very Important 2 = Important 3 = Neutral 4 = Somewhat Important 5 = Not Important)

- ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

19. Would you be willing to pay more for a home that offers greater spatial flexibility and adaptability?

- ☐ Yes
- ☐ No
- ☐ Maybe

20. Any additional comments or insights regarding the flexibility and adaptability of apartment units in Addis Ababa's private real estate sector._____

Thank you very much for your contribution and your valuable time!

Appendix 4: Survey Questionnaire Stakeholder Amharic

የዳሰሳ ጥናት መጠይቅ፡ የኢፓርትመንት መኖሪያ ክፍሎችን ተለዋዋጭነት እና ተቀያይሪነት በአዲስ አበባ ሪል እስቴት መኖሪያ ቤቶች ውድ የጥናቱ ተሳታፊ፤

ዳንኤል አስራት አበበ እባላለሁ፤ በአዲስ አበባ ዩኒቨርሲቲ የኢትዮጵያ ኦርክቴክቸር፣ የሕንፃ ግንባታ እና የከተማ ልማት ተቋም፤ የስነ-ህንፃ ዲዛይን የድጎረ-ምረቃ ተማሪ ነኝ። የዚህ መጠይቅ ዋናው ዓላማ በአዲስ አበባ የሪል እስቴት ልማት ውስጥ የኢፓርትመንት መኖሪያ ቤቶች ዲዛይን ለተለያዩ እና ተለዋዋጭ የኑሮ ዘዴዬ (Flexibility and Adaptability) አመችነት እንዴት አስተዋፅዖ እንደሚያበረክት የሚያጠና ነው። ይህ ጥናት የተጠቃሚዎችን ተሞክሮ እና ግንዛቤዎችን በመረዳት ለወደፊቱ የስነ-ህንፃ ንድፍ መሻሻል ጉልህ አስተዋፅዖ ያደርጋል።

ይህ የዳሰሳ ጥናት **ለማጠናቃቅ ከ10-15 ደቂቃ** በላይ አይወስድም። የእርስዎ ምላሾች ለትምህርታዊ ዓላማ ብቻ ጥቅም ላይ ይውላሉ። የሚሰበሰበው መረጃ ሁሉ ሚስጥራዊነታቸው የተጠበቀ ነው። የጥናቱ ተሳትፎ በፈቃደኝነት ሲሆን ማንኛውንም ጥያቄ መዝለል ሆነ በማንኛውም ጊዜ ማቋረጥ ይችላሉ።

በዚህ ጥናት ውስጥ በመሳትፍ ስለሰጡት ጊዜዎ እና ድጋፍዎ እጅግ አድርጌ አመሰግናለሁ።

ከሰላምታ ጋር

ዳንኤል አስራት አበበ

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ክፍል 1፡ የስነ ሕዝብ እና አጠቃላይ የቤተሰብ ሁኔታ መረጃ

1. ስም (ፍቃደኛ ከሆኑ) _____

2. ዕድሜ፡

- ☐ 18-24
- ☐ 25-34
- ☐ 35-44
- ☐ 45-54
- ☐ 55 እና ከዚያ በላይ

3. ጾታ፡

- ☐ ወንድ
- ☐ ሴት

4. በሪል እስቴት ዘርፍ የእርስዎ የሥራ ድርሻ ምንድነው ?

- ☐ ገንቢ
- ☐ አርክቴክት
- ☐ የመንግስት ተቆጣጣሪ
- ☐ የሽያጭ ባለሙያ
- ☐ የውስጥ ዲዛይነር
- ☐ ተቋራጭ
- ☐ ሌላ (እባክዎ ይግለጹ) _____

5. በሪል እስቴት የሥራ ዘርፍ ምን ያህል ጊዜ ቆዩ?

- ☐ ከ 1 ዓመት በታች
- ☐ 1-2 ዓመት
- ☐ 3-5 ዓመት
- ☐ 5-ዓመት በላይ

6. በሥነ ሕንፃ ዲዛይን ውስጥ ስለ ተለዋዋጭ እና ተስማሚ መኖሪያ ቤት (Flexibil Housing and Adaptabel Housing) ጽንሰ-ሀሳቦችን ምን ያህል ያውቃሉ?

- ☐ በሚገባ አውቃለሁ ☐ በበቂ አውቃለሁ ☐ መካከለኛ ☐ በመጠኑ አውቃለሁ ☐ ምንም አላውቅም

ክፍል 2: የአፓርትመንት መኖሪያ ክፍሎች አቅማመጥ እና ንድፍ በነዋሪዎች የአኗኗር ዘይቤ ላይ ያለው ተጽዕኖ

7. በአዲስ አበባ ውስጥ ያሉ የአፓርትመንት መኖሪያ ክፍሎች የነዋሪዎችን ተለዋዋጭ ፍላጎቶች ምን ያህል ያስተናግዳሉ? (ለምሳሌ፡- የቤተሰብ ዕድገት፣ ክብት ሆኖ ለመስራት፣ አረጋውያንን ለመጠር)

- (1= እጅግ በጣም 2= በመጠኑ 3=መካከለኛ 4= ደካማ 5 = በጣም ደካማ)
- ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

8. ለነዋሪዎች የአፓርትመንት መኖሪያ ክፍሎቻቸው የቦታ አቀማመጥ ወይም ተግባር መቀየር ምን ያህል ቀላል ነው? (ለምሳሌ የቤት እቃዎችን ማስተካከል፣ የክፍል አጠቃቀምን መለወጥ፣ ክፍልፋዮችን መጨመር/ማስወገድ)

- (1 = በጣም ቀላል 2= ቀላል 3= መካከለኛ 4= አስቸጋሪ 5 = በጣም አስቸጋሪ)
- ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

9. በአዲስ አበባ ያሉት የአፓርትመንት መኖሪያ ክፍል ዲዛይኖች የአካባቢውን የባህል ወይም የአኗኗር ፍላጎቶች የሚያገጥሟቸው ይመስልዎታል? (ለምሳሌ ምግብ ማብሰል፣ የፀሎት ቦታ)

- ☐ አዎ ይመስለኛል
☐ አይመስለኝም
☐ እርግጠኛ አይደለሁም

ክፍል 3: በተለዋዋጭነት እና በተቀያይረነት ላይ ተጽእኖ የሚያሳድሩ የንድፍ ምክኛቶችን መለየት

10. የአፓርትመንት መኖሪያ ክፍሎችን ለተለያዩ የአኗኗር ዘይቤ ፍላጎቶች የበለጠ ተለዋዋጭ እና ተስማሚ የሚያደርጉት የትኞቹ ባህሪያት ናቸው? (የሚመለከተውን ሁሉ ይምረጡ)

- ☐ ክፍት-ዕቅድ አቀማመጥ
☐ ተንሽራታች ወይም ተንቀሳቃሽ ክፍልፋዮች
☐ ለተለያዩ አገልግሎት የሚውሉ የቤት እቃዎች (ለምሳሌ የሚታጠፍ አልጋዎች)
☐ አመቺ የክፍል ስፋት እና ቅርፅ
☐ ሁለገብ ቦታዎች (ለምሳሌ፡ እንደ ቢሮ እና መሻታ ክፍል ሆኖ ሊያገለግል የሚችል ክፍል)
☐ ሞዱል/በፍርግርግ ላይ የተመሰረተ ንድፍ
☐ በቂ የማከማቻ ቦታ
☐ ሌላ (እባክዎ ይግለጹ)_____

11. የአፓርትመንት መኖሪያ ክፍሎችን ለተለያዩ የአኗኗር ዘይቤ ተስማሚ እና ተለዋዋጭ አድርጎ ለመጠቀም የሚገድቡት የትኞቹ ናቸው? (የሚመለከተውን ሁሉ ይምረጡ)

- ☐ ቋሚ ግድግዳዎች / ክፍልፋዮች
☐ አነስተኛ የክፍል መጠን እና ቅርጽ
☐ በቂ ያልሆነ የተፈጥሮ ብርሃን ወይም አየር
☐ ከክፍሎች ጋር አብረው የተገነቡ የቤት ዕቃዎች (ለምሳሌ ቋሚ ቁም ሣጥኖች፣ የወጥ ቤት ደሴቶች)
☐ የሚከለክሉ ህጎች እና መመሪያዎች
☐ የፍላጎት ቦታ (ወጥ ቤት፣ መታጠቢያ ቤት)
☐ የበር እና የመስኮት አቀማመጥ
☐ የዋጋ ውድነት
☐ አመቺ ያልሆኑ መተላለፊያ እና ጠባብ ኮሪዶሮች
☐ ሌላ (እባክዎ ይግለጹ)_____

12. በአዲስ አበባ ውስጥ ለሚገኙ የኢፓርትመንት መኖሪያ ከፍሎች ለተለያዩ የአኗኗር ዘይቤዎች እና ፍላጎቶች ተለዋዋጭ እና ተስማሚ ንድፎችን ማካተት ምን ያህል አስፈላጊ ነው?

(1 = በጣም አስፈላጊ 2 = አስፈላጊ 3 = መካከለኛ 4 = በመጠኑ 5 = አስፈላጊ አይደለም)

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

13. በአዲስ አበባ ውስጥ የሚገኙ የግል ሪል እስቴት አልሚዎች የሚመሩባቸው ዋና የትኩረት አቅጣጫዎች ምንድን ናቸው? (የሚመለከተውን ሁሉ ይምረጡ)

- ☐ የገበያ ተወዳዳሪነት
- ☐ ወጪ ቆጣቢነት
- ☐ የቁጥጥር መስፈርቶች
- ☐ ደንበኛ/ገዢ ለተወሰኑ አቀማመጦች ይጠይቃሉ።
- ☐ ተለዋዋጭነት እና መላመድ
- ☐ ባህላዊ ደንቦች
- ☐ የአካባቢ ዘላቂነት ግቦች
- ☐ ሌላ (እባክዎ ይግለጹ)_____

14. የኢፓርትመንት መኖሪያ ከፍሎች ንድፎችን ተለዋዋጭ እና ለተለያዩ አጠቃቀም ተስማሚነት ለማድረግ ምን ተግዳሮቶች ወይም ከፍተኞች ያስተውላሉ? (የሚመለከተውን ሁሉ ይምረጡ)

- ☐ የቴክኖሎጂ ገደቦች
- ☐ እውቀትና ክህሎት ማነስ
- ☐ የደንበኛ ወይም የገበያ ምርጫዎች
- ☐ የዋጋ ውድነት
- ☐ የሰለጠነ ባለሙያ /የኝባታ ቁሳቁሶች አለመኖር
- ☐ የቁጥጥር ገደቦች
- ☐ ሌላ (እባክዎ ይግለጹ)_____

ክፍል 4: ለተለዋዋጭ ኢፓርትመንት መኖሪያ ከፍሎች ዲዛይን የንድፍ ስልቶች እና አማራጮች

15. ነዋሪዎች ስለ ኢፓርትመንት መኖሪያ ከፍሎች ለተለያዩ የኑሮ ዘይቤ ተስማሚነት እና ተለዋዋጭነት ምን ቅሬታዎች ወይም ገንቢ አስተያየቶች አሏቸው? (እባክዎ በተደጋጋሚ የሚነሱ ቅሬታዎችን ይግለጹ)_____

16. የኢፓርትመንት መኖሪያ ከፍሎች ለተለያዩ የአኗኗር ዘይቤዎች እና ፍላጎቶች እንዲሆኑ ለማድረግ ምን ማሻሻያዎችን ወይም የንድፍ ለውጦችን ይጠቁማሉ?_____

ስላደረጉት አስተዋጽኦ እና ውድ ጊዜዎን ስለሰጡን በጣም አመሰግናለሁ!

Appendix 5: Survey Questionnaire Stakeholder English

Survey Questionnaire: Spatial Configuration, Flexibility, and Adaptability in Addis Ababa Real Estate Living Spaces

Dear Participant,

My name is Daniel Asrat Abebe, a postgraduate student in Advanced Architectural Design at Addis Ababa University. I am conducting research for my thesis on how spatial design contributes to the **flexibility** and **adaptability of apartment units** within Addis Ababa real estate developments. Your valuable insights will significantly contribute to understanding user experiences and informing future architectural design.

This survey will take approximately **10–15 minutes** to complete. All responses are **confidential** and will be used **exclusively for academic purposes**. Participation is voluntary, and you may skip any question or exit the survey at any time.

Thank you very much for your time and valuable input in this research.

Sincerely,

Daniel Asrat Abebe

 +251 911 607886 |  asratdaniel@gmail.com

Section 1: Demographics and Household Information

1. **Name (Optional):** _____

2. **Age Group:**

- ☐ 18-24
- ☐ 25-34
- ☐ 35-44
- ☐ 45-54
- ☐ 55 and above

3. **Gender:**

- ☐ Male
- ☐ Female

4. **What is your primary role in the real estate sector?**

- ☐ Developer
- ☐ Architect
- ☐ Government Regulatory
- ☐ Sales Professional
- ☐ Interior Designer
- ☐ Contractor
- ☐ Other (please specify): _____

5. **How long have you been in the real estate sector?**

- ☐ Less than 1 year
- ☐ 1-2 years
- ☐ 3-5 years
- ☐ 5-10 years
- ☐ More than 5 years

6. How familiar are you with the concepts of "flexible housing" and "adaptable housing" in architectural design?

☐ Expert ☐ Very Familiar ☐ Moderate ☐ Slightly Familiar ☐ Not Familiar

Section 2: Evaluate Apartment Units' Spatial Flexibility and Adaptability

7. In your opinion, how well do current apartment living spaces in Addis Ababa accommodate residents' changing needs? (e.g., growing family, working from home, aging residents)

(1 = Extremely Well 2 = Well 3 = Neutral 4 = Poorly 5 = Very Poorly)

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

8. How easy is it for residents to modify the layout or function of their apartment units? (e.g., rearranging furniture, changing room use, adding/removing partitions)

(1 = Very Easy 2 = Easy 3 = Neutral 4 = Difficult 5 = Very Difficult)

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

9. Do you think the current apartment designs in Addis Ababa reflect local cultural or lifestyle needs? (e.g. cooking, religious practice)

- ☐ Yes
 - ☐ No
 - ☐ Not Sure
-

Section 3: Identifying Key Design Factors Influencing Flexibility and Adaptability

10. Which features make apartment units more flexible and adaptable to different needs or uses? (Select all that apply)

- ☐ Open-plan layout
- ☐ Sliding or movable partitions
- ☐ Multi-functional furniture (e.g. foldable beds, storage-integrated sofas)
- ☐ Room proportions (shape and size)
- ☐ Multi-purpose spaces (e.g., room that can be used as both office and bedroom)
- ☐ Modular/grid-based planning
- ☐ Adequate Storage Space
- ☐ Other (please specify): _____

11. Which features limit apartment units' adaptability and flexibility? (Select all that apply)

- ☐ Fixed walls/ partitions
- ☐ Small room size and shape
- ☐ Limited natural lighting or ventilation
- ☐ Built-in furniture or fixtures (e.g., fixed wardrobes, kitchen islands)
- ☐ Restrictive Rules and Regulation
- ☐ Plumbing location (kitchen, bathrooms placement)
- ☐ Door and window positions
- ☐ Cost Constraints
- ☐ Poor circulation and corridor design
- ☐ Other (please specify): _____

Section 4: Design Strategies and Opportunities for Flexible and Adaptable Apartment Design

12. How important is it for future apartment buildings in Addis Ababa to include flexible and adaptable living spaces?

(1 = Very Important 2 = Important 3 = Neutral 4 = Somewhat Important 5 = Not Important)

- ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

13. What are the main drivers behind the spatial configurations in private real estate developments in Addis Ababa? (Select all that apply)

- ☐ Market competitiveness
- ☐ Cost efficiency
- ☐ Regulatory requirements
- ☐ Client/buyer demands for specific layouts
- ☐ Flexibility and Adaptability
- ☐ Cultural norms
- ☐ Environmental sustainability goals
- ☐ Other (please specify): _____

14. What challenges or gaps do you notice in integrating flexibility and adaptability into apartment design and development? (Select all that apply)

- ☐ Technology constraints
- ☐ Lack of knowledge and skills
- ☐ Client or market preferences
- ☐ Cost Constraints
- ☐ Skilled labor/materials for flexible solutions
- ☐ Regulatory limitations
- ☐ Other (please specify): _____

15. What common complaints or feedback do residents have about apartment layout and spatial usability? *(Please provide a summary of recurring issues)* _____

16. What improvements or design changes would you suggest to make apartment units more adaptable to different lifestyles and changing needs? _____

Thank you very much for your contribution and your valuable time!

Appendix 6: Survey Participation Consent Form Amharic

የነዋሪዎች መጠይቅ ዳሰሳ ጥናት የተሳታፊ ፈቃድ ማረጋገጫ ቅጽ

ውድ የጥናቱ ተሳታፊ፤

ዳንኤል አስራት አበበ እባላለሁ፤ በአዲስ አበባ ዩኒቨርሲቲ የኢትዮጵያ አርክቴክቸር፣ የሕንፃ ግንባታ እና የከተማ ልማት ተቋም፤ የስነ-ህንፃ ዲዛይን የድኅረ-ምረቃ ተማሪ ነኝ።

የዚህ መጠይቅ ዓላማ በአፓርትመንት መኖሪያ ቤቶች ውስጥ ያለው የውስጥ ቦታ አቅማመጥ (Spatial Configuration) የነዋሪዎችን ተለዋዋጭ ፍላጎቶች፣ የኑሮ ዘይቤዎችና የቤተሰብ አወቃቀር ለመቀበል ባለው ተለዋዋጭነትና ተቀያይሪነት (Flexibility and Adaptability) ላይ ያለውን ተፅዕኖ ለመገምገም ነው። የእርስዎ ምላሾች በአዲስ አበባ ባሉ የግል ሪል ኢስቴት አፓርትመንት መኖሪያ ቤቶች ውስጥ ያሉ የንድፍ ጠንካራና ደካማ ጎኖችን ለመለየት ይረዳሉ።

እርስዎ በዚህ ጥናት እንዲሳተፉ የተጋበዙት በአሁኑ ጊዜ በግል ሪል ኢስቴት መኖሪያ ቤት ውስጥ ስለሚኖሩ ሲሆን፣ የእርስዎ ተሞክሮ እና ግንዛቤ እነዚህ ቤቶች አገልግሎት ከዋሉ በኋላ እንዴት እንደሚሰሩ ለመገምገም እጅግ ጠቃሚ ናቸው።

በዚህ መጠይቅ የሚሰበሰበው መረጃ ለትምህርታዊ እና ምርምር ዓላማ ብቻ ይውላል። የእርስዎ ምላሽ ሙሉ በሙሉ ሚስጥራዊ እና ማንነትዎን አይገለጽም። ተሳትፎዎ ፈቃደኝነት ላይ የተመሠረተ ነው። መመለስ የማይፈልጉትን ጥያቄ መዘለል ይችላሉ፤ እንዲሁም በማንኛውም ጊዜ ምክንያት ሳይገልጹ መጠይቁን መመላለት ማቆም ይችላሉ። ይህን መጠይቅ ለመመላለት በግምት 10-15 ደቂቃ ጊዜ ይወስዳል።

ከታች በመፈረም ወይም መጠይቁን በመመላለት፣ ከላይ የተገለጸውን መረጃ አንብቤ ተረድቼ እና በፈቃደኝነት በዚህ ጥናት ለመሳተፍ እንደተስማሙ ያረጋግጣሉ።

☐ በጥናቱ ለመሳተፍ እስማማለሁ

☐ በጥናቱ ለመሳተፍ አልስማማም

የተሳታፊ ስም (ፈቃደኛ ከሆኑ): _____

ፊርማ (ከሆነ): _____

ቀን: ____ / ____ / ____

Appendix 7: Survey Participation Consent Form English

Resident Survey Participation Informed Consent Form

Dear respondent,

My name is Daniel Asrat Abebe, and I am currently pursuing my postgraduate studies for an MSc in Advanced Architectural Design (MAAD) at Addis Ababa University, College of Technology and Built Environment, Department of Architecture.

The purpose of this questionnaire is to examine how the internal spatial configuration of apartment units influences their flexibility and adaptability in accommodating residents' changing needs, lifestyles, and household structures. Your responses will help identify design strengths and limitations in current private real estate apartment units in Addis Ababa.

You are invited to participate in this study because you are currently living in private real estate unit and your experience and perception are valuable and help with understanding how these units perform after occupancy.

I would like to assure you that the information collected using this questionnaire will be used for educational purposes only. Your responses will be kept strictly confidential and remain anonymous. Your participation is entirely voluntary. You may skip any question you do not wish to answer, and you may withdraw at any time without giving a reason. Participation in this survey will take approximately 10–15 minutes.

By signing below or by proceeding with the questionnaire, you confirm that you have read and understood the information provided above and voluntarily agree to participate in this research study.

☐ I agree to participate

☐ I do not agree to participate

Participant Name (Optional): _____

Signature (if applicable): _____

Date: _____

Appendix 8: ON-SITE OBSERVATION CHECKLIST

Study: Influence of Spatial Configuration on Flexibility and Adaptability

Section 1: General Information

Name of Real Estate: _____ Location: _____

Building Typology: _____ Unit Information: _____

Section 2: Structural System

1.1 Structural Grid & Column System

Item	Yes	No	Notes
Structural system clearly identifiable (frame / load-bearing walls)	☐	☐	
Internal walls lightweight/ removable	☐	☐	
Column shape/spacing allows reconfiguration	☐	☐	
Open or Semi-open plan layout	☐	☐	

Section 3: Spatial Configuration & Layout Logic

2.1 Plan Organization

Item	Good	Moderate	Poor	Notes
Logical room connectivity and circulation pattern	☐	☐	☐	
Rooms proportioned for multiple uses	☐	☐	☐	
Regular geometry (rectangular / modular)	☐	☐	☐	
Multi-Functional Space possible	☐	☐	☐	
Availability of auxiliary space storage, maids' room, laundry	☐	☐	☐	

Section 3: Electrical, Mechanical and Sanitary Flexibility

Item	Yes	No	Notes
Plumbing accessible for modification	☐	☐	
Electrical wiring embedded rigidly in walls	☐	☐	
Surface-mounted systems allowing alteration	☐	☐	
HVAC fixed system limiting change	☐	☐	

Section 4: Partitioning & Internal Modification Potential

Item	Yes No Notes	
	Yes	No
Evidence of movable partitions	☐	☐
Non-structural partitions clearly identifiable	☐	☐
Door/Window placement allow layout changes	☐	☐

Section 5: Evidence of Resident Modification

Type of Change	Observed?		Description
	Yes	No	
Partition add/removal	☐	☐	
Converted Balcony	☐	☐	
Flexible furniture use observed	☐	☐	
Spaces used differently from original design	☐	☐	

SECTION 6: Overall observation for spatial Configuration for Flexibility & Adaptability:
