

UNIVERSITY OF BAHRAIN

College of Engineering



**Department of Architecture
& Interior Design**

Identifying the Issues Leading to Residents' Modifications in Bahraini Subsidized Housing Units

A thesis submitted in partial fulfilment of the requirements for the
degree of Master of Architecture (Interior Architecture).

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Abstract

Residents' modifications in subsidized housing are a widespread phenomenon in Bahrain. Households begin modifying their housing units after receiving them, resulting in dire impacts like violations, financial burdens, and distortion of housing uniformity. This research aims to identify the issues leading to residents' modifications in Bahraini subsidized housing units. Literature indicates that this phenomenon is closely related to resident behaviors. Thus, the study presents a conceptual framework that examines the similarities and differences in residents' behaviors in subsidized housing. Accordingly, the study employed the qualitative approach and was conducted in two phases. The first phase investigated common resident behaviors through structured interviews with twenty experts involved in the modification process. The second phase used the case study strategy with six selected cases from the East Hidd housing project to examine the different behaviors related to residents' lifestyles. It included on-site observations, plan analysis, and structured interviews with householders using the AIO approach.

The findings revealed general and specific issues that lead to residents' modifications. On the one hand, the general issues represent common behaviors among most residents and are usually associated with the prior-occupancy stage. These preferences include simple modern designs with spacious living rooms and bedrooms, trendy modern materials, and large windows. Additionally, there is a need for sustainable housing units that incorporate all three aspects of sustainability, particularly the sociocultural aspect, which relates to privacy, hospitality, and the aesthetics and distinction of houses. Another general issue is the damage resulting from improper practices, such as excluding experts and involving unqualified individuals in the modification process.

On the other hand, the specific issues represent different behaviors among families and are usually associated with the post-occupancy stage. Those include residents' need to modify their houses according to their lifestyles and priorities, primarily seen in the various ways of expanding living rooms and bedrooms. These expansions are mainly associated with three spaces: the guest room, the courtyard, and the kitchen. Furthermore, residents need to personalize the interior layout of their bedrooms to meet their individual requirements.

Publications

Thesis-Related Publications:

- Lafi, M. W., Alkhalifa, H. E., & Jiwane, A. V. (2023). Identifying the issues leading to residents' modifications in Bahraini subsidized housing units. *Frontiers in Built Environment*, 9(June), 1154546. <https://doi.org/10.3389/fbuil.2023.1154546>

Dedication

This work is dedicated to my parents and my brothers for their unwavering support and love.

Acknowledgment

I want to express my heartfelt gratitude to everyone who has supported me throughout this journey. Thank you to my parents for their constant support and love. I also extend my thanks to my brothers, my family, and everyone who supported me. I am deeply grateful to my supervisor Dr. Haifa Alkhalifa for her invaluable guidance and insights. A special thanks to my friends and colleagues for their encouragement and feedback. Your contributions, big and small, have made a significant difference.

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Abbreviations

AIO	Demographics, Activities, Interests, and Opinions
MoH	Ministry of Housing
GCC	Gulf Cooperation Council
WPC	Wood-Plastic Composite
PVC	Polyvinyl Chloride
MDF	Medium Density Fiberboard
HDF	High-Density Fiberboard

Chapter 1: Introduction to the Study

This chapter begins by introducing the research topic. The research problem is then thoroughly explained, and the knowledge gaps are summarized. This is followed by the research question, aims, objectives, and significance. Eventually, the setting and terminology of the study, as well as the thesis structure, are presented.

1.1. Introduction

Home is a haven for humans and a refuge from the outside world's noise (Bachelard, 1994). It is a place that fosters a profound sense of belonging, where individuals can make cherished memories, cultivate deep bonds and social relationships, and express themselves freely, making it a reflection of their personalities (Dayaratne & Kellett, 2008; Lawrence, 1987; Marcus, 1995). It embodies an essence of security, serenity, and seclusion, providing its residents with a sanctuary of safety and comfort (Jacobson, 2010). Thus, a home must meet one's needs, desires, and preferences (Jiwane, 2021).

For this reason, architects should constantly, first and foremost, provide designs that respond to residents' demands and tastes. Nonetheless, what if the design of the house is unified for a large group of people? How can the architect make it suitable for all of them? It will undoubtedly be challenging to achieve since each resident has different desires and perceptions. This completely applies to subsidized housing projects developed based on universal designs to serve a substantial proportion of the community.

Although subsidized housing units are typically designed to satisfy residents' needs and requirements, their standard designs do not entirely fulfill these expectations (Othman, 2007). Simultaneously, responsible authorities are unable to provide a precise unit design for a wide variety of residents with different needs (Jiwane, 2021). Accordingly, most residents modify their housing units to meet their passions and desires, resulting in financial burdens and other dire consequences (Aduwo et al., 2013; Mwaba, 2017; Natakun & O'Brien, 2009; Nwankwo et al., 2014; Othman, 2007).

Residents' modifications are a widespread phenomenon in subsidized housing worldwide, including Bahrain, where residents modify their dwellings immediately after acquiring the keys (Saraiva et al., 2019). It is an inevitable continuous process influenced by sociocultural factors, evolving lifestyles and circumstances, human needs and behaviors, and economic and technological growth (Dayaratne & Kellett, 2008; Obeidat et al., 2022; Ozer & Jacoby, 2022). Thus, this phenomenon is unstoppable because a typical design cannot meet the diverse demands of each family (Jiwane, 2021).

However, the modifications can be either reduced or facilitated in future projects (Chukwuma-Uchegbu & Aliero, 2022). This necessitates a thorough understanding of the phenomenon and exploring the reasons behind it. Although the basis for modifications is generally related to the typical designs of the units, this rationale is insufficient to fully comprehend the phenomenon as those designs are based on different social, cultural, and economic standards (Ozer & Jacoby, 2022). Hence, the underlying reasons driving these modifications vary by region as residents behave differently.

In fact, the literature indicates a strong link between this phenomenon and residents' behaviors (Aryani & Jen-tu, 2021; Mahmood & Hussain, 2018; Obeidat et al., 2022; Sunarti et al., 2019). Besides, studying the similarities and differences in subsidized housing designs and transformation patterns aids in exploring residents' needs (Aryani et al., 2015; Ozer & Jacoby, 2022). Therefore, as a critical step in identifying the issues leading to the modifications in Bahraini subsidized housing, the study focuses on residents' common and different behaviors within these houses. These encompass their shared preferences, underlying motivations, implications, and varying patterns of modifications that reflect their distinct lifestyles.

Notably, a portion of this master's thesis, comprising the preliminary findings from twelve expert interviews and three case studies, has previously been published in a journal paper. Consequently, this study enhances these insights by integrating data from a broader sample of twenty experts and six case studies, facilitating a more comprehensive discussion.

1.2. Research Problem

Subsidized housing worldwide, including in Bahrain, faces challenges due to residents' constant modifications to their assigned housing units, which leads to severe consequences. This issue has two primary facets. On the one hand, the standardized designs that characterize these dwellings don't adequately address residents' needs and expectations (Salman, 2016; Saraiva et al., 2019). Additionally, resident modifications are an ongoing, unavoidable process and part of residents' innate instinctual behaviour (Aryani & Jen-tu, 2021; Sunarti et al., 2019). On the other hand, housing authorities cannot offer designs that accommodate the varying needs and lifestyles of a wide range of resident families (El-ghonaimy, 2010; Jiwane, 2021).

Some local studies in Bahrain have raised this phenomenon. According to Saraiva et al. (2019), once subsidized houses are distributed to owners, they undergo constant modifications, including the style, function, or structure. This is also highlighted by Salman (2016), who argues that Bahraini residents of public housing intend to modify the designs of their dwellings as soon as they move in to fit their preferences and particular requirements. Similarly, Taki & Alsheglawi (2022) and Alkhenazi (2018) also emphasize that most Bahraini families adapt their current dwellings

through space expansions or additions to offer an appropriate residence for their male children once they become adults or marry. So, residents' modifications are prominent in Bahraini subsidized housing.

Local Bahraini newspapers have widely discussed the consequences of this phenomenon. For example, according to the article "774 Serious Building Violations" (2020), severe violations that endanger citizens' safety have been detected in the new subsidized housing projects throughout Bahrain. The article further points out that the unplanned haphazard modifications impede the city's quality and overall aesthetic form. Moreover, the article "Unlicensed Modifications in the 'Lawzi' Units" (2018) foreshadows the possibility of rainwater drainage network damage in the Al-Lawzi subsidized housing project. The article attributes this to unauthorized random modifications made by some residents in their dwellings, which may endanger the lives of the entire project's residents.

Ahmed (2017) also points out that some residents violate the housing laws solely for the sake of change and decoration without an urgent need, resulting in substantial expenditures that may exceed the cost of the housing unit itself. Another piece, "Compliance with Building Codes" (2021), reveals that several building modification infractions committed by residents, including incorrect engineering practices, resulted in cracks in the units' walls and other significant damages. Similarly, a recent piece, "81 Housing Violations" (2022) expands on this, stating that there are 81 building violations in the eighth district of the Southern Governorate in compliance with building regulations in housing developments.

It is noteworthy that subsidized housing projects adhere to universal standards and are developed to provide comprehensive services that tackle the general requirements of the subsidized housing community as a whole. Besides, these initiatives must be financially sustainable (Ozer & Jacoby, 2022; Wardrip et al., 2011). Nevertheless, residents' modifications can be reduced or simplified in future subsidized housing projects (Chukwuma-Uchegbu & Aliero, 2022; Othman, 2007). Thus, there is an urgent need to delve deeper into this phenomenon and explore its causes, whether pre- or post-occupancy. This will aid in developing strategies to mitigate them and their negative consequences.

Despite the prevalence of residents' modifications in Bahraini subsidized housing units, there has been limited focus on this phenomenon in local research, as only a few studies have addressed it (Salman, 2016; Saraiva et al., 2019). In addition, while the 'one-size-fits-all' design of subsidized housing units contributes to this phenomenon, a more comprehensive explanation is required to convey a complete picture of the root causes. This is because housing design standards differ from region to region based on specific cultural and social norms (Ozer & Jacoby, 2022). Accordingly, residents' behaviors also vary, as they are influenced by their culture, traditions, and their region's environmental and economic conditions (Salman, 2016; Sunarti et al., 2019). This is, in turn, reflected in the modifications that residents make and the motivations behind them. In other words, each country has different issues contributing to this phenomenon (Aduwo et al., 2013). Therefore, there is a need to explore the issues that lead to this phenomenon in subsidized housing in Bahrain.

1.3. Research Question

As demonstrated in the research problem section, the phenomenon of residents' modifications is a constant process. However, its occurrence can be reduced, and its negative consequences and challenges mitigated. This necessitates a thorough investigation of the phenomenon, which first requires exploring the triggers that contribute to it. So, this research seeks to answer the following question:

- What are the issues that lead to residents' modifications in Bahraini subsidized housing units?

1.4. Research Aims and Objectives

The research aims to explore the issues that lead to residents' modifications in Bahraini subsidized housing units. It also seeks to shed light on current resident needs, housing preferences, and trends while raising awareness of the significant implications of residents' incorrect practices in the modification process. Additionally, it aims to propose recommendations for the design and modification process in future projects aimed at mitigating this phenomenon and its negative consequences.

Since this phenomenon is linked to residents' behaviors concerning the modification process, and the literature indicates that there are both similar and different patterns of residents' modifications, the aims of the research will be achieved by the following objectives:

- Determine residents' common behaviors in Bahraini subsidized housing units.

- Analyze the patterns of residents' modifications.
- Study the relationship between residents' modifications and their lifestyles.

1.5. Research Significance

This research is essential at the local level because studies in this domain are limited despite the widespread prevalence of residents' modifications in Bahraini subsidized housing units. Besides, studying the issues behind this phenomenon aids in understanding the similarities and differences in residents' behaviors as well as exploring the patterns of their modifications. This allows for determining residents' current needs and preferences. It also reveals residents' wrong and inappropriate practices that exacerbate and complicate the modification process. Thus, this will, in turn, help to suggest strategies that will assist Bahrain's Ministry of Housing (MoH) in improving the design of subsidized housing units. Moreover, it will contribute to reducing the modifications and simplifying their implementation in future projects. It will further contribute to minimizing the violations and negative implications associated with the modification process.

In addition, it should be noted that residents of each region have distinct cultures and customs. This implies that every region has different issues underlying the phenomenon and necessitates thorough investigation. In other words, this research is occasionally and regionally necessary since technology, social, and cultural factors significantly impact residents' behaviors and lifestyles (Dayaratne & Kellett, 2008; Duffy, 2009; Ozer & Jacoby, 2022). For this reason, the study presents a comprehensive

conceptual framework for studying the behaviors of subsidized housing residents.

The conceptual framework lays the groundwork for future research addressing the same topic in different regions. This means that, while the findings of this study cannot be generalized because they are specific to Bahrain, the framework developed and the research tools used can be employed in future studies on other subsidized housing projects in Bahrain, the Gulf countries, and worldwide. Overall, examining this topic promotes a more profound understanding and provides fruitful insights for future considerations.

1.6. The Study's Setting

The study aims to identify the issues leading to residents' modifications in Bahraini subsidized housing units. Therefore, the research took place in the Kingdom of Bahrain and was conducted in two phases. The study specifically focused on resident modifications in subsidized single-family housing units.

1.7. Research Terminology

The research includes the following terms:

- **Subsidized housing**: a set of residential units financially supported by the government or other entities. It includes a variety of policies, initiatives, and programs that target to deliver low-income residents affordable housing. It's also based on

standard designs and regulations (Freeman & Botein, 2002; Ozer & Jacoby, 2022).

- **Residents' modifications**: the alterations that residents make to the design or construction of their housing units to meet their needs and desires (Aduwo et al., 2013).
- **Residents' behaviors**: it refers to residents' actions, attitudes, habits, and tastes within their living environment. It includes how residents interact with their surroundings and their decisions regarding space usage, housing alternatives, preferences, and modifications (This definition is developed by the author based on a comprehensive review of the relevant literature).
- **Housing preferences**: the housing attributes and characteristics that residents would prefer in their dwellings regarding quantity and quality (Morris & Winter, 1978).
- **Housing Components**: these are essential elements of a house's structure and functionality, including windows, doors, ceilings, and lighting systems, and are fundamental to its overall performance (Ibrahim, 2020).
- **Lifestyle**: a manner that people adopt to cope with different matters and is strongly linked to their behaviors and perspectives (Plummer, 1974).
- **The AIO approach**: a measurement tool for studying lifestyles by examining users' activities, interests, opinions, and demographics (Plummer, 1974).

- **Patterns of residents' modifications**: the results of the transformations that residents made to their housing units (Aryani et al., 2015).
- **Householder**: in this study, it refers to the family member chosen for the interview in the second phase. This could be the wife or the husband.
- **Homeowners**: in this study, it refers to the wife and husband who made the decisions about the house modifications.
- **Majlis**: an Arabic term that refers to the room where formal meetings with visitors take place and is usually used to receive male guests (Remali et al., 2016).
- **Eid**: an essential official holiday for Muslims marked by prayers, feasting, and social gatherings.
- **Ramadan**: the ninth month of the Islamic calendar, during which Muslims worldwide fast for the entire month.
- **Mashrabiya**: It's an architectural element used in Islamic culture, consisting of perforated wooden panels that help provide light, air, and privacy indoors while also allowing a visual connection with the outdoors (Almerbati et al., 2014).

1.8. Thesis Structure

The thesis is divided into five chapters, which are as follows:

- **Chapter One**: this chapter begins by introducing the research topic. The research problem is then thoroughly explained, and the

knowledge gaps are summarized. This is followed by the research question, aims, objectives, and significance. Eventually, the setting and terminology of the study, as well as the thesis structure, are presented.

- **Chapter Two:** this chapter presents a literature review divided into different themes. It begins with a background from the literature on subsidized housing. Then, it reviews the phenomenon of residents' modifications in subsidized housing units by discussing its definitions, the significance of studying it, and examples from international and local contexts with the current solutions. The chapter then covers the literature on residents' behaviors in subsidized housing, including the motivations behind the modifications, their implications, and the lifestyle concept. This is followed by the literature discussing the significance of sustainability in subsidized housing. Finally, the chapter identifies gaps in the literature, summarizes the key concepts, and then presents a conceptual framework accordingly.
- **Chapter Three:** this chapter first presents the research methodology, which clarifies the use of the qualitative approach and explains the primary methods used in the study. After that, the research design, which consists of two phases, is demonstrated. Then, it outlines the sampling strategy, which includes clarifications for the target samples, selection criteria, and sampling techniques used in each phase. The research tools are then discussed, focusing on their reliability and contribution to fulfilling the study's objectives. This is followed by an in-

depth explanation of the data collection procedures and data analysis. Finally, the chapter addresses the ethical considerations, as well as the strengths and limitations of the methodology.

- **Chapter Four:** this chapter presents the research findings, beginning with the analysis of the data collected during the first phase, which involved expert interviews. Subsequently, it delves into the analysis of the data obtained in the second phase, incorporating a case study strategy comprising on-site observations, plan analysis, and interviews with householders. This is followed by a comprehensive discussion and comparison of the results, aligning with the study's objectives.
- **Chapter Five:** this chapter provides a comprehensive overview of the study's findings, drawing clear conclusions from the data analysis. Additionally, it presents valuable recommendations based on these findings and critically assesses the study's limitations for future research in the field.

Chapter 2: Literature Review

This chapter presents a literature review divided into different themes. It begins with a background from the literature on subsidized housing. Then, it reviews the phenomenon of residents' modifications in subsidized housing units by discussing its definitions, the significance of studying it, and examples from international and local contexts with the current solutions. The chapter then covers the literature on residents' behaviors in subsidized housing, including the motivations behind the modifications, their implications, and the lifestyle concept. This is followed by the literature discussing the significance of sustainability in subsidized housing. Finally, the chapter identifies gaps in the literature, summarizes the key concepts, and then presents a conceptual framework accordingly.

2.1. Introduction

While relatively few studies have addressed the issue of residents' modifications in subsidized housing, it is noteworthy that the investigations that have tackled this issue have taken diverse directions. Some have debated the nature of the modifications and their motivations (Chukwuma-Uchegbu & Aliero, 2022; Nwankwo et al., 2014). Others have concentrated on studying residents' behaviors and analyzing the modification patterns (Abed et al., 2023; Aryani et al., 2015; Natakun & O'Brien, 2009). Some also have shed light on the implications of this phenomenon and proposed solutions (Garrefa et al., 2021; Mwaba, 2017). Thus, to provide a deep and comprehensive understanding of this phenomenon, this chapter reviews the literature that discusses all those aspects and other related facets. So, the literature review in this study concerning residents' modifications in subsidized housing revolves around key themes, as shown in Figure 2.1 below:

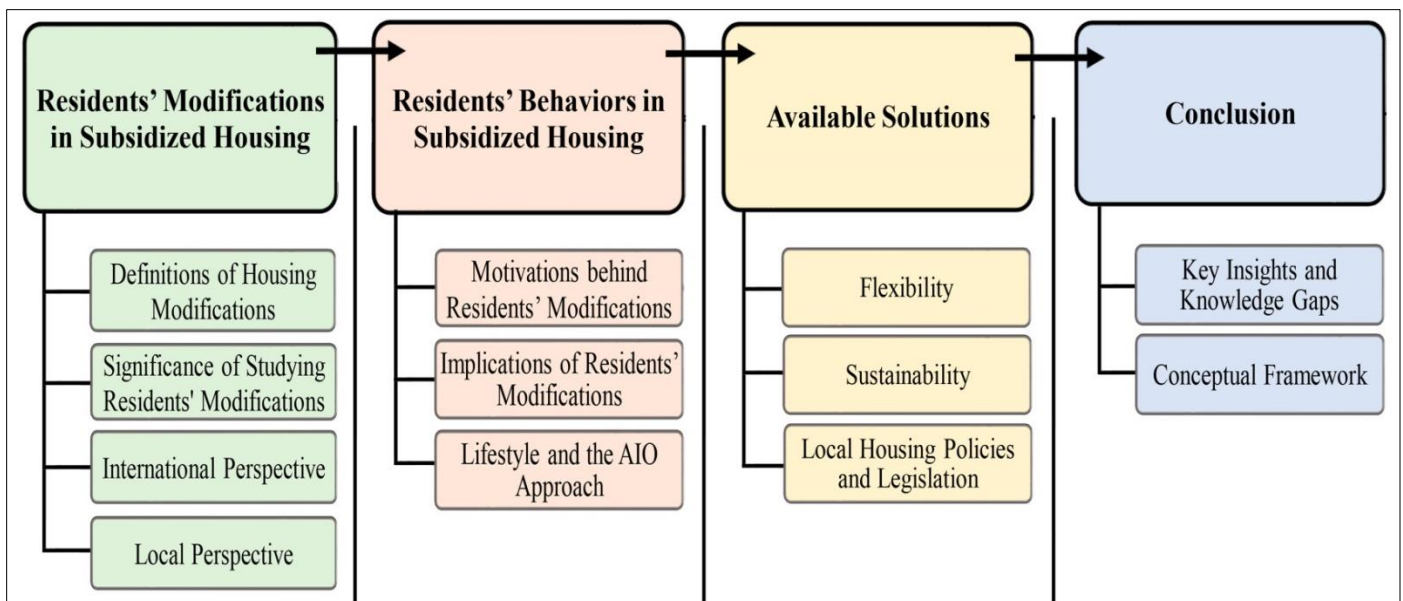


Fig. 2.1: Chapter Structure Overview (Drafted by the Author)

2.2. Subsidized Housing - Background

A subsidized housing project is a local government-provided program that consists of residential units for low-income residents (Freeman & Botein, 2002; Ozer & Jacoby, 2022). The term 'Subsidized housing' is inclusive as it encompasses a variety of housing that is financially subsidized and granted by the local housing authorities (Ozer & Jacoby, 2022). According to Granath Hansson & Lundgren (2019), subsidized housing offers rents below market rates and requires financial support from the private or public sector. Providing those housing projects is essential for societies because they significantly contribute to offering affordable accommodation and public services for low-income households (Drews, 1983).

Hence, subsidized housing projects are considered a cornerstone for reviving and prospering the social and economic sectors (Wardrip et al., 2011). This is owing to the massive scale of these projects and the use of standard designs, which reduces construction costs (Ozer & Jacoby, 2022). Besides, they significantly contribute to the society's social stability, cohesiveness, and improved quality of life (Ozer & Jacoby, 2022). The primary goal of these initiatives is to provide low-income families with convenient, affordable, and secure housing, ensuring that each of these households, regardless of their financial standing, owns a home (Drews, 1983; Granath Hansson & Lundgren, 2019; Ozer & Jacoby, 2022).

Subsidized housing units usually stand two or three stories high (Stoloff, 2004). Those units follow specific regulations and are provided with general needs that comply with social and cultural norms (Reeves,

2005). Since these units follow standards and universal characteristics, their designs are typical (Salman, 2016). However, these standards differ from one country to another according to the sociocultural aspect (Ozer & Jacoby, 2022).

In Bahrain, the growing urbanization and overpopulation put severe stress on the Ministry of Housing (MoH) to accelerate the construction of housing projects and fulfill the current and future public demands (Al-Saffar, 2014). Consequently, the MoH has made significant efforts in this regard, including the implementation of land reclamation. This strategy involves creating new land by filling sections of the sea with cement, expanding Bahrain's land area. This expansion has facilitated the development of more housing projects in various locations across the country, such as Diyar Al Muharraq and East Hidd, contributing to economic advancement (Seddiq & Al Khalifa, 2023).

In fact, the Kingdom of Bahrain is considered one of the Arab Gulf countries with conspicuous success and prosperity in the housing sector due to its ability to accommodate rapid urbanization and residential development (Al-Saffar, 2014). Ministry of Housing and Urban Planning (2023) highlights the diverse financial services provided to help citizens obtain suitable housing, as follows:

- **MoH-Subsidized Housing Projects**: Offers fully constructed houses, vacant plots, or apartments owned by the Ministry.
- **Housing Loans**: Provides loans repayable in installments for purchasing, constructing on owned land, or renovating an existing property.

- **Mazaya Program**: In partnership with private sectors such as Diyar al Muharraq, this program offers loans from partner banks, where citizens pay 25% of their income, and the Ministry covers the balance.
- **Temporary Apartments**: These are available for eligible citizens or those awaiting the completion of their MoH-subsidized houses.

Thus, subsidized housing projects are among the fundamental policies of the MoH, accomplished either through extending existing cities or establishing entirely new ones through the reclamation process. (Al-Khalifa, 2015). The primary goal of those projects is to provide appropriate accommodations for low-income households (Al-Khalifa, 2015; Al-Saffar, 2014; Salman, 2016). Subsidized housing units are allocated to eligible residents based on specified criteria set by the MoH, which mandates that residents must be married, aged 21 to 50, and earn a monthly income below 600 Bahraini Dinars. Notably, the design of the units adheres to standard regulations and specifications (Salman, 2016). Due to that, the layouts are nearly identical, with slight variations (Saraiva et al., 2019). Besides, the sizes of those units fluctuate between 189 to 255 square meters (Albuflasa, 2018).

Isa and Hamad towns, established between 1963 and 1984, are considered among the initial housing initiatives and significant achievements of the MoH (Al-Khalifa, 2015; Hamouche, 2004). Both of those housing developments provided residents with subsidized housing units and public services (Hamouche, 2004). Since then, the MoH has developed various housing projects in several regions throughout Bahrain (Al-Khalifa, 2015).

In addition to Isa and Hamad Towns, previous subsidized housing projects include Malkiya, Madinat Zayed, and Zallaq, while recent developments include East Hidd, East Sitra, Salmabad, and others.

So, subsidized housing is an urgent priority for societies since it offers suitable lodging and basic amenities for families with low incomes while also improving the social and economic sectors. However, the concept of housing carries more profound meanings than just a structure and a shelter (Dayaratne & Kellett, 2008; Habraken, 1988; Marcus, 2006; Tipple, 2000). These meanings are inextricably linked to residents, their way of living, their behavior inside homes, and their attachment to their own places (Marcus, 2006). According to Salman (2016), architecture doesn't only concern buildings' forms, dimensions, and materials, but it encompasses meaningful spaces for users where they have multiple experiences. This demonstrates the strong bond between people and their living environments. Therefore, this emphasizes the fundamental need for subsidized housing residents to modify and improve their houses to satisfy their requirements, perceptions, and particular desires.

2.3. Residents' Modifications in Subsidized Housing

Resident modifications represent a widespread and complex phenomenon within subsidized housing projects worldwide. Several studies have examined this topic in various regions around the world. Most of these scholarly studies indicate that residents begin modifying their housing units shortly after relocating, and this process continues over time to meet their evolving requirements (Agyefi-Mensah et al., 2020; Aryani et al., 2015;

Atália et al., 2022; Natakun & O'Brien, 2009; Obeidat et al., 2022; Saraiva et al., 2019; Tipple, 1999).

In fact, the phenomenon of residents' modifications is closely related to the philosophy of dwelling. This philosophy explores the relationship between individuals and their living environments. In other words, it demonstrates how individuals adjust their surroundings to accommodate their demands and desires while cultivating a sense of personalization. Many researchers and philosophers have extensively debated this philosophy. For example, Heidegger (1971) discusses this philosophy in different aspects. According to Heidegger, being in the world is represented by the interaction between human beings and their surroundings, resulting in a dwelt life including various places and experiences that lead to different phenomena. Heidegger further argues that human beings are naturally homely, because their presence in the home is based on developing secure and familiar places for themselves and their living, which enhances their sense of belonging.

Likewise, Bachelard (1994) contends that a home symbolizes one's presence in the world, embodied through daily emotions and actions that foster a sense of "ownness." The same idea is supported by Aragonés et al. (2010), who indicate that inhabitants arrange and modify their dwellings to meet their demands and preferences, providing them with a unique identity. Furthermore, Merleau-Ponty & Smith (1962) and Tipple (1999) claim that spaces at home change frequently as a never-ending process in which one keeps developing his own familiar places with a specific style that reflects his personality. Aligning with these views, Dayaratne & Kellett (2008) also affirm that as the circumstances of families and communities change, efforts

are made to develop and maintain homes that strengthen a sense of belonging.

Consequently, this suggests that people articulate places inside homes through the ongoing use of objects organized according to their activities and behaviors (Heidegger, 1971; Malpas, 1998; Seamon, 2020). Thus, each home has a different identity reflecting the attitudes and behaviors of its inhabitants. Those behaviors usually refer to the user's first childhood home, which is the place where he forms his first experiences and acquires certain habits and dispositions that he will carry with him for the rest of his life (Bachelard, 1994). In addition, residents also behave according to the cultural values of the society in which they reside (Lawrence, 1987).

So, the process of residents' modifications is an instinctual human behavior that reflects an inherent need to develop the living environment to satisfy particular requirements, habits, and emotions. This natural attitude reflects the distinctness and variation of people's necessities and lifestyles. Indeed, all individuals have the innate tendency to regulate their own places in a way that corresponds to their personality and ambitions.

Thus, the phenomenon is logical and certainly not an issue by itself, mainly since the housings are typically designed (Avogo et al., 2017). Nevertheless, the presence of this phenomenon in subsidized housing poses a significant challenge and creates numerous complications due to substantial reasons (Aduwo et al., 2013; Mwaba, 2017; Othman, 2007). Firstly, most of these modifications are chaotic, random, and informal, made by the residents themselves (Garrefa et al., 2021; Mwaba, 2017; Tipple, 2000). Secondly, subsidized housing is designed based on standard

specifications and adheres to particular regulations and policies established to cater to a large segment of society rather than individual preferences (Reeves, 2005).

In other words, this phenomenon presents a significant challenge to decision-makers and developers. The responsible authorities endeavor to offer their residents high-quality and affordable houses. However, developing housing units that fulfill all the requirements of its users is infeasible (El-ghonaimy, 2010; Habraken, 2002; Jiwane, 2021; Othman, 2007). Therefore, despite the diligent initiatives of housing authorities to deliver appropriate accommodations, residents are compelled to make modifications to their housing units.

2.3.1. Definitions of Housing Modifications

The process of modifications in housing units can be described in several terms, including housing transformations, extensions, adjustments, and alterations (Aduwo et al., 2013). The primary purpose of this process is to provide specific requirements and enhance livability (Abed et al., 2023; Morris & Winter, 1975). The modifications can take many forms; they could be major, like the structural alterations and the additions of rooms, or minor, such as arranging the furniture and changing the color of the rooms (Obeidat et al., 2022). They differ in their legislation, as many are illegal and don't follow the existing regulations (Tippie, 2000). Besides, modifications are made to different locations inside and outside the dwellings (Tippie, 2000). This signifies the wide range and diversity of modifications that residents make to their housing units.

Researchers have described the process of residents' modifications with different definitions. For example, Chukwuma-Uchegbu & Aliero (2022) define it as occupants' responses to unfulfilled needs in typical housing units. Aryani et al. (2015) present a comprehensive definition highlighting that it is an architectural process of residents' modifications that results in new patterns reflecting housing improvements. Similarly, Obeidat et al. (2022) describe the outcome of this process as transformation patterns, emphasizing that these patterns reflect inhabitants' spatial behaviors and sociocultural needs. Nguluma (2003) also provides viewpoints on this topic, defining the process as residents' attempts to improve or rejuvenate parts of the house.

Moreover, Natakun & O'Brien (2009) describe the process as remodeling internal and external spaces through a set of changes to the design and structure of the house to meet the particular family needs while also reflecting their tastes and personalities. Aduwo et al. (2013) also claim that this process refers to the adjustments that inhabitants make to the layout of their housing units to meet their evolving demands and preferences. Sunarti et al. (2019) describes it differently, indicating that the transformation process is a shift from a particular shape to an alternative one with a new function or structure. In addition, Tipple (2000) elaborates, stating that housing transformations include expansions, additions, or adaptations performed to the initial design of the dwelling.

While all these expressions provide different understandings and perspectives for the modification process in housing units, the definitions of Aryani et al. (2015) and Obeidat et al. (2022) are the most appropriate, compelling, and accurate. They define modifications as patterns reflecting housing enhancements and occupant behaviors and demands. Using the term

‘pattern’ is successful since it has considerable meaning and accurately depicts that the modifications were done in a particular manner and have a specific form or rhythm. The definitions are summarized in Table 2.1 below:

Table (2.1): Key Definitions of Housing Modifications (Compiled by the Author)

Source	Definition
(Chukwuma-Uchegbu & Aliero, 2022)	Occupants' responses to unfulfilled needs in typical housing units.
(Aryani et al., 2015)	An architectural process that results in new patterns reflecting housing improvements.
(Obeidat et al., 2022)	Transformation patterns that reflect inhabitants' spatial behaviors and sociocultural needs.
(Nguluma, 2003)	Residents' attempts to renovate or improve parts of the house.
(Natakun & O’Brien, 2009)	Remodeling indoor and external spaces through a series of alterations to the house's design and structure to fulfill the specific demands of the family while also reflecting their preferences and personalities.

(Aduwo et al., 2013)	The adjustments that inhabitants make to the layout of their housing units to meet their evolving demands and preferences.
(Sunarti et al., 2019)	A shift from a particular shape to an alternative one with a new function or structure.
(Tipple, 1999)	The expansions, additions, or adaptations performed to the initial design of the dwelling.

2.3.2. Significance of Studying Residents' Modifications

Studying the transformations and outcomes of subsidized housing is a crucial field of research (Nguluma, 2003; Ozer & Jacoby, 2022). The significance of studying this topic, as highlighted by the literature, can be classified as follows:

- **Social Significance:**
 - It sheds light on the social developments and trends that influence individuals' behaviors and attitudes manifest in their home designs (Mohit & Azim, 2012; Obeidat et al., 2022; Opoku & Abdul-Muhmin, 2010).

- It reveals residents' needs and fosters awareness of their current preferences and specific requirements, thereby facilitating improvements in the design of future projects (Atália et al., 2022).
- The findings of such a study could be helpful for architects and building designers to acquire a more thorough comprehension of people's demands (Obeidat et al., 2022). Thus, this contributes to providing design solutions that enhance building performance and residents' satisfaction.
- Examining inhabitants' modifications in housing units is critical for addressing the concerns related to societal comfort and well-being, subsequently improving people's quality of life (Nguluma, 2003; Watson et al., 2016).

- **Economic Significance:**

- Studying the modifications assists responsible authorities and decision-makers in setting housing design guidelines for future projects, thereby potentially reducing the need for modifications when improved designs align closely with residents' needs (Obeidat et al., 2022; Saraiva et al., 2019).
- Ozer & Jacoby (2022) agree, arguing that exploring the similarities and differences in the design patterns of subsidized housing adds value to dwelling design

regulations, potentially impacting construction costs and efficiency.

- **Environmental Significance:**

- Considering the similarities in the patterns of residents' transformations in the design of future developments fosters sustainable housing (Aryani et al., 2015). This aligns with sustainable practices and ensures that housing projects are environmentally friendly and resource-efficient.
- Studying this topic shows the positive and negative aspects of home transformations, as well as the best techniques to apply modifications (Nguluma, 2003). Thus, this can lead to more sustainable and environmentally friendly housing practices.

So, the process of resident modification is a common occurrence in subsidized housing around the world, drawing great attention from several studies. Therefore, it is essential to comprehensively review the existing research from both local and international perspectives, shedding light on the recent findings and recommendations in this regard.

2.3.3. International Perspective

Several international studies have discussed the issue of residents' modifications in subsidized housing units. For example, Jiwane (2021) investigated residents' opinions and satisfaction with a housing project in Kanhapur village, India, using a mixed methods approach that included on-site observations and a survey. The findings of this study show that

dwellings were modified and altered by the occupants because they didn't meet their demands. Tipple (1999) examined the housing transformation in four different countries: Egypt, Bangladesh, Ghana, and Zimbabwe. The study's outcomes clearly demonstrate that the selected case studies have a common issue of not having enough rooms for the residents, and the plot size is small, which led them to extend the space. The results further show that many new owners of subsidized housing units have plans to expand their living spaces to make their homes more suitable for their lifestyles.

Tipple (2000) built on his earlier research in his book "Extending Themselves: User Initiated Transformations of Government-built Housing in Developing Countries." In this extensive investigation, Tipple dug deeper into the precise forms of alterations that individuals make in their housing units. He indicates that modifications typically include extensions of living spaces by reducing the area of other rooms, additions of utilities such as bathrooms and exterior kitchens, and construction of fences and shops. In addition, Natakun & O'Brien (2009) investigated the common patterns of modifications made in one of the housing projects in Bangkok by analyzing the architectural plans and conducting interviews with its residents. The findings indicate that residents modified their homes by following common patterns, such as extending the front and back patios, living rooms, and roofs. The results further imply that the modifications made by residents reflect their preferences and emotional needs.

Nwankwo et al. (2014) also conducted a survey to assess post-occupancy alterations in Housing Estates in South-Eastern Nigeria. According to the study, three characteristics were altered: function, aesthetics, and structure. As a result, Nwankwo et al. (2014) underline the

significance of considering these factors during the construction of housing units as this will contribute to creating sustainable housing estates. The same methodology was employed in a recent study by Chukwuma-Uchegbu & Aliero (2022), who examined post-occupancy modifications in five low-income housing developments in Nigeria. The study reveals that residents have made various alterations to their units, including prohibited ones, to fulfill their preferences and requirements while attaining the requisite degree of comfort. Besides, Chukwuma-Uchegbu & Aliero (2022) demonstrate that most adjustments involve building additional rooms, modifying the spatial organization of the site, extending existing spaces, and redesigning the boundary walls.

Aduwo et al. (2013) conducted a similar study in Nigeria, analyzing the patterns of adjustments made by inhabitants to one of the housing projects using a cross-sectional survey of 614 dwellings. According to the findings of the survey, the majority of the inhabitants were unsatisfied with the living rooms, kitchens, and bedrooms, which prompted them to modify those spaces. The results also indicate that bedrooms were the most altered area due to inhabitants' desire to build adequate environments for the coming generations. Likewise, Aryani et al. (2015) analyzed the transformation patterns of residents' modifications to a housing development in Indonesia through interviews and observations. The study's findings show that inhabitants made comparable modifications, focusing primarily on the back side of the site, which represents the services area.

Obeidat et al. (2022) conducted a recent study on a Jordanian housing project by utilizing observations, space syntax, and interviews to explore the transformations that occupants have made to attain privacy in their

residences. It can be marked from the findings that the modifications took many forms, such as enclosing the balconies and merging their spaces with the internal ones, building separate entryways, and extending the area of the patios. Moreover, Aryani & Jen-tu (2021) employed a case study strategy to evaluate resident behavior in social housing units in Surabaya, Indonesia, by applying several methods, including observations, photographs, and interviews. The results clearly show that residents' have increased the size of their residences, which goes against the laws of the local government.

So, the review reveals that numerous international studies explored the issue of residents' modifications in subsidized housing. It also demonstrates that transformations are ongoing, with the primary goal of expanding the spaces of the dwelling. However, each subsidized housing project in a different country focuses on specific adaptations.

2.3.4. Local Perspective

The phenomenon of residents' modifications has been discussed in some local research. Salman (2016) indicate that Bahraini residents adjust their housing units as soon as they move in to meet their requirements and reflect their identities. Salman attributes this to the typical layout of housing units that don't suit inhabitants' diverse tastes and spatial experiences. Moreover, Alkhenazi (2018) claims that numerous households in Bahrain expand their houses for the potential that one of the children would eventually marry and require their own living area within the house to settle comfortably with their family. Taki & Alsheglawi (2022) support this, arguing that Bahraini residents adapt their dwellings to meet future circumstances and cultural customs, such as the marriage of one of the sons.

Notably, this demand is primarily prevalent in current contemporary housing. In contrast, the traditional courtyard house in Bahrain addressed this need because it could accommodate more than one family (Salman, 2016). This is also confirmed by Saraiva et al. (2017), who analyzed and compared the spatial configurations of traditional houses and current subsidized housing units in Bahrain. The analysis further indicates that gender segregation, one of the fundamental social values of Bahraini society, is missing in the new subsidized housing. This is owing to people's preference for open-plan and modern designs characterized by expansive windows that strengthen the connection between indoor and outdoor spaces, which leads to a lack of privacy (Taki & Alsheglawi, 2022).

This means that Bahraini residents desire to achieve both privacy and openness to the outside in the design of their homes. Thus, these two variables are among the motivators that encourage residents to make the modifications. Lafi & Al-khalifa (2022) elaborate on this, highlighting the importance of accomplishing that balance in today's contemporary residences in Bahrain. Likewise, a study by Saraiva et al. (2019) endorses this viewpoint. The study analyzes the patterns of alterations in the Samaheej subsidized housing project. The outcomes of this study emphasize that residents immediately modify the functional distribution of spaces, structure, and style when they receive their houses. Furthermore, the results demonstrate that several modifications were made to the layouts of the housing units, including structural transformations, connecting the setbacks with the indoor and extending spaces.

Even though this phenomenon is prevalent in subsidized housing in Bahrain, there is a notable lack of research on this topic. Additionally, the

existing studies have concentrated more on investigating the nature of the modifications rather than their reasons. This reinforces the significance of expanding local research on this particular subject. Since both the international and local perspectives indicate that subsidized housing residents worldwide behaved differently, resulting in various and specific alterations in each region, the issues that lead residents to make the modifications also differ. This implies that the process of modifications in subsidized housing is firmly based on the behaviors of residents. So, to explore the issues, it is essential first to study residents' behaviors.

2.4. Residents' Behaviors in Subsidized Housing

Subsidized housing residents make various modifications to their units to fulfill particular needs. For example, they modify their dwellings to enhance their living conditions while also meeting the emerging demands of their family members (Salim, 1998). They also aspire to provide additional spaces that satisfy their housing requirements and activities (Aduwo et al., 2013). Furthermore, housing transformations enable residents to personalize their homes to meet their desires and expectations (Mohit et al., 2010). Thus, residents' needs and requirements are linked to diverse aspects. Accordingly, these aspects shape residents' behaviors that are, in turn, reflected in housing designs. This indicates that occupants' behaviors play a fundamental role in the process of modifications in subsidized housing.

Obeidat et al. (2022), for instance, argue that the alterations made to housing units are attributed to the spatial behaviors of residents. Similarly, Sunarti et al. (2019) found that occupants' changing behavior led to a transformation in low-income housing. Mahmood & Hussain (2018) agree

on the same point, affirming that adjustments to physical housing spaces reflect inhabitants' behaviors. Therefore, it's essential to study the aspects associated with residents' behaviors and their influence on the design of housing units (Obeidat et al., 2022). The literature discusses the following aspects:

2.4.1. Motivations Behind Residents' Modifications

Studies have discussed several motivations that influence residents' behaviors and stimulate them to modify their housing units. The following figure categorizes these motivations alongside their associated factors:

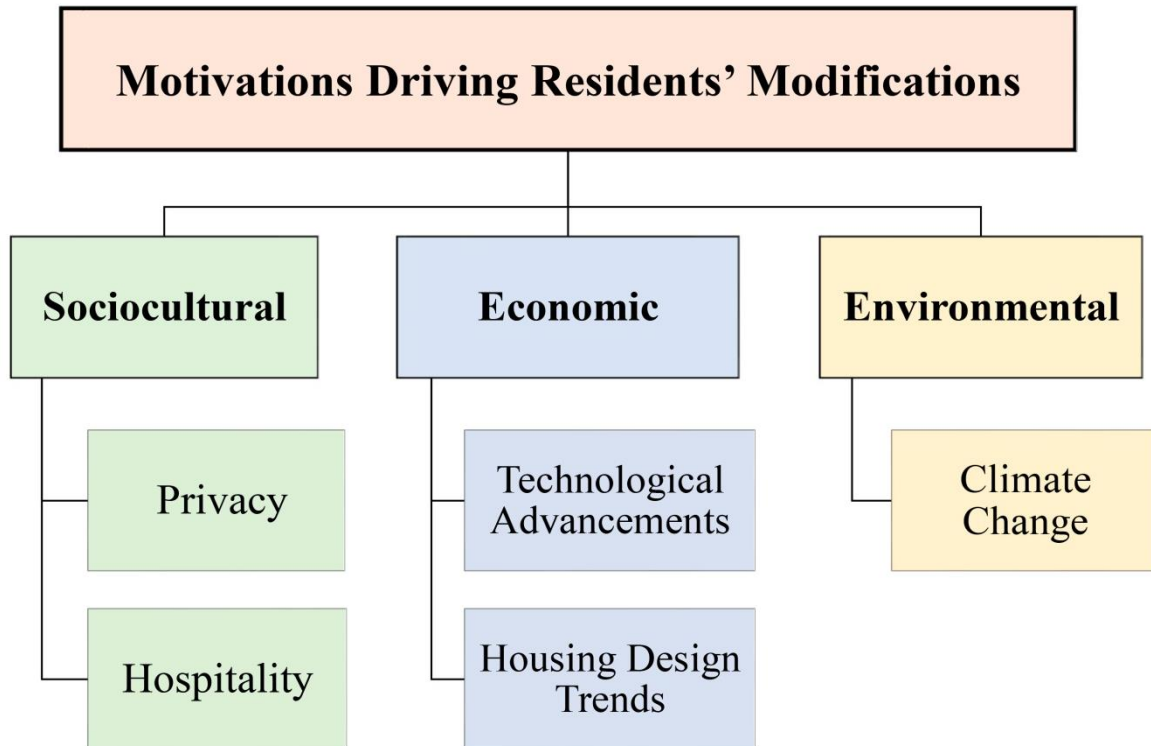


Fig. 2.2: Classification of Motivations for Housing Modifications Based on Literature (Drafted by the Author)

2.4.1.1. Sociocultural

Socio-culture is among the most critical influencers on residents' behaviors (Salman, 2016). This is prominently evident in the various house designs and functions expressing diverse cultural and social principles and concepts (Lawrence, 2019). Indeed, inhabitants rate housing conditions based on the extent to which family and cultural norms are employed (Morris & Winter, 1975). Not only that, if the housing does not meet those standards, it frequently leads to residents' dissatisfaction (Morris & Winter, 1975). Ozer & Jacoby (2022) found that sociocultural norms fundamentally influence housing designs and standards. They also underline that these norms determine the varying requirements for subsidized housing residents. Furthermore, Obeidat et al. (2022) claim that the modifications made to housing designs are based on sociocultural norms. Likewise, Saraiva et al. (2017) acknowledge that each community has cultural values that should be reflected in space designs.

Unfortunately, many contemporary housing designs today disregard the local culture and social demands (Aljawder & El-Wakeel, 2019; Salman, 2016). This absence of sociocultural attributes affects resident contentment, necessitating the adaptation of house plans to produce more appropriate and individualized living environment (Abed et al., 2023). Thus, architects must always be conscious of the region's cultural values and incorporate them into residential designs. This is due to people's constant yearning and enduring desire to keep a connection with their heritage and culture (Habraken, 2002). Notably, the socio-culture is deeply rooted in religious beliefs and more than merely a precious heritage for citizens or fundamental customs and traditions passed down through generations. Islamic culture, for example, has

influenced the architectural designs and typologies of various traditional, historical, and contemporary public buildings and residences (Sobh & Belk, 2011; Taki & Alsheglawi, 2022). According to Othman (2007), Islam's teachings include guidelines with tangible impacts on Muslim families, particularly affecting space organization and residents' behavior. For this reason, in Arab and Muslim countries, socio-culture encompasses solidified and robust principles of considerable importance in the Islamic religion.

The following factors are considered among the most critical sociocultural values and Islamic precepts that have a substantial and direct impact on housing designs in Arab countries, including Bahrain:

a) Privacy

Privacy is concerned with protecting personal information and avoiding unwelcome visual and physical access (Aljawder & El-Wakeel, 2020). In residences, this multidimensional conception can be divided into four levels: private limits among neighbors, genders, family circles, and personal privacy (Mortada, 2003). The significance of privacy lies in allowing residents to have a life independent from the outside (Salman, 2016). It is imperative to note that privacy is not merely a part of the sociocultural fabric but also an essential religious requirement for Muslims. For this reason, visual privacy has always been a recurring issue within Muslim houses (Aljawder & El-Wakeel, 2020; Rahim, 2015).

Several studies have focused on privacy as a fundamental sociocultural factor that plays a prominent role in housing designs and transformations. Rahim (2015) underscores that visual privacy impacts house design features such as space layout and the placement of doors and windows in respect to

the neighboring houses. In Saudi Arabia, Alnaim & Noaime (2022) confirm that privacy is an essential sociocultural factor that defines the spatial configuration of dwellings. This encompasses privacy in terms of sight, hearing, and odor. Obeidat et al. (2022) point out the vital role of privacy as a primary motivating factor behind residents' modifications in Jordanian public housing. Abed et al. (2023) have also found that inhabitants modify their housing units to alter the degree of privacy. Similarly, Sobh & Belk (2011) indicate that most Qatari houses contain private spaces for household members, male relatives, and visitors.

The same applies to the local context, where traditional courtyard houses have always been an outstanding privacy instance in Bahrain. These houses were designed with specific traits and qualities to meet the religious and cultural demands of the inhabitants (Aljawder & El-Wakeel, 2019). All house rooms have windows overlooking an open central courtyard to ensure residents' privacy, as illustrated in Figure 2.3 below.

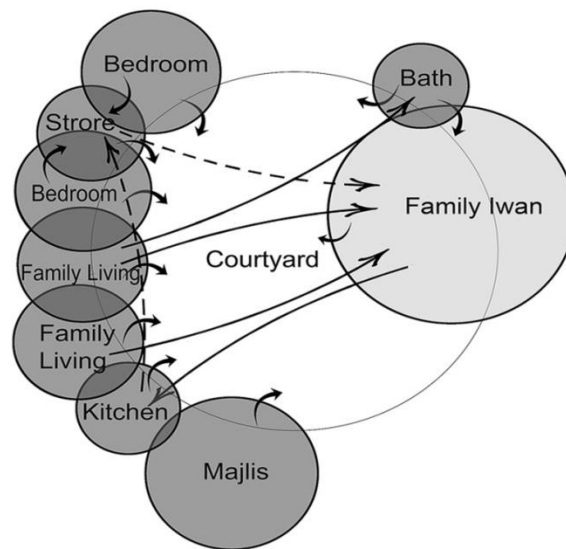


Fig. 2.3: The Spatial Relationship between the Courtyard and Adjoining Spaces in Traditional Bahraini Houses (Adopted from Remali et al., 2016)

Nowadays, while modern architectural styles have been gaining considerable traction, Bahraini residents nevertheless prioritize sociocultural attributes in their home designs, with a particular emphasis on privacy (Taki & Alsheglawi, 2022). According to Lafi & Al-khalifa (2022), the demand for privacy is increasing significantly in today's Bahraini contemporary residences, making it one of the critical considerations in design. This is further evidenced by Aljawder & El-Wakeel (2020), who claims that residents of Bahrain have an enormous need for visual privacy, which poses difficulties for developers. Al-Khalifa (2015) attributes this need to shield female family members from being exposed to foreign males. Alkhenazi (2018) also indicates that, in Bahraini houses, spaces used for social gatherings with non-relative visitors adhere to gender segregation. Saraiva et al. (2019), likewise, found that residents of the Samaheej housing project separate the Majlis from the rest of the house.

Moreover, Taki & Alsheglawi (2022) contend that privacy constitutes one of the primary factors influencing the layout and spatial configuration of Bahraini houses. Due to that, Taki & Alsheglawi present some suggestions for housing designs in Bahrain. They underline the essential need to isolate the guest room from the private areas of the house inhabited by family members, as well as provide a different exterior entry for that guest quarter. They further demonstrate that the windows of the bedrooms shouldn't overlook the main roadway. In addition, they advocate erecting covered outdoor areas to ensure visual privacy for female inhabitants, allowing them to utilize these spaces freely.

b) Hospitality

Hospitality is one of the noble values and qualities profoundly ingrained in Arab culture (Abed et al., 2023). This act involves welcoming and greeting visitors and assuring their comfort (Abed et al., 2023). It is also regarded as a societal custom that continues to shape individuals' behaviors (Salman, 2016). Indeed, hospitality is more than just a critical sociocultural factor; it is also regarded as one of Islam's fundamental morals and values (Sobh & Belk, 2011). Prophet Muhammad, peace be upon him, taught supreme virtues and urged the high morals of entertaining neighbors and guests and treating them with kindness and respect.

Moreover, hospitality in Arab-Muslim societies is essential for improving social ties among family members and the whole community (Othman, 2007). It is observed on several occasions especially during Ramadan and Eid, where there are regular family reunions, invites from relatives, and warm receptions for acquaintances and friends. Besides, a particular form of hospitality in Arab culture is when a stranger is sheltered in a house and fed for three days without being questioned, signifying that the stranger is not just greeted but also treated as one of the family members (Sobh & Belk, 2011). Due to the importance of hospitality in Arab and Muslim cultures, a specific space called Majlis has been allocated in households for welcoming visitors, particularly males. Sobh & Belk (2011) point out that the availability of social spaces for men and women is essential in Middle Eastern houses. They further demonstrate that the females in Middle Eastern homes frequently entertain visitors in living rooms, whereas men use the Majlis.

Hospitality has been dramatically valued in Bahrain, evidenced by traditional houses that feature designated Majlis for male meetings. According to Salman (2016), this indicates solid social ties, generosity, and a manner of expressing riches and enjoyment. Hospitality is also considered an essential cultural trait of Bahraini families since visitors are usually expected, and welcoming them maintains the social circle (Alkhenazi, 2018). Commonly, if guests come at lunch or dinner time, they must be served a meal (Taki & Alsheglawi, 2022).

Saraiva et al. (2019) found that, in the Samaheej housing project, the Majlis serves as an exhibit zone, as the homeowner can manifest care, generosity, and hospitality for guests; hence, it should always be maintained neat and ready for hosting visitors at any time. They also found that in some households, female visitors utilize the living area while male visitors utilize the Majlis, which supports Sobh & Belk's (2011) assert. For this reason, many Bahrainis modify their dwellings to make the living room spacious enough to accommodate guests (Salman, 2016). Moreover, Taki & Alsheglawi (2022) also underline the significance of both the front and back yards in Bahraini houses for hospitality. They suggest that the front courtyard is partially private and suited for male visitors. In contrast, the back patio has more privacy and could potentially be allocated for the gatherings of household members and female visits.

So, sociocultural factors play an integral role in the spatial organization of the housing layout (Abed et al., 2023). Privacy and hospitality, in particular, are major sociocultural characteristics and part of Arab culture and Islamic religious teachings that significantly influence housing designs in Arab-Muslim nations such as Bahrain. As a result, several modifications

made by subsidized housing residents are driven by those factors, demonstrating the need to focus on them throughout the design stage.

2.4.1.2. Economic

The economic development and contextual features play a considerable role in influencing residents' behaviors, manifested in the modifications made to subsidized housing units. Aduwo et al. (2013) indicate that various interconnected factors, including socioeconomic trigger housing alterations. Sunarti et al. (2019) agree with the same view, claiming that economic status impacts the transformation of housing units. Similarly, Avogo et al. (2017) argue that housing transformations are attributed to rapid economic dynamics and notable shifts in residents' circumstances and conditions. This implies that several economic factors influence residents' housing behaviors. Those factors are classified as follows:

a) Technological Advancements

One of the most critical factors affecting housing design is the technological advancement. It mainly refers to the developments or innovations in housing design and construction. Few housing research has tackled this issue and its impact on home design and occupant preferences. As per Muianga et al. (2022), the advancements related to building materials and techniques considerably influence housing designs. Salman (2016) emphasizes that technology has substantially transformed the shape of architecture during the past two decades. Furthermore, Mirmoghtadaee (2009) found that modernization contributes to housing transformation, as evidenced by contemporary dwellings that are smaller than traditional ones.

Habraken (2002) also highlights this indicating that individuals always want to remain clinging to their cultural norms while simultaneously seeking contemporary comforts and modern conveniences. This stems from people's desire to stay current with recent developments and avoid feeling left behind in global progress. This tendency is also observable in housing sectors in the Arabian Gulf area, including Bahrain, where economic prosperity and social development influence individuals and their interaction with their surrounding environment and living spaces (Salman, 2016).

According to Saraiva et al. (2019), the swift shifts in the Gulf region in the aftermath of the oil discovery have greatly influenced the social fabric and the daily manifestation of the inhabitants, including the built environments. That's particularly apparent in housing designs in GCC countries, as households migrated away from courtyard houses and toward contemporary ones that encourage individual expression (El-Haddad, 2003). Similarly, Alkhenaizi (2018) argues that Bahraini residents' behaviors have changed due to globalization. Alkhenaizi (2018) further demonstrates that many Bahraini households currently live in modest, modern-style homes rather than the larger ones that used to house generation upon generation.

Salman (2016) supports this argument, claiming that globalization has impacted the built environment by considerably minimizing the plot size of residences. Salman (2016) expands on this point, indicating that contemporary Bahraini houses have become smaller than they were in the past, particularly with the advent of air conditioning that necessitates closed spaces, thereby contributing to the decline in the traditional courtyard concept. This explains the rationale behind the development of housing typologies with diverse layouts and spatial arrangements by Bahrain's

Ministry of Housing (MoH) since 1976, as Saraiva et al. (2017) demonstrate. So, indeed, technological advancements affect residents' behaviors and housing typology and lead to various housing transformation (Remali et al., 2016).

Remali et al. (2016) have investigated this in-depth by examining the typological evolution and alterations of housing units in four cities in the Gulf region, including Manama City in Bahrain. Their findings show a four-stage evolution of housing development: "the Post-Nomadic Period, the Traditional Period, the Modern Period, and the Contemporary Period." As indicated in the development of housing typology in Manama City, the evolution started with modest houses and progressively evolved to cubic structures on more miniature land spaces (Figure 2.4). According to Remali et al. (2016), this evolution reflects the consequences of rising oil revenue, socioeconomic conversions, and technological advancements.

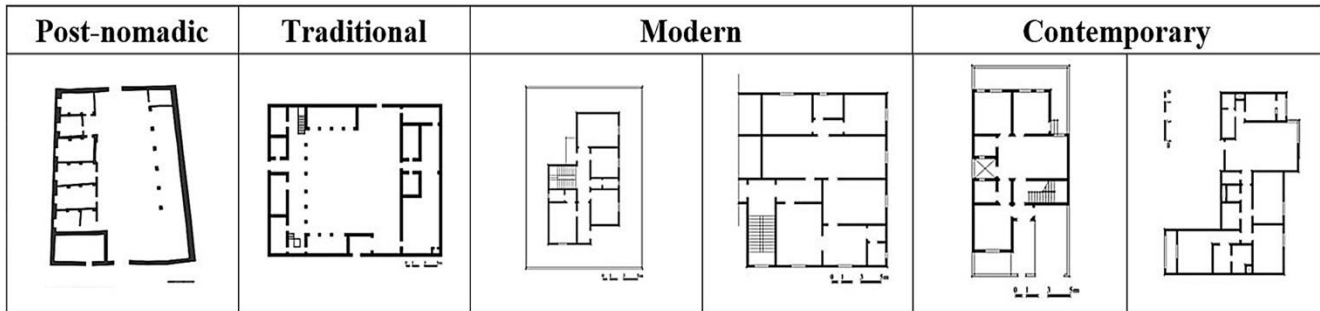


Fig. 2.4: Housing Typology Evolution in Manama City (Adopted from Remali et al., 2016)

The influence of technological development is also evident in the materials used in building construction and the adoption of modern styles. Aljawder & El-Wakeel (2020) corroborate the widespread application of glass, concrete, and steel as a sign of advancement and progress in

construction processes. Saraiva et al. (2019) have also tackled this issue, arguing that Bahraini residents appear to be attempting to strike a balance between cultural customs and economic and technological advancements. This duality creates a gap between individuals' perceptions of societal relationships and how spaces are arranged. This is observed today in Bahraini residents' demand for privacy alongside a penchant for modern designs featuring spacious spaces firmly connected to the outdoors (Taki & Alsheglawi, 2022). So, economic prosperity and technological advances are prominently reflected in housing designs. Therefore, modifications made by inhabitants vary as new demands of residents emerge with the new dwelling designs.

b) Housing Design Trends

Housing design trends represent another factor related to the economic aspect influencing individuals' behaviors. This factor refers to the dominant tendencies or directions in housing preferences, construction techniques, or architectural styles that have acquired acceptance and prominence among residents during a specific period, particularly with the social media revolution and the rise of artificial intelligence. It also reflects the recurrent and prevalent patterns and behaviors in home designs that occur in a particular region.

Alexander (1977) delves deep into this topic, demonstrating that each town has a shared language that consists of distinctive small and large patterns defined by the community. Alexander (1977) further argues that it is essential to know and understand the evolving global patterns that relate to each society. This indicates that there are common patterns among housing

designs that reflect the preferences of the local community, which vary over time. Indeed, this further signifies that many of the modifications that residents make in subsidized housing units are driven by the recent and prevalent trends in housing designs. According to Nwankwo et al. (2014), housing modifications change over time, reflecting new trends that necessitate ongoing research. Salman (2016) highlights that globalization has introduced numerous new trends, resulting in the progressive disappearance of traditional indigenous designs.

Moreover, Avogo et al. (2017) discuss how recent urbanization trends in their study area have adversely impacted the socioeconomic stability of low-income residents in public housing. As a result, many people have modified their dwellings to cope with these evolutions and establish a new sort of metropolitan adaptability. This aligns with the discussion of Obeidat et al. (2022), who confirm that the spatial configurations of housing units vary throughout time due to residents' evolving behavioral patterns. For this reason, designers and developers must be conscious of consumers' changing demands and preferences and stay current with the latest trends in housing designs (Aduwo & Ibem, 2017; Lee et al., 2007).

This has also been highlighted in local research. Taki & Alsheglawi (2022) indicate that the optimal housing design and space arrangement must be based on the current tastes and preferences of the residents as well as recent design trends. Salman (2016) underlines that Western patterns currently affect customers' choices and inclinations for dwelling designs. Similarly, Aljawder & El-Wakeel (2020) affirm that individuals' interests are nowadays directed to the latest designs and building techniques. Aljawder &

El-Wakeel (2020) further clarify that this tendency stems from residents' desire to have contemporary and trendy homes.

So, specific trends in housing designs periodically emerge and spread among residents. These trends vary across regions, as they are influenced by the economic conditions and housing preferences of the majority of occupants. Accordingly, many of the modifications that residents make in subsidized housing are based on prevalent design trends. Therefore, it is crucial to identify the recent design trends that trigger housing modifications.

2.4.1.3. Environmental

Studying the intricate relationship between individuals, society, and the environment is crucial in housing studies (Nguluma, 2003). This arises from the fact that the surrounding environment significantly influences individuals' behaviors within their residences. This interplay, therefore, prompts inhabitants to embark on an ongoing process of modifications, customizing their dwellings to align with their necessities and tastes. According to Abed et al. (2023), numerous environmental factors motivate residents to undergo diverse housing modifications. Thus, it's imperative to highlight these factors as a critical step toward improving individuals' living spaces (Nguluma, 2003). The existing literature on housing modifications has mainly concentrated on the following critical environmental factor:

a) Climate Change

Climate change is one of the current concerns that societies face (Opoku, 2015). It's a major environmental factor that impacts housing

design and prompts residents to undertake a variety of transformations. According to Nwankwo et al. (2014), environmental elements like indoor air quality and light, can either enhance or hinder residents' well-being, necessitating frequent home alterations. Muianga et al. (2022) highlight that the primary motive for public housing modifications is to adapt to the issues and challenges associated with climate change. For this reason, Muianga et al. (2022) stress the importance of utilizing energy more effectively in the design of housing units to mitigate the effects of climate change. Moreover, Ozer & Jacoby (2022) expand on the same topic, claiming that the global climate issue has revealed severe weaknesses and flaws in the designs of subsidized housing.

Thus, climatic conditions considerably impact inhabitants' comfort and satisfaction and are considered primary drivers for the modifications. Indeed, this poses a substantial challenge for residents, particularly in regions like Bahrain, which has high temperatures for most of the year. Taki & Alsheglawi (2022) indicate that Bahrain's hot and humid weather endures more than half of the year. They further demonstrate that due to this severe climate, occupants prefer to spend most of their time in indoor spaces, and a cooling system is frequently needed during the day to maintain the desired thermal comfort. Salman (2016) also elaborates on this, noting that residents in Bahrain are accustomed to staying in indoor air-conditioned spaces and are unable to cope with extreme weather conditions. This, in turn, prompts Bahraini residents to modify their dwellings to improve thermal comfort levels while saving energy.

So, inhabitants constantly behave in response to varying weather patterns and evolving climatic conditions, including temperature fluctuations

and variations in humidity ratios or wind dynamics. This continual interplay between climate variability and individual behavioral responses manifests in the modifications made to living spaces. This implies that considering climate conditions in housing design is very important as it will strengthen the link between individuals and their surroundings, resulting in suitable living environments (Taki & Alsheglawi, 2022). Al-Khalifa (2015) highlights the same point, indicating the need for an environmental strategy to mitigate the consequences of climate change, including the increase in humidity and temperatures.

Based on the literature reviewed above, a variety of insights arise from analyzing the 'Motivations behind residents' modifications.' These insights indicate that residents of the same region exhibit similar behaviors as they share the same sociocultural customs and traditions and experience the same economic and environmental conditions. Consequently, housing modifications are considered an effect of these behaviors (Aryani & Jen-tu, 2021). In other words, there are common multiple factors motivating subsidized housing inhabitants to modify their residences, pointing to an intricate relationship involving social, economic, and environmental motivations. All of these motives have a substantial influence on residents' behaviors and play an integral role in the modification process (Figure 2.5).



Fig. 2.5: The Sequential Emergence of Housing Modifications (Source: The Author)

Notably, these motivations are vulnerable to change; accordingly, the common needs and behaviors of each generation vary with time. This means that housing modifications will endure as families expand (Sunarti et al., 2019). To put it another way, residents' common modifications that reflect their needs and housing preferences, as well as the main motives behind them, change from time to time. Therefore, there is a need to investigate those aspects constantly as this contributes to providing a comprehensive understanding of the major issues driving residents' modifications in housing units and developing the appropriate remedies to address this phenomenon.

2.4.2. Implications of Residents' Modifications

While modifications to housing units increase residents' satisfaction, they negatively impact the building's efficiency and sustainability (Aduwo et al., 2013; Othman, 2007). This arises due to residents' incorrect behaviors and habits during the modification process, triggering numerous problems and risks. Various studies have acknowledged the incidence of these improper practices and illegal acts among subsidized housing dwellers. Abdellatif & Othman (2006) found in their research that the behaviors of end-users contributed to the degradation of housing units. Chukwuma-Uchegbu & Aliero (2022) revealed that many residents in low-income housing developments in Nigeria disregard the regulations and alter their dwellings independently. Moreover, Aryani & Jen-tu (2021) discovered that residents surpass the size limitations established by the local authorities on housing units.

Tipple (2000) adds that housing modifications are often seen as illegal since there is frequently a disparity between building standards and

residents' needs. Likewise, Mwaba (2017) claims that most modifications are unlawful and chaotic because householders behave as project managers. This is consistent with Aduwo & Ibem's (2017) argument that housing modifications are mostly executed without referring to building plans or obtaining the requisite approval. Indeed, unauthorized modifications pose several dangers and serious consequences, leaving houses vulnerable due to incorrect building procedures and a lack of awareness about construction (Garrefa et al., 2021).

Abdellatif & Othman (2006) conducted a study on a low-income housing project in Abu Dhabi, United Arab Emirates, investigating the mistakes and negative impacts of residents' modifications. The findings of this study have revealed that these mistakes resulted either from wrong design decisions or construction flaws caused by the residents through the modification process. For example, one of the clients' mistakes was converting the parking lot into stores and apartments. This resulted in sanitary obstructions and power outages due to increased electricity and water usage. The study also points out another mistake: placing the kitchens and toilets above the electric rooms, which might cause water leakage into the latter, endangering residents' lives.

Therefore, when residents make various modifications, they violate the standard regulations and fundamental housing policies, resulting in severe consequences (Rothenberg et al., 1991; Tipple, 2000). Violations and serious construction mistakes are among the dangerous consequences of residents' modifications in subsidized housing projects (Aduwo & Ibem, 2017; Mwaba, 2017; Othman, 2007). These may endanger the lives of residents while also impairing the performance of the buildings and shortening their

life span (Abdellatif & Othman, 2006). This, in turn, impacts the habitability of the dwellings and the sustainability of the surrounding environment (Abdellatif & Othman, 2006; Mwaba, 2017).

Furthermore, residents incur enormous financial burdens due to the modification process (Aduwo & Ibem, 2017; Mwaba, 2017). Such expenses are prohibitively expensive for residents, even if the modifications are minor. Notably, this goes against the main target of the subsidized housing project, which aimed to support low-income residents (Granath Hansson & Lundgren, 2019). Beyond that, the abundance of modifications and their variations distort the monotony and the uniform physical appearance that characterizes the housing units in these projects (Aduwo & Ibem, 2017; Mwaba, 2017; Nwankwo et al., 2014). As a result, it negatively affects the region's aesthetics and the identity of the place (Nwankwo et al., 2014).

Makachia (2005) investigated the transformations of a housing project in Nairobi city and discovered that they have influenced the aesthetic aspect. Makachia further found that the modifications created shambles, reduced the intended convenience and privacy, decreased interior ventilation for the interiors, and limited leisure and social spaces. Garrefa et al. (2021) point out some potentially catastrophic consequences of informal alterations to housing units. These include issues with acoustics, thermal comfort, and infrastructure.

Mwaba (2017) agrees, indicating that housing modifications gradually affect the community's comfort, well-being, and safety. Furthermore, Aduwo & Ibem (2017) note that the transformation process entails a significant financial commitment. They also add that the illegal modifications lead

to physical and spatial deformation. Additionally, Aryani & Jen-tu (2021) highlight an essential point in this regard, indicating that constant alterations to housing units decrease the opportunity for future generations to modify them as the structure may be damaged, making the house useless.

This issue also exists in subsidized housing projects in Bahrain. Although local research did not focus on the consequences of modifications, they were extensively tackled by local Bahraini newspapers. According to the article “774 Serious Building Violations” (2020), there have been several infractions of building modifications in housing projects, including wrong engineering practices that resulted in cracks in the walls of the units, water leaks, and faulty electrical connections that may lead to fires. The article also demonstrates that many residents attempted to fix the illegal practices, but they encountered difficulties due to the seriousness of those infractions and the high financial cost. Moreover, it clarifies that some other residents had difficulty obtaining building permits because they were not adhering to the regulations.

In addition, Ahmed (2017) points out that many modifications are undertaken for aesthetic and decorative purposes, resulting in violations and inhabitants incurring significant financial costs as they alter the design and finishes of their dwellings. For example, one of the noticed violations was a subsidized housing occupant expended a considerable amount beyond the cost of the housing unit itself to enlarge his residence, as cited by Ahmed (2017). Another article “Procedures against Unauthorized Additions and Modifications” (2018), states that periodic checks and upkeep of the residential units revealed that several citizens began making random and unauthorized modifications, including electrical connections and

construction works, by unskilled labor. This, indeed, may endanger the lives of the residents as well as harm the rainwater drainage network of the whole subsidized housing project. The article further indicates that many of the building violations are against the terms of the contract signed by residents with the Ministry, despite the Ministry's constant emphasis on the importance of adhering to legal guidelines and procedures during the lectures presented before handing them the keys. Similarly, the article "Compliance with Building Codes" (2021) discusses the risks that result from violations of building modifications and incorrect engineering practices. Those include wall cracks, water leaks, faulty electrical connections that may lead to fires, and blockages in sewage drainage systems and rainwater drainage networks.

Thus, all that underscores the crucial role of architects and experienced specialists in the modification process. Consequently, it's important to involve experts and engineers in this complex process, as many residents ignore this (Nwankwo et al., 2014). This is also supported by the fact that the designs of housing projects are related to many aspects, including social, economic, and environmental, making them complex and requiring experts from various disciplines (Suglia, 2018). Garrefa et al. (2021) expanded on this, stating that the modification process is extensive, requiring a feasibility study, comprehensive design, a cost assessment, and many other procedures. Therefore, experts, such as professional engineers and designers, must understand residents' behaviors because their primary role is to serve and meet their (Habraken, 1988; Mahmoud, 2018).

So, the mistakes and illegal practices are considered part of the common wrong and risky behaviors many residents make during the

modifications process in subsidized housing (Abdellatif & Othman, 2006). This is significantly owing to residents' scanty experience in this field. Therefore, it's essential to pinpoint those mistakes and flaws in residents' modifications in low-income housing projects to prevent duplicating them and enhancing their quality in subsequent projects (Abdellatif & Othman, 2006). Besides, identifying these mistakes is a critical step toward understanding the issues that lead to residents' modifications.

Overall, the process of residents' modifications, motivations, and implications probably vary among nations (Aduwo et al., 2013). At the same time, they are comparable for the same region since inhabitants of subsidized housing in a particular area have common housing attitudes and practices (Salman, 2016). However, there are some differences in residents' behaviors related to their lifestyles that experts must be aware of and account for in every modification they make, as they differ from one family to another and from one house to another.

2.4.3. Lifestyle and the AIO Approach

The concept of lifestyle is usually employed in studies of users' behaviors and preferences (Lee et al., 2007). Scholars have heatedly debated and described this concept in a variety of ways. Plummer (1974) described it as a way of life that deals with many issues intimately connected to individuals' attitudes in their daily life and work. Reichman (1977) considered it an individual's behavioral reaction to socioeconomic disparities. Similarly, Veal (1993) defined it as a distinct pattern reflecting interpersonal or social behavior. Bourdieu & Nice (1984) also described it as a behavioral pattern that reflects one's social condition and is based on

cohesive socio-demographic variables. This is consistent with the viewpoint of Adnan et al. (2022), who assert that lifestyles are behavioral patterns. Furthermore, Jensen (2009) believe that lifestyle should not be viewed as a fixed thing because it is associated with mutable habits, implying that lifestyle changes with time. This indicates that lifestyle research is critical in understanding users' behaviors.

Most studies focus on lifestyles as a representation of behavioral orientations and patterns (Zhao & Lyu, 2022). This is reflected in residents' modifications to their units, resulting in various design patterns (Nanta, 2009). Consequently, this suggests a relationship between residents' modifications in housing units and their lifestyles. According to Aduwo et al. (2013), residents modify their housing dwellings because they do not meet their demands and lifestyles. Avogo et al. (2017) indicate that residents transform their living spaces in housing units as a response to family structure and lifestyle variations. Besides, both Mirmoghtadaee (2009) and Nanta (2009) confirm the link between housing modifications and residents' lifestyles. They suggest that the physical attributes of residential units reflect the dominant lifestyles of their inhabitants, which evolve in response to sociocultural influences. Mirmoghtadaee (2009) further emphasizes that residents alter their environments to suit their needs and lifestyles.

Likewise, Sidawi (2008) found that considering users' lifestyles throughout the initial planning phase contributes to avoiding negative and undesirable consequences like the consumption of time and effort for modifying housing units to meet particular needs. Due to that, Sidawi (2008) argues that it's imperative to raise awareness about the significance of integrating individuals' lifestyles into affordable housing designs. Besides,

Lee et al. (2007) underline the profound relationship between users' lifestyles and housing preferences. Accordingly, Lee et al. (2007) emphasize the necessity of studying and comprehending how lifestyles powerfully shape residents' housing behaviors and perceptions. A recent study by Obeidat et al. (2022) highlights the same point, indicating that housing transformations and designs are reflections of people's lifestyles and spatial needs.

Diverse variables can influence users' lifestyles, including income, fortune, age, socioeconomic factors, material status, presence of children, place, and interests (Beamish et al., 2001). Those variables can be examined by the "AIO approach," which is a measurement tool developed to study users' lifestyles and understand their behaviors (Adnan et al., 2022; Lee et al., 2007; Zhao & Lyu, 2022). It was first devised by Wells et al. (1971), focusing on three dimensions: users' activities, interests, and opinions. These dimensions are associated with how people utilize their leisure time, their areas of interest, and their perspectives (Zhao & Lyu, 2022). They are also concerned with how people interact with their surrounding environment (Meidayana & Mukhlis, 2020). Later, Plummer (1974) expanded the AIO approach by including the demographic dimension. According to Plummer, demographic is related to several characteristics, including age, family size, and occupation.

Thus, the AIO approach is an effective tool for assessing the different lifestyles of users (Adnan et al., 2022). It explores four dimensions of users' lifestyles: their Demographics, Activities, Interests, and Opinions. As initially stated by Wells & Tigert (1971) and recently clarified by Zhao &

Lyu (2022) and Adnan et al. (2022), each of these dimensions focuses on a particular aspect and is concerned with several variables as follows:

- Demographics: this dimension is concerned with general information about the users. It comprises family size, gender, profession, dwelling, geography, etc.
- Activities: this dimension is concerned with the observable behaviors of users. It includes their actions, hobbies, daily routine, and how they spend their time.
- Interests: this dimension is concerned with users' subjective inclinations and passions toward particular aspects that attract their attention. It includes their prioritizations and distinct choices.
- Opinions: this dimension is concerned with users' perceptions, views, and reactions in particular situations. It includes their degree of satisfaction and future plans.

So, as noted earlier, subsidized housing residents share similar behaviors shaped by social, cultural, and economic influences. Besides, they may share some incorrect and risky behaviors and practices that can lead to severe implications. Conversely, residents have different behaviors that arise from their distinct lifestyles. This indicates that residents' modifications are a reflection of their behaviors. Thus, studying similar and different behaviors provides an in-depth understanding of the issues leading to residents' modifications in subsidized housing. Nevertheless, examining the current and recent solutions offered in this area is also necessary.

2.5. Available Solutions

The literature was not confined to investigating the types of transformations made by residents, but researchers also discussed different solutions and suggested strategies to mitigate this phenomenon and its negative consequences. The solutions found in the literature are classified into three key facets as follows:

2.5.1. Flexibility

Most of the literature has concentrated on flexibility as a viable solution for facilitating and mitigating the process of resident modifications in residences. Housing flexibility is described as the house's ability to cope with various social uses and spatial configurations (Schneider & Till, 2005). Numerous studies, particularly recent ones, have emphasized the significance of this approach. Aryani & Jen-tu (2021) underline the need for a flexible unit design to meet the diverse functions and increasing demands of inhabitants. Similarly, Obeidat et al. (2022) agree that designers must incorporate more flexibility in subsidized housing units' spatial configurations and layouts. Elkady et al. (2018) also support this, noting that an adaptable design allows for customization of the plan based on occupants' preferences. Besides, De Paris & Lopes (2018) argue that housing flexibility is one of the most critical topics constantly being researched. They further indicate that flexibility is the key to sustainable design since it prolongs the building lifespan and permits structural alterations that are required over time.

Thus, studies across various time scales have proposed different design solutions to achieve flexible housing units. One of the most significant solutions in this field is Habraken's (2002) "open building" concept. This concept involves separating a building into levels that can be modified independently, allowing for individual customization while maintaining the overall structural integrity. It focuses on flexible housing that adapts to occupants' changing requirements and encourages residents to design and build their surroundings based on their preferences (Habraken, 2002). According to Habraken (2021), this approach divides the building into two levels: "support and infill." The support represents the standard building structure that contains the foundation, columns, and slabs designed by architects and can be mass-produced in several locations. In contrast, the infill part represents the interior of the building, like the partitions and finishes, determined by users and varies according to their needs and desires.

Many professionals have employed this technique in housing developments. Indeed, it has proven its efficacy in delivering housing units adaptable to any circumstances at any time and involving end-users in the design process (Habraken, 2002). Nevertheless, implementing this proposal requires residents to hire an architect to design the infill component correctly based on their desires and needs while also supervising its construction. Thus, it may not be appropriate for low-income households because employing expert engineers would entail additional expenses, requiring them to perform the task themselves. As a result, the physical form will be distorted, and many mistakes, hazards, and violations will arise owing to the

residents' lack of experience in this field, as explained by Tipple (2000) and Aduwo & Ibem (2017).

In addition, De Paris & Lopes (2018) advocate using folding furniture for housing flexibility as it can be utilized for various functions. Raviz et al. (2015) also propose incorporating sliding walls to achieve flexible designs in residences. As Raviz et al. describe, sliding walls offer different alternatives for spatial arrangement, allowing residents to select any option based on the prevailing conditions. Besides, Garrefa et al. (2021) highlight the relevance of providing flexibility in the plot size of the housing unit. They claim that this allows inhabitants to adjust their homes and expand the spaces to accommodate additional functions and services.

Moreover, Ozer & Jacoby (2022) conducted a comparative analysis of technical standards for housing dwellings in various countries, demonstrating the techniques each country uses to deal with the challenges of residents' modifications. For instance, Ozer & Jacoby claim that Singapore pursues a unique technique based on offering master bedrooms with private bathrooms, spacious and open living rooms, and detachable kitchens. Additionally, Ozer & Jacoby describe Colombia's experience, which focuses on adding at least one more bedroom to the same residence to accommodate future generations. Hong Kong and China, on the other hand, prioritize adaptable interiors for housing via flexible partitions, as Ozer & Jacoby indicate. It is obvious that all the solutions employed in those countries are built on the principle of flexibility.

One of the recent solutions also provided for house adaptability is "flexibility in use." According to Lavikka & Paiho (2023), this can be

accomplished by introducing characteristics that improve the functionality of each space. Lavikka & Paiho also note that by employing this strategy, each room can serve many tasks, enabling effective utilization of spaces inside the house. They further elaborate on this idea with an example, indicating that installing a fireplace in each room of Finnish dwellings allows occupants to use the rooms for any activity regardless of external circumstances.

Simultaneously, local studies also expand on the same argument, highlighting the significance of flexible housing in Bahrain and providing some solutions. Taki & Alsheglawi (2022), for example, recommend employing flexible partitions because locals favor open-plan house designs. Additionally, they suggest placing an additional bedroom on the ground level as a spare area that might be used by an elderly family member who cannot utilize the stairs to access the bedroom on the first floor. Likewise, Alkhenaizi (2018) advocates designing adaptable residences that can be divided into separate apartments to meet the social needs of Bahraini families. As Alkhenaizi indicates, this will reduce future adjustments, save construction costs, and enable faster implementation of house modifications and improvements if necessary. Furthermore, Saraiva et al. (2019) recommend imitating traditional Bahraini house designs that provide spatial flexibility to accommodate all social activities while maintaining privacy and gender segregation.

Although the techniques described in the international studies might be beneficial in mitigating residents' modifications in subsidized housing, they may be incompatible with the local housing policies, design standards, and regulations based on cultural norms (Garrefa et al., 2021; Ozer & Jacoby, 2022). They must also be in sync with economic and social factors,

technological advancements, and market trends (De Paris & Lopes, 2018; Lavikka & Paiho, 2023; Schneider & Till, 2005). On the other hand, the solutions supplied by local studies are broad; therefore, a more detailed examination is required to explain their application.

2.5.2. Sustainability

Sustainability is one of the most significant issues in the architectural field at the current time. It's not merely a trend but a massive step toward healthier environments and better lifestyles (Abouelela, 2021; El-ghonaimy, 2010). According to Kirkby et al. (2023), sustainability is a development that addresses the demands of both current and future generations (Kirkby et al., 2023). It's noteworthy that this broad concept is a multifaceted one spanning across various domains (Suglia, 2018). Despite its complexity, it encompasses crucial characteristics that inhabitants aspire to incorporate into their home designs, encapsulated within three pillars: Environmental, Social, and Economic.

Regarding the environmental aspect, it focuses on providing a healthy and safe environment through the efficient use of natural resources while minimizing harmful consequences (Abouelela, 2021). It also ensures the long-term preservation of the environment for future generations (Taki & Alsheglawi, 2022). It includes elements like colors and materials, noise, lighting, and ventilation, all of which influence the health and well-being of individuals (Melnick, 2005; Nwankwo et al., 2014). The economic sustainability is concerned with durability and cost-efficiency solutions. This encompasses the appropriate use of resources to meet fundamental needs and improve living conditions (Taki & Alsheglawi, 2022). Furthermore, it

includes using locally available, environmentally friendly, and affordable materials that require less maintenance (Mokal et al., 2015).

As for the social aspect, it concentrates on ensuring that communities are cohesive and adapting to social changes (Abdellatif & Othman, 2006). It is also concerned with developing structures that foster well-being and considering their impact on societies and local communities (Abdellatif & Othman, 2006). Besides, social sustainability is linked to preserving local cultural values and heritage (Opoku, 2015). This suggests that the social aspect also includes the integration of traditions, customs, and norms, which promote socializing and contribute to creating a sense of place and belonging. In short, sustainability reduces the environmental footprint associated with building construction, fostering healthier environments for residents (Sassi, 2006).

Sustainability has been a primary focus of research in public housing (Maina et al., 2021). Numerous recent studies have discussed the significance of sustainability for housing projects (Garrefa et al., 2021; Ibrahim, 2020; Sharafeddin & Arocho, 2022). This is attributed to its crucial role in improving the quality of life, housing conditions, and residents' well-being (Abouelela, 2021; Muianga et al., 2022). Besides, implementing sustainability aspects in housing developments enhances their performance and boosts residents' satisfaction by catering to their demands and expectations (El-ghonaimy, 2010; Ibrahim, 2020).

On the other hand, there have been limited discussions about the importance of sustainability concerning residents' modifications in subsidized housing. Abdellatif & Othman (2006) indicate that sustainability

provides the possibility to accommodate future user modifications in low-income housing. They further emphasize that sustainable construction reduces the damages of residents' modifications while minimizing maintenance costs due to the durability of these structures. Moreover, the study of Nwankwo et al. (2014) discusses the modifications that residents have made in one of the housing developments in Nigeria. Nwankwo et al. (2014) found that residents' modifications primarily revolve around three critical elements: function, aesthetics, and structure. This reflects residents' need for the social and environmental aspects in the design of their houses.

Sharafeddin & Arocho (2022) have also tackled this matter, highlighting that public housing residents in Libya have modified the interior and exterior spaces due to the lack of social considerations within these developments. As a result, Sharafeddin & Arocho (2022) affirm the significance of social sustainability in public housing to enhance privacy, safety, and a sense of community. Furthermore, Aryani et al. (2015) examined the patterns of residents' modifications of low-income housing in Indonesia. According to Aryani (2020), sustainability must be implemented in future projects to reduce any substantial devastation that might occur during the modification process.

Hence, incorporating sustainability aspects into the design of subsidized housing assists in fulfilling the requirements of residents. This, in turn, contributes to reducing potential resident alterations and the detrimental consequences. In contrast, modifications and subsequent adverse impacts weaken the house's sustainability (Othman, 2007). This, therefore, restricts future generations from modifying the spaces to suit their new demands and evolving needs (Sunarti et al., 2019). Thus, it can be deduced

that these findings confirm a link between the sustainability of dwellings and the phenomenon of residents' modifications in subsidized housing. Accordingly, sustainability can be considered a vital and robust solution for addressing this phenomenon.

So, since sustainability aspects are essential for subsidized housing residents in satisfying their environmental, economic, and social demands (Talen & Koschinsky, 2011), it is necessary to comprehend the proper integration of these aspects into dwelling design to attain sustainable housing. That can be achieved at different levels and through several approaches. Thus, various solutions and strategies have been suggested in this regard. For example, Sharafeddin & Arocho (2022) advocate incorporating traditional architectural elements. According to the authors, “*Al-Mashrabiya*” is a sustainable component consistent with climate-responsive designs as it improves indoor environment quality and lowers energy consumption. They also underline the importance of incorporating nature into home designs to alleviate stress and create a welcoming atmosphere that promotes socializing among family members.

Moreover, Nwankwo et al. (2014) stress adopting the “*Equilibrium of Appropriate Balance*” concept. As Nwankwo et al. (2014) explain, this concept assures functional, aesthetic, and structural balance, which leads to sustainable housing and reduces modifications. Aryani et al. (2015) propose a different approach, stating that examining the patterns of residents' modifications and investigating their recent preferences aids in developing sustainable housing. Muianga et al. (2022) analyzed a group of studies to identify the appropriate actions for improving housing sustainability. The findings indicate multiple straightforward yet efficient methods that

contribute to housing sustainability. These include installing sizable openings to optimize ventilation and natural light indoors and employing wall insulation to enhance walls' performance. Besides, Gorantla et al. (2021) confirm that opaque and glazed walls are required for energy conservation in buildings. For this reason, Gorantla et al. (2021) present an "energy-efficient triple-glazing system" that minimizes the expenses of conditioning and emits greenhouse gases when contrasted with single- and double-glazing systems.

Locally, the Kingdom of Bahrain has paid great attention to housing sustainability. A variety of initiatives have been established in line with Bahrain's Economic Vision 2030 to promote secure, inclusive, resilient, and sustainable housing (Ministry of Housing and Urban Planning, 2020). Accordingly, local studies present some suggestions and solutions in this regard. Al-Saffar (2014), for instance, indicates that walls should be exceedingly insulated in housing units. According to Al-Saffar (2014), the wall is a fundamental element within the building's envelope that contributes considerably to lower cooling energy, carbon dioxide emissions, and overall energy consumption. Furthermore, Aljawder & El-Wakeel (2020) advocate expanding the use of sunlight, claiming that it is a crucial feature of building sustainability since it minimizes power usage. Thus, Aljawder & El-Wakeel (2020) propose the modern Mashrabiya as a feasible and viable solution. They argue that this technique capitalizes on the most recent advances in providing sustainable designs.

EzzEldin et al. (2022) present another approach, stressing the deployment of photovoltaic systems on the rooftops of housing dwellings to increase their environmental efficiency substantially. These solar systems,

according to EzzEldin et al. (2022), integrate aesthetics, social acceptability, and practicality. On the other hand, Taki & Alsheglawi (2022) developed a prototype model of an energy-saving house that fulfills cultural and social demands. The study results show that the prototype model can lower energy usage to fifty-seven percent and operational temperature to four degrees Celsius. Based on that, Taki & Alsheglawi (2022) outline parameters and specifications for sustainable housing design related to the layout, spatial configuration, and house components. These include using flat roofs, extensive green areas in different zones, double-glazed window systems, shaded corner courtyards, and others.

So, sustainability is one of the most significant features that must be considered in the design of housing units. While various studies underline the importance of sustainability for housing units, less emphasis has been given to its relationship with the phenomenon of residents' modifications in subsidized housing and its role in mitigating it. Furthermore, the existing sustainability solutions for this phenomenon, including the local ones, are insufficient as they have concentrated on the economic and environmental aspects. Nevertheless, it is critical to balance the three aspects of sustainability: Economic, Environmental, and Social (Abdellatif & Othman, 2006). This is consistent with the findings of Nwankwo et al. (2014), who observed that the design of public housing units in their study area was entirely centered on the economic aspect, prompting residents to make frequent modifications to their dwellings after occupation. This emphasizes the relevance of the three sustainability pillars for housing occupants.

However, it should be highlighted that these aspects fluctuate from one region to another, as indicated in the earlier section of the literature review,

which revealed that those aspects act as the motivating drivers underlying residents' modifications and vary among nations. Therefore, to obtain sustainable subsidized housing with fewer modifications, comprehensive strategies that considers cultural, social, economic, and environmental factors must be adopted. Besides, those strategies must be tailored to the regional circumstances and residents' aspirations. This implies that it's essential to investigate and comprehend the precise sustainability attributes primarily needed by subsidized housing residents (Talen & Koschinsky, 2011), which are considered among the issues leading to modifications. This will, in turn, aid in developing adequate and efficient sustainability solutions that cater to residents' demands and preferences, ultimately minimizing the necessity for housing modifications.

2.5.3. Local Housing Policies and Legislation

Local newspapers in Bahrain have discussed the initiatives and efforts of the MoH to prevent the infractions and consequences of residents' modifications. According to the article "774 Serious Building Violations" (2020), the MoH was keen to consider the potential of expanding housing units. It has taken substantial steps to ensure that occupants of subsidized housing can enlarge their houses without causing any damage or negatively impacting the project's overall physical appearance. As a result, the ministry has presented different design options that allow for expansions of up to 30% of the dwelling size, allowing residents to choose the one that best matches their needs. In addition, the article "81 Housing Violations" (2022) demonstrates that the MoH is keen to provide lectures to residents before contract handover. It further indicates that the purpose of those lectures is to encourage residents to adhere to regulations and obtain construction permits

before making any additions or modifications to their housing units. This will, therefore, protect the citizens from the threats that may arise due to random alterations.

Similarly, the piece "Compliance with Building Codes" (2021) shows that the MoH exhorts residents to preserve the external facades of residences to retain the architectural style and avoid unit distortion, as these facades reflect the identity of the housing area. Besides, it constantly develops awareness campaigns about building regulations in cooperation with the Ministry of Works. Notably, the latter has established regulatory laws for housing projects in Bahrain, which include guidelines for residents' additions and modifications. These laws are intended to safeguard residential units and prevent deformation while also maintaining public order.

According to the Ministry of Works, and Municipalities Affairs and Urban Planning (2018), the general legislation for building modifications that applies to all housing projects involves:

- Disallow making any additional openings, such as doors or windows, in the original façade, as well as modifying the original openings of the house.
- Prohibit creating parking lots outside the boundaries of the house's ownership.
- Prevent constructing an exterior guest room (Majlis) in the front setback area.
- Disallow canceling or changing the function of the covered parking spaces (garages) in residence.

The Ministry of Works, Municipalities Affairs and Urban Planning (2018) clarifies further laws relating to the three types of housing projects: A, B, and C. It should be noted that these classifications are based on differences in the plot area size. For example, the laws for housing projects of type A permit the additions to the original existing house under the following conditions:

- The percentage of the total built-up area should not exceed 180% of the plot area.
- The percentage of the built-up area for each floor should not exceed 60% of the plot area.
- Allowing the addition of residential facilities on the roof at a rate of no more than 30% of the roof area, which must be on the back side and is excluded from the permissible built-up area.
- Permitting extensions above covered parking lots (garages) and first-floor facilities only, noting that they should be counted within the permissible built-up area.
- Allowing the addition of two parking spaces in the front façade, parallel or perpendicular to the original parking lot.
- Allowing the addition of residential amenities, whether attached or separate from the existing house, according to certain conditions.

In a similar vein, the laws have been outlined for housing projects of types B and C. Even though the strategies of the MoH allow for some modifications to housing units and have contributed to their facilitation, many residents continue to commit violations that pose numerous dangers and threaten the sustainability of houses, as evidenced by the article

"Unlicensed Modifications in the 'Lawzi' Units" (2018). Therefore, relevant solutions that contribute more to minimizing the hazards associated with this phenomenon are required. This requires first investigating the issues that lead to residents' modifications in subsidized housing units.

2.6. Conclusion

2.6.1. Key Insights and Knowledge Gaps

Based on the literature review, the phenomenon of residents' modifications in subsidized housing is widespread locally and internationally. Although this process is inevitable, as residents will continue to make alterations based on their needs and preferences, it can nevertheless be decreased or facilitated for occupants. This necessitates finding appropriate remedies, as the currently available solutions are insufficient. In addition, given the different designs of subsidized housing among countries, this mandates approaches and strategies suited to the particular policies of each nation. This, in turn, requires a deep understanding of the issues driving the modifications.

In fact, comprehending the root causes behind housing modifications involves an examination of residents' behaviors. This is because the existing research shows that this phenomenon is mainly associated with the behavioral patterns of inhabitants. In other words, studying residents' behaviors is critical for exploring the underlying issues that lead to modifications. This perception serves as the basis for developing proper solutions and strategies for mitigating and alleviating these transformations and their consequences (Figure 2.6).

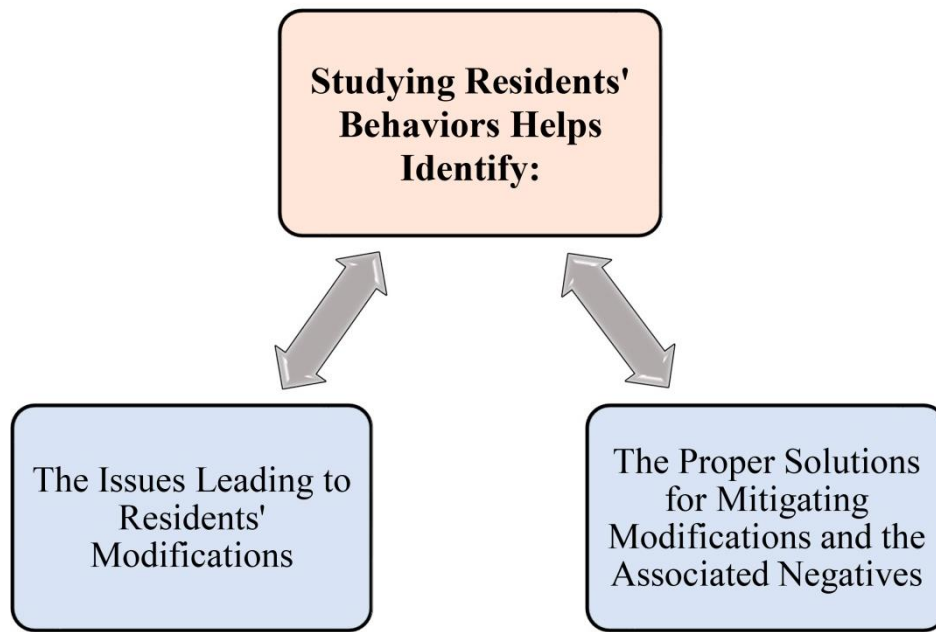


Fig. 2.6: The Advantages of Studying Residents' Behaviors in Subsidized Housing
(Source: The Author)

Notably, the literature further shows that a variety of factors, such as social customs, economic settings, and environmental conditions, shape residents' behaviors. Since these factors vary by region, the issues behind the phenomenon also differ. This, therefore, emphasizes the significance of conducting a thorough investigation of this phenomenon, digging into the particular issues in each nation, including Bahrain. Hence, based on those findings derived from the analysis of the existing literature, it's evident that there are some knowledge gaps in the local and international studies.

Regarding the local context, despite the prevalence of residents' modifications in Bahraini subsidized housing units, particularly in recent times, local research has paid minimal attention to this phenomenon, as only a few studies have addressed it. Besides, most existing local studies in this regard have concentrated on the modifications made by residents in private

housing rather than subsidized housing. Therefore, there is a need to explore the issues that lead to residents' modifications in subsidized housing in Bahrain.

In terms of the broader international context, it is critical to note that while the literature has extensively discussed residents' behaviors in subsidized housing, few have addressed the similarities of these behaviors in the process of modifications. Thus, more research is required to investigate the intricate details of housing modifications among most subsidized housing inhabitants in light of the changing housing preferences and demands. This also encompasses residents' common mistakes and incorrect practices that were not adequately highlighted despite the seriousness of the matter, its negative impacts on the buildings, and its widespread prevalence in subsidized housing worldwide.

In addition, few studies have been conducted on the differences in behaviors related to the lifestyle of subsidized housing residents, notwithstanding the literature indicating an association between the modifications and lifestyles. Despite the efficiency of the AIO approach in studying and comprehending users' lifestyles and behaviors, only a limited number of studies have applied it in housing research. Furthermore, although recent studies have shown extensive interest in housing sustainability, there is a significant lack of studies assessing its correlation and impact on the process of modifications. Therefore, this study seeks to fill these gaps and answer the research question: What are the issues that lead to residents' modifications in Bahraini subsidized housing units?

2.6.2. Conceptual Framework

As previously indicated, exploring the fundamental causes of residents' modifications in subsidized housing demands an examination of the inhabitants' behaviors. Those behaviors might be similar or different and are influenced by several factors, as noted in the discussed literature. This is demonstrated in the following key findings garnered from recent studies (Abed et al., 2023; Chukwuma-Uchegbu & Aliero, 2022; Muianga et al., 2022; Obeidat et al., 2022; Ozer & Jacoby, 2022; Zhao & Lyu, 2022):

- Residents of the same region share similar behaviors and practices because they share the same customs and traditions and experience the same circumstances. These common behaviors, however, can change over time and are influenced by social changes, economic growth, and environmental conditions.
- Residents' common behaviors during the modification process in subsidized housing reflect their housing preferences toward recent trends, common motivations for the modifications, and residents' common mistakes and incorrect practices.
- Residents' behaviors differ in some ways due to the unique lifestyles of each family. This can be seen in the modifications that residents make to the design of their housing units based on their particular needs and perceptions, resulting in various design patterns.
- There is an inverse relationship between residents' modifications and sustainability aspects. These aspects represent common motivators for residents to make modifications, and they vary by

region. When sustainability aspects are incorporated into housing units, residents tend to make fewer modifications. Conversely, the absence of sustainability features leads to more modifications as residents strive to meet their needs and desires. Therefore, it is necessary to investigate which sustainability aspects are most required for housing residents.

So, residents of subsidized housing in the same region have similarities and differences in their behaviors and practices in the modification process. On the one hand, similarities represent residents' common behaviors. Those are associated with three categories: current common and repeated modifications reflecting most residents' inclinations and preferences, common motivations behind modifications, and common improper practices. On the other hand, differences represent residents' distinct lifestyles and are linked to four dimensions: Demographics, Activities, Interests, and Opinions.

Accordingly, building upon the following:

- Essential insights, knowledge gaps, and key findings discussed earlier.
- Limited research investigating the similarities and differences in housing designs..
- As an initial step toward answering the research question, which seeks to identify the issues that lead to residents' modifications.

This study develops a Conceptual Framework that investigates the similarities and differences in residents' behaviors in subsidized housing (see Figure 2.7 below).

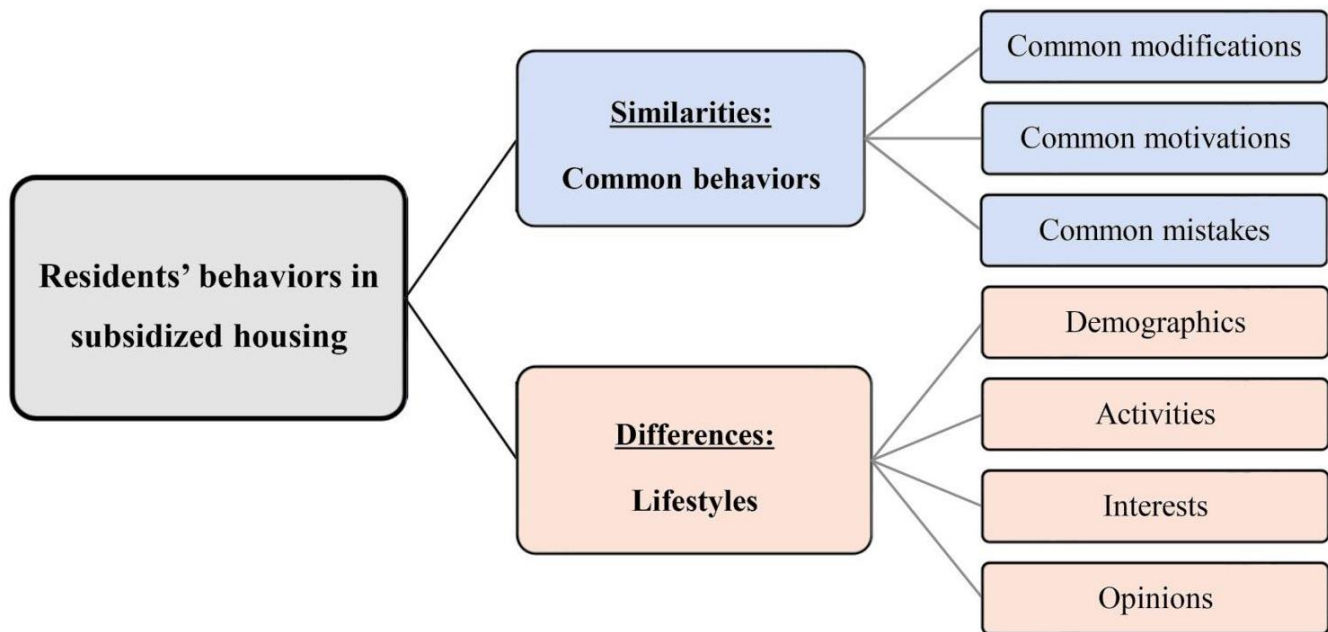


Fig. 2.7: Conceptual Framework (Crafted by the Author)

Chapter 3: Methodology

This chapter first presents the research methodology, which clarifies the use of the qualitative approach and explains the primary methods used in the study. After that, the research design, which consists of two phases, is demonstrated. Then, it outlines the sampling strategy, which includes clarifications for the target samples, selection criteria, and sampling techniques used in each phase. The research tools are then discussed, focusing on their reliability and contribution to fulfilling the study's objectives. This is followed by an in-depth explanation of the data collection procedures and data analysis. Finally, the chapter addresses the ethical considerations, as well as the strengths and limitations of the methodology.

3.1. Introduction

The literature review chapter, in which recent studies were analyzed and critiqued, revealed a need to explore the issues behind residents' modifications in subsidized housing. It also showed that examining residents' behaviors aids in identifying these issues. Hence, a conceptual framework was developed, illustrating that residents' behaviors during the modification process can be classified into two categories: similarities and differences, where similarities pertain to common behaviors, while differences refer to varying lifestyles. This framework served as the research plan for gathering the required data to fill the identified gaps and answer the research question, which seeks to identify the issues that lead to residents' modifications in Bahraini subsidized housing units. Accordingly, the research objectives were determined as follows:

- Determine residents' common behaviors in Bahraini subsidized housing units.
- Analyze the patterns of residents' modifications.
- Study the relationship between residents' modifications and their lifestyles.

So, based on these objectives, the research methodology and data collection methods were carefully chosen, as detailed in this chapter.

3.2. Research Methodology

The study is phenomenological and ethnographic; it delves deep into residents' behaviors, exploring the issues behind their modifications. Thus, due to the exploratory nature of this research, a qualitative methodology was

employed. This approach enables an extensive examination of residents' behaviors, consistent with the flexible and deep investigation needed to answer the research question comprehensively. Silverman (2021) points out that the qualitative methodology is appropriate for studying individuals' daily lives and behaviors. Similarly, Shufutinsky (2020) indicates that qualitative approaches are frequently used in social and behavioral research as they allow obtaining rich and valuable information.

This is further supported by Groat & Wang (2013), who affirm that the critical advantage of qualitative studies is their ability to grasp the processes underlying human actions. Many studies on this subject have employed the qualitative methodology. For example, Aryani et al. (2015), Sunarti et al. (2019), and Obeidat et al. (2022) have used this approach to investigate and analyze the transformations implemented in public housings. It was also adopted by local studies like Saraiva et al. (2019) and Alkhenazi (2018) to better understand and explore the modifications in Bahraini dwellings.

Based on the conceptual framework outlined in the preceding chapter, studying residents' behaviors for this research should comprise gathering comprehensive and detailed data on residents' common behaviors and distinct lifestyles. Hence, two primary methods were used in this study: qualitative interviews and a case study strategy. On the one hand, the qualitative interview method was implemented to explore the recurrent and prevalent behaviors of most residents during the modification process in Bahraini subsidized housing. According to Kuzmanić (2009), in qualitative interviews, participants express their own viewpoints and experiences; nonetheless, they share some common perspectives. Thus, this method is applicable for looking into residents' general and mutual behaviors.

On the other hand, the qualitative case study strategy was employed to investigate the different and particular behaviors of Bahraini subsidized housing residents. This method was chosen because it concentrates on researching a specific phenomenon under a given condition within its authentic context (Eisenhardt, 1989; Groat & Wang, 2013). This, in turn, makes it an appropriate method for delving into residents' individual and distinctive behaviors. Selecting the case study strategy was also driven by the complicated nature of the study, which requires an inquiry into multiple aspects. So, this method is effective in this case as it allows integrating different sources and data collection tools (Groat & Wang, 2013). Several studies have adopted this method for studying housing modifications, including Alkhenazi (2018), Obeidat et al. (2022), and Sunarti et al. (2019).

3.3. Research Design

As stated earlier, the study employed a qualitative methodology for data collection using two primary methods: qualitative interviews and a case study strategy. This was carried out in two phases as follows:

- The first phase concentrated on exploring the similarities in the behaviors of residents in subsidized housing across various projects in Bahrain. The data was gathered through interviews with experts who participated in the modification process. It should be noted that interviews with experts were insufficient to understand the issues underlying the modifications because they only allowed for the exploration of typical and recurrent behaviors of residents regarding subsidized housing projects in Bahrain in general. In other words, they didn't reveal the different

issues that necessitate a thorough examination of residents' lifestyles, which can only be known through the residents themselves, to understand their activities, daily routines, areas of interest, satisfaction, and opinions. Due to that, a second, more focused phase of data collection was carried out.

- The second phase concentrated on investigating the differences in residents' behaviors in Bahraini subsidized housing. This entails studying the modifications that residents have made based on their various needs and desires related to their distinct and changing lifestyles. Thus, the case study strategy was employed in this phase to focus on specific housing units within a single subsidized housing project in Bahrain. Significantly, this phase played a crucial role not only in examining the diverse behaviors of residents but also in triangulating and validating the findings from the first phase.

Although each phase concentrates on studying specific aspects, they both contribute to filling the identified gaps and answering the research question.

3.4. Sampling Strategy

The sampling strategies for this study were meticulously selected to ensure the acquisition of accurate, reliable, and comprehensive data that aligns with the study's aims and objectives, as elaborated below:

3.4.1. First Phase

3.4.1.1. Population and Target Sample

In the first phase of the study, which involved qualitative interviews, the population consisted of experts engaged in the modification process from various engineering and interior design offices around Bahrain, including architects, interior designers, and civil engineers. The decision to focus on this population arose from the complexity of the modification process in subsidized housing, which involves multiple parties from different disciplines (Muianga et al., 2022; Suglia, 2018). Therefore, examining residents' similar behaviors across the various fields within this process was imperative to attain comprehensive data. From this population, a target sample of twenty experts was selected. Although the existing literature stresses the significant role of experts in the processes of residents' modifications (Nwankwo et al., 2014; Obeidat et al., 2022; Sharafeddin & Arocho, 2022; Taki & Alsheglawi, 2022), few research studies have used experts as a sample. This, in turn, ensures that the data obtained is valuable and contributes to current knowledge effectively.

3.4.1.2. Selection Criteria for Experts

Since the first phase focuses on studying the similarities in residents' behaviors, the target sample, which consists of twenty experts, was chosen based on the following criteria:

- The experts should have at least five years of professional experience in the field. This ensures their thorough understanding and extensive familiarity with residents' common behaviors, as

they have engaged with a variety of clientele nationwide. This, in turn, guarantees collecting more profound information, viewpoints, and insights that contribute to enriching the study's findings. It also increases the reliability and credibility of the study, leading to valid conclusions (Dorussen et al., 2005).

- The experts should have worked on modifying residences from diverse subsidized housing projects in Bahrain within the last two years, either participating in the design, construction, or supervision processes. This is because this research is concerned with investigating the issues behind resident modifications in the current context of Bahraini subsidized housing, filling a fundamental gap in the literature where recent studies on this subject are limited. Thus, choosing such experts ensures their awareness of residents' prevalent behaviors associated with contemporary housing preferences and trends and widespread mistakes during the modification process. Moreover, it helps explore residents' shared needs at the current time. This thereby contributes to minimizing the need for modifications in future projects, which aligns with the aims of this study.

3.4.1.3. Sampling Technique

The twenty experts were chosen through snowball sampling, a non-probability purposive sampling technique. According to Parker et al. (2019), this technique is widely used in qualitative studies and usually relies on social relationships to reach the initial sample. It entails requesting referrals from initial participants to invite more participants matching the study's

criteria. The latter, in turn, suggest other new participants, and so on. Several research studies in the domain have employed the snowball sampling technique (Mrani et al., 2022; Sunarti et al., 2019; Taki & Alsheglawi, 2022). So, communication with experts began on social media platforms, starting with colleagues from the architecture, interior design, and civil engineering specialties alongside other notable experts who constantly showcase their works in modifying subsidized housing units on social media. Those meeting the selection criteria were invited to participate in the interviews. After each interview, participants were asked to propose additional experts in the field who met the selection criteria. Then, the experts recommended by the initial interviewees were contacted, and the same procedure was followed for each subsequent interviewee, expanding the pool of potential participants. It should be noted that each selected expert was from a different office to avoid bias and ensure diversity.

3.4.2. Second Phase

3.4.2.1. Population and Target Sample

In the second phase of the study, which involved a case study strategy, the population consisted of residential units within the East Hidd housing project. This project is one of the recent subsidized housing developments in Bahrain (Figure 3.1). It is located on reclaimed land in a new city in the Muharraq Governorate, east of the existing town of Al Hidd, and thus derives its name from this geographical position (Figure 3.2). The MoH has offered housing units classified into different types for this project, each featuring a slightly different layout (Table 3.1). These units consist of two floors with a total built-up area ranging from 240.85 to 256.337 square

meters. The project is expected to comprise 2,827 housing units upon its final completion (MoH, 2023). This population was selected based on the data obtained from the experts in the first phase. During the interviews, experts were asked about the housing projects where they had been most frequently involved in residents' modification processes over the past two years. The responses revealed that the East Hidd housing development is one of the projects currently witnessing the highest rate of resident modifications. Besides, this project is one of Bahrain's recent subsidized housing initiatives. This enhances the validity of the study by ensuring the availability of data and contemporary relevance through an up-to-date examination. Six modified housing units from this project were chosen as the target sample for this phase.



Fig. 3.1: East Hidd Housing Project
(Source: Project Management International Systems - PMIS, 2023)

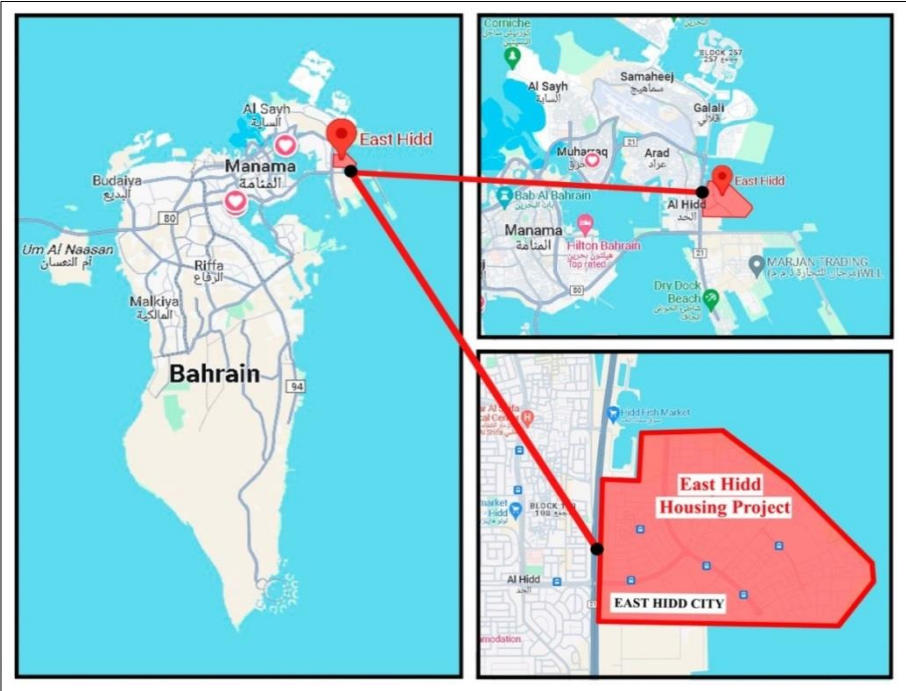


Fig. 3.2: Location map of East Hidd Housing Project
(Adapted from Google Maps, 2024)

Table (3.1): Variety of Housing Unit Types in the East Hidd Subsidized Housing Project

Housing type	Layouts
Type 1	Ground Floor First Floor

Fig. 3.3 : East Hidd Villa- Type 1
(Adopted from Ministry of Housing and Urban Planning, 2023)

Type 2	Ground Floor  First Floor  Fig. 3.4 : East Hidd Villa- Type 2 (Adopted from Ministry of Housing and Urban Planning, 2023)
Type 3	Ground Floor  First Floor  Fig. 3.5 : East Hidd Villa- Type 3 (Adopted from Ministry of Housing and Urban Planning, 2023)

3.4.2.2. Selection Criteria for Case Studies

Since the second phase focuses on studying the differences in residents' behaviors, the target sample, comprising six case studies of modified housing units within the East Hidd subsidized housing, was chosen based on the following criteria:

- The housing units should have been modified within the last two years. This helps gain insights into the present developments in housing projects. It also enables an extensive assessment of the recent patterns of resident modifications within contemporary housing designs, contributing to the development of appropriate design strategies for future projects.
- The housing units must currently be occupied by their respective residents. This allows for examining inhabitants' behaviors within the modified housing units, including their activities and interactions within the spaces, as well as their perceptions and satisfaction levels. As a result, this aids in comprehending the relationship between residents' lifestyles and the modifications they undertake.

3.4.2.3. Sampling Technique

A combination of both snowball and convenience sampling techniques was employed in selecting the target sample for the second phase of the study. Initially, the experts interviewed in the first phase were asked to propose projects for modified houses in the East Hidd housing on which they had worked within the previous two years, and a list was created based

on their suggestions. Notably, the experts contributed to these projects either through design, consultation, construction, or supervision work. So, in this case, the snowball sampling technique was used to reach the initial target sample. Then, the homeowners of the suggested houses were contacted, and only six consented to participate. Consequently, the final target sample consisted of six case studies selected through convenience sampling. It should be noted that this technique relies on residents' availability and readiness to participate in the research (Etikan et al., 2016). Besides, It's widely applied in qualitative studies (Etikan et al., 2016).

3.5. Research Tools

Different research tools were employed to collect data throughout the two phases of the study, as follows:

3.5.1. First Phase: Qualitative Expert Interviews

The research tool used in this phase is expert interviews. The existing literature highlights the advantages of employing expert interviews in qualitative research. For example, Dorussen et al. (2005) confirm that expert interviews are an efficient tool for data collection, yielding valuable insights and substantial conclusions. Moreover, a recent study by Von Soest (2023) affirms that one of the primary strengths of utilizing expert interviews is that bias tends to be minimal. Similarly, Döringer (2021) indicates that employing this technique in qualitative exploratory studies helps to understand certain aspects of complicated processes or phenomena within a designated domain and generates significant and robust knowledge about it.

So, expert interviews were employed in the initial phase of this study to acquire comprehensive information about the similar behaviors of residents in the housing modification process. Hence, this was linked to fulfilling the study's first objective, which aimed to determine the common resident behaviors in Bahraini subsidized housing units. This tool has been implemented in comparable studies within the housing field (Abed, 2021; Nanta, 2009; Sunarti et al., 2019). Besides, a local study by Taki & Alsheglawi (2022) has used this tool with experts from architecture and civil engineering disciplines.

3.5.2. Second Phase: Qualitative Case Study Strategy

In this phase, three research tools were applied within each selected case study to investigate the different behaviors of residents in the housing modification process. These tools include the following:

3.5.2.1. On-Site Observations

Observations play a fundamental role in qualitative research. It is the cornerstone of behavioral and social studies (Adler & Adler, 1994). It entails gathering information mainly through sight and hearing senses (Given, 2008). As a result, it enables an active engagement with the studied phenomena while allowing immediate data documentation. In housing studies, observations are employed to assess resident behaviors and document the physical attributes of their dwellings (Groat & Wang, 2013). Therefore, this study employed site observations to explore and record the modifications made by residents. A notable research study by Nanta (2009) has used the same technique to examine house modifications. Furthermore,

several comparable studies in the housing field have also utilized the observation tool (Abed et al., 2023; Agyefi-Mensah et al., 2020; Avogo et al., 2017; Chukwuma-Uchegbu & Aliero, 2022; Jiwane, 2021; Obeidat et al., 2022; Sunarti et al., 2019).

3.5.2.2. Plan Analysis

Plan analysis is one of the research tactics used in architectural studies to assess building design pre- and post-occupancy (Groat & Wang, 2013). Applying this technique is crucial in housing modification investigations. According to Nguluma (2003), transformation processes lead to different house designs with varied architectural characteristics. Thus, Nguluma suggests that analyzing housing modifications enhances understanding of residence performance. Nguluma further argues that it provides a comprehensive understanding of the link between inhabitants and their living spaces, as well as significant insights for improving housing design.

Similarly, Abed et al. (2023) claim that exploring modification patterns within the public housing context is fruitful. Saraiva et al. (2019) confirm that spatial analysis can help identify the patterns of transformations, which aids in developing future designs for subsidized housing. Obeidat et al (2022) agree on the same point, indicating that analyzing residential modifications provides an opportunity for a deeper comprehension of inhabitants' spatial demands. Moreover, Natakun & O'Brien (2009) underscore the essential role of analyzing housing layouts for simplifying the comparison process between original and modified dwelling designs. Consequently, due to these fundamental benefits, numerous studies in the field have utilized plan analysis to investigate the patterns of residents'

modifications (Abed, 2021; Aduwo et al., 2013; Alkhenaizi, 2018; Aryani et al., 2015; Nanta, 2009; Natakun & O'Brien, 2009).

So, the plan analysis tool was employed in the study's second phase to build upon and expand the insights from prior site observations. This combination aimed to enhance comprehension of resident modifications in each case study and clarify their nature, facilitating comparisons with the original designs. Hence, both the plan analysis and on-site observation tools were integrated to achieve the second objective of this research, which concentrates on analyzing the patterns of residents' modifications.

3.5.2.3. Interviews with Householders

The last tool used in the second phase was interviews with householders. Employing this tool was essential to enhance the exploratory inquiry into inhabitants' diverse behaviors and lifestyles. According to Wagner et al. (2018), researchers must delve deeper into the patterns of residents' behaviors to better understand the underlying reasons behind these behaviors within their living spaces. Wagner et al. (2018) further indicate that this can be accomplished using qualitative tools, which have the potential to provide researchers with fundamental data on resident activities, perspectives, and perceptions.

Thus, Wagner et al. (2018) suggest the open-ended interviews with residents as an effective research tool for examining their distinct behaviors. Similarly, Day & Gunderson (2015) confirm that qualitative interviews with residents can successfully determine the exact causes related to particular occupant behaviors. Moreover, Jansen et al. (2011) argue that qualitative

resident interviews are one of the appropriate tools that can be used to measure lifestyles in housing research.

Several studies in the field have used interviews with residents to study their behaviors and lifestyles and explore the patterns of housing modifications (Nanta, 2009; Natakun & O'Brien, 2009; Obeidat et al., 2022; Saraiva et al., 2019). Consequently, interviews with householders were employed in this phase to accumulate informative data on inhabitants' different lifestyles in their housing units. This, in turn, contributes to understanding the rationale behind the specific modification patterns of each case study that were defined based on both the observations and plan analysis tools. Therefore, using this tool was linked with the third objective of the study, which concentrated on studying the relationship between residents' modifications and their lifestyles.

It's noteworthy that the decision to interview householders was made not only to study their lifestyles but also because they are responsible for making housing modifications to fulfill specific requirements and qualities. Hence, conducting interviews with them provides a great opportunity to reveal the nuances of these modifications. Additionally, given that this research enormously concerns residents' behaviors and livelihoods within their living spaces, it was critical to obtain insights regarding their perspectives and perceptions to understand their priorities and expectations for subsidized housing designs. So, after describing the tools used in both study phases, the following (Figure 3.6) provides a concise summary and overview of these tools and their association with the study's objectives:

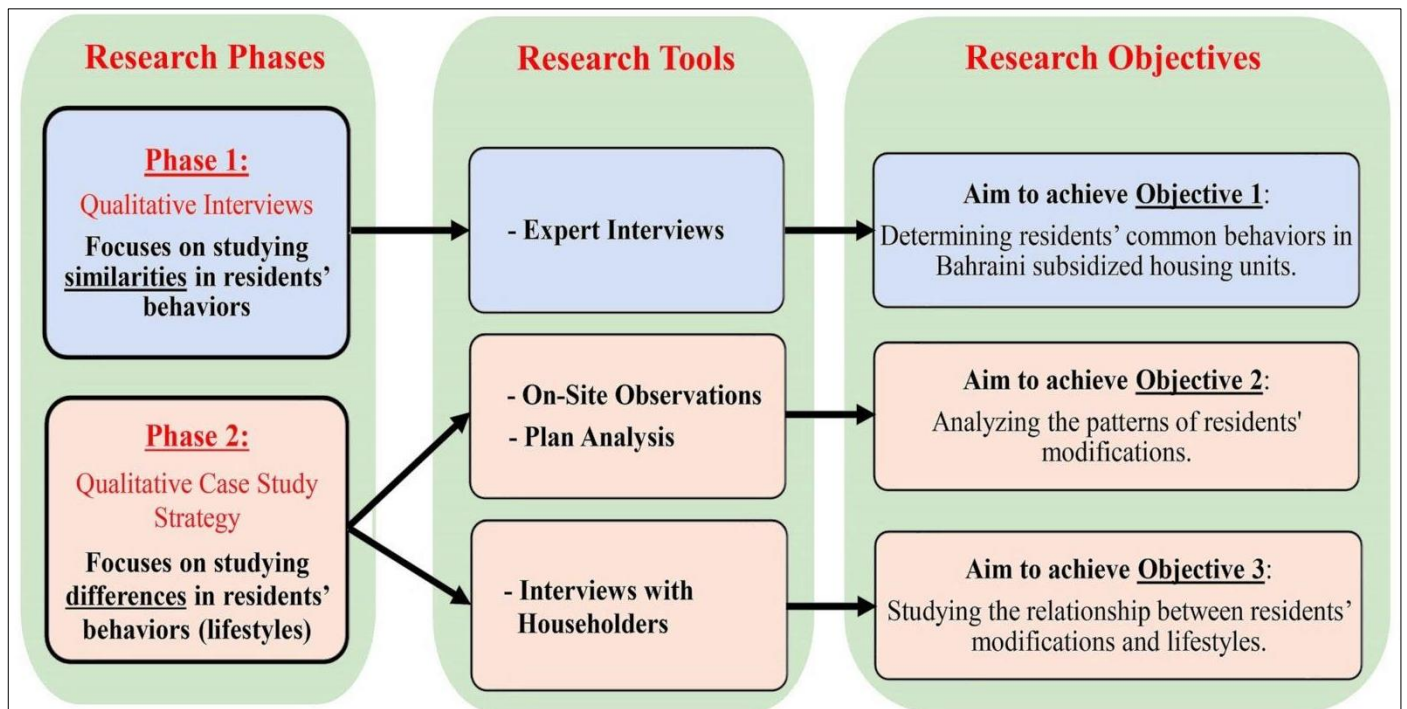


Fig. 3.6: Research Tools and Objectives Alignment

3.6. Data Collection Procedures

The data for this study were gathered from both secondary and primary sources. The secondary sources involved a comprehensive analysis of existing archival and recent literature on the research topic, obtained from scholarly publications, books, reports, official documents, theses, and other relevant sources to gain an in-depth understanding. This literature review process included identifying, synthesizing, and categorizing the information into themes. It should be noted that the presentation and discussion of these themes in the literature review chapter differs from earlier research; they were arranged sequentially to assist in comprehending their interrelationships and relevance to the research problem.

After reviewing and analyzing the literature, several knowledge gaps became apparent. Accordingly, a conceptual framework was developed, representing a new approach to investigating the phenomenon of resident modifications in subsidized housing and a significant step toward exploring the issues behind it. Hence, in this study, this framework served as the blueprint and groundwork for collecting the primary data needed to address the research question and bridge the identified gaps. So, the data collection involved two primary sources, as detailed below:

3.6.1. Expert Interviews

As stated earlier, interviews were conducted with twenty expert engineers from various disciplines who actively participated in the modification process. Before commencing these interviews, a pilot test was conducted with five experts who met the previously outlined selection criteria and possessed substantial competence and expertise. This step was critical for evaluating the initial interview questions and identifying any potential concerns or difficulties to be addressed prior to the main study. It also ensures the validation of the interview protocol, thereby enhancing the reliability and validity of the data collected. The test revealed the following two areas of confusion:

- The first confusion arose when experts were asked to identify the common modifications requested by residents in Bahraini subsidized housing units and specify their scale as minor, intermediate, or major. The results showed that each expert holds a different perspective on this matter, as evidenced by the varying responses. For example, some experts considered

certain modifications intermediate, while others considered them major. This discrepancy arises from the nuances of the approaches used in making the modifications, the techniques employed, and the design attributes, as clarified by one of the experts.

- The second confusion occurred when experts were asked two separate questions: one regarding common mistakes made by residents during modifications and the other regarding obstacles encountered by experts in the process. Unexpectedly, responses to these questions showed a notable degree of repetition and similarity. Besides, one of the experts pointed out that obstacles arise as a result of residents' mistakes; therefore, when discussing the latter, it is logical to address the associated obstacles simultaneously.

Hence, based on the preceding insights, confusion-causing questions were removed, and the updated interviews comprised fewer and more focused questions. After the pilot study, data were collected from the twenty experts, the participants of the main study, through structured, in-depth interviews with open-ended questions. This interview format, characterized by its predetermined yet open-ended nature, was chosen because it aligned with the inherent essence and subject matter of the study, as well as the characteristics of the target sample. According to Monroe (2002), structured, open-ended interviews focus on eliciting detailed information about individuals' preferences and behaviors. Furthermore, a recent study by Döringer (2021) confirms that structured interviews are suitable for experts

owing to their clear and straightforward design, which saves time, particularly considering the limited free time of experts.

In addition, structured interviews were the appropriate option since the conceptual framework derived from the literature outlines the key concepts required for tackling the research question. In other words, the clarity of the study objectives and the subjects under investigation allowed for the design of interview questions that directly focused on the designated areas of inquiry. Thus, the structured interviews contained predetermined questions compatible with the conceptual framework. Rashidi et al. (2014) have thoroughly discussed this matter, indicating that employing structured interviews ensures that the data collected is directly related to the study's objectives while also effectively acquiring valuable insights and perspectives from the participants, concentrating on specific crucial points. Besides, Blouin et al. (2011) indicate that this format is considered more reliable compared to unstructured interviews. This stems from their ability to reduce bias by providing consistent questioning contexts for all participants (Rashidi et al., 2014). Monroe (2002) elaborates on this, emphasizing that structured, open-ended interviews can generate significant findings and relevant information.

So, the interviews consisted of predefined questions that concentrated on specific themes. First, experts were asked about their demographic information and professional background. Following the initial questions, the interviews revolved around three main aspects relating to residents' similar behaviors in subsidized housing. These aspects, previously illustrated in the conceptual framework presented at the conclusion of the literature review chapter (refer to Figure 2.6), are considered significant contributors

to residents' modifications in subsidized housing. They encompass the following:

- Common and repeated modifications that reflect the inclinations and housing preferences of the majority of residents.
- Common motivations behind modifications.
- Common mistakes and improper practices during the modification process.

Notably, within the predetermined questions, the interviews also included follow-up questions that varied with each interviewee based on their responses. These follow-up questions aimed to clarify or expand on particular issues discussed by the interviewees while responding.

The interviews with the experts were held online. The decision to conduct online interviews with the experts was based on their preferences. After scheduling the interviews, they were asked to choose between online and face-to-face formats. The majority showed a preference for online interviewing. This approach saves time and effort, particularly given the limited free time experts have due to their hectic schedules. Furthermore, in recent times, the means of communication have evolved with technological advancements, allowing for easier engagement through the use of applications.

This trend was particularly reinforced after the emergence of COVID-19 when remote work became prevalent. Indeed, this significantly influenced the techniques employed by researchers to collect data. This issue has been tackled in various studies. For example, Von Soest (2023) indicates that using online expert interviews can significantly enhance the credibility

of data collection, particularly now that they can replace conventional in-person meetings. Von Soest further emphasizes that this approach is comfortable for both interviewers and interviewees. Moreover, Archibald et al. (2019) underscore the potential of advancements to provide new approaches in qualitative research methodologies.

So, the interviews were scheduled, conducted, and recorded via the Zoom platform. First, the date, day, and time were confirmed with the interviewees. After confirmation, the interviews were scheduled through Zoom, and interviewees were provided with the meeting link, along with the passcode. Prior to commencing the interviews, permission to record was requested from all interviewees, and they all consented. It should be noted that Zoom platform was chosen due to its simplicity, user-friendly interface, and widespread use, as many experts are familiar with it (Archibald et al., 2019). It also offers easy accessibility for participants because it doesn't require an account or registration; once the link is received, participants can join the meeting by entering the provided passcode and writing down any preferred username. Additionally, Zoom offers simple and efficient recording capabilities. Archibald et al. (2019) applaud Zoom's efficacy in acquiring qualitative research data, attributing this to its distinctive features. Besides, Von Soest (2023) stresses the benefits of online interviewing using platforms like Zoom due to their robust security measures and ability to minimize risks.

The interviews were conducted in colloquial Arabic dialect as most experts found it easier to clarify their replies. Notes were taken during the interviews to document key points. The duration for all the interviews spanned from October 21, 2022, to February 19, 2023. This timeframe was

necessary due to the experts' limited availability, as meetings were meticulously scheduled to accommodate their schedules. Each interview lasted 30 to 50 minutes, varying based on the depth of explanation and level of detail provided by each interviewee. The interviews reached a saturation point around interview number 15, as many responses became repetitive. However, an additional five interviews were conducted, bringing the total to twenty interviews. This decision was made as a precaution to ensure thoroughness and to confirm that no new information emerged.

3.6.2. Case Study Strategy

Data collection for each case study commenced with on-site observations after obtaining permission from the householders and getting their signatures on consent forms. These observations were conducted visually and non-participant, respecting the limited time available during the visits to ensure residents' privacy. Prolonged presence, photography, and inquiries during these visits might cause discomfort to residents. Consequently, interviews were scheduled separately and conducted later to explore the relationship between the observed modifications and residents' lifestyles. Detailed notes and photographs were used to document the observations, with an emphasis on safeguarding residents' privacy. The notes encompassed details about the type of housing unit and the specific modifications made in each area. It should be noted that only a limited number of photos—typically three to four—were taken within each case study to maintain privacy. Additionally, 3D perspectives provided by some of the householders, sourced from the expert engineers involved in the modification process, were used to document the modifications in private spaces, like bedrooms, where photography was not permitted.

Moreover, original plans obtained from the Ministry of Housing (MoH) were utilized during the site visits to comprehend the observed modifications on the ground and first floors (Appendix A). Subsequently, the plan analysis process was initiated, involving analyzing the plans for each case study. This entailed recreating the original plans in the AutoCAD program, as the copies obtained from the Ministry were in PDF format. It also included drawing post-modification plans in AutoCAD based on the documented on-site observations.

Then, interviews were conducted with one of the householders for each case study to investigate the relationship between the family's lifestyle and the modifications they have made. This chosen representative was either the wife or the husband, selected based on their availability. The choice to interview householders stems from their central role and responsibility in making decisions regarding home modifications. Similar to the expert interviews conducted in the study's first phase, the interviews with householders were structured, in-depth, and comprised open-ended questions.

The structured interviews were chosen for their precision, focus, and straightforward nature (Rashidi et al., 2014). Hence, this approach minimizes confusion by employing fewer and clearer questions. Such clarity is essential for ensuring smooth and effective resident interviews. This notion is supported by Wagner et al. (2018), who suggest that interviews with occupants should feature simple, unambiguous, and easily understandable questions. This approach assures that participants can provide rich responses, as they can readily comprehend and respond to the inquiries. This type of interview also saves time (Döringer, 2021),

particularly considering that the residents interviewed were all employees and had limited availability. Due to that, it was imperative to adopt an organized and predefined interview design.

As discussed in the literature review chapter, recent studies underscore the efficacy of the AIO approach in studying and understanding users' distinct lifestyles (Adnan et al., 2022; Zhao & Lyu, 2022). Therefore, interview questions were tailored to align with this approach, which focuses on four primary lifestyle dimensions outlined in the conceptual framework of this study (refer to Figure 2.6): Demographics, Activities, Interests, and Opinions. Each dimension encapsulates various aspects pertinent to residents' lives. Thus, the interviews were structured around predetermined questions addressing these dimensions and their associated aspects, as illustrated below:

- Demographics: This dimension encompasses general information about the residents, including the number of family members, their ages, duration of residence, and housing type.
- Activities: This dimension delves into how residents spend their time at home, encompassing their daily routines, activities, and hobbies.
- Interests: This dimension encompasses the factors that the householders considered during the modification process, including their prioritizations and distinct choices.
- Opinions: This dimension encompasses residents' perspectives and satisfaction regarding the modifications, including their perceptions and expectations for future plans.

In addition, follow-up questions were used to gather additional details and increase the depth of information obtained. These follow-up inquiries varied based on the responses of each interviewee. Before scheduling the interviews with the householders, the questions were presented to them to ensure clarity and comprehensibility. Besides, this pilot testing aimed to address any potential ambiguities in the questions and maintain consistency across the sample. The householders displayed a clear understanding of the interview questions, as no signs of confusion or anxiety were observed, indicating the suitability of the questions for the study. Consequently, the interview questions remained unchanged, maintaining their focus on the dimensions and aspects clarified earlier.

Regarding the interview procedures, residents were given the choice between online or face-to-face interviews. The majority opted for online interviews due to their enhanced privacy and confidentiality, fostering a more comfortable environment for discussing their lifestyles. Furthermore, online interviews provided convenience for the participants, especially considering their various responsibilities as employees, particularly among employed housewives. Consistent with the approach adopted for expert interviews in the first phase, Zoom was employed to conduct and record the interviews, renowned for its user-friendly interface and robust security features (Archibald et al., 2019). Participants were provided with the interview link and passcode before the scheduled sessions.

The interviews were conducted in colloquial Arabic to ensure the participants' comfort and ease of communication. Detailed notes were taken during each session to aid in summarizing the interviews later on and to capture essential information. The interviews took place between November

11, 2022, and March 2, 2023, aligning with the participants' availability and preferences. Each interview lasted between 30 to 40 minutes, varying based on the depth of information shared by each participant.

3.7. Data Analysis

The data analysis of expert interviews and case studies occurred in two stages. Initially, twelve interviews and three case studies were analyzed, and the preliminary findings were compiled and published in a scientific journal. Subsequently, for the current study, the analysis was extended to include eight additional expert interviews and three more case studies. In total, the data analysis comprised twenty interviews and six case studies, as outlined below:

3.7.1. Analysis of Expert Interviews

The first step in data analysis was initiated during the interview sessions, which involved the coding process to distinguish between individual interviews. Each interview was assigned a distinct identifier, ranging from Interviewee #1 to Interviewee #20. Such a coding system facilitated clear differentiation among the interviewees and simplified subsequent analysis procedures. After the completion of each interview, the recording was promptly reviewed and transcribed, ensuring an organized transcription process without confusion. However, the colloquial dialect used during the interviews required extra time for the transcription and translation processes. Initially, the interviews were transcribed into standard Arabic and then translated into English.

After that, all the data were scrutinized and analyzed manually to identify themes. This process involved reading, comparing, and compiling the data, followed by classifying the findings into main categories, each comprising diverse nuanced themes. Notably, these main categories—common modifications, common motivations, and common mistakes—aligned with the primary focus areas of the interview questions. Subsequently, upon delineating the categories and their specific themes, the data were meticulously organized within them. Upon completing the analysis, key findings were distilled by summarizing the significant points associated with each specific theme and presented in structured tables for clarity and accessibility.

3.7.2. Analysis of Case Studies

The data analysis process for each case study involved a comprehensive examination of the information obtained from on-site observations, plan analysis, and householder interviews. Initially, the data collected through observations was organized into individual tables, with each table encompassing the notes captured during the site visits. The photographs were then arranged after the tables for further reference and illustration. Subsequently, the data collected through the plan analysis tool, which involved analyzing and drafting the original and post-modification plans of each case study using AutoCAD, underwent a detailed zoning analysis. Using Photoshop, each zone was assigned a different color. Notably, identical zones in the pre- and post-modification plans had the same color to ensure consistency, facilitating an effective comparison process. This analysis aided in identifying the distinct design patterns of residents'

modifications for each individual case study. After that, a comparative analysis of modification patterns was conducted across the six case studies. Pre-modification living areas and bedrooms from the original plans were juxtaposed with subsequent extensions, employing a distinct color scheme for clarity. This facilitated easy visual comparison between the original spaces and the added modifications.

Then, the analysis of the householders' interviews proceeded following a similar process to that outlined for the expert interviews. It involved transcribing, translating, summarizing, and categorizing the interviews into themes based on the AIO approach dimensions. Finally, after analyzing all the data collected from both phases, a triangulation approach was utilized to compare the findings from expert interviews in the first phase with those from case studies in the second phase, as this process helps ensuring the reliability and validity of the results in qualitative research (Nassaji, 2020).

3.8. Ethical Considerations

Various measures were undertaken to maintain participants' confidentiality, integrity, comfort, and respect throughout the study. In the first phase, all interviewed experts were briefed on the research subject and objectives, as well as the confidentiality of any information shared. Interviews were thoughtfully scheduled to accommodate participants' availability and respect their hectic timetables. Participants were also provided the option to choose between online and face-to-face meetings for their comfort. Furthermore, an official stamped letter was obtained from the Office of the Dean of the College of Engineering at the University of Bahrain, formally requesting information for the master's thesis (Appendix

B). This letter, serving as a testament to the research's credibility, was presented to participants before the interviews to establish trust. Besides, participants were asked for consent to record the interview, and no objections were raised.

In the second phase, the previously mentioned letter was emailed to an engineer at the Ministry of Housing, seeking the original plans for housing units in the East Hidd housing project to be used during the site visits. Additionally, official research consent forms, stamped by the Office of the Dean of the College of Engineering, were sent to householders who participated in the interviews (Appendix C). These forms guaranteed complete confidentiality of shared information and sought permission for photography, alongside personal details and signatures. Interviews commenced only after receiving completed letters containing requisite participant information and signatures.

Moreover, householders were presented with interview questions in advance during the scheduling process. This step was crucial to ensure participants' comfort, particularly because the interviews focused on studying their lifestyles. Besides, Bahraini residents are naturally inclined to be reserved about sharing personal information and details about their homes (Taki & Alsheglawi, 2022). So, introducing the questions to the residents in advance helped alleviate any apprehensions they may have had. Furthermore, prior to conducting the interviews with householders, it was ensured that recording was permissible, and all participants agreed to this condition.

Beyond that, the research paper published in a journal as part of this thesis obtained ethical approval from the Research and Scientific Publications Committee at the College of Engineering, University of Bahrain (Appendix D).

3.9. Strengths and Limitations

After thorough data collection and analysis, it became evident that numerous factors could potentially influence the outcomes. This section outlines the strengths and weaknesses of the methodology, methods, sampling, and data collection procedures utilized in this study.

3.9.1. First Phase: Expert Interviews

3.9.1.1. Strengths

- The snowball purposive sampling technique employed in selecting the sample for the first phase proved effective, facilitating the rapid assembly of the experts required for the interviews. Its flexibility allowed for the immediate commencement of interviews and data collection with an initial, incomplete sample. Then, additional participants were gradually reached with the assistance of the initial sample, optimizing the researcher's time by conducting interviews and expanding the sample size simultaneously.
- During the interviews, the experts expressed their enthusiasm for the subject at hand, emphasizing its significance in light of the current prevalence of this phenomenon among Bahraini

subsidized housing residents. This acknowledgment from seasoned professionals is a noteworthy strength of the research issue, lending credibility to the research's aims and objectives.

- The depth and breadth of the questions posed in the interviews prompted the experts to provide a wealth of insights as they shared numerous anecdotes and scenarios encountered throughout the modification process. This depth of discussion enabled the collection of significant, comprehensive, and nuanced responses to the research question.
- The notes taken during the expert interviews played a crucial role in the data analysis process. They were concise summaries of key points, facilitating the rapid identification of themes and ultimately saving time during analysis.
- Expert interviews provided valuable insights due to the participants' significant experiences, with one boasting over 15 years and another over 20 years in the field. Each expert brought a unique perspective based on their specialization, highlighting various important points. This diverse expertise underscores the importance of selecting experts from different backgrounds.

3.9.1.2. Limitations

- Scheduling interviews with experts proved to be time-consuming. Due to the limited availability of experts during weekdays, coupled with their personal and professional commitments on weekends (Friday and Saturday), including family gatherings and travel plans, securing appointments

required advanced planning. In some instances, appointment waiting periods had extended up to two weeks.

- The interviews conducted in colloquial language required extensive analysis, doubling the time needed due to the transcription and subsequent translation processes.
- While participants answered the interview questions smoothly, their enthusiasm and abundance of information, driven by their desire to explain and clarify all the situations and experiences they went through, sometimes led to forgetting critical points during the interview, prolonging the process. Some even provided additional insights post-interview. Hence, providing questions in advance could aid in better preparation and more insightful discussions in future research.

3.9.2. Second Phase: Case Study Strategy

3.9.2.1. Strengths

- The combination of snowball sampling and convenience sampling techniques facilitated the identification and selection of case studies. Snowball sampling accelerated the initial sample collection by utilizing experts' recommendations, a crucial step considering the challenges in directly approaching residents due to privacy concerns. This approach instilled confidence in residents as they were approached by familiar experts who had previously assisted with their home modifications. Meanwhile, convenience sampling proved effective in engaging householders

by offering flexibility according to their availability, which is essential for studying their house design and lifestyle.

- Employing the AIO approach as the interview instrument proved highly effective in examining residents' lifestyles. The depth and richness of the responses obtained from the householders, delivered with comfort and passion, underscored the efficiency of the AIO tool in eliciting detailed insights into their lifestyle.
- The enthusiasm displayed by the interviewed householders during the interviews, where they eagerly discussed their lifestyle and home modifications tailored to their family's needs, underscores their engagement with the topic. Furthermore, their willingness to address additional questions reflects their comfort and clarity with the interview process, thus highlighting the significance of the studied subject.
- The methodological triangulation strategy employed in data collection, which involved various data sources and methods like on-site observations, plan analysis, and resident interviews, helped ensure the study's validity and reliability. It also enabled a more robust and subtle interpretation of the findings and a more thorough comparison.

3.9.2.2. Limitations

- While the convenient sampling technique demonstrated efficiency in selecting the target sample of case studies due to its flexibility, it nevertheless led to delays in data collection. This delay primarily stemmed from the necessity to accommodate

each householder's availability. Consequently, this approach may consume additional time, as participants might not promptly respond or schedule appointments that align with the researcher's schedule.

- Obtaining householders' consent for participating in the study's second phase, which examined residents' lifestyles and housing modifications, proved to be a significant challenge. Despite initially having a list of over 15 recommended case studies from experts interviewed in the first phase, only six householders ultimately agreed to participate. This is because not all householders would accept the involvement of their homes in the study, primarily to maintain privacy and due to concerns about potential violations they may have made. Consequently, this highlights the necessity of gathering a broader range of proposals to ensure adequate final samples.
- Scheduling appointments with the householders for home visits and photography sessions involved meticulous planning, spanning almost a week for each case study. It was essential to schedule these visits on days without family gatherings to ensure privacy and facilitate the on-site observations.
- Photography during site visits posed challenges as householders were reluctant to allow extensive documentation of the modifications inside their homes. Consequently, only limited photos were permitted, taken from specified angles and locations, with specific areas off-limits to photography.

3.10. Conclusion

The methodological approach adopted in this study was meticulously tailored to address the gaps identified in the literature review and effectively accomplish the research objectives. In the initial phase, expert interviews were utilized to fill gaps pertaining to the scarcity of data collected from experts in this field and the limited discussions on residents' mistakes during the modification process. Subsequently, the second phase aimed to address the gap stemming from the absence of lifestyle studies and the AIO approach in housing research. Through the rigorous and systematic application of these methods, closely aligned with the study's objectives, the research methodology facilitated the acquisition of sufficient information regarding residents' similar and disparate behaviors concerning subsidized housing modification. This, in turn, enabled the provision of clear and comprehensive answers to the research question.

Chapter 4: Results and Discussion

This chapter presents the research findings, beginning with the analysis of the data collected during the first phase, which involved expert interviews. Subsequently, it delves into the analysis of the data obtained in the second phase, incorporating a case study strategy comprising on-site observations, plan analysis, and interviews with householders. This is followed by a comprehensive discussion and comparison of the results, aligning with the study's objectives.

4.1. Introduction

The preceding chapter thoroughly explained the methodologies, tools, and procedures employed in this research's two-phased investigation into subsidized housing modifications in Bahrain. The current chapter is structured into two main sections: The results section presents the analysis of data collected during each phase, while the discussion section critically examines these findings, establishing connections with existing literature and directly addressing the research question.

4.2. Results

4.2.1. First Phase: Expert Interviews — Objective 1

Collecting data through expert interviews was linked to the study's first objective, which focused on determining similar and prevalent resident behaviors in Bahraini subsidized housing units during the modification process. Hence, the results of this phase revolved around three main categories: Residents' common modifications in Bahraini subsidized housing, the common motivations behind them, and the common mistakes that residents make in this process. So, based on experts' responses, the data collected about each of these categories were classified into different themes as follows:

4.2.1.1. The Common Modifications

This category includes the following themes:

a) Spaces

Interviews conducted revealed that space-related modifications are prevalent among residents of Bahraini subsidized housing. This stems from a general dissatisfaction among residents regarding the sizes of the housing units, as highlighted by Interviewees #5 and #15. Further support for this assertion was provided by Interviewees #4 and #3, who confirmed that the spaces of subsidized housing units are insufficient to meet the needs of Bahraini families. Interviewee #6 articulated that "small spaces don't fulfill the requirements of the eastern Bahraini family." Additionally, residents often undertake these modifications because the number of family members exceeds the number of existing rooms, as emphasized by Interviewee #20. Consequently, residents undertake numerous modifications to adapt the spaces according to their needs and preferences, as corroborated by Interviewees #12, #15, and #17. These modifications, as indicated by the interviews, typically involve either expanding existing spaces or adding new ones.

Regarding space expansions, a recurring theme among interviewees, notably Interviewees #15 and #18, is the prioritization of expanding living rooms. Interviewees #2 and #14 emphasized the consistent demand for enlarging living room spaces to provide additional sitting areas for female guests. Furthermore, Interviewees #2 and #20 shed light on another aspect, highlighting a preference among many clients for spacious, open layouts with fewer partitions, often resulting in the integration of kitchens, dining areas, and living rooms all together in one space. Moreover, Interviewees #17, #18, and #20 pointed out that residents frequently request living room expansions to accommodate family gatherings. This was also noted by

Interviewee #4, who stressed that the Bahraini family tradition of weekend gatherings underscores the necessity for a larger, interconnected hall that seamlessly integrates with the kitchen and dining areas rather than isolating each space individually.

Interviewees elaborated on various methods residents employ to expand their living rooms. For instance, Interviewees #1 and #11 described how some residents merge the living room with the adjacent guest room (Majlis). Interviewee #20 further highlighted this practice, noting that residents often combine the Majlis with the living room to accommodate family gatherings and visits. Another strategy, as explained by Interviewees #4 and #15, involves reconfiguring the kitchen layout. According to Interviewees #4 and #17, residents commonly expand their living rooms by removing kitchen walls, transforming enclosed kitchens into open-plan spaces, and thereby creating a more expansive living area with an integrated dining space. Additionally, Interviewees #12 and #16 noted residents' preference for opening the kitchen gives the impression of a larger living room area while also providing a combined dining and kitchen space. Interviewee #13 corroborated these observations, stating that many subsidized housing residents opt for such modifications to "modernize their homes" with open-plan designs.

Furthermore, some residents expand the living room by using part of the garage space, which is illegal, as highlighted by Interviewees #6 and #20. Alternatively, Interviewees #14 and #19 noted that residents may extend the living room by utilizing space from setbacks or courtyards. In some cases, residents utilize the entire area of back or side setbacks to enlarge the living room, as indicated by Interviewee #19. However, others

choose to use only a portion of that area for the extension, as Interviewee #16 highlighted.

In addition to expanding living rooms, residents also extend other spaces within their homes. Interviewees #6, #10, and #15 highlighted that many residents extend the guest room by using the garage space, which is illegal. This point was reiterated by Interviewees #11 and #17, who emphasized that residents often expand the Majlis due to its insufficient size for accommodating family guests. Moreover, Interviewee #1 mentioned that residents frequently expand bedrooms by repurposing balconies from master rooms. Similarly, Interviewee #7 discussed residents' requests to combine two rooms into one to create larger bedrooms. Some residents also extend bedrooms by utilizing the space above the garage, as confirmed by Interviewees #11, #14, and #16. Furthermore, extensions may encompass the house's main entrance lobby, because it "reflects the taste of the households," as Interviewee #4 argued.

Interviews also revealed that, alongside extensions, residents frequently make additions to their housing units to better accommodate their needs. These additions include either the creation of entirely new spaces or the integration of additional features within existing structures. As evidenced by the interviews, one crucial addition desired by residents is the inclusion of an outdoor kitchen. Interviewee #2 stressed the consistent demand for outdoor kitchens among residents, emphasizing their significance by stating: "An exterior kitchen is always necessary to isolate the odors from the rest of the house." Additionally, Interviewee #6 highlighted the importance of outdoor kitchens in eastern homes, noting that they are essential for daily cooking needs. Interviewee #15 also commented on this matter, stating that the

contemporary lifestyle increasingly demands both a traditional indoor kitchen for regular uses and an outdoor kitchen for more intensive cooking tasks, reflecting a shift in living preferences in Bahrain. Interviewee #4 expanded on this notion, explaining that residents frequently construct outdoor kitchens to cater to family needs without affecting the main house with smells and heat while simultaneously integrating a smaller kitchen inside the house for simple cooking needs, overlapping with the living area.

Moreover, residents often request the addition of a ground-floor toilet for accommodating guests, to either serve the Majlis when it's used by male guests or the living room when it's used as a secondary Majlis for female guests, as indicated by Interviewee #14. This was further noted by Interviewees #10 and #15, who emphasized residents' preference for adding a guest toilet or repurposing the space of the existing bathroom on the ground floor to accommodate guest needs. Interviewee #17 highlighted the same point and underscored the necessity of providing a dedicated toilet for guests in housing units.

Interviewees #4, #11, and #20 emphasized another common practice falling under the additions category: repurposing the garage as a guest room, often occurring concurrently with residents expanding the living room into the Majlis area. Both interviewees underscored that this action is typically deemed illegal. Alternatively, as Interviewee #10 pointed out, residents may convert the garage into an additional Majlis for men while keeping the original Majlis for women and opting to park their cars on the street. Interviewees #6 and #7 noted that this practice goes against housing legislation in Bahrain, as at least one parking space must be reserved for the car within the plot of the housing unit. Interviewee #6 elaborated that when

homeowners undertake this action and park their cars on the streets, it disrupts traffic flow in the area and contributes to the disorderliness observed in residential neighborhoods.

Additions may also extend to include additional bedrooms on the first floor. Interviewee #13 emphasized the inadequacy of the current number of bedrooms in today's housing units, attributing this to the lengthy waiting period residents endure before receiving their homes. Interviewee #13 also highlighted that after enduring waiting periods of over ten years, residents' families have grown, necessitating additional bedrooms, typically totaling four to five for each unit. Similarly, Interviewee #6 reiterated this viewpoint, underscoring the prolonged process of acquiring housing units.

Interviewee #6 further noted that residents often begin with smaller families when initially requesting a home; however, after obtaining the housing unit 20 or 25 years later, the size of their families has significantly expanded. Besides, Interviewees #7 and #15 elaborated on how larger Bahraini families, typically comprising eight members, would require extra space and additional bedrooms on the first floor. Notably, most residents utilize the area above the garage on the first floor to construct these additional bedrooms, as indicated by Interviewees #14 and #20.

Residents not only add bedrooms but also incorporate bathrooms and dressing rooms. Interviewee #3 corroborated this, pointing out that some clients prefer having more bedrooms, each with its own bathroom. Additionally, Interviewees #15 and #17 highlighted that homeowners constantly add a bathroom and dressing area to each bedroom on the first floor. Furthermore, Interviewee #16 mentioned that residents often request

the addition of a bathroom within the bedroom if one is not already present. Interviewee #16 further clarified that this addition creates a sense of having a private suite for each family member. Interviewees #2 and #10 provided insights into the original and updated bathroom layout of the housing unit, which is commonly observed among residents. The house's original plan contains a private bathroom exclusively attached to the master bedroom, while the remaining rooms share a separate bathroom. As a result, residents typically allocate the shared bathroom to one room and consider adding an extra bathroom for the other room based on their needs.

Both Interviewees #4 and #16 highlighted another addition that most residents make: incorporating a living room on the first floor for everyday family use. Interviewee #4 expanded on this, explaining that residents commonly convert one of the rooms to serve as a living room. Moreover, Interviewees #2, #4, #15, and #16 emphasized that many Bahraini residents find it essential to add a third floor to cater to various services, such as a maid's room with a toilet, laundry facilities, and storage. Interviewee #3 also pointed out that, nowadays, most families have at least one maid, necessitating a dedicated space comprising a bedroom with an attached bathroom. Moreover, residents frequently request additional rooms with bathrooms on rooftops, regardless of whether they have a live-in maid. These rooms serve immediate accommodation needs when existing bedrooms are insufficient or reserved for future use, as Interviewees #8 and #19 explained.

For this reason, many residents have been requesting the addition of an elevator, as revealed in the interviews. Interviewee #15 indicated that one of the most frequent modifications residents opt for is installing an elevator.

Besides, Interviewee #4 clarified that this practice has emerged as a recent trend and prevalent modification in Bahraini subsidized housing units, primarily observed among those constructing a third floor. Interviewee #2 explained that residents commonly allocate space for future elevator installation, even if it's not immediately implemented, with those financially able often opting for immediate construction. Interviewee #11 added that the demand for providing space for an elevator has increased recently, given that residential units usually lack the infrastructure to accommodate one.

Residents also modify the outdoor spaces. Interviewees #1, #3, and #14 highlighted that residents often transform setbacks into private gardens and shaded sitting areas. Interviewee #3 underscored the importance of outdoor spaces, remarking, "Even if it's a small area, residents believe it must be present." Interviewee #15 also reinforced this, noting that after modifications and expansions of interior spaces, residents often choose to create outdoor seating areas in any remaining surplus space. These areas are then enhanced with features like plants and water elements. Similarly, Interviewee #5 stated that most residents prefer to include an outdoor garden as a play area for their children.

As indicated by Interviewee #18, clients usually request a backyard design because it has a larger area. Interviewees #9, #10, #13, and #16 also confirmed this trend, highlighting residents' desire to transform backyard spaces. They often opt for small private gardens with carefully chosen plantings complemented by aesthetically appealing pergolas, decorative pebbles, and soothing fountains. Interviewees #16 and #18 corroborated this point, noting residents' requests for additional features, such as lighting and decorative wall designs in their backyards. Interviewee #19 further

highlighted a specific addition: swimming pools, often requested by residents of corner houses due to the larger available backyard space.

Furthermore, residents also prioritize modifying and designing their front yards. According to Interviewee #9, residents typically opt for modern and visually appealing designs for the front gardens, often incorporating water elements like waterfalls to enhance the aesthetic appeal of the house's main entrance. In contrast, the backyard serves a more practical purpose, designed not only to complement the interior spaces aesthetically but also to facilitate various activities such as family gatherings, as demonstrated by Interviewee #9. Interviewee #11 reiterated this insight, indicating that residents seeking to add green spaces for aesthetic purposes usually do so in the front of the house.

Residents are not only concerned with their back and front yards but also strive to create rooftop gardens for their units, complete with pergolas, planting areas, and barbecue spaces, as highlighted by Interviewees #4, #15, and #16. Interviewee #6 further noted that residents have started to retreat to their house rooftops in search of privacy and a peaceful outdoor seating area.

b) Materials

Residents frequently choose to modify materials in both the interior and exterior spaces of their housing units. The interviews revealed shared preferences among residents in this regard. Overall, residents prioritize high-quality and sustainable materials that align with contemporary trends and the simple modern style, as Interviewees #7, #9, and #18 noted. Regarding interior spaces, residents make various modifications to finishing materials and paint colors for ceilings, walls, and floors, as emphasized by Interviewee

#9. For example, Interviewees #1 and #4 noted that gypsum ceilings are commonly favored indoors for their versatility and resilience to temperature and humidity, making them suitable for various areas, including kitchens.

As for interior wall finishes, Interviewees #11, #14, #15, and #16 confirmed residents' frequent use of neutral-colored paints and wallpapers. Specifically, Interviewees #16 and #18 highlighted the current preference for beige, cream, and grey shades for interior walls. Interviewee #20 underscored this trend, citing the widespread use of wallpapers due to their availability, ease of installation, affordability, and diverse range of patterns and colors, some of which create a three-dimensional effect.

Furthermore, the interviewees agreed that residents commonly choose substitute materials over original ones for cladding and decorating interior walls. According to Interviewees #3, #4, and #15, residents prefer these materials due to their affordability, wide range of options, and ease of installation and maintenance. Interviewee #9 added that while these alternative materials are indeed valued for their high quality and durability, residents primarily favor them due to their cost-effectiveness compared to natural materials. Moreover, these substitutes add an elegant touch and contribute to a simple modern style in the house, including materials such as WPC boards, MDF panels, and PVC marble sheets, as detailed by Interviewees #12, #13, and #16. Interviewee #4 also highlighted that residents mostly prefer using these materials on the ground floor, especially in areas frequently visited by guests, such as the main entrance, living rooms, and Majlis.

Additionally, Interviewees #3, #14, #15, and #16 underscored residents' preference for ceramic and porcelain tiles for flooring over pricier alternatives. Interviewees #12, #13, and #19 agreed with this assertion, noting that residents mainly opt for porcelain tiles in ground floor areas such as Majlis and living rooms. They also indicated a preference for HDF laminated flooring as a cost-effective alternative to traditional solid wood parquet in bedrooms, citing its comparable aesthetic appeal at a lower cost, along with its resistance to moisture and scratches, making it a practical choice. Moreover, Interviewees #8 and #20 stated that residents commonly change bathroom finishes, such as wall and floor tiling, opting for higher-quality materials like porcelain.

Regarding exterior facades, residents usually select trendy materials frequently found in modern home designs, as highlighted by Interviewee #8. According to Interviewees #4 and #10, there's a growing trend towards simple modern designs in housing facades, characterized by minimalism and the absence of intricate details, reflecting prevailing preferences. This was further confirmed by Interviewees #9 and #11, who noted that the majority of homeowners modify their exterior facades to keep pace with current modern designs. Both Interviewee #1 and Interviewee #4 emphasized the prevalent use of modern materials such as glass, wood, aluminum, and stone cladding for exterior facades. Interviewee #20 also underlined the widespread use of stone cladding in exterior facades.

For outdoor spaces (setbacks), residents commonly utilize artificial grass for wall cladding or flooring, valued for its aesthetic appeal and minimal maintenance requirements, as Interviewees #10 and #16 stated. Besides, Interviewee #19 observed that many residents prefer artificial grass

over natural grass to avoid insect attraction and the need for daily care and irrigation, citing its practicality. Both Interviewees #16 and #20 noted that artificial grass is often paired with flooring tiles such as stone or concrete for outdoor spaces, enhancing their visual appeal, particularly at the house entrance.

c) Housing Components

Interviews revealed common modifications concerning housing components. These include enlarging living room windows facing the backyard and expanding windows on the main façade, despite the latter being illegal, as noted by Interviewees #2, #12, and #16. Interviewee #15 added that the standard window heights have increased from 2.1 to 2.4 meters. Interviewee #18 confirmed this, stating that it can even reach 2 meters, particularly on the ground floor in the living room. Interviewee #17 also emphasized this trend, highlighting that residents often enlarge the windows to create an illusion of spaciousness. Moreover, some residents install shading or awnings for their living room windows overlooking the backyard to ensure privacy from neighbors, as indicated by Interviewees #12 and #19.

Residents also make modifications related to doors. According to Interviewees #1 and #15, residents consistently request the addition of a sliding door between the living room and the backyard, typically made of reflective glass, to ensure privacy from neighbors. Interviewee #19 noted that sliding doors are particularly favored and highly sought after for their effectiveness in reducing dust and providing tighter seals. Additionally, Interviewees #10, #16, and #19 agreed that an external door for the Majlis is

often added to ensure privacy. Similarly, Interviewee #17 indicated that many homeowners request adding an external entrance to the Majlis to facilitate the movement of guests separately from the residents.

In discussions about ceiling designs, interviewees agreed that residents tend toward trendy, modern, and simple styles. Specifically, Interviewees #10, #11, and #14 highlighted residents' preference for plain gypsum ceiling designs, valued for their simplicity, contemporary appearance, and compatibility with various interior aesthetics. Interviewee #15 elaborated on this, explaining that ceilings in residential units are often basic and bare. As a result, residents consistently request their demolition and replacement with a simple gypsum ceiling design, whether in the Majlis, living room, or dining room. Besides, Interviewee #19 contributed to this point by noting that the simple design of gypsum ceilings simplifies access to electrical extensions and facilitates maintenance work.

Residents also modify their lighting systems to enhance energy efficiency and aesthetics. For instance, many opt to reduce the number of ceiling lights in order to lower electricity costs, as confirmed by Interviewee #4. Interviewees #17 and #19 further highlighted that numerous homeowners choose to replace existing lighting fixtures with energy-efficient options such as smart lighting. Aside from that, interviewees noted several types of lighting commonly favored by residents. Interviewees #1, #11, and #12 particularly underscored an increasing demand for magnet-track lighting due to its versatility and ease of installation. According to Interviewee #11, this lighting solution offers adjustable brightness levels, catering to individual preferences or needs with simple installation procedures.

Furthermore, Interviewees #15 and #20 confirmed a recurring preference among residents for concealed lighting in both ceilings and walls. Interviewee #17 also emphasized that the lighting fixtures typically supplied in housing units are basic, consisting primarily of fixed spotlights and chandeliers; thus, homeowners often find it necessary to replace them with more decorative or attractive lighting that aligns with their design aesthetic. Besides, Interviewees #18 and #19 observed a tendency among residents toward spotlights featuring visually soothing tones, such as off-white.

In addition, throughout the interviews, it became evident that residents' modifications also extend to external housing components. Interviewees #1, #10, and #19 stated that most residents raise the heights of external boundaries to improve privacy. Interviewee #19 explained that this practice is illegal, as houses should maintain uniform shapes and heights. Interviewees #10 and #20 concurred, adding that it's common for residents to elevate their front and rear fences to provide privacy for entranceways and backyard areas, especially when incorporating features like pergolas or seating areas. Residents also tend to raise parapet walls, especially when designing the rooftop and adding seating areas, as Interviewees #4 and #20 indicated.

So, residents' common modifications in Bahraini subsidized housing units revolve around three themes. The key findings of each theme are summarized in Table 4.1 below:

**Table (4.1): Key Findings of Common Resident Modifications in Bahraini
Subsidized Housing Units**

Spaces	Materials	Housing Components
<u>Expansions:</u> • Expanding the living room into the adjacent Majlis, kitchen, or courtyard space. • Expanding the bedrooms into the balcony or an adjacent room. • Expanding the Majlis into the garage space. • Expanding the main entrance lobby. <u>Additions:</u> • Adding an external kitchen. • Adding an additional Majlis by repurposing the garage space. • Adding a ground-floor toilet. • Adding an elevator.	<u>Interiors:</u> • Using heat- and moisture-resistant gypsum ceilings, particularly in kitchens. • Using neutral-colored paints and wallpapers for wall finishes. • Using substitute materials that are affordable and cost-effective for cladding and wall decoration, such as WPC boards, MDF panels, and PVC marble sheets. • Using ceramic and porcelain floor tiles in the Majlis and living room areas. • Using HDF laminated flooring in bedrooms.	<u>Windows:</u> • Enlarging living room windows overlooking the backyard. • Expanding windows on the main façade. • Installing shadings for living room windows. <u>Doors:</u> • Installing a sliding door in the living room overlooking the backyard. • Adding an external entrance to the Majlis. <u>Ceilings:</u> • Installing simple plain gypsum ceiling designs.

• Adding an additional bedroom on the first floor. • Adding bathrooms to the bedrooms (if not already present). • Adding dressing rooms to the bedrooms. • Adding a living room on the first floor (if not already present). • Adding an additional floor containing either a maid's room, laundry room, and storage or an additional bedroom with a bathroom. • Adding private gardens with shaded seating areas in the setbacks (particularly backyards). • Adding a rooftop garden with shaded seating areas.	• Changing bathroom finishes by replacing wall and floor tiles with high-quality porcelain tiles. <u>Exteriors:</u> • Using glass, wood, aluminum, and stone cladding for exterior facades. • Using artificial grass for external wall cladding or flooring. • Using a combination of artificial grass and stone or concrete tiles for flooring, particularly at the entrance.	<u>Lighting:</u> • Reducing the number of lighting in the ceiling. • Replacing existing lighting with energy-efficient lighting such as smart lighting. • Using magnet-track lighting systems for ceilings. • Using concealed lighting for ceilings and walls. • Using spotlights with calm and comfortable colors. <u>Boundaries and Parapet walls:</u> • Raising the heights of front and rear fences. • Raising the heights of parapet walls.
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4.2.1.2. The Common Motivations

This category includes the following themes:

a) Socio-Cultural Aspect

The interviews showed that many of the residents' modifications are driven by social considerations. Interviewees #2, #3, and #14 observed that residents often expand their housing units because the existing sizes do not meet their social needs or accommodate their family sizes. For example, residents frequently opt to expand their living rooms due to the regular weekend gatherings typical of Bahraini families, as highlighted by Interviewee #4. Interviewee #18 elaborated that a room measuring three meters by three meters is inadequate for gatherings of more than six individuals; thus, given that Bahraini families are usually large and extended, residents need more spacious areas to accommodate these events.

Interviewee #11 provided further insight, highlighting residents' desire for additional space driven by concerns about future family circumstances. He noted, "During modifications, clients often seek information regarding the structural capacity to accommodate future floor additions and room expansions." Interviewee #2 also indicated that residents have a forward-thinking approach to housing modifications, stating, "Indeed ... one of the children will eventually settle in the family home." Interviewees #1 and #13 concurred with this viewpoint, explaining that residents sometimes seek to add extra rooms or create separate apartments to accommodate their children after marriage. Similarly, Interviewee #19 emphasized that the majority of residents consider the long-term implications, envisioning their home as a space not only for themselves but also for their children and future

generations. Consequently, they endeavor to maximize its potential by expanding it as much as possible.

The interviews also underscored privacy as a significant motivating factor driving these modifications. According to Interviewees #13 and #18, while residents appreciate the concept of openness, they also prioritize privacy. This encompasses residents' keenness to ensure privacy from surrounding neighbors, as indicated by Interviewee #12. Interviewee #19 elaborated on this aspect, explaining that many homeowners raise the front fence of their properties due to concerns about visibility from the street. However, Interviewee #19 clarified that adequate privacy can still be maintained even with a standard fence height. Additionally, Interviewee #1 emphasized the frequent request for shadings in the backyard to enable comfortable use without being visible to neighbors.

Residents also prioritize maintaining privacy during house visits. Interviewee #10 noted the necessity of privacy modifications to segregate male and female guests, especially given the conservative nature of Bahraini society. Interviewee #16 concurred, emphasizing residents' efforts to safeguard family privacy during guest visits. Besides, Interviewees #5 and #17 articulated residents' desire to provide a discrete space for guests, isolated from the rest of the house, designated for formal visits, and preferably larger than the current available space.

As the interviews elucidated, privacy is also crucial for each family member. According to Interviewees #2 and #3, residents seek to ensure privacy for every family member by allocating individual bedrooms, each equipped with a bathroom and dressing room. Interviewee #10 underscored

the significance of offering personal space for each individual, stating that residents prioritize enhancing privacy by expanding bedrooms and adding private bathrooms. Interviewee #10 further highlighted residents' desire for personalized spaces where they can express themselves and add their own touches. Interviewee #16 supported this viewpoint, elaborating that residents expand or add rooms to cater to the diverse needs of each family member. For example, if a son desires to marry and reside in the family home, he requires his own suite, underscoring the importance of privacy for all household members.

Furthermore, Bahraini residents value their social relationships, prompting them to seek modifications that enhance the aesthetic appeal of their homes as a gesture of appreciation for guests and to foster a welcoming atmosphere, as stated by Interviewees #15, #18, and #20. In this context, Interviewees #4, #15, and #16 remarked that residents prioritize the aesthetic appeal of their residences, particularly when hosting guests. They also highlighted that residents often tailor their ground floor specifically for guest use. Likewise, Interviewee #18 emphasized residents' dedication to maintaining an aesthetic ambiance when entertaining visitors. He further noted that residents usually prioritize the visual appeal of the outdoor Majlis for accommodating male guests and the indoor hall for hosting female guests.

In addition, in their pursuit of refining the aesthetic appeal of their housing units, numerous residents, as emphasized by Interviewees #1, #8, and #14, modify their exterior facades to attain distinct and unique contemporary designs. Interviewee #3 further noted that residents often modify the existing facades to "break their rigidity and monotony."

Moreover, both Interviewees #5 and #14 elaborated that residents aim to differentiate their homes from others to avoid uniformity and ensure distinction within their neighborhood. Interviewee #17 expanded on this point, clarifying that residents seek to create unique identities for their homes by making modifications to the exterior facade. These modifications often include altering the color of the paints or materials, introducing decorative elements, or enlarging the windows, as highlighted by Interviewee #17. This perspective was also supported by Interviewee #1, who indicated that the alterations primarily target the main facades due to the standardized style of houses resulting from mass production; this "can lead to confusion and difficulties in locating or describing the house's address, especially for new visitors."

b) Economic Aspect

As interviews showed, the economic aspect plays an integral role in the modification process, and it's one of the fundamental concerns for Bahraini residents in subsidized housing. For example, most residents prioritize cost-effective, high-quality materials that require less maintenance, a viewpoint affirmed by most interviewees, including Interviewees #4, #10, and #18, who distinctly emphasized this facet. Besides, Interviewee #15 highlighted that residents view their homes as lifelong investments or dream residences. As a result, they prioritize higher quality, sustainable materials that enhance durability and living standards. Interviewee #17 agreed, observing that constrained budgets often lead householders to select affordable materials that improve the overall finish while minimizing future maintenance expenses. Similarly, Interviewee #19 underscored residents' preference for

sustainable materials that provide longevity and resilience, thereby reducing the necessity for frequent replacements and mitigating the risk of damage.

Other modifications pertaining to the economic aspect also involve initiatives directed at conserving energy within the household. Many residents, for instance, "tend to reduce the number of lights in the ceiling while still providing adequate illumination, resulting in lower lighting costs," as demonstrated by Interviewee #4. Both Interviewees #17 and #19 also addressed this aspect, noting the increasing preference among residents for installing smart lighting solutions. These systems, controllable remotely, not only offer convenience but also promote energy conservation.

Furthermore, residents frequently make adjustments to align with prevailing housing design trends. Interviewee #19 clarified this, noting that residents prefer to stay abreast of the latest home design trends and innovations to avoid feeling left behind. This was also confirmed by Interviewee #20, who indicated the general inclination among Bahrain residents to embrace modern housing approaches and stay updated with emerging trends. Likewise, Interviewee #9 illustrated residents' aspirations to stay current and keep pace with contemporary trends by choosing modern facades and departing from conventional designs to infuse residential units with a distinctive character.

In addition, residents' modifications are based on the needs of future generations as well as changing circumstances, as confirmed by Interviewee #10. According to Interviewee #2, "Nowadays, the demands have shifted, particularly among newer generations... they now seek additional spaces such as dedicated study or work areas, home gyms, gaming zones, or

entertainment spaces." Interviewee #2 correlated these emerging demands with evolving conditions, particularly emphasizing the significant impact of the COVID-19 period on the client's needs. Interviewee #4 agreed and illustrated that residential gardens have gained significance as people have recognized the need for an indoor area for relaxing and socializing. Interviewee #4 further elaborated that these areas have become essential for family gatherings and gardening activities, particularly during the COVID-19 pandemic. Additionally, Interviewee #10 stressed the increased importance of recreational amenities post-pandemic and the necessity of including indoor green spaces and seating areas for gatherings. Besides, Interviewee #10 argued that creating home offices has become a common request from most residents, as they are necessary for remote work.

c) Environmental Aspect

The interviews revealed that residents' modifications often stem from environmental considerations. Residents' desire to foster a stronger connection with nature is a significant driver behind these modifications, as indicated by Interviewees #14 and #17. According to Interviewee #9, residents aim to strengthen the connection between interior and exterior spaces in subsidized housing by enhancing visual, sensory, and auditory links with nature. For example, residents request larger windows to allow more sunlight and natural ventilation, creating a greater sense of openness to the outside courtyard. Similarly, Interviewees #4, #12, #15, and #18 emphasized a common demand to expand windows and doors to maximize natural light and ventilation within interior spaces. Interviewee #4 observed that contemporary houses no longer feature small windows; instead, larger windows are now essential for ventilation, lighting, and offering an

attractive external view. Interviewees #12 and #20 also underlined residents' desire for greater natural light penetration within their homes.

Moreover, Interviewee #19 emphasized a crucial aspect: when homeowners first receive the housing unit, their immediate focus is on the outdoor area and its landscaping due to its vital role in infusing vitality and fostering a deep, enduring bond with nature. He further noted that adding green spaces around housing units is one of the top priorities for homeowners. Interviewee #20 also confirmed this, noting that outdoor areas around residential units often lack natural elements, leading residents to enhance these spaces with landscaping. Additionally, Interviewee #18 explained that Bahrain residents have maintained a strong connection to courtyards, rooted in their heritage and the traditional Bahraini homes that featured central courtyards. According to Interviewee #9, residents extensively modify the outdoor spaces surrounding their homes, particularly the backyard, as a means of strengthening their connection with nature. Interviewee #3 elaborated: "A backyard is essential for residents as they prefer having private gardens rather than visiting public ones."

Consequently, residents often aspire to incorporate glass facades overlooking the backyard, as emphasized by Interviewee #1. Interviewees #4, #12, and #20 echoed this sentiment, explaining that residents frequently install more oversized windows facing the backyard to enhance indoor spaces with visually appealing views, especially when complemented by water features, vegetation, and pergolas. Interviewee #17 also confirmed this, indicating that residents request incorporating gardens or natural views into the interior spaces of their homes.

Interviewee #4 also shed light on another aspect, highlighting the influence of local geography on residents' modification preferences. According to Interviewee #4, there is a noticeable trend among residents of the East Hidd subsidized housing project, where most prioritize maximizing the sea view by installing larger windows." Interviewee #11 shared an example from past experience, where a client aimed to arrange the interior spaces of a first-floor residence to offer sea views, notably in the East Hidd Housing project. Hence, Interviewee #11 highlighted how the external environment significantly influences the layout of interior spaces. Similarly, Interviewee #14 stressed the impact of the natural environment on residents' behavior. She noted that this influence is evident among residents of Salman City Housing, who frequently request sea-facing windows to enhance their living experience. Interviewee #9 corroborated this, indicating frequent requests to reposition doors and windows for optimal natural views and sunlight exposure.

The interviews further revealed that residents often modify their dwellings not only to enhance their connection to nature but also to mitigate the adverse effects of the local weather. Interviewee #10 emphasized residents' usual inclination to incorporate plantations and trees into the outdoor areas surrounding their residences, citing their effective heat-reducing properties as a primary motivator. Interviewee #19 supported this explaining that some residents either enclose the side or rear setbacks by extending the living room towards them or install shading on windows overlooking them to minimize dust accumulation. Besides, Interviewee #19 stated that residents use transparent window shadings to reduce sunlight intensity while maintaining natural daylight.

So, the common motivations behind residents' modifications in Bahraini subsidized housing units revolve around three themes. The key findings of each theme are summarized in Table 4.2 below:

Table (4.2): Key Findings of Common Motivations Behind Resident Modifications in Bahraini Subsidized Housing Units

Socio-Cultural Aspect	Economic Aspect	Environmental Aspect
<u>Space Optimization:</u> - Addressing family social needs and accommodating their growing size due to inadequate housing unit sizes. - Addressing concerns about future family circumstances, such as the potential marriage of sons. <u>Privacy:</u> - Ensuring privacy from the surrounding neighbors. - Maintaining family privacy during guest visits.	<u>Cost Savings:</u> - Reducing maintenance expenses. - Conserving energy and reducing electricity expenses. <u>Contemporary Demands:</u> - Keeping up with the current housing design trends. - Meeting the diverse needs of today's generations. - Meeting the emerging demands with evolving conditions.	<u>Nature Integration:</u> - Fostering a stronger connection with nature by strengthening the link between interior and exterior spaces. - Creating a greater sense of openness to the outdoors. - Maximizing natural light and ventilation within interior spaces. - Enhancing outdoor spaces with landscaping.

• Ensuring privacy and personalization for each family member. <u>Aesthetics:</u> • Enhancing house aesthetics for guest hospitality. • Breaking the rigidity and monotony of the external facades. • Distinguishing the house and creating a unique identity.		• Enhancing indoor spaces with visually appealing natural views. • Preserving the traditional Bahraini connection to courtyards and residents' inherent interest in them. • Taking advantage of the natural environment that surrounds the housing unit. <u>Climate Control:</u> • Addressing local weather challenges by reducing heat, dust accumulation, and sunlight intensity while preserving natural daylight.
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4.2.1.3. The Common Mistakes

This category includes the following themes:

a) Ignoring the role of experts in the modification process

As revealed in the interviews, one of the common mistakes identified among residents in subsidized housing is the disregard and underestimation of professionals' expertise in the modification process. According to Interviewees #7 and #16, residents often neglect involving experts in modifications and opt to make adjustments independently. Interviewee #20 highlighted this, stating that most residents undertake modifications without consulting an engineer, resulting in severe problems due to lack of experience. The Interviewees further elaborated on this aspect, discussing the reasons behind this behavior and its consequences.

In discussing why residents undertake modifications independently, Interviewee #14 pointed out that they often underestimate the complexity of the process, assuming they can manage without professional assistance. Additionally, Interviewee #8 emphasized residents' limited awareness regarding the quality of building materials, which can lead to potential structural issues. She also highlighted the Ministry of Housing's (MoH) extensive efforts in providing sustainable systems and durable materials with lifespans exceeding ten years. Unfortunately, residents often overlook these details, resulting in damage during alterations, such as voiding warranties and compromising structural integrity, as stated by Interviewee #8.

Interviewee #14 also highlighted another prevalent reason: many residents prefer to redesign their homes and undertake modifications

independently, knowing in advance that these modifications might be illegal. This is often due to their impatience in waiting for municipal approval and their desire to expedite the process. Interviewees #4, #15, and #16 also clarified that many residents are aware of the violations and municipal rules but still prioritize their need for modifications. Additionally, Interviewee #10 noted that some individuals are willing to pay fines for these violations because they value the appearance of their homes over potential penalties.

Regarding the consequences of these modifications and violations, the interviews revealed several issues. Interviewee #9 noted that residents often ignore detailed engineering drawings and proceed with modifications without them, leading to a higher error rate and significant damage. These drawings are crucial as they indicate the location of columns, which are the foundation of the building; any impact on them during modifications can compromise the house's structure. Interviewees #1 and #20 explained that residents sometimes remove load-bearing walls that contain electrical extensions, affecting the building's stability and functionality. They also mentioned that residents often close ventilation outlets, resulting in air circulation issues and negatively impacting the appearance of external facades. This was also underscored by Interviewee #5, indicating that residents can "remove a wall without realizing it is a bearer or direct support for the house... this impacts the building's safety in the future".

Furthermore, Interviewee #8 highlighted that unplanned modifications can directly affect the structural system, leading to wall cracks and paint damage. Interviewee #6 noted that residents often ignore proper construction methods, resulting in higher electricity costs, potential fires, and encroachment on neighboring properties. For example, residents may add

outdoor kitchens without adequate ventilation, increasing fire risk. They may also expand spaces randomly, removing structural supports and compromising safety. Interviewee #6 also added that improper placement of pipes and air conditioning drainage systems are common issues seen in the modified houses due to the absence of architects, as residents, often with limited incomes, try to avoid the cost of professional assistance. Similarly, Interviewee #19 noted that seemingly simple modifications can pose significant risks. For example, when residents convert their parking lots into living areas, the increased electricity consumption can potentially lead to power outages across the entire region.

Additionally, Interviewee #19 highlighted several common violations with severe consequences, such as canceling ducts or courtyards on the first and second floors to expand hall spaces, converting garages into sitting rooms, turning existing guest rooms into living rooms or bedrooms, and opening side windows or building towards side setbacks, which violates the neighbor's right to a two-meter setback. Interviewee #8 recounted an incident where residents complained of water leaks after installing a Jacuzzi and redesigning their bathrooms. The leaks were attributed to the residents' alteration of the piping system, resulting in the voiding of the warranty.

Moreover, Interviewee #6 highlighted how residents' random modifications result in distortion in the physical forms of residential units, explaining that: "During my involvement with the Hamad Town project in 1988, the residential units shared a uniform appearance, characterized by consistent building lines and setbacks, and were constructed with exceptional craftsmanship and aesthetic appeal. Initially, the area had a distinct identity. However, over time, this collective identity evolved into

individual expressions, resulting in a loss of the area's original character and identity."

While numerous residents undertake modifications independently, interviewees also noted instances where residents may seek expert involvement later in the process. Interviewee #14 highlighted that residents often overlook experts, particularly designers, failing to engage with them early in the process. This lack of communication, as Interviewees #14 and #10 clarified, results in increased costs. Interviewee #14 further notes that when homeowners approach designers after completing modifications, they may encounter structures that don't meet their expectations, risking demolition if changes are required. In this context, Interviewee #10 underscored a prevalent mistake commonly observed: starting construction without consulting a specialized engineer.

According to Interviewee #15, some householders start the construction process with a contractor before consulting a designer. When issues arise, they seek the designer's help too late, causing delays and extra costs. Interviewee #19 added that this late involvement often leads to confusion, as the engineering office must then deduce the contractor's work without prior knowledge. Due to that, "most designers realize they need to make considerable changes to correct what the client has done... for example, they may need to break a wall, change the paint, or add new electrical outlets, increasing the costs and efforts and delaying the project delivery", as explained by interviewee #4.

For this reason, Interviewee #5 emphasized that residents must first get Ministry approval for any modifications. Interviewees #17 and #19 also

stressed that experts from various disciplines should be involved early in the modification process, following a coordinated sequence to guarantee efficiency and prevent delays. They highlighted the need for coordination among contractors and workers to avoid mistakes and violations, ensuring the best solutions based on client needs and budgets, and preventing conflicts among contractors.

In addition, Interviewees #14 and #16 highlighted that residents may involve experts early but often ignore their advice, opting to make modifications according to their own preferences. Interviewee #14 noted that residents frequently consult experts but proceed with their own plans, committing violations and paying fines to implement their ideas. Interviewee #14 also elaborated that this disregard extends to essential structural advice, such as retaining supportive walls and columns. Interviewee #11 added that engineers usually struggle to convince clients of the risks and flaws in their proposed modifications, resulting in project rejections to uphold professional integrity and safety standards.

Interviewee #3 expanded on this point, noting that clients often insist on modifications that violate municipal requirements due to their lack of awareness. For example, a client might want to add a design that doesn't comply with regulations despite being warned by the design engineer that the municipality will reject it. Interviewee #2 shared a similar case where a client requested a glass façade for his house, ignoring advice about the increased temperature from sun exposure and proceeding with the contractor anyway. Besides, Interviewee #10 also cited an example where a contractor installed a door incorrectly despite the interior designer's advice. This misstep resulted in additional expenses for the homeowner to rectify issues

such as electrical points and bathroom layouts after completing plumbing installations.

Interviewee #12 further confirmed that clients frequently agree on plans with designers but implement different ones with contractors, disregarding the designers' warnings. Similarly, Interviewees #4, #11, and #16 highlighted that homeowners often disregard engineering office plans during modifications, resulting in changes such as door removals, room expansions, or facade alterations. This tendency stems from homeowners seeking advice from inexperienced sources and trusting their judgment, as emphasized by Interviewees #2, #15, and #16. Moreover, Interviewee #10 affirmed that clients insist on modifications because they see their house as a lifetime investment and want to implement all their ideas, making it challenging for engineers to convince them.

Furthermore, interviewees also highlighted residents' tendency to rely on a single expert to handle all tasks, neglecting the contributions of other specialists needed for the process. For instance, Interviewee #19 illustrated how some homeowners bypass specialized engineers and depend only on contractors for modifications, resulting in mistakes and complications. Similarly, Interviewee #14 noted instances where homeowners choose contractors over designers due to cost concerns. Interviewee #9 explained how projects solely managed by contractors result in disorganized electrical layouts, suggesting that involving engineers or interior designers would ensure better planning. This lack of awareness about the roles of various experts is attributed by Interviewee #4 to residents' inexperience. Thus, Interviewee #17 stressed the importance of educating residents about the

distinct roles of each expert, emphasizing that contractors execute construction while designers analyze plans before modifications.

b) Involving the unqualified in the modification process

The interviewees indicated that while many residents exclude experts from the modification process, they often involve unqualified individuals instead. According to Interviewee #2, many residents turn to unlicensed offices instead of specialized engineering firms, believing that engineering offices are only necessary for building new houses, not for additions or modifications. Interviewee #19 added that small, unlicensed contracting offices usually assign tasks outside workers' areas of expertise to save costs, resulting in numerous issues. Interviewee #19 also explained that these unqualified offices often disregard their reputation; if problems arise, they close and reopen under a new commercial name, retaining the same management and workers.

Interviewee #10 highlighted that some residents turn to unlicensed contracting companies with insufficient labor, leading to workflow delays as the same workers perform various tasks. Interviewees #1, #2, #11, and #20 also noted that some homeowners seek approval from specialized engineering offices to obtain a municipal license for modifications. However, after receiving the permit based on compliant initial drawings, they turn to unlicensed offices to make changes that the licensed offices had refused. These unlicensed offices willingly alter the approved plans, leading to further complications. Yet, this strategy proves ineffective, as municipal inspections often reveal these violations, leading to fines for homeowners, as emphasized by Interviewee #1. Besides, Interviewee #1 highlighted that

homeowners are compelled to return to licensed engineering offices to address these breaches.

Interviewee #1 asserted that this approach results in budget deficits, impeding residents from adequately furnishing their homes. Interviewee #2 argued that neglecting specialized offices may lead to long-term structural issues. Therefore, Interviewees #11 and #17 emphasized the necessity of residents understanding the crucial role of engineering offices. They stressed the importance of engaging only licensed engineering offices with expert engineers to avoid problems. Interviewee #4 further underscored that engineering offices can assist inexperienced clients in selecting suitable designs or proposing options tailored to their needs and budgets.

In addition, most interviewees emphasized the common mistake of hiring inexperienced contractors. According to Interviewee #1, this mistake often involves direct engagement with inexperienced contractors who may disregard building requirements, leading to various violations. Interviewee #3 highlighted that clients typically assign the designs to contractors, often chosen based on personal connections rather than expertise. Moreover, Interviewee #10 pointed out the drawbacks of inexperienced contractors, including increased costs, time wastage, and heightened risk of errors. Similarly, Interviewee #4 outlined the consequences of unqualified contractors, including misunderstanding of designs and inadequate supervision, resulting in mistakes like improper flooring installation.

Interviewees #5, #17, #18, and #19 all highlighted the risks associated with inexperienced contractors. These contractors often lack the expertise to assess how modifications will impact the overall design, leading to

architectural distortions and structural issues, as noted by Interviewees #5 and #18. Interviewee #17 cautioned against engaging inexperienced contractors without proper plans or design concepts, which frequently results in problems during implementation. Interviewee #19 further elucidated this point, emphasizing that inexperienced contractors often work without referring to engineering plans, leading to severe issues such as drainage blockages and electrical faults. Interviewee #19 warned against the misconception that choosing the lowest-priced contractor saves money, as it often leads to additional costs and delays. An example provided by Interviewee #18 illustrated the consequences of hiring an unqualified contractor, highlighting the need for expert intervention to rectify resulting problems. Interviewee #3 stressed the importance of selecting contractors through a licensed engineering office to avoid exploitation and ensure quality work.

Moreover, many residents turn to unqualified laborers for modifications, as highlighted by Interviewees #2, #6, #18, and #19. These workers lack the necessary expertise in construction and reading engineering drawings, leading to future problems for homeowners. Interviewee #19 explained that inexperienced workers often rush their work, leading to incomplete and error-prone outcomes. Besides, Interviewee #6 elaborated that, despite the risks, residents opt for unlicensed labor due to its affordability, particularly those with limited income seeking cost-effective solutions. Interviewee #20 also emphasized that some homeowners opt to modify or demolish without hiring licensed contractors or qualified laborers, aiming to save money. However, this often results in poor design and construction mistakes. For instance, workers may incorrectly install

insulation or waterproofing materials to reduce costs, leading to environmentally unfriendly buildings with high electricity consumption. Additionally, these workers often lack experience with materials, resulting in misplaced or incorrectly installed floors, as noted by Interviewee #4. Interviewee #12 shared a concerning incident where workers, unsupervised by an engineer or contractor, accidentally damaged structural elements, highlighting the potential dangers of such practices.

c) Implementing Inappropriate Modifications

Influence from social media designs is one of the most prevalent behaviors among residents, as highlighted by Interviewees #1, #2, #16, and #18. They discussed the challenges faced when residents insist on inappropriate home modifications based on these influences. Interviewee #2 explained that constant exposure to the internet and social media leads homeowners to hold unrealistic expectations, filling their minds with numerous ideas. Interviewee #2 also noted that despite efforts to explain the drawbacks of such modifications, residents prioritize aesthetics over practicality, driven by their fascination with impressive 3D online images.

Interviewee #10 noted that clients are often confused by various online images and designs. This, in turn, affects designers, who struggle to incorporate the clients' desires. He also highlighted that clients request changes constantly due to their indecision and lack of clarity. Interviewee #18 added that clients sometimes want to combine elements from contrasting designs, which can result in disproportionate outcomes. Interviewee #11 pointed out that many modifications are luxuries rather than necessities, citing an example of a client who went into debt by

overspending on non-essential changes influenced by social media. Interviewee #11 further indicated that clients often insist on using specific finishing materials seen online, which are hard to match precisely, causing further issues.

As noted by Interviewees #15, #16, and #17, residents often replicate designs not only from online images but also from their neighbors. Interviewee #8 confirmed that approximately 60% of the modifications made by residents are driven by imitation rather than correcting construction or design errors. Furthermore, Interviewee #6 highlighted that the first mistake residents make is copying their neighbors. Interviewee #6 further presented an example of this case, stating that "if the neighbor builds something inside his house, the inhabitant imitates him or seeks the assistance of the same contractor in charge of the construction, whether he is experienced or not."

Interviewees #4 and #19 also confirmed this, noting that many residents imitate their neighbors. For example, if they see a neighbor breaking a wall to open up space, they do the same without prior engineering consultation. Interviewee #16 shared an experience where a project took longer because the client constantly brought new ideas seen in neighbors' houses. Similarly, Interviewee #2 mentioned a case where a client wanted to remove a crucial column because a neighbor had done so despite being warned of potential problems. The client insisted, believing that if it worked for the neighbor, it would work for them too.

Moreover, residents' modifications may not suit the available space in their residential units, as noted by Interviewees #7 and #17. They explained

that many clients struggle to estimate space accurately, often overestimating its actual size. This misconception leads to difficulties in meeting their requirements. Interviewee #2 elaborated that there is also a lack of awareness of accommodating spaces. For example, residents request large halls, rooms, and gardens in small spaces. Enlarging one area inevitably reduces another, leading to dissatisfaction. Interviewee #20 pointed out that homeowners often insist on adding rooms or expanding areas despite insufficient space, resulting in impractical layouts.

Interviewee #1 highlighted how residents' high expectations often clash with the limited space in their dwellings, leading to impractical modifications. For instance, adding multiple rooms to a small unit can result in a crowded and poorly ventilated living space, as described by Interviewee #1. This tendency stems from residents' unrealistic expectations regarding the quality of finishing materials and the final design within constrained areas, as explained by Interviewee #9. Similarly, Interviewees #16 and #18 emphasized how residents' insistence on incompatible modifications poses challenges during implementation, particularly within structural constraints like columns and beams.

Additionally, residents often encounter budgetary constraints when implementing modifications, as highlighted by most Interviewees. Interviewee #3 noted instances where clients find that the cost of implementation exceeds their initial expectations, leading to financial strain. Similarly, Interviewee #5 observed that many homeowners exceed their budget due to unlicensed modifications, especially those with limited incomes. Besides, both Interviewees #14 and #20 emphasized the challenges and difficulties designers encounter when clients desire extravagant designs

beyond their budgetary limits. Despite designers' efforts to inform clients about budget constraints, some residents overlook financial considerations until later in the process, as noted by Interviewee #15.

So, residents' common mistakes in the modification process in Bahraini subsidized housing units revolve around three themes. The key findings of each theme are summarized in Table 4.3 below:

Table (4.3): Key Findings of Common Resident Mistakes During the Modification Process in Bahraini Subsidized Housing Units

Ignoring the role of experts in the modification process	Involving the unqualified in the modification process	Implementing Inappropriate Modifications
• Making the modifications independently without involving experts. • Involving experts at a late stage in the modification process. • Disregarding experts' advice and insisting on their own decisions. • Assigning all the responsibilities to a single expert.	• Involving unlicensed offices. • Involving an inexperienced contractor. • Hiring unqualified laborers.	• Imitating designs from social media platforms. • Replicating designs seen in neighboring residences. • Overestimating the dwelling space. • Undertaking modifications exceeding the allocated budget.

4.2.2. Second Phase: Case Study Strategy

During this phase, the primary focus was on exploring the behavioral differences among residents of Bahraini subsidized housing by employing the case study strategy. This approach allowed for an in-depth analysis of various resident behaviors in the context of subsidized housing. Within each case study, data were collected using different tools and structured as follows:

4.2.2.1. On-Site Observations and Plan Analysis — Objective 2

Collecting data through on-site observations and plan analysis tools was aligned with the study's second objective, which aimed to analyze residents' modification patterns in Bahraini subsidized housing units. Consequently, the results obtained through these tools were analyzed as follows:

a) Case Study 1 _____

- **On-Site Observations**

The observations were documented for case study 1 through notes and photographs as follows:

- **Observation Notes**

The notes were compiled and organized in the following table:

Table (4.4): Observation Notes for Case Study 1

Observation Notes —Case Study 1	
Housing Unit Type	Type-3A
Observed Modifications	<u>Spaces:</u> • The living room was extended into the future expansion space and the central courtyard. • A dining area was added as part of the extended living room, located directly in front of the kitchen. • A small part of the central courtyard (1-meter by 1.5-meter) was left. • The ground floor bathroom area was halved, and the other half was used as a vanity area. • The master bedroom on the first floor was expanded into the future expansion area and divided into a bed area and a sitting area. • Two bathrooms, serving the master bedroom and a nearby bedroom, were added to the central courtyard area on the first floor, and a 1 x 1.7m duct was left open for ventilation. <u>Materials:</u> • Porcelain flooring was used on the ground floor, and parquet flooring was used in the bedrooms.

Observed Modifications (Cont.)	• WPC cladding was used to decorate sections of the entrance lobby walls and bedroom walls. • Artificial grass was used for the courtyard flooring. • Foam panel moldings were added to the ground floor walls as decorative elements. <u>Housing Components:</u> • A simple, plain gypsum ceiling was used for all spaces. • Concealed lighting and spotlights were installed in the ceilings of the ground-floor hall and first-floor bedrooms. • Luxurious chandeliers were added to the living room and bedrooms. • The entrance to the Majlis was moved from the lobby to the external porch, and a fixed console table was added in place of the old entrance. • A glass door was installed as an entrance to the remaining area of the central courtyard, with a tree placed in the middle to create an aesthetic view for the dining area. • An additional glass door was added to the courtyard facing the living room. • The shared bathroom on the first floor was converted to an ensuite, with the door now accessible from the adjacent bedroom.
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- **Observation Photographs**



Fig. 4.1: Entrance Lobby

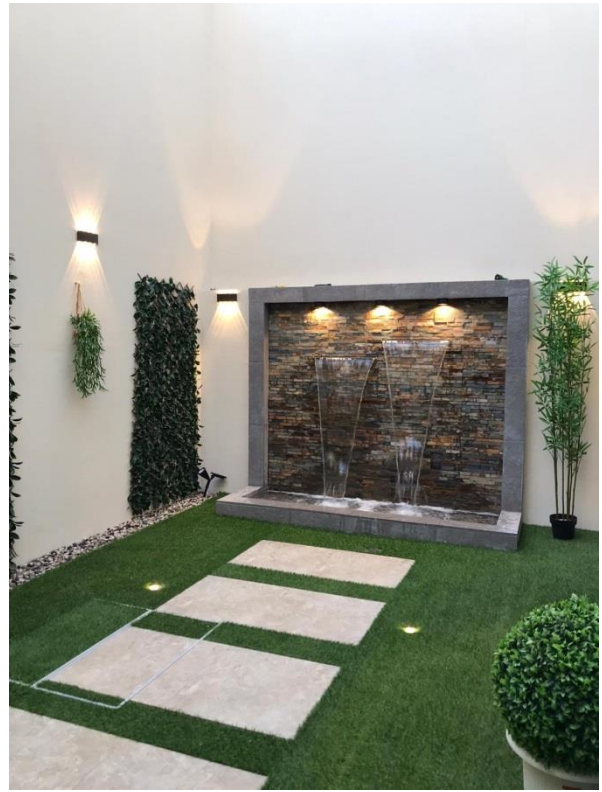


Fig. 4.2: Courtyard



Fig. 4.3: The Expanded Bedroom: 3D Rendering (Source: Householder)

- **Plan Analysis**

The figure below shows the pre- and post-modification plan analysis for Case Study 1:



Fig. 4.4: Patterns of Residents' Modifications—Case Study 1

b) Case Study 2

- **On-Site Observations**

The observations were documented for case study 2 through notes and photographs as follows:

○ **Observation Notes**

The notes were compiled and organized in the following table:

Table (4.5): Observation Notes for Case Study 2

Observation Notes —Case Study 2	
Housing Unit Type	Type-2
Observed Modifications	<u>Spaces:</u> • The entrance lobby was extended into the porch. • The living room was expanded using the kitchen space and part of the courtyard, leaving a 3.1m by 3.4m courtyard. • A dining area was added to the living room in front of the remaining courtyard. • The future expansion space was used for a new kitchen, as the original kitchen was used to expand the living room. • The first-floor bedroom adjacent to the living room was turned into a master suite and expanded to include the balcony space as a sitting area and the living room as a dressing room. • The shared bathroom is now accessed from the master bedroom.

Observed Modifications (Cont.)	• The bedroom next to the staircase was extended above the new living room extension. • The bedroom adjacent to the staircase was extended above the new living room extension, complemented by the addition of a bathroom and balcony. <u>Materials:</u> • Ceramic flooring tiles were used on the ground floor. • The interior and exterior walls were repainted. <u>Housing Components:</u> • Windows on the ground floor were enlarged. • A glass door was installed in the extended living room, providing access to the remaining courtyard space. • The partition between the staircase and living room was removed and replaced with an ornate goldish aluminum partition. • An entrance door was added to the extended master bedroom, located in the corridor to the right of the staircase. • A simple, plain gypsum ceiling was used for all spaces. • Concealed lighting and spotlights were installed in the ceilings of the ground floor. • Luxurious chandeliers were added to the living room and dining area.
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○ **Observation Photographs**



Fig. 4.5: Glassdoor Overlooking the Backyard



Fig. 4.6: Aluminum Staircase Partition



Fig. 4.7: A View of the Extended Living Room

- **Plan Analysis**

The figure below shows the pre- and post-modification plan analysis for Case Study 2:



Fig. 4.8: Patterns of Residents' Modifications—Case Study 2

c) Case Study 3

- **On-Site Observations**

The observations were documented for case study 3 through notes and photographs as follows:

○ **Observation Notes**

The notes were compiled and organized in the following table:

Table (4.6): Observation Notes for Case Study 3

Observation Notes —Case Study 3	
Housing Unit Type	Type-1 (<u>Staircase</u> located on the <u>left side</u> in the floor plan)
Observed Modifications	<u>Spaces:</u> • The original living room was converted into a bedroom for the grandmother. • A new living room was constructed in the future expansion area, utilizing part of the adjacent courtyard space. • A bathroom was added in the courtyard area next to the Majlis. • A 1.6m by 1m section of the courtyard was maintained as a duct to ventilate the bathroom and provide daylight to the new living room through a glass door. • The first floor was divided into two separate apartments, one on the left side of the staircase and the other on the right.

Observed Modifications (Cont.)	• The area on the first floor, which serves as the roof for the new ground-floor living room and bathroom, is used for drying clothes by the window. <u>Materials:</u> • Ceramic flooring tiles were installed on both the ground and first floors. <u>Housing Components:</u> • A door was added as an entrance to the grandmother's bedroom, now occupying the space of the original living room. • A glass door was installed in the new living room, providing access to the duct. • Two entrance doors were added on the first floor for the two separate apartments. • Two luxurious chandeliers were installed: one in the living room and the other in the Majlis. • The height of the external boundary was increased. • The Majlis window was sealed off during the construction of the new bathroom.
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○ Observation Photographs



Fig. 4.9: The New Living Room



Fig. 4.10: Courtyard facing the Grandmother's Bedroom



Fig. 4.11: First-Floor Apartments after Separation

- **Plan Analysis**

The figure below shows the pre- and post-modification plan analysis for Case Study 3:



Fig. 4.12: Patterns of Residents' Modifications—Case Study 3

d) Case Study 4

- **On-Site Observations**

The observations were documented for case study 4 through notes and photographs as follows:

○ **Observation Notes**

The notes were compiled and organized in the following table:

Table (4.7): Observation Notes for Case Study 4

Observation Notes —Case Study 4	
Housing Unit Type	Type-1 (<u>Staircase</u> located on the <u>right side</u> in the floor plan)
Observed Modifications	<u>Spaces:</u> • The entrance lobby was extended into the porch. • The ground floor living room was expanded into the future expansion space. • A dining area was integrated into the expanded living room, positioned towards the courtyard. • On the first floor, the bedroom with a balcony was enlarged by enclosing the balcony space, now serving as the main master bedroom. • The shared bathroom was expanded into the roof deck space. • A section of the expanded bathroom was repurposed as a small dressing room. <u>Materials:</u> • The entrance lobby was extended into the porch.

Observed Modifications (Cont.)	• Porcelain flooring tiles were installed in the courtyard. • Privacy ribbons were added to the main master bedroom windows on the first floor. • A simple, plain gypsum ceiling was used for all spaces. • Concealed lighting and spotlights were installed in the ceilings of all spaces on the ground and first floors. • Foam panel moldings were added to the ground floor walls as decorative elements. <u>Housing Components:</u> • A sizable, reflective glass sliding door was added in the extended living room, linking the indoor dining area and the outdoor courtyard. • In the extended master bedroom, a new window occupies the space previously held by the balcony. • Access to the dressing area in the expanded master bedroom is facilitated through an opening directly from the bedroom itself. • The window in the first-floor shared bathroom was relocated post-expansion. • A new door was installed in the shared bathroom, accessible from the dressing room.
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- **Observation Photographs**



**Fig. 4.13: Expanded Entrance
Lobby**



**Fig. 4.14: Dining Area Overlooking
the Courtyard**



Fig. 4.15: Living Room Extension

- **Plan Analysis**

The figure below shows the pre- and post-modification plan analysis for Case Study 4:



Fig. 4.16: Patterns of Residents' Modifications—Case Study 4

e) Case Study 5

- **On-Site Observations**

The observations were documented for case study 5 through notes and photographs as follows:

○ **Observation Notes**

The notes were compiled and organized in the following table:

Table (4.8): Observation Notes for Case Study 5

Observation Notes —Case Study 5	
Housing Unit Type	Type-3A
Observed Modifications	<u>Spaces:</u> • The living room was expanded by utilizing the entire central courtyard space, along with future expansion space. • A dining area has been incorporated into the expanded living room formerly occupied by the central courtyard. • A new living room has been introduced on the first floor, directly above the previous central courtyard location. • The adjacent first-floor bedroom has been converted into a master bedroom, which will expand into the designated future expansion space used for enlarging the ground-floor living room. • A bathroom with an accompanying dressing area has been added to the newly extended master bedroom on the first floor.

Observed Modifications (Cont.)	<u>Materials:</u> • The ceramic flooring tiles on the ground floor were replaced with porcelain tiles. • Porcelain tiles were also chosen for the courtyard flooring. • Moisture resistant gypsum ceiling was installed throughout the entire house. <u>Housing Components:</u> • The door to the Majlis was removed. • With the cancellation of the central courtyard, which acted as a ventilation duct for the ground-floor bathroom, the courtyard-facing window was sealed, and a new one was opened on the seaside. • An external door was installed on the back side of the house, leading from the courtyard to an external garden at the rear of the property. • Large windows measuring 2.5m x 2.75m were added to the expanded living room: three facing the sea, one overlooking the exterior garden, and another facing the house's courtyard. • The window of the first-floor shared bathroom was relocated to the seaside. • Expansive windows facing the sea were incorporated into both the new first-floor living room and the extended master bedroom.
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- **Observation Photographs**



Fig. 4.17: The New External Door Facing the Exterior Garden



Fig. 4.18: Living Room Large Window Facing the Exterior Garden



Fig. 4.19: Living Room Large Window with a Sea View

- **Plan Analysis**

The figure below shows the pre- and post-modification plan analysis for Case Study 5:



Fig. 4.20: Patterns of Residents' Modifications—Case Study 5

f) Case Study 6

- **On-Site Observations**

The observations were documented for case study 6 through notes and photographs as follows:

○ **Observation Notes**

The notes were compiled and organized in the following table:

Table (4.9): Observation Notes for Case Study 6

Observation Notes —Case Study 6	
Housing Unit Type	Type-1 (<u>Staircase</u> located on the <u>left side</u> in the floor plan)
Observed Modifications	<u>Spaces:</u> • The entrance lobby was expanded into the porch and the shared bathroom, with an additional 2m x 2m area. • An elevator was installed in the entrance lobby. • The original living room was transformed into a Majlis. • The kitchen was expanded into the courtyard, becoming the new living room. • The living room and Majlis merged into one large hall. • The former Majlis now serves as the kitchen. • The future expansion and courtyard spaces were merged into a dining and buffet area, featuring a toilet with a vanity. • On the first floor, the living room expanded into the courtyard. • A 2m x 2m shaft was left open in the expanded living room area, with the remaining space used as a pantry. • The master bedroom in the original plan was expanded into the adjacent room, now functioning as a dressing area.

Observed Modifications (Cont.)	• The balcony bedroom was expanded by enclosing the balcony, which is now the main master bedroom. The adjacent room became a workout area, merging its bathroom space with the roof deck to form a dressing area. • A new floor mirroring the layout of the first floor was added above. • A maid's room with laundry facilities was added to the roof. <u>Materials:</u> • Beige ceramic tiles were used for the entire house floor. • Decorative foam panel moldings were used for the ground floor walls. • Gold metal strips decorated select wall areas, including the Majlis. <u>Housing Components:</u> • A window overlooking the garage was installed in the new kitchen. • A large window was added to the expanded ground floor hall. • Two doors were added to the new kitchen, providing access from both the garage and dining area. • Large windows were incorporated into both the first-floor living room and main master bedroom. • Luxurious chandeliers were used on the ground floor, complemented by concealed lighting on select walls and ceilings.
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○ **Observation Photographs**



Fig. 4.21: Expanded Entrance Lobby



Fig. 4.22: Majlis Located in the Former Living Room Space.



Fig. 4.23: Dining Area in the Enclosed Courtyard Space

- **Plan Analysis**

The figure below shows the pre- and post-modification plan analysis for Case Study 6:



Fig. 4.24: Patterns of Residents' Modifications—Case Study 6

g) Comparative Analysis of Modification Patterns

The analyzed plans for the six case studies showed that residents primarily focused on extending the living rooms on the ground floor and the bedrooms on the first floor. Thus, a comparative analysis of these

modifications was conducted, highlighting the different patterns among the case studies, as illustrated in the figures below.

- **Patterns of Living Room Expansions—Ground floor**



Fig. 4.25: Pre-modification ground-floor plans, illustrating Living Room Expansions in the Six Case Studies

- **Patterns of Bedroom Expansions—First floor**

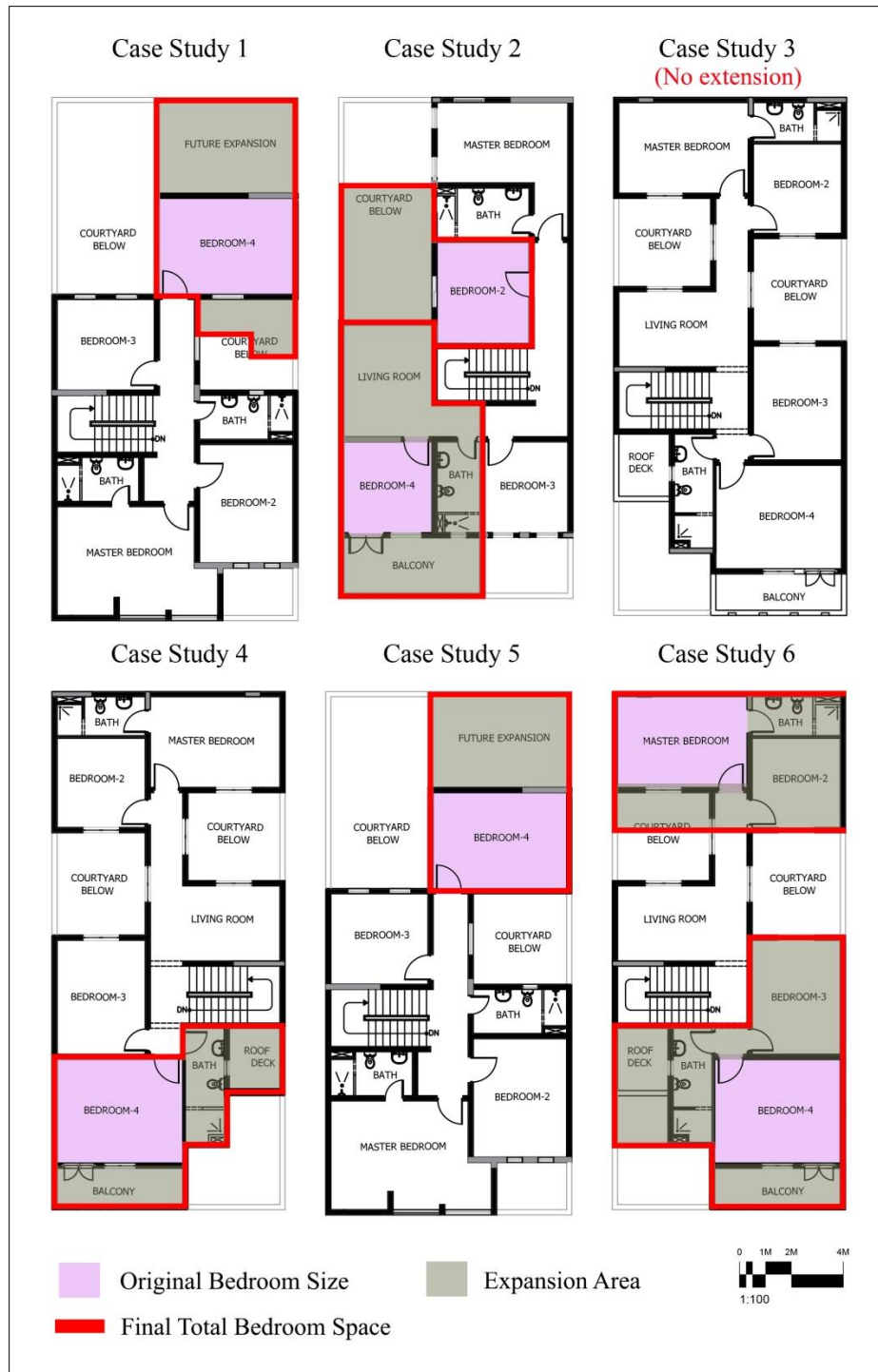


Fig. 4.26: Pre-modification first-floor plans, illustrating Bedroom Expansions in the Six Case Studies

4.2.2.2. Interviews with Householders — Objective 3

Collecting data through householder interviews was linked to the study's third objective, which focused on studying the relationship between residents' modifications and lifestyles. The results were classified according to the AIO approach dimensions and summarized as follows:

a) Case Study 1

- **Demographics**

The house is inhabited by six members: the homeowner, his wife, their two sons, one daughter, and a maid. The couple is 38 and 36 years old, their sons are 17 and 6, and their daughter is 13. They have been residing the house for a year and a half.

- **Activities**

One of the most significant activities for the homeowners is having breakfast and lunch with their children, given their work requires them to spend most of their time outside the home. Consequently, they reduced the size of the courtyard and added a dining space near the kitchen on the ground floor. They also downsized the bathroom and designed a washing zone to serve the dining area. The living room is another critical space for family gatherings every weekend, which motivated them to extend it into the area reserved for future expansions. The children's private tutors mostly use the guest room Majlis because it's a quiet space apart from the rest of the house. Additionally, the homeowner uses it to host friends once a week. To

maintain the house's privacy, an external door was installed for the guest room, as explained by the interviewed householder.

The family members frequently use the courtyard's outdoor seating area on weekends during pleasant weather. Here, they can relax, barbecue, and enjoy the view of the waterfall and the plants they have sown (Figure 4.2). They also use this space for family gatherings, particularly during Ramadan. Another activity preferred by the homeowners is using the sitting room in the first-floor bedroom, which they designed specifically for their needs by expanding its area and dividing it into two zones: one for the bed and the other for seating with a TV, or "a home cinema," as the house owner described it (Figure 4.3).

- **Interests**

The couple is concerned with the aesthetics of their home, which influences their selection of furniture, materials, colors, and finishes. Besides, because their budget is limited, they were looking for affordable and aesthetically pleasing solutions. However, they prioritize some preferences, even if expensive, such as the safest electrical sockets, floors, and furniture to ensure they last longer. As for the lighting, they provided a low-cost option that also looks beautiful because, for them, it is one of the items that can be easily replaced, regardless of its quality.

The householder interviewed confirmed that he took special care of the entrance, hall, and Majlis because they are "the address of the house," where guests are welcomed (Figure 4.1). As a result, he employed high-priced and high-quality materials in these areas. The homeowners are also interested in home gardening, as they sow plants, roses, and fruit trees in the courtyard.

They are also interested in nature, so they have installed an additional glass door in the living room facing the courtyard to allow more natural light and ventilation to enter indoors and provide an aesthetic view.

- **Opinions**

The householder expressed his delight with all the changes, especially since the modifications were designed by a licensed engineering office. He advised everyone to consult an engineer before considering anything, believing they had made the house better suited to family members' needs and desires. He also noted that the modifications made the house look more beautiful, in keeping with the modern style, indicating their interest in recent trends, as most subsidized housing residents prefer this style. However, the householder admits that he overspent on decoration and luxuries, saying, "I should have saved this amount for necessities before spending it on decoration."

b) Case Study 2

- **Demographics**

The house is inhabited by four members: the homeowner and his wife, one son, and one daughter. The couple is 39 and 45 years old; their son is 15, and their daughter is 14. They have been residing the house for three years.

- **Activities**

The house owners spend most of their time at work while their children are at school. For this reason, the time they spend at home is for "meeting to dine," as described by the interviewed householder. Thus, having a dedicated

dining area is critical for them, so they expanded the living room to accommodate this need (Figure 4.7). Furthermore, the homeowners rarely have guests or family gatherings. Hence, they are unconcerned about the guest room and do not use it regularly; as the interviewed householder stated, "It would be better if the guest room's space were combined with the living room in the future."

The householder also confirmed that family members frequently use the living room to gather and watch TV together on weekends or after work. In addition, cooking and baking are regular activities for the housewife, which is why the kitchen was expanded. Not only that, but the housewife also enjoys spending her free time reading stories and novels in a quiet area with a view of the outside, exposed to sunlight, and connected to nature. Therefore, the main bedroom was enlarged to accommodate this, and a sitting area was added, including a designated reading corner.

- **Interests**

One of the elements that homeowners are interested in is large windows that allow plenty of natural light and sunlight. As a result, they enlarged the window and installed a glass door overlooking the courtyard to provide a stronger connection with nature (Figure 4.5). It is also important to them that the spaces are spacious, even if they do not have family gatherings, because this provides them with comfort when moving around, as described by the interviewed householder. They are also concerned with the aesthetic aspect and the quality, even if the cost is higher, so they removed the wall next to the staircase and replaced it with a golden-colored aluminum partition to provide an aesthetic to the living room (Figure 4.6).

In addition, gypsum ceilings with concealed lighting were installed in most of the rooms. It is also critical for homeowners to achieve comfort in the home by customizing it to their preferences, even if it comes at a cost. For example, the housewife is interested in more spacious modern house designs with large windows that connect to the outside. She is also interested in fashion and makeup and prefers having her own space in her bedroom. As a result, she considered these requirements when expanding her bedroom, which she describes as a separate apartment. Thus, the bedroom includes spaces for different functions: a seating area for reading and a dressing area with a makeup corner, precisely what the housewife desired. Since the daughter is also interested in fashion, just like the mother, her bedroom was expanded to accommodate this desire.

- **Opinions**

The homeowners are not completely satisfied with the modifications because, for example, they discovered after experiencing the modified spaces that the guest room is underutilized. Furthermore, the interviewed householder confirmed that they wished to close off the area in front of the entrance door but could not do so because it is illegal. They also wanted to replace the windows with larger ones. Since the homeowners do not benefit from the guest room and they rarely use it, they want to open it up to the living room in the future. Besides, after enlarging the living room, the ground floor courtyard (garden) area became relatively small, so one of their plans is to add a garden on the roof. They also intend to build an entire floor for the son when he is older. In the opinion of the homeowners, future housing projects should have more spacious interiors. Furthermore, the householder confirmed their intention to fully restore the finishes,

particularly addressing insulation issues in the bathrooms caused by workers' incorrect installation, which led to leaks.

c) Case Study 3

- **Demographics**

The house is inhabited by six members: the homeowner and his wife, their son, their daughter, their grandmother, and their uncle. The couple is 31 and 36 years old, their son and daughter are 10 and 8, their grandmother is 70, and their uncle is 54. They have been residing the house for two months.

- **Activities**

One of the essential activities for homeowners is family gatherings on weekends. So, the homeowners took advantage of the space available for future expansion, constructing a living room for family gatherings instead of using the small existing one, according to the interviewed householder (Figure 4.9). They also used a portion of the courtyard space to construct a bathroom adjacent to the living room, with a ventilation space behind it. The interviewed householder explained, "The living room is used not only for family gatherings but also for dining, and the children use it to play and study." Accordingly, the homeowners expand the living room since it serves as the primary gathering and activity space.

The guest room is typically used when male guests, such as friends of the husband or uncle, arrive while women sit in the newly built living room. The homeowners are very concerned with both gender segregation and privacy. As it is difficult for the grandmother to ascend to the first floor, the old living room was replaced with a bedroom for the grandmother. The old

living room was also chosen as the grandmother's bedroom because it faces the courtyard, allowing natural light to enter the room, which the grandmother values (Figure 4.10). Besides, the grandmother usually fries strong-smelling foods like fish in the courtyard. The house's owners also divided the first-floor area into two sections by adding a door to each section, creating two separate apartments (Figure 4.11). This is because one of the two sections is inhabited by the spouses and their children, while the other is being prepared for the uncle who is planning to marry and settle there.

- **Interests**

One of the things that homeowners are interested in is connectivity with nature and space ventilation. For this reason, when they built the living room and bathroom, they were determined to leave a space from the courtyard for ventilation, as explained by the interviewed householder. The grandmother also values the courtyard because she is passionate about home gardening. Besides, homeowners are also interested in family gatherings, which take place every weekend, especially since the house is considered "the grandmother's house, where the children and grandchildren gather," as described by the interviewed householder.

They also prefer practical home solutions that are both affordable and long-lasting, whether for materials, furniture, or finishes. They have no interest in the aesthetic aspect of the design as they think that selecting practical solutions is more crucial, especially in the living room, where they perform most of the activities. During the interview, the householder also confirmed, "The modifications are based on the needs and priorities of the

family." Privacy is at the top of their priorities, especially when men attend family gatherings and visits. So, the householder stated they would prefer an external door for the guest room.

- **Opinions**

The house's residents are pleased with all the modifications they have made because they meet their needs and provide leisure and comfort and because the modifications were made based on the opinions and needs of the family. According to the interviewed householder, "the space does not allow for more modifications, as any modification affects other spaces." However, the homeowners intend to use a portion of the garage space in the future to construct a toilet for the guest room that will be used by male guests, particularly during visits and family gatherings. They also plan to widen the front internal entrance lobby of the house and build a maid's room with a laundry room on the roof.

The householder also mentioned her uncle's intention to enclose his bedroom's balcony to prevent dust accumulation. She highlighted the importance of natural lighting and regretted the missed opportunity to add a window when expanding the living room. She attributed this to the contractor, who ignored this matter. The householder further emphasized the importance of incorporating natural lighting in all interior spaces of future housing units. She also noted the importance of increasing the size of the bedrooms and living rooms in future projects. The interviewee also believes that housing units should include a separate guest room with a toilet because "most Bahraini families require privacy while hosting guests, particularly non-relatives."

d) Case Study 4

- **Demographics**

The house is inhabited by six members: the homeowner, his wife, their twin sons, a daughter, and a maid. The couple is 43 and 42 years old, the twins are 13, and their daughter is 14. They have been residing the house for almost a year.

- **Activities**

One of the most cherished moments for homeowners is coming together around the dining table for lunch with their children after a long day's work. They've extended their living room area to accommodate this daily ritual, creating a cozy space that overlooks the courtyard (Figure 4.14). Later in the day, each family member retreats to their bedroom before reconvening in the living room for some evening TV time. The homeowner emphasized the significance of the living room, where they spend most of their family time and entertain guests, especially since the Majlis has been repurposed as a maid's quarters. Additionally, they've carved out a reading corner in the living room, which has become an adaptable space for work and relaxation. For this reason, they have extended the living room to accommodate all those functions (Figure 4.15). While homeowners spend much of their time indoors, the children prefer outdoor activities like playing football.

- **Interests**

Homeowners prioritize practicality over aesthetics, opting for high-quality, long-lasting materials rather than those that are simply visually

appealing but of lower quality. Cost is also secondary to quality, as they are willing to invest in items that offer longevity. For instance, the homeowner expressed a willingness to pay more for durable items that contribute to the home's sustainability. Privacy is another concern, evidenced by the expansion of the entrance area (Figure 4.13). Additionally, maintaining a connection with nature is important; hence, the preservation of courtyards to maximize natural light penetration into the interior spaces for a sense of tranquility and connection with the outdoors.

- **Opinions**

The homeowner expressed satisfaction with all modifications made and plans to continue improving the house. Future plans include adding a ground-floor bathroom to serve the frequently used living room and constructing a maid's room and laundry room on the roof. Emphasizing the importance of nature and sunlight, the homeowner advises integrating these elements into future home designs. She also recommended expanding living rooms while removing balconies from bedrooms to minimize dust and insect intrusion.

e) Case Study 5

- **Demographics**

The house is inhabited by five members: the homeowner, his wife, their two sons, and a daughter. The couple is 40 and 47 years old, the sons are 15 and 12, and their daughter is 11. They have been residing the house for six months.

- **Activities**

The homeowner, a housewife, spends most of her day at home, primarily in the kitchen, preparing meals and gathering with family at the dining table. Afternoon activities center around the expanded living room, where she teaches her children and later enjoys outdoor time in the garden. A direct door from the courtyard eases children's access to the garden (Figure 4.17). The Majlis is reserved for private teachers and male guests, while female guests are welcomed in the living hall. Family gatherings often take place in the first-floor living room, with ground-floor living areas reserved for guests. Bedrooms are mainly used for sleeping, while a portion of the courtyard is dedicated to children's agricultural activities.

- **Interests**

Homeowners prioritize connecting their home's interior with nature. For this reason, they have expanded the windows to overlook the sea view and external garden (see Figures 4.18 and 4.19). Aesthetic concerns led to the allocation of a first-floor living room for family gatherings, while the ground-floor living room is reserved for guests. Safety is paramount, prompting the addition of a door from the courtyard to the garden to prevent children from accessing the street. Quality is emphasized, particularly in areas prone to heat and humidity.

- **Opinions**

The homeowner expressed complete satisfaction with all the modifications, attributing it to consulting a licensed engineering office and avoiding hasty decisions regarding demolition and modification. Looking

ahead, they plan to construct a second floor with an apartment system for their children. The homeowner recommends expanding living rooms in future homes, emphasizing the importance of maintaining a connection with nature for ventilation and sunlight. Additionally, they suggest ensuring each bedroom has an attached bathroom and adding an extra bathroom on the ground floor.

f) Case Study 6

- **Demographics**

The house is inhabited by five members: the homeowner, his wife, and their three sons. The couple is 40 and 35 years old, the sons are 16, 11, and 6. They have been residing the house for almost a year.

- **Activities**

The household predominantly utilizes the first-floor living room for their daily activities, reserving the entire ground floor exclusively for guests and family gatherings. To accommodate this, the homeowners expanded the first-floor living room and incorporated a dining area with a pantry. This space serves as a central hub for various activities, including watching television and teaching their children. When guests arrive, they are received in the expanded living room on the ground floor, which contains an open Majlis (Figure 4.22). The expanded living room also includes a spacious dining area adjacent to the kitchen (Figure 4.23). Additionally, the householder mentioned that they have regular visits from relatives. He also notes that one of their activities is barbecuing, often done in the duct space located on the first floor.

- **Interests**

Homeowners prioritize privacy, allocating the ground floor to guests and the first floor to family activities. Additionally, they built a second floor identical to the first, providing each family member with ample privacy. Aesthetic appeal is also crucial, leading them to close courtyards to maintain cleanliness and select décor with care, especially on the ground floor. Ventilation concerns prompted the expansion of some windows, while a focus on quality materials aims to minimize maintenance needs.

- **Opinions**

Homeowners prioritize privacy, allocating the ground floor to guests and the first floor to family activities. Additionally, they built a second floor identical to the first, providing each family member with ample privacy. Aesthetic appeal is also crucial, leading them to close courtyards to maintain cleanliness and select décor with care, especially on the ground floor. Ventilation concerns prompted the expansion of some windows. The house owner points out that this attention to detail extends even to the entrance area, which was expanded to accommodate a console table serving as a courteous reception for guests (Figure 4.21). Quality materials are also a priority, aimed at reducing maintenance times.

4.3. Discussion

The research aimed to explore the issues leading to residents' modifications in Bahraini subsidized housing through two phases. **The first phase, linked with the study's first objective**, focused on understanding residents' common behaviors concerning the modification process by interviewing experts. Those are categorized into three areas: residents' common modifications, motivations, and mistakes. Regarding the common modifications, findings show that residents desire specific preferences and new trends in housing design before inhabitation. Those preferences are related to different themes, including particular space arrangements and sizes, materials, and housing components, both internally and externally, as detailed in Table 4.1.

The analysis highlights that the majority of modifications focus on spaces. Residents typically either expand existing spaces or incorporate new ones within available areas. Specifically, interviews underscore that space expansion is particularly prevalent in living rooms. This is because the living room holds significant importance in Bahraini homes as it is the most used area where family members gather daily. On weekends, it becomes the venue for extended family gatherings, a prominent custom and tradition in Bahraini society. Thus, the living room is crucial not only for daily family interactions but also for hosting extended family and relatives. Although homes often include a Majlis for official visits or acquaintances, the living room is frequently used for personal gatherings. Many residents, observing gender segregation customs, use the living room to entertain female guests when male guests occupy the Majlis.

Consequently, this underscores the importance of a spacious living room that comfortably accommodates immediate and extended family members. In line with these views, Remali et al. (2016) also emphasize the significance of living areas in Bahraini homes. They highlight their role as central spaces that connect all rooms, serving as a modern alternative to the traditional courtyard in traditional houses. They also indicate that this space is typically open and visible, facilitating interaction with surrounding daily family activities. Besides, Salman (2016) observed a similar trend in her study, noting that Bahraini residents often enlarge their living rooms to accommodate more guests.

Interviews further reveal that residents commonly achieve living room expansions by utilizing kitchen space to create an open area. This observation is supported by Saraiva et al., (2019), who emphasize the frequent integration of kitchen space in expanding living rooms. As a result, many residents opt to add an external kitchen, which emerges as another common modification. Salman (2016) confirms the importance of exterior kitchens in mitigating strong cooking odors from Bahraini cuisines. Similarly, Taki & Alsheglawi (2022) stress the necessity of both internal kitchens for casual cooking and external kitchens for heavy cooking in Bahraini residences to maintain a pleasant indoor environment.

Expanding bedrooms is another frequent modification, driven by the need to accommodate additional functions such as dressing areas and private bathrooms or to provide individual bedrooms for family members' privacy. This modification is particularly significant, reflecting the growing emphasis on personal privacy and individual household space. The findings indicate that residents seek to provide separate bedrooms for each family member

and desire individual bathrooms and dressing areas. This preference is evident even for young children, highlighting a shift towards ensuring privacy and personal space for all family members. This trend is consistent with findings from Abed et al.'s (2023) study on public housing transformations, which reveal that each family member prefers to have their own bedroom. So, the analysis of space modifications underscores that residents primarily prioritize expanding living rooms and bedrooms. This observation is further corroborated by Aryani & Jen-tu (2021), who emphasize the critical concern of residents regarding the spatial arrangement of living room and bedroom spaces.

In the domain of material modifications, the findings reveal an apparent inclination toward modern styles and sustainable, trendy options, both indoors and outdoors. Residents favor substitute materials like WPC wooden panels, PVC marble sheets, porcelain tiles, and artificial grass, which are prized for their cost-effectiveness and quality. These materials are popular due to their ability to mimic the appearance of original materials, aligning with contemporary home decor trends. Indeed, the extensive influence of social media has contributed significantly to spreading these trends among residents, indicating their constant eagerness to adopt new trends in home decor.

Residents' preference for modern styles extends to modifications in various housing components, such as windows, ceilings, and lighting. The findings reveal that most residents opt for moisture-resistant, simple, modern gypsum ceiling designs and lighting fixtures. Moreover, there is a noticeable trend among residents towards replacing small windows with expansive glazed windows or facades, notably in living room areas overlooking the

backyard and the main facade. This preference stems from residents' desire to maximize natural daylight and enhance the aesthetic appeal of interior spaces. This shift towards larger windows, as highlighted by Taki & Alsheglawi (2022), underscores residents' aspiration to strengthen their connection with the outdoor environment.

Overall, the analysis of residents' common modifications, whether pertaining to spaces, materials, or housing components, reveals a preference for trendy, simple modern designs. This corroborates the assertion of Taki & Alsheglawi (2022) that Bahrain is shifting towards modern architectural styles, which align with the preferences of most residents. This inclination is primarily manifested in the spacious living areas favored by residents, as interviews indicate that space expansion is a prevalent modification in Bahraini subsidized housing. Additionally, residents' preference for openness, demonstrated by their choice of expansive windows, further emphasizes the ongoing transition toward modern design. Besides, their selections for simple and less detailed styles also contribute to this transition, reflecting a preference for clean lines and minimalist aesthetics.

Regarding the common motivations, the findings reveal that the dominant reasons for modifications are based on the three pillars of sustainability, as shown in Table 4.2. Notably, the results concentrated extensively on the motivations related to the social-cultural aspect. This manifests through residents' desire to optimize space to accommodate present and future family needs, their strong emphasis on privacy, and their commitment to maintaining the appearance of their homes for guests—a gesture reflecting their attention to social bonds, obligations, and appreciation integral to the fabric of Bahraini households.

This underscores the socio-cultural aspect as a primary motivator for resident modifications, driven by shared customs, traditions, and religious values. Residents aim to preserve these values through diverse modifications. Obeidat et al. (2022) observe that while residents may implement socio-cultural adaptations in various ways, their common goal is to sustain these principles. For example, families use different methods to expand living rooms, each selecting the most suitable approach. However, the overarching aim remains constant: expanding living spaces driven by social motivations. Therefore, architects and designers involved in the modification process must thoroughly understand the significance of incorporating this aspect and the diverse methods of achieving it. Agyefi-Mensah et al. (2020) also confirm this, emphasizing the critical role of cultural knowledge in housing design.

Thus, this reflects how strongly the Bahraini residents cling to their cultural identity, evident in their concerns for social needs, privacy, hospitality, and housing aesthetics, affirmed by Alkhenazi (2018), Saraiva et al. (2019), and Obeidat et al. (2022). Notably, privacy emerges as a significant motivator for adjustments, encompassing concerns such as privacy from neighbors, guest visits, and individual privacy. This aligns with the findings of Taki & Alsheglawi (2022), which highlight privacy and gender segregation as critical concerns for Bahraini households. Obeidat et al. (2022) reinforce this notion, praising privacy as a critical factor motivating residents to modify their homes, which is particularly notable in Arabian and Islamic regions.

The findings also highlight the residents' crucial need for economic considerations. For example, most residents undertake modifications to

achieve affordable design solutions that help reduce electricity and maintenance expenses. Alternatively, they make changes to meet contemporary demands, including current housing design trends, the diverse needs of today's generations, and evolving conditions and circumstances. Previous studies support these observations. Sunarti et al. (2019) claim that economic status impacts the transformation of housing units. Similarly, Avogo et al. (2017) argue that housing transformations are driven by rapid economic dynamics and significant shifts in residents' circumstances.

Furthermore, the findings reveal that environmental factors are significant motivations for modifications. Residents aim to integrate nature into their home designs to enhance the relationship between indoor and outdoor spaces, create a sense of openness, and provide visually appealing natural views. Bahraini residents, particularly, value a solid connection to courtyards rooted in their heritage of traditional homes with central courtyards. This is evident as they often treat their backyard as a private garden and a prominent view from the living room where families spend most of their time.

Additionally, many residents modify their homes to leverage the natural environment, especially in housing projects near the sea. Conversely, residents also modify their homes to mitigate weather effects, such as reducing heat from the sun, which is critical due to Bahrain's long, hot, and humid periods, dust accumulation, and intense sunlight while still preserving natural daylight. These environmental modifications aim to improve well-being and thermal comfort, as Nwankwo et al. (2014) confirm. Muianga et al. (2022) highlight the importance of incorporating design solutions in housing to mitigate the effects of climate change and enhance resident

satisfaction. Similarly, Taki & Alsheglawi (2022) emphasize that environmental sustainability is crucial for maintaining the integrity of future generations. So, all three aspects of sustainability motivate residents to make modifications, highlighting the importance of these elements in their homes. Obeidat et al. (2022) support this view, noting that housing transformations reflect residents' physical, behavioral, environmental, social, and cultural needs. Taki & Alsheglawi (2022) also underscore the importance of balancing these aspects in housing designs.

Findings regarding common mistakes indicate that most residents make widespread mistakes before and during the modification process, as illustrated in Table 4.3. These include ignoring the role of experts, involving unqualified individuals, and implementing inappropriate modifications. These mistakes can stem from factors such as residents' lack of expertise or knowledge, misunderstanding of regulations, budget constraints, or inadequate access to qualified professionals. Moreover, a significant motivator for residents to make inappropriate modifications is their desire to imitate the designs of neighbors and trends seen online. Homeowners who do not follow these trending designs often feel their homes are incomplete, leading to dissatisfaction. This influence from neighbors and relatives has turned these trends into perceived necessities, increasing the demand for their implementation.

These mistakes complicate the modification process and can cause significant damage. Abdellatif & Othman (2006) also noted these issues in a housing project, highlighting the associated obstacles. The results underscore the importance of involving experts in the modification process to save time and reduce costs. This approach also helps avoid severe

violations and mistakes in design and implementation. Despite the significance of this topic and the valuable insights from interviewed experts, few studies detail this aspect.

Therefore, to implement modifications accurately and effectively, selecting experienced contractors and qualified design offices is crucial before beginning the modification process. This helps clients understand building codes, violations, and the dangers of working without specialist assistance. Recognizing these mistakes can help avoid them in future projects, reducing the need for modifications, as Chukwuma-Uchegbu & Aliero (2022) emphasize. Similarly, Abdellatif & Othman (2006) highlight the importance of providing residents with proper guidance, resources, and support to ensure successful, sustainable, and safe housing modifications.

The findings show that common mistakes made by residents involve various aspects of residential unit designs, such as space distribution, material and finish choices, windows, ceilings, electrical points, and landscaping. Most residents make these errors without consulting experts, indicating the complexity of the modification process and the need for specialists from various fields. Therefore, Suglia (2018) stresses the importance of involving expert engineers from different specializations to carry out these modifications.

In the second phase, the focus was directed toward understanding residents' different behaviors concerning the modification process by implementing a case study strategy comprising different research tools. The data obtained through **on-site observations and plan analysis was linked with the study's second objective,** which centered on analyzing patterns of

resident modifications. The findings reveal significant and notable differences in resident modification patterns across the six case studies, particularly in the modified spaces, materials, and housing components.

There are notable variations in the modified spaces among the case studies, particularly in living room expansions on the ground floor. Despite different housing types, all six case studies expanded their living spaces, though methods varied:

- In case studies 1, 3, and 5, the living room is expanded by incorporating the central courtyard and future expansion areas, with variations in the extent of courtyard use (Figures 4.4, 4.12, and 4.20).
- In case study 2, the living room is expanded by adding the entire kitchen area and a large part of the courtyard (Figure 4.8).
- In case study 4, the living room is expanded by using a large portion of the future expansion area without altering the two courtyards (Figure 4.16).
- Case study 6 utilized both courtyards and a large portion of the future expansion space to enlarge the living room (Figure 4.24).

The residents didn't just utilize the space designated for future expansion to enlarge the living room; they also tapped into other areas for expansion. Living room expansions primarily impacted three areas: courtyards, Majlis, and kitchens. The extent of space utilized from each area varied across case studies, affecting these spaces differently:

- **The impact of living room expansion on the courtyard:**
 - For housing with two courtyards (as in case studies 1, 3, and 5):
 - In case studies 1 and 3, most of the central courtyard was used, leaving a small portion unused, while the other courtyards were untouched (Figures 4.4 and 4.12).
 - In case study 4, neither of the two courtyards was utilized for expansion (Figure 4.16).
 - In case study 5, the entire central courtyard area was utilized (Figure 4.20).
 - In case study 6, both courtyards were fully utilized for expansion (Figure 4.24).
 - For housing with one courtyard (e.g., case study 2):
 - A significant portion of the courtyard was used, with part left untouched (Figure 4.8).
- **The impact of living room expansion on the Kitchen:**
 - In case studies 2 and 6, the entire kitchen area was used for expansion (Figures 4.8 and 4.24).
- **The impact of living room expansion on the Majlis:**
 - In case study 6, the expanded living room absorbed the Majlis as an open area, while the old Majlis space became part of the kitchen, now connected to the new dining area within the expanded living hall (Figure 4.24).

In addition to enlarging living rooms, homeowners have expanded bedrooms on the first floor, tailored to the ground floor's living space expansion. Specifically, bedrooms were enlarged directly above the ground floor in cases where future expansion was utilized, as seen in case studies 1 and 5. However, in case studies 2 and 6, bedrooms were expanded towards the courtyard area used for living room expansion on the ground floor. Thus, bedroom expansions typically align with living room expansions. However, the internal layout of the expanded bedrooms, especially the primary master, differs in each case study:

- In case study 1, the expanded bedroom space was divided into two halves: one for sleeping and the other for a TV sitting area (Figures 4.3 and 4.4).
- In case study 2, the expanded bedroom space was divided into a large dressing area, and a sleeping area, with a sitting area and reading corner, included (Figure 4.8).
- In case studies 4 and 5, bedroom expansions included adding a small dressing area connected to a bathroom (Figures 4.16 and 4.20).
- In case study 6, the primary bedroom was significantly expanded to include a dressing area with a bathroom on one side and a spacious workout area on the other (Figure 4.24).

In three case studies, besides expanding living and bedroom spaces, modifications were observed in the ground floor bathroom serving the living room. These alterations varied across studies. In case study 1, the shared

bathroom area was halved, adding a sink area. Case study 3 retained the original shared bathroom and added another in the central courtyard. Case study 6 replaced the original bathroom with a vanity one built in the future expansion space. Variations were also observed in materials and housing components across all case studies (see Tables 4.4, 4.5, and 4.6). Residents differed in material choices, even though they sought cheaper substitutes with different qualities, shapes, and prices. For example, Case Study 1 used artificial grass for courtyard flooring, while Case Study 4 used porcelain tiles. Modifications to Majlis doors also varied: Case Study 1 installed an external door, while Case Studies 5 and 6 removed the door entirely.

Analysis revealed significant differences in residents' modifications, particularly in space alterations, such as living room expansions and interior divisions of main master bedrooms. This reinforces Aryani & Jen-tu's (2021) argument, emphasizing that residents prioritize the arrangement of living rooms and bedrooms. Comparing patterns helps understand the diverse ways residents modify their homes and regions. Similar design patterns are noted in previous studies by Abed (2021) and Aryani et al. (2015), underscoring the diversity within the study sample.

Understanding these varied modifications can be enhanced by delving into residents' lifestyles in each case study. So, as part of examining the different behaviors of residents in the **second phase** of this study and as part of the case study strategy, interviews were conducted with the householders. The data obtained through **householder interviews was linked with the study's third objective**, which focused on studying the relationship between residents' modifications and lifestyles. The findings from this phase reveal that differences in residents' behaviors in subsidized housing, particularly in

the post-occupancy stage, are closely tied to their unique lifestyles. Many modifications are influenced by lifestyle dimensions such as demographics, activities, interests, and opinions.

For instance, household demographics played a significant role in driving many modifications. In case study 3, the ground floor living room was converted into a bedroom for the grandmother. This indicates that residents accommodating elderly family members may tailor modifications to meet their specific needs. Besides, in the same case study, the residents divided the first floor into two separate apartments to accommodate the owner's uncle, who prefers to live independently. In case study 2, homeowners planned substantial changes in the house finishes, particularly in bathrooms, given their extended accommodation period compared to other case studies. This suggests that prolonged residency may necessitate additional modifications as maintenance issues become more apparent over time. Moreover, the extended duration of residence allowed homeowners to evaluate previous modifications, realizing that some were unsuitable. During interviews, a homeowner mentioned the intention to expand the living room by incorporating the guest room space, as it was rarely used and unnecessary for non-family visits.

Furthermore, residents modify their dwellings to cater to their activities, which differ from one family to another. As the interviews with householders reveal, residents' activities are closely related to their working and leisure time, visitors, and family gatherings. The interviews demonstrate varying relationships between residents and home spaces based on their activities. For instance, in Case Study 1, the courtyard serves as a gathering spot for family dinners and Ramadan breakfasts. At the same time, in Case

Study 3, it's utilized for cooking, especially for preparing foods with strong odors like fried fish. Conversely, homeowners in Case Studies 2 and 4 view the courtyard mainly as a visual and ventilation element, with children preferring outdoor gardens over the home courtyard. In contrast, in Case Study 5, the courtyard is designated a safe play area for children.

As for the Majlis, its importance varies among households. Case Study 1 is a social hub for family gatherings and study sessions, while Case Study 3 is crucial for hosting male guests. However, in Case Studies 2 and 4, the Majlis holds less significance, with plans to repurpose the space for practical uses like additional kitchen space. In Case Study 6, the Majlis is integrated into the living area to accommodate large family gatherings, with a slight separation to maintain gender-specific spaces.

Bedroom divisions also vary based on activities and preferences. In Case Study 1, the homeowner splits the bedroom to create a home cinema, while in Case Study 2, additional corners for reading and studying are added. In Case Study 6, space for morning exercise is incorporated into the expanded bedroom, highlighting the importance of personalized spaces to express residents' identities and needs.

Moreover, in all three cases, residents modified their housing units to accommodate their various interests. In Case Study 1, the homeowner's passion for agriculture is evident through preserving courtyard spaces for gardening and adding glass enclosures for protection. Similarly, in Case Study 3, the courtyard opposite the grandmother's room is maintained for her enjoyment of nature and natural ventilation. Contrastingly, the fashion enthusiast in Case Study 2 prioritizes a large dressing room. In Case Study 4,

the homeowner emphasizes connection with nature by preserving courtyards untouched. Safety concerns led the homeowner in Case Study 5 to install a door leading to a secure outdoor garden and add a first-floor living room for family gatherings. In Case Study 6, aesthetic appeal guides decisions, leading to the dedication of the ground floor to guests and the expansion of bedrooms for privacy.

Homeowners in different case studies address similar concerns in unique ways. For instance, in Case Study 1, privacy is safeguarded by adding an external Majlis entrance for non-relative guests, while in Case Study 3, the Majlis is closed exclusively for male guests. In Case Study 5, privacy and sunlight are balanced through wall insulation and strategic window placement, with additional measures like shutting off the entrance area. In Case Study 6, privacy is paramount, reflected in the allocation of the ground floor for guests and upper floors for family. Furthermore, aesthetic preferences vary among homeowners. In Case Study 1, luxurious bathroom fittings and decorative elements are favored, while simplicity is valued in Case Studies 3 and 4, focusing on practical yet visually pleasing decor.

Moreover, findings also demonstrate that residents express various concerns in different ways and to varying extents regarding family gatherings and integrating indoor spaces with nature. This was evident in how living rooms were expanded and connected to courtyards, with each homeowner prioritizing differently. For instance, in Case Study 4, connecting with nature was paramount, extending the living space while preserving courtyard views. Conversely, in Case Study 1, the emphasis was on creating a natural backdrop in the backyard while still connecting to indoor spaces. Meanwhile, in Case Study 2, a spacious living room was

prioritized over nature contact, leading to extensive courtyard use for expansion. In Case Study 3, family gatherings took precedence, creating an ample living room space. Similarly, in Case Study 5, a balance between nature and family gatherings was sought, achieved by expanding the living room while preserving one courtyard. In Case Study 6, outdoor spaces were eschewed entirely to accommodate family gatherings indoors.

These varying approaches to expanding living spaces reflect residents' diverse priorities and interests. Each family's choice of expansion method aligns with their unique lifestyle needs and preferences. This correlation between living room expansion and lifestyle dimensions underscores the individualized nature of residents' modifications, as they tailor their homes to suit their specific activities and priorities. This observation aligns with the assertion of Obeidat et al. (2022) that residents adapt their homes differently to achieve particular goals.

Residents' opinions and future plans drive various modifications, reflecting individual circumstances and demographic factors. Analysis of interviews revealed three key aspects: residents' satisfaction, future plans, and design preferences. Most residents expressed satisfaction with their modifications, albeit with exceptions, such as the regret expressed by the homeowner in Case Study 2 regarding the removal of a space. These changes contribute to resident satisfaction by addressing their needs, echoing findings from previous studies like Mwaba (2017). Residents emphasized the importance of spaciousness, connectivity with nature, and sunlight access in residential design.

Future plans hinge on changing circumstances, with residents intending to modify further to adapt to evolving needs or accommodate new events like family weddings. This aligns with Jensen's (2009) argument on lifestyle evolution over time. Personalization in design enables residents to tailor their surroundings, reflecting their preferences and personalities, as discussed by Tipple (1999) and Marcus (2006).

These modifications reflect family lifestyles, showcasing diverse design patterns across case studies. The relationship between lifestyle and modifications is evident in the varying design choices, as illustrated in Figures 4.4, 4.8, 4.12, 4.16, 4.20, and 4.24. Flexibility in design is recommended to accommodate residents' evolving needs over time, as highlighted by Aryani & Jen-tu (2021) and Obeidat et al. (2022).

- **Triangulation process:**

When comparing case study patterns, it's evident that the most common space modifications include expanding living areas on the ground floor and enlarging bedrooms, particularly the primary bedroom, reflecting residents' desire for personalization. Additionally, there's a preference for modern materials like porcelain, reflecting a blend of modernity and practicality. Experts highlight these modifications as common in subsidized housing units, emphasizing their importance to residents' preferences.

Motivations for modifications vary, with a dominant focus on social and cultural aspects, followed by environmental and economic considerations. Residents prioritize accommodating family gatherings, ensuring bedroom privacy, and integrating nature views. Despite the focus on social-cultural aspects, environmental and economic factors also play a

role, with residents opting for durable materials. This is consistent with experts' responses about the common motivations behind residents' modifications, implying that these aspects are considered motivators for residents to make general or specific modifications, as illustrated in Figure 4.27 below:

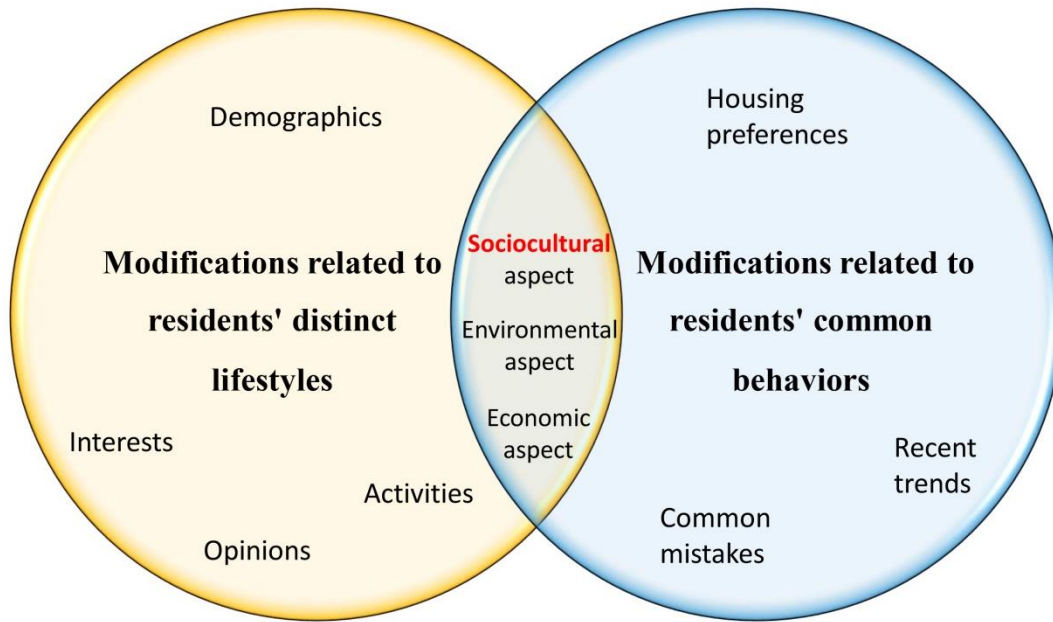


Fig. 4.27: Sustainability Aspects as Motivational Factors for Residents' Modifications

When comparing the mistakes identified by experts in the first stage with those observed in the case studies, it's evident that the involvement of expert engineers in the modification process has minimized errors. Homeowners in Case Studies 1, 5, and 6 sought guidance from engineering professionals, ensuring safer modifications. However, some residents, like in Case Studies 2 and 3, faced issues due to not following expert advice, leading to ventilation problems and other defects. This underscores the

importance of consulting engineering offices to minimize errors during home modifications and highlights the risks of disregarding expert guidance.

The findings from both phases of this study reveal similarities and differences in residents' behaviors regarding modifications in subsidized housing. While modern design and social-cultural sustainability are common priorities for residents, individual needs and lifestyle changes also drive unique modifications. Moreover, identifying common mistakes in the modification process underscores the need for further attention. Understanding these shared and distinct issues that lead to modifications is crucial for informing future housing initiatives.

Chapter 5: Conclusion

This chapter provides a comprehensive overview of the study's findings, drawing clear conclusions from the data analysis. Additionally, it presents valuable recommendations based on these findings and critically assesses the study's limitations for future research in the field.

5.1. Conclusion

Modifications in subsidized housing result from residents' behaviors associated with a combination of shared factors and distinctive lifestyles. General factors, such as customs, traditions, and local circumstances, influence widespread modifications reflecting common needs, recent trends, and recurring practices. Meanwhile, diverse lifestyles contribute to a variety of modifications tailored to specific family needs. Hence, this study has examined two dimensions: similarities and differences in residents' behaviors in Bahraini subsidized housing.

The findings indicate that most Bahraini residents prefer simple, modern designs with spaciousness, openness to outdoor spaces, and modern materials and techniques. Results also highlight the importance of sustainable housing units that incorporate all three aspects of sustainability, particularly the socio-cultural. They have also revealed the critical role of experts in this process in minimizing these modifications and avoiding violations when hiring them from the beginning.

Moreover, results emphasize that lifestyle has a strong relationship with these modifications. Therefore, it's crucial to consider the common behaviors of residents in subsidized housing when designing future housing projects. Simultaneously, housing units must be flexible and adaptable to accommodate the evolving lifestyles of families and allow for modifications at any time. This will, in turn, contribute to reducing and streamlining the process of modifications.

This study also confirms the significance of studying the two directions related to residents' modifications in subsidized housing: similarities in the

prior-occupancy stage and differences in the post-occupancy stage. This is because most previous studies concentrated solely on the post-occupancy stage, although residents usually begin making modifications during the pre-occupancy. Future studies should consider both phases to comprehensively understand the issues leading to resident modifications in subsidized housing.

So, based on the comprehensive study of residents' behaviors and the triangulation of expert interviews and case studies, the issues that lead to modifications in Bahraini subsidized housing units are classified as follows:

- **General issues** represent the similarities of residents' behaviors in subsidized housing and are usually associated with the prior-occupancy stage. These issues affect the majority of residents, and they include the following:
 - Residents' preference for simple modern designs with openness and spacious interiors. This was abundantly clear through the common modifications that most residents make, such as extending living rooms and bedrooms, using trendy modern materials and techniques, and installing large windows and glazed sliding doors overlooking the courtyard.
 - Residents' desire for sustainable housing units that consider social, cultural, economic, and environmental aspects—with the sociocultural part having the most significant influence on this process because it is affiliated with critical factors such as privacy, hospitality, and the aesthetics and distinction of houses—means that residents' modifications are a complex process that

necessitates a thorough investigation and comprehension of all of these aspects.

- Damages, violations, and adverse consequences stemming from residents' common mistakes committed before and during the modification process necessitate urgent further modifications to rectify errors and mitigate negative impacts on the housing unit. These mistakes, attributed to residents' erroneous decisions, involve excluding experts, disregarding consultation with engineering offices, hiring unqualified contractors and inexperienced laborers, and implementing inappropriate designs often influenced by neighboring or internet-based sources that fail to align with their needs, budget, or dwelling space.
- **Specific issues** represent differences in the behaviors of subsidized housing residents and are usually associated with the post-occupancy stage. These issues relate to families' distinct lifestyles and are primarily seen in the various ways of expanding living rooms and the different interior layouts of bedrooms. They include the following:
 - Residents' need to modify the house based on demographic factors, including the number and ages of family members, marital status, occupation period, and housing unit type.
 - Residents' need to modify the house based on their activities, which include their routines, habits, hobbies, and time use. So, it is linked to the functions performed by residents. Thus, the modifications associated with this dimension are typically related to the space size and arrangement.

- Residents' need to modify the house based on their interests related to intangible factors, such as their desire for a particular style. It also includes residents' adherence to cultural norms and religious values, such as family gatherings and privacy, as well as their concern for natural resources, budget, and quality.
- Residents' need to modify the house based on their opinions and perceptions. This includes their satisfaction with the current design and modifications, future plans, and perspectives on the essential housing requirements.

This study provides a comprehensive conceptual framework for studying the two directions. It lays the groundwork for future research addressing the same issue in different regions in Bahrain, the Gulf countries, and worldwide. Therefore, the research proposes using the same two-phased methodology to study the same issue in other housing projects locally or regionally.

In conclusion, this study answers the research question: What are the issues that lead to residents' modifications in Bahraini subsidized housing units? By identifying these issues, this research fills gaps in the literature and provides valuable insights for future housing design and policy development.

5.2. Recommendations

Recommendations are based on study findings from expert interviews, analysis of modification patterns, and householder interviews. They aim to simplify the resident modification process, mitigate negative impacts, and provide sustainable and flexible housing units in future subsidized housing projects. The recommendations are categorized as follows:

➤ **Recommendations based on expert interviews:**

- **Regarding housing preferences and needs related to sustainability aspects aligned with the Bahrain 2030 strategy, the following suggestions should be considered by the responsible authorities for future projects:**

- **Socio-cultural aspect:**

- Living rooms should be spacious enough to accommodate family members and extended relatives or serve as a reception area for female guests.
- Entrance lobbies should be larger, as Bahraini residents value social relationships and aesthetics. A larger lobby, seen as the welcoming zone, enhances the house's appearance and allows for various decorative elements.
- A separate external door should be added to the Majlis to maintain residents' privacy when guests visit.
- Each bedroom should include a bathroom and dressing area to enhance individual privacy.

- The waiting period for residents to receive their homes should be reduced, as families often outgrow their allocated housing size during long wait times.
- Housing unit designs should accommodate extended family members or changing household dynamics, such as a son's marriage.
- **Economic aspect:**
 - Sustainable finishing materials should be used for longer-lasting homes.
 - Insulated double-glazed windows should be used to save energy and reflect heat, reducing the need for air conditioning in mild weather.
 - Prefabricated modular components should be considered to reduce waste and expenses during the modification process, enhancing economic sustainability.
 - Regular surveys should be conducted to gauge new housing preferences and trends.
 - Residents should be educated about material types and qualities to make informed choices for finishing.
 - It is advisable to minimize the number of ceiling lights in housing units and instead choose fewer, more powerful, and cost-effective options.

- **Environmental aspect:**
 - Larger windows are needed, especially in the living room, to maintain a visual connection with the outdoors and maximize daylight and ventilation in indoor spaces.
 - Insulated double-glazed windows should be used to reduce heat transmission and improve thermal comfort.
 - Green roofs can be incorporated to improve insulation and reduce urban heat.
 - Despite some residents using courtyards for expansions, it is crucial to recognize their high value among the majority for their natural connection. Therefore, ensuring that courtyards are always preserved and included in future housing designs is essential to maintain this connectivity with nature.
- **Regarding widespread incorrect practices, the following suggestions should be considered by residents before beginning the modification process:**
 - Entrust the selection of contractors to the engineering office responsible for the design and execution of modifications. This office possesses the expertise to find suitable contractors at competitive prices and facilitate effective communication, ensuring smoother modifications with fewer errors.

- Residents should seek expert advice before engaging contractors to prevent errors and violations.
- Prior to contracting, consulting with electrical and plumbing experts, architects, and interior designers is crucial for successful project completion.
- Preserve engineering plans, especially structural maps, to support future high-quality modifications and ensure accurate implementation.
- Select designs and modifications that meet personal needs and regulatory requirements, avoiding those sourced from the internet or neighbors that do not suit their lifestyles.
- Adhere to housing regulations and manage expectations to prevent inappropriate modifications.
- Request that architects and interior designers involved in the modification process utilize 3D visualization programs. This aids in visualizing outcomes effectively and reduces the need for extensive changes during the project.

➤ **Recommendations based on the analysis of case studies:**

- **Regarding residents' lifestyles, the following strategies should be considered by the responsible authorities for future projects to meet the distinct needs of each family and enable modifications at any time and under any circumstances:**

- Residents often expand living rooms into courtyards, kitchens, or Majlis areas. Providing flexibility in these spaces can be achieved through options like folding doors, sliding walls, or movable partitions. These elements facilitate easy expansion between areas, adapting to changing needs and enhancing spatial versatility.
- Provide flexibility in bedroom expansions through modular construction techniques. Prefabricated partitions or modules can be integrated into adjacent spaces like bedrooms or balconies with minimal on-site construction, enhancing adaptability and longevity while allowing for customization.
- Ensure flexibility on the first floor to add additional bedrooms as needed, accommodating growing family sizes without major structural interventions.
- Housing units can be left partially unfinished, allowing clients to customize their homes to their preferences. This approach lowers costs and simplifies future modifications. For instance, providing an unfinished kitchen space without electrical connections is more economical, as clients can avoid the expense of replacing a fully finished kitchen that doesn't meet their needs.
- Offer a variety of standard design options to cater to diverse family needs and preferences effectively.

- Allow residents some degree of customization within their units to foster a sense of ownership and reduce the necessity for extensive modifications.
- Utilize post and beam structures to facilitate wall removal and space expansion as needed.
- Propose future-proof solutions like internal elevator installations that are cost-effective and aesthetically integrated, avoiding external disruptions and maintaining architectural coherence.

5.3. Limitations

- Despite its antiquity, modifications are ongoing and must be explored occasionally in different regions. This study focused on the East Hidd project, so future research should focus on other housing projects in Bahrain to explore other issues related to this phenomenon.
- Common modifications need periodic study due to shifts in economic and technological landscapes. New trends in home designs and materials introduce different resident preferences, even though cultural principles like privacy, family gatherings, and hospitality persist. The challenge lies in how these principles are implemented in design, which varies.
- Mistakes in the modification process pose significant challenges for experts. Future research should investigate these obstacles to understand how they impede the modification process and explore strategies to mitigate them. Addressing these obstacles is crucial for

ensuring a successful modification process with minimal losses, especially considering that errors often lead to further complications and increased modifications to rectify them.

- Expanding the study to include more case studies is necessary to gain more profound insights into modification patterns and trends. This broader scope will offer a more comprehensive understanding of common modifications and their implications.
- Future studies should focus on identifying practical solutions to streamline the modification process effectively. These solutions should simplify the process, minimize errors, and enhance the overall efficiency of modifications in residential settings.

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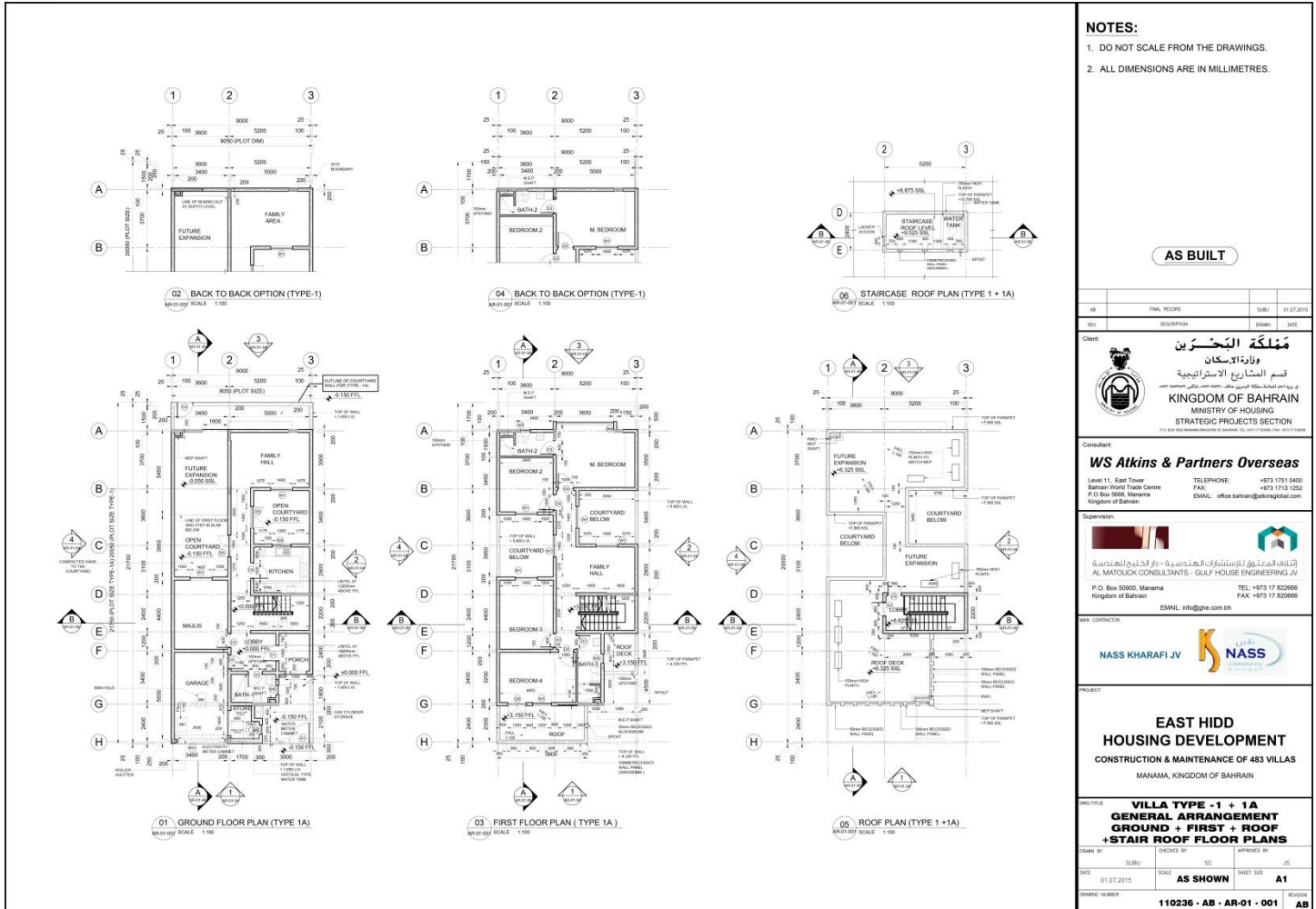
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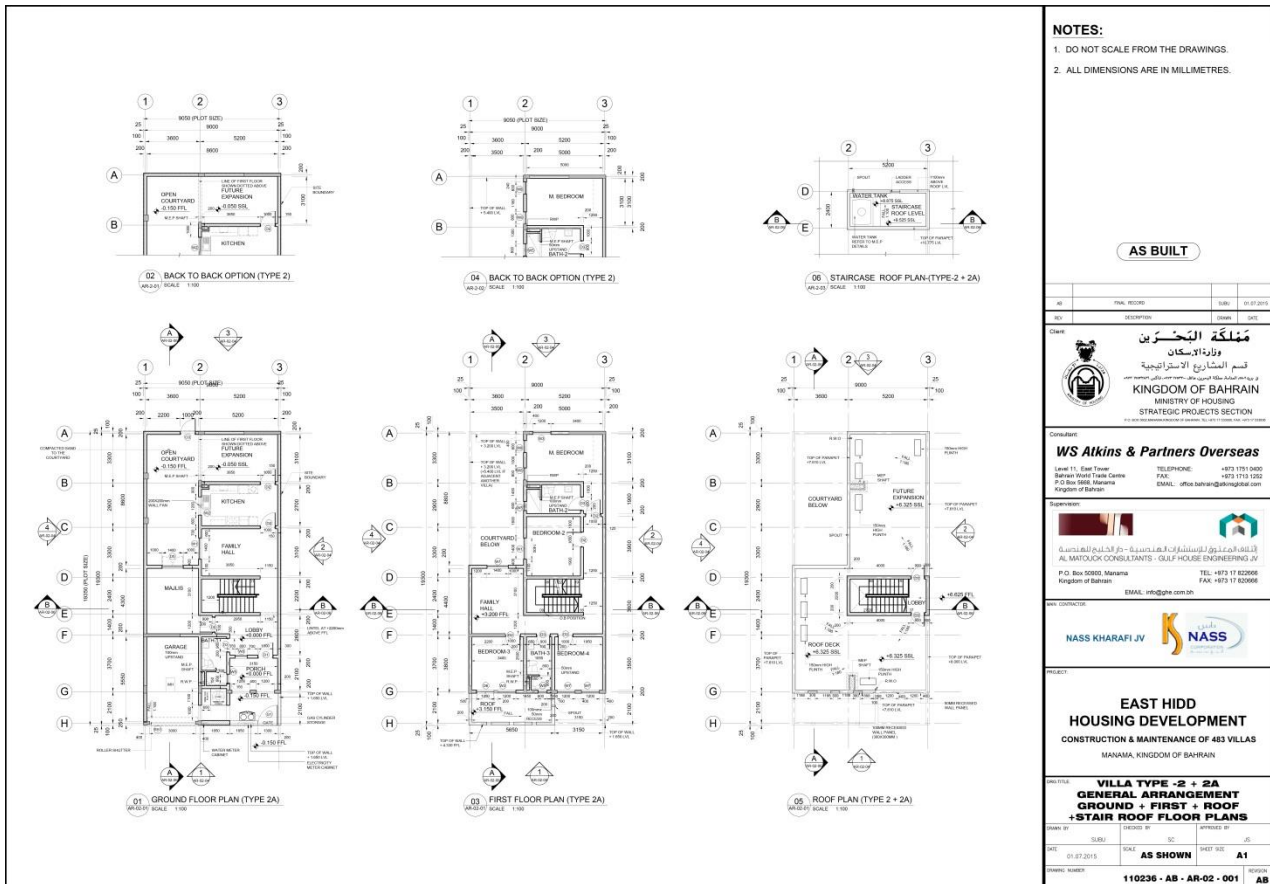
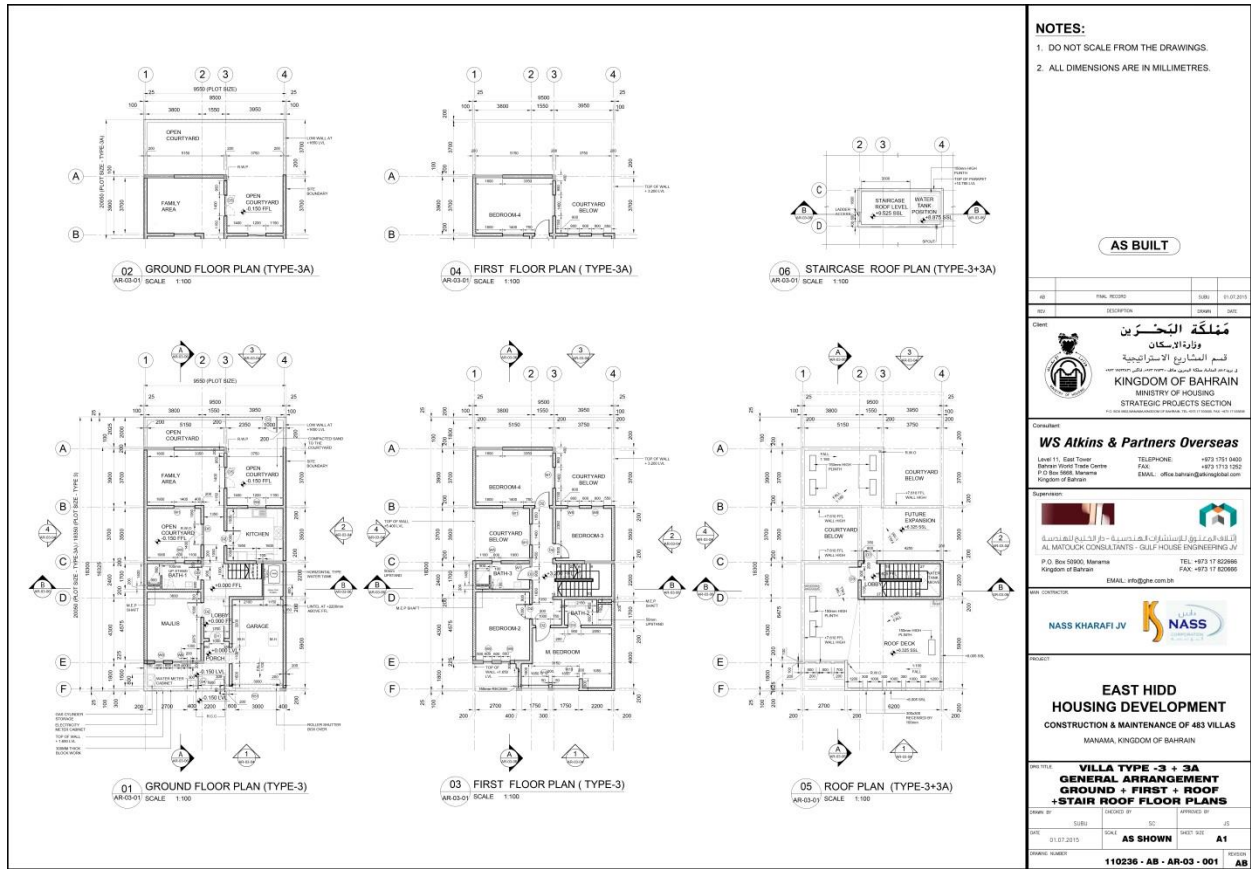
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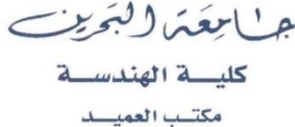
Appendix

1. Appendix A : (Original Plans Obtained from MOH)





2. Appendix B: (Permission Letter)

 UNIVERSITY OF BAHRAIN College of Engineering Office of the Dean	 جامعة البحرين كلية الهندسة مكتب العميد	
م ع ك هـ / ع 2022/110 5 سبتمبر 2022م		
لمن يهمه الامر		
الموضوع: طلب الحصول على معلومات لأطروحة الماجستير		
تحية طيبة وبعد،		
نفيدكم علماً بأن الطالبة مي وليد لافي (الرقم الجامعي 20092901)، طالبة ماجستير في العمارة، تعمل على اطروحة الماجستير بعنوان (Study Residents' Modifications in Subsidized Housing Units) Bahrain)، تحت اشراف الدكتورة هيفاء بنت ابراهيم آل خليفة عميدة كلية الهندسة.		
آملين من عنايتكم السماح لها بالحصول على بعض المعلومات والدراسات ذات العلاقة والتي تساعدنا في اتمام بحثها.		
هذا ما لازم، وتفضلوا بقبول وافر التحية والتقدير		
 د. هيفاء بنت إبراهيم آل خليفة عميد كلية الهندسة		
P.O. Box: 32038 - Kingdom of Bahrain Tels.: (+973) 17876601 / 17876101 / 17876006 Fax: (+973) 17684844 Web Site: http://www.uob.edu.bh		
صندوق بريد: ٣٢٠٣٨ - مملكة البحرين هاتف: ١٧٨٧٦٠١ / ١٧٨٧٦١٠١ / ١٧٨٧٦٠٠٦ (+٩٧٣) فاكس: ١٧٦٨٤٨٤٤ (+٩٧٣) الموقع الإلكتروني: http://www.uob.edu.bh		

3. Appendix C: (Consent Letter)

 UNIVERSITY OF BAHRAIN College of Engineering Office of the Dean	جامعة البحرين كلية الهندسة مكتب العميد			
Research Consent Form				
Research Title: Identifying the Issues Leading to Residents' Modifications in Bahraini Subsidized Housing Units Author(s) Name(s): ▪ Ms. May Lafi ▪ Dr. Haifa Alkhalifa Research Brief: The study focuses on understanding the common and distinct behaviors of residents in Bahraini subsidized housing and the reflection of those behaviors on the modifications they've made to their housing units. This involves examining residents' lifestyles in various dimensions, including activities, interests, opinions, satisfaction, and future plans. Research Significance: The study will aid in determining the most recent and common preferences and needs of Bahraini residents of subsidized housing. This will be a step toward improving future housing unit design and reducing modifications and violations. Confidentiality: The data provided by the participant will be shared upon their consent, and the names or personal identities will not be disclosed in the research. Undertaking: ▪ I confirm that my participation in this research project is voluntary. ▪ I have read and understood the research brief and its implications for the target audience. ▪ I understand that the researchers will not identify me by name in any reports using information taken from my interview or the photographs captured from my residence interiors. ▪ I understand that the researchers will publish their materials in a research journal. Participant Information: ▪ Participant's Name: Mr. ▪ Age: ▪ Gender: Male ▪ Contact email: ▪ Date: 18/11/2022 ▪ Participant's signature: Research Representative: ▪ Name of Individual taking the consent: Ms. May Lafi ▪ Research Representative's Signature:				
جامعة البحرين - كلية الهندسة مكتب العميد Office of the Dean UNIVERSITY OF BAHRAIN COLLEGE OF ENGINEERING				
<table style="width: 100%;"><tr><td style="width: 50%; vertical-align: top;">P.O. Box : 32038 - Kingdom of Bahrain Tel. : (+973) 17876601 / 17876101 / 17876006 Fax : (+973) 17684844</td><td style="width: 50%; vertical-align: top; text-align: right;">صندوق بريد : ٣٢٠٣٨ - مملكة البحرين هاتف : ١٧٨٧٦٦٠١ / ١٧٨٧٦١٠١ / ١٧٨٧٦٠٠٦ (+٩٧٣) فاكس : ١٧٦٨٤٨٤٤ (+٩٧٣)</td></tr></table>			P.O. Box : 32038 - Kingdom of Bahrain Tel. : (+973) 17876601 / 17876101 / 17876006 Fax : (+973) 17684844	صندوق بريد : ٣٢٠٣٨ - مملكة البحرين هاتف : ١٧٨٧٦٦٠١ / ١٧٨٧٦١٠١ / ١٧٨٧٦٠٠٦ (+٩٧٣) فاكس : ١٧٦٨٤٨٤٤ (+٩٧٣)
P.O. Box : 32038 - Kingdom of Bahrain Tel. : (+973) 17876601 / 17876101 / 17876006 Fax : (+973) 17684844	صندوق بريد : ٣٢٠٣٨ - مملكة البحرين هاتف : ١٧٨٧٦٦٠١ / ١٧٨٧٦١٠١ / ١٧٨٧٦٠٠٦ (+٩٧٣) فاكس : ١٧٦٨٤٨٤٤ (+٩٧٣)			

4. Appendix D: (Ethical approval)

**College of Engineering
Research and Scientific Publications Committee
Committee Meeting Minutes: No. CRSPC 2022-2023/02**

2022-2023 Academic Year, First Semester

Date: 16/02/2023

Time: 14:00-14:30

Meeting No: 2.

Venue: online meeting

Head : Prof. Khaled Zehar

Members : Dr Majeed Safar (Secretary), Dr. Islam Elghonaimy, and Dr. Nagib Ghaleb

Apologies : Dr. Bader AlMannai

Absent : None

The Research and Scientific Publications Committee received the paper titled **"Identifying the Issues Leading to Residents' Modifications in Bahraini Subsidized Housing Units"** authored by **May Lafi, Haifa Alkhalifa, and Anamika Jiwane**.

The committee found that the paper is ethically sound based on the declarations of the authors in part 6 of the journal paper including authors contributions, acknowledgments, funding and conflict of interest. The committee is not responsible about the technical contents as per the peer reviewing process of the journal.

The Head of the Research and Scientific Publications Committee



Prof. Khaled Zehar

5. Appendix E: (Expert interviews)

Interviewee #1

Time: 8:25 PM

Date: 21/ 10/ 2022

1. What is your major, and where do you work?

I am an architect who has worked in interior design engineering for five years. I was in a university-affiliated training program while pursuing my bachelor's degree, and then I got a job as an architect in an architecture and interior design office.

2. Have you previously worked on residents' modifications in subsidized housing?

I worked on about 30 projects involving modifications to housing units.

3. What are the common modifications most residents ask to make in subsidized housing units nowadays?

Most of the required modifications involve expansion, such as closing the balconies in the master bedrooms to expand the space, building a part of the garage and adding it to the living room, or removing the Majlis and enlarging the living room with its space. Modifications are also made for privacy or personal space, such as raising the height of the roof fence to gain more privacy for family gatherings or to obtain personal space while using the laundry room on the roof, especially since the housing units are adjacent. External modifications are also related to privacy and personal space, as it is necessary to add shading or a pergola to the backyard of the house to use it comfortably without being seen by the neighbor. Furthermore, modifications have been made to the exterior main façades of the dwellings because they are typical in style and formation due to mass production, which can lead to confusion and difficulties in locating or describing the house's address, especially for new visitors. As a result, residents desire a façade that distinguishes the house from the other housing units. So, they make various modifications to accomplish this, such as adding different modern materials or colors –like glass, wood, stone, or aluminum cladding–, closing the existing balconies, and changing the shape, size, or type of windows.

In addition, since housing units only have two floors, some modifications included adding an entire third floor or a half-floor floor above the garage. Besides that, residents prefer to expand interior spaces over exterior ones. As a result, as the interior spaces expand, the external spaces contract. So, due to internal expansions, most housing units have small exterior spaces. However, some residents value their outdoor surrounding spaces and prefer outdoor activities. So even though space is limited, these residents usual

request minor modifications, such as shaded sitting areas for family gatherings, and rarely ask for major ones, such as the construction of swimming pools.

Due to the simple ceiling design of housing units with electrical connections, modifications are usually made to the ceilings. Although the floors can be changed based on the preferences and budget of the client, they are generally kept as they are. Residents prefer simple and modern designs over complex classic designs. For example, they add a secondary gypsum ceiling with magnetic or hidden lighting to highlight the beauty and spaciousness of the rooms.

4. Explain why residents ask for these modifications?

One of the most common reasons is a large number of family members and their need for a space for each individual. For example, housing units usually suit a family of four to five. So, if the family contains six members, each two has one room, which is unsuitable for some families, as they need a space for each member. Besides, building a third floor or adding bedrooms to prepare for the future, as some youths live in the family home after their marriage. Another reason is that some people want to have a design that distinguishes them from their neighbors, whether through color or by changing the interior design of their home.

In most cases, the customer requests significant modifications. As engineers, we explain to them the cost of changing the window's location, for example, as each step has a specific price. Providing an opening for the window, using

aluminum material, and adding a frame to the window are all expensive, especially since the customer has a specific budget from which he cannot deviate. Therefore, most customers are committed to the number and sizes of existing windows. They follow the advice of sticking to a budget.

If the balcony is closed and added to the interior space, only one window is added. The same applies to doors, there is no change of its own, but when an internal wall is added to divide a specific room, a door is added. It is possible that the residents would have the desire to make glass facades or sliding doors overlooking the back garden, but some of them when knowing the cost and the additions that will be made to create them and the possibility of adding more air conditioners to the place - because of the large window will cause a temperature rise, and requires utilizing air conditioners most of the time during summer which will, in turn, increases the cost of electricity- they constantly avoid this idea.

Some customers prefer to buy cheap materials, while others prefer to buy expensive materials because of their high quality and ability to last for a long time without having to be replaced frequently. So, depending on the budget, some people prefer quality over price and vice versa.

So, these are the main motives for residents as this is the house of the future, and they do not have a second alternative to change or choose another place, so these modifications are required to obtain the best results that suit their requirements in decoration, expansion, and colors.

5. What are the common mistakes made by residents in the process of modifications?

One of the most common mistakes is that residents sometimes deal with inexperienced contractor directly rather than with an engineering office. As a result, because each housing project area has its own set of regulations, this leads to disregarding construction regulations. Housing units in the eastern Hidd, for example, have different guidelines than housing in the Ramli area, and so on. In some areas, the rules may prohibit building on top of a garage. So, the client agrees to a specific design with the contractor without knowing the regulations, and the contractor begins implementation. He receives a building violation, which prompts him to return to a licensed engineering office to obtain a building permit without a breach, and the process is repeated.

Spending a lot of money on expansions and re-planning, which results in a budget deficit, and residents won't have enough money for furnishing. Besides, the desire to modify or supplement something that cannot be altered or supplemented. For example, suppose a customer wants to demolish a wall but is unable to do so because of the presence of a column or electrical connections. But, of course, the client isn't aware of this because he didn't consult the engineering office and instead agreed with the contractor without reviewing engineering drawings.

As I mentioned earlier, the client also sometimes acts without referring to the engineering office and agreeing with the contractor. For example, the client asks the contractor to build a wall, demolish a wall, or close a balcony,

so he will face a problem later, especially in closing the balcony and adding it to the space of a room sometimes where there is no ventilation for the room. Another example is that the balcony ventilates the master bedroom bathroom. So, a skylight in the bathroom's roof is opened to provide ventilation when the balcony is closed.

Interviewee #2

Time: 6:32 PM

Date: 24/ 10/ 2022

1. What are the common modifications most residents ask to make in subsidized housing units nowadays?

The most common modification is to expand the living room, which serves as the women's reception area. Typically, there are two receptions or halls, one for men and one for women. In addition, it is always requested to expand the living room hall to include a sitting area for female guests. Besides, an external kitchen is always required, which is one of the fixed modifications for all customers, especially since families cook foods with strong odors. Hence, an exterior kitchen is always necessary to isolate the odors from the rest of the house.

One of the modifications is also the expansion of the bedrooms and the addition of a private bathroom for each room due to the presence of one bathroom for the master room and another bathroom shared between the rooms. So, the shared bathroom is added to one of the rooms, and a new bathroom is built for the other room.

Similarly, even if an elevator hasn't been installed yet, residents always try to find a location for it out of consideration for the future. Most clients also ask for the elevator to be built from the beginning if they have enough budget; otherwise, a location is found and marked as a potential location for the elevator.

And they are also adding a maid's room and a laundry room on the roof. Then, finally, adjust the window sizes and enlarge them. As for the windows, the most altered are the windows of the main facade and some of the main rooms and living rooms. Residents also tend to place plant pots or waterfalls on the interior side of the fence that faces the indoor spaces. This phenomenon is widespread because there is no possibility of anything more significant. Also, the residents want to change the house's exterior facade to distinguish it from the rest of the houses and the difference in its form, and they try as much as possible to change the façade, but the municipality's requirements do not allow this. Some people also prefer a kitchen that is open to the living room, despite the presence of an external kitchen.

2. Explain why residents ask for these modifications?

Household spaces must be large enough to accommodate the number of family members, especially the living room, which is primarily used for family and friends gatherings. Some clients prefer large open spaces not constrained by specific sizes or walls. So, they try to open up spaces on each other, such as an open kitchen to the living room and dining room. The new generation has different requirements. For example, children nowadays require a bedroom, a bathroom, and a dressing room, forcing parents to separate girls from boys and open every room to each other to expand the space and add a dressing room and bathroom for each of them. They also request a gym, a gaming room, and a study area.

In fact, the period of COVID-19 had a significant effect on the client's needs. These requirements, such as a home gym or an indoor gaming room, did not previously exist, but they are now required, even if the number of

family members is small. Residents also desire privacy, so each room has a bathroom and a dressing room. Finally, clients always plan for future extra space and a kitchen on the roof. Indeed, when he grows up and marries, one of the children will eventually settle in the family home, and he will, of course, require some privacy.

3. What are the common mistakes made by residents in the process of modifications?

One of the most common and frequent mistakes is the lack of an engineering source or reference and agreement with the contractor directly and listening to opinions of little experience, or dealing with a designer without referring to an engineering office, and the idea that the engineering office is for building a new house only. Therefore, there is no need to resort to it during the addition. So, a lack of awareness of the municipality's regulations and laws forces the client to return to the engineering office after completing the amendments to obtain a license. In the long run, not consulting a specialized office may result in structural flaws in these modifications. On the other hand, residents who consult an engineering office will be aware of these regulations.

Also, due to the use of the Internet and social media, many ideas haunt the client's mind, which makes him unable to determine his priorities in choosing the design. Some of them only care about the aesthetic aspect, for example, requesting a glass facade; in this case, advice is given regarding the height and the temperature of the house due to the direct sun, but this is not important to them, as the shape is more important. All this is due to viewing and fascination with the pictures on the Internet.

From one of the experiences that I went through, a client wanted to remove a central column in the building because his neighbor had drawn it in his house, so I told him that this was a different case and that removing the column would cause a problem. However, the client insisted on removing it and that nothing happened to the neighbor's house, so his house also would not happen to him. So we tried to advise him to reverse this decision, but he was very insistent, and I think he will implement it.

One of the mistakes is also disregarding the designers and their advice. As I mentioned, the glass façade will undoubtedly cause a temperature rise. Nonetheless, the client neglects this advice and goes straight to the contractor for implementation. Residents also hire workers with no prior experience in construction or reading engineering drawings due to their low costs. Of course, this is an illegal practice. As an engineering office, our services are based on providing accurate and licensed drawings to the municipality.

6. Appendix F: (Householder interviews)

Case study 1

Time: 9:34 PM

Date: 18/ 11/ 2022

Demographics:

1- How many people live in the house?

Six with the maid.

2- What are your ages?

I am 38 years old, my wife is 36 years old, my first children are 17 years old, my daughter is 13 years old, and my third son is 6 years old.

3- How long have you been residing in this house?

Almost a year and a half.

Activities:

4- Describe how you and your family spend your time at home, including your daily routine, activities, and hobbies.

First, we wake up and gather around the dining table for breakfast. Then, the children go to school. After I return from work and the children come home, we gather again for lunch in the same place. After lunch, the children spend most of their time in their rooms. Occasionally, we all gather in the living room to watch TV.

▪ **Do you always use the living room?**

We rarely use the living room; it has almost become a guest room. As for the garden, we use it when the weather is nice. For example, on weekends, I organize barbecue parties with family or friends, mainly during winter. In summer, we avoid sitting outside due to the heat. Currently, I use the Majlis the most for studying, while the children spend time with private tutors during exams. Even during Ramadan, when the weather is pleasant, we have Iftar outside in the garden.

▪ **Well, do you sit for a long time at work?**

Yes, it's almost routine for me to come back late, and my wife does the same. She usually returns home around 10:30 after finishing her work and her master's classes.

▪ **What about holidays and weekends?**

During holidays or weekends, we don't stay at home much. We might be at my parents' house or out somewhere, but we rarely stay home.

▪ **Do you use the kitchen for light cooking or extensive cooking?**

Of course, we use it for extensive cooking. I didn't create an outdoor kitchen because our kitchen overlooks the garden, but I installed an extractor fan with two motors to eliminate any food odors.

- **Does this mean only the living room or hall is used when guests come?**

No, actually, when my mother-in-law or my wife's friends visit, they sit in the bedroom with my wife; they don't use the living room. Even the children sit in the Majlis when their friends or maternal uncles visit; they don't use the living room either.

Interests:

5- What are the factors that you considered during the process of modifications?

I prioritized aesthetics and quality. My work demands these qualities, so I chose a highly experienced contractor.

- **What about the costs?**

Yes, price is important because my financial resources are limited, as I obtained the house from housing units.

- **Regarding tool quality, there are cheap tools that need frequent maintenance and more expensive, durable ones. What do you prioritize?**

For safety-related items like sockets, I choose high quality. For lighting, I opt for cheaper options. I bought high-quality furniture from IKEA, similar to hotel standards.

- **Are the floor materials you have chosen of high quality?**

Yes, especially in the living room and Majlis, where I spent the most on paint and walls. I installed parquet flooring for the children's rooms, which is easier to replace.

▪ **How important is privacy to you?**

Very important; that's why I have separated the Majlis from the living room.

▪ **Do you value natural light entering the house?**

Absolutely! I planted lemon, rose, fig, basil, pomegranate, and guava and added a waterfall.

▪ **Did you modify the external facade?**

No, I only added car shades, as I don't prioritize the exterior. And yes, I added two glass doors overlooking the living room.

▪ **Is this for sunlight to enter?**

Yes, housing units need many modifications and additions to make them livable, providing each person with a separate room and bathroom.

▪ **Are family gatherings important to you, or do relatives usually visit?**

Yes, I value social relationships, and we often have visitors.

Opinion:

6- What do you think about the current modifications? Are you satisfied with them?

I'm very satisfied with the modifications I've made.

▪ **Do you not regret any modification you made?**

It's not just a decoration change but a reduction in the building costs, as I focused on some decorative elements. I should have saved this amount for necessities before spending it on decoration.

▪ **What about some décor elements that you did not see a negative impact on?**

No, not at all. It was carefully planned, especially since the modifications were designed by a licensed engineering office. I advise everyone to consult an engineer before considering anything.

7- Do you have any plans for future modifications?

Yes, I'm considering creating two apartments, each with two bedrooms, a living room, a bathroom, and a kitchen for my two sons.

8- What are the most crucial design principles that should be included in future subsidized housing units?

My most significant modification was the adjustment of my bedroom, where I created a home cinema and installed comfortable chairs for watching movies.

▪ **What do you advise for future housing projects that are essential and cannot be dispensed with?**

From my perspective, a ventilation system is essential as neighboring houses surround mine. An external guest entrance is also preferable, and the existing living rooms need to be larger.

Case study 2

Time: 9:27 AM

Date: 22/ 11/ 2022

Demographics:

1- How many people live in the house?

Four of us are a couple, a daughter and a son.

2- What are your ages?

I am 39 years old, my husband is 45, my daughter is 15, and my son is 14.

3- How long have you been residing in this house?

We have been living here for almost three years.

Activities:

4- Describe how you and your family spend your time at home, including your daily routine, activities, and hobbies.

We do a few activities at home, like watching TV. Most of our time is spent at work while the children are at school.

- **Do you gather in the hall or living room?**

Yes, we spend most of our time in the living room.

- **What about the weekend? Do you stay at home or go out?**

We usually spend it outside.

- **How often do you receive guests?**

We don't usually have family visits on weekends. It would be better if the guest room's space were combined with the living room in the future.

- **So you use the living room more?**

Yes, we use the living room a lot. We gather there to watch TV on weekends or when we return from work.

- **What activities do you do at home regularly?**

As a housewife, I regularly cook and make sweets. I also enjoy spending my free time reading stories and novels in a quiet area with dim lighting, overlooking an outdoor view, and letting the sun in.

Interests:

5- What are the factors that you considered during the process of modifications?

I have a Makeup Corner, as one of my interests is putting on makeup. If someone is interested in fashion, they can allocate a room for that purpose. For example, my daughter and I are interested in makeup, so we have

particular corner. My son enjoys PlayStation and has a dedicated area in his room for electronic games. We expanded, changed the floor tiles, added a floor, and installed additional lighting.

- **Do you have outdoor sessions? Do you like to use the garden, for example, for barbecuing?**

Yes, especially on days when the weather is mild.

- **Was the expansion necessary for family gatherings?**

No, but we wanted more space.

- **Are there visits from guests?**

No.

- **When choosing finishing materials, did you opt for cheaper materials or those that last longer? Or was aesthetic appearance more critical, even if it was more expensive?**

Quality and aesthetic appearance were essential.

- **Even if it was more expensive?**

Answer: Yes.

- **Do you care about privacy?**

Yes. Therefore, we installed a door at the entrance to the house that does not overlook the inner hall and does not compromise the privacy of the house.

- **What about the first floor? Are there any modifications?**

Yes, the regular bedroom is not the main one. We converted it into a dressing room, and part of it is a sitting room.

▪ **What about the boys' rooms?**

We expanded and added a bathroom to my daughter's room. We did not change anything in the boy's room, but all rooms have televisions.

▪ **Is there an additional bedroom for guests?**

There is a spare room, even if there are no guests, and it is also unfurnished. I have not decided what it will be in the future, but I am considering it as a spare bedroom.

Opinion:

6- What do you think about the current modifications? Are you satisfied with them?

No.

▪ **Why? Do you regret anything?**

We wanted to enlarge the windows and change their aluminum frames. An open part in front of the entrance had to be added to the interior space because it is small and unimportant. However, its inclusion is one of the municipality's conditions.

▪ **Did you add it?**

No, but it would be better if we did. Also, if we converted the parking spaces into a kitchen, for example, or a sitting room and expanded the hall, it would be better.

7- Do you have any plans for future modifications?

A complete refinishing and changing of the drainage system was necessary due to its poor condition. Additionally, incorrect installation of bathroom insulation by workers led to leaks. With housing units connected to each other and sharing walls, there's no insulation from neighbors.

- **What else? Are you considering adding a room on the roof, for example?**

Not currently, but adding a garden or a sitting area on the roof is possible.

- **Some have mentioned building apartments for children in the future.**

At the moment, no. The room sizes are suitable for the children's ages. However, it's possible to build a whole floor in the future. Also, creating a men's Majlis is necessary, but most homes I've visited don't require Majlis, so they expand instead. They put a dining table, for example, or turn the space into a kitchen because its size is suitable. Therefore, it's better to enlarge it and open it to the living room, especially now that we've reached 2022; residents need a larger and more spacious place, so they tend to prefer Diyar Al Muharraq homes more than housing units due to the presence of gardens and beautiful, spacious designs. Our goal in the modifications was expansion, not only for us but for most of the neighbors as well. We canceled the internal kitchen and opened the living room to its space and the

outdoor area for more space and spaciousness. Among the expensive things was refinishing and completely removing the tiles from the house.

Also, I love making sweets, so it was a priority for me to have a fully equipped kitchen. Unfortunately, we didn't have enough money, so we took a small part of the kitchen. However, in the future, I'm thinking of turning the Majlis into a comfortable and spacious kitchen where I can practice my cooking activity.

8- What are the most crucial design principles that should be included in future subsidized housing units?

Expansion.

- **Do you mean to the living room?**

For almost everything: the living room, the rooms, even changing the tiles. Gypsum is also important to be included in future housing.

- **What else?**

There should be a good choice of finishes, and the house should be spacious with a beautiful design.

الملخص

تعد التعديلات التي يجريها السكان على المساكن المدعومة في البحرين ظاهرة واسعة الانتشار. يبدأ السكان في تعديل وحداتهم السكنية بعد استلامها، مما يؤدي إلى آثار وخيمة كالمخالفات والأعباء المالية والإخلال بالمنظر العام للمساكن. تهدف هذه الدراسة إلى تحديد القضايا التي تؤدي إلى تعديلات السكان في الوحدات السكنية المدعومة في البحرين. تشير الأدبيات إلى أن هذه الظاهرة ترتبط ارتباطاً وثيقاً بسلوكيات السكان. لذلك، تقدم الدراسة إطاراً مفاهيمياً يفحص أوجه التشابه والاختلاف في سلوكيات السكان في المساكن المدعومة. تم اعتماد المنهج النوعي في الدراسة التي أجريت على مرحلتين. تناولت المرحلة الأولى سلوكيات السكان المشتركة من خلال مقابلات منظمة مع عشرين خبيراً مشاركين في عملية التعديل. استخدمت المرحلة الثانية استراتيجية دراسة الحالة مع ست حالات مختارة من مشروع إسكان شرق الحد لدراسة السلوكيات المختلفة المرتبطة بأنماط حياة السكان. تضمنت هذه المرحلة ملاحظات ميدانية، تحليل خطط المساكن، ومقابلات منظمة مع السكان باستخدام منهج الأنشطة والاهتمامات والآراء (AIO).

كشفت النتائج عن قضايا عامة وخاصة تؤدي إلى تعديلات السكان. من جهة، تمثل القضايا العامة سلوكيات مشتركة بين معظم السكان وعادة ما ترتبط بمرحلة ما قبل السكن. تشمل هذه التفضيلات التصميمات الحديثة البسيطة مع غرف معيشة وغرف نوم فسيحة، ومواد حديثة عصرية، ونوافذ كبيرة. بالإضافة إلى ذلك، هناك حاجة إلى وحدات سكنية مستدامة تدمج جميع جوانب الاستدامة الثلاثة، وخاصة الجانب الاجتماعي والثقافي الذي يتعلق بالخصوصية، والضيافة، وجمالية وتميز المساكن. كما تمثل الأضرار الناتجة عن الممارسات غير الصحيحة، مثل استبعاد الخبراء وإشراك غير المؤهلين في عملية التعديل، مشكلة عامة أخرى.

من جهة أخرى، تمثل القضايا الخاصة سلوكيات مختلفة بين الأسر وعادة ما ترتبط بمرحلة ما بعد السكن. تشمل هذه القضايا حاجة السكان لتعديل منازلهم وفقاً لأنماط حياتهم وأولوياتهم، وهو ما يظهر بشكل أساسي في الطرق المختلفة لتوسيع غرف المعيشة وغرف النوم. ترتبط هذه التوسعات بشكل رئيسي بثلاثة مساحات: غرفة الضيوف، الفناء، والمطبخ. بالإضافة إلى ذلك، يحتاج السكان إلى تخصيص التصميم الداخلي لغرف النوم الموسعة لتلبية احتياجاتهم الفردية.

جامعة البحرين



قسم العمارة والتصميم الداخلي

كلية الهندسة

تحديد القضايا التي تؤدي إلى تعديلات السكان في الوحدات السكنية المدعومة في البحرين

أطروحة مقدمة في استيفاء جزئي لمتطلبات درجة الماجستير في العمارة (العمارة الداخلية).

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عميدة كلية الهندسة

جامعة البحرين

مملكة البحرين

يونيو 2024