

# THE ADAPTABLE HOME A CONCEPTUAL FRAMEWORK FOR DESIGNING ADAPTABLE MIDDLE-INCOME HOUSES IN SRI LANKA

WEERAKKODY. B.R<sup>1\*</sup> & AROOZ. F.R<sup>2</sup>

<sup>1,2</sup> General Sir John Kotelawala Defence University, Dehiwala-Mount Lavinia, Sri Lanka

<sup>1</sup>binurawe@gmail.com, <sup>2</sup>frarooz@kdu.ac.lk

**Abstract:** Adaptability in architecture refers to a building's ability to change or evolve to meet the needs of occupants over time. This can make buildings accommodate changes to family size, lifestyle, and trends, as well as undergo upgrades without extensive and costly renovations. Adaptable homes offer sustainability by minimizing disruptive modifications and allowing for personalization and extending their usability. However, there is a significant gap in understanding the specific adaptability needs in contexts like Sri Lanka. This study aims to address this gap by understanding the importance of adaptability in middle-income Sri Lankan households and developing a framework to help architects and stakeholders measure adaptability. Existing Literature was studied to compare adaptability strategies and synthesize a set of core adaptability principles. The methodology involved using an online questionnaire to gather data from both residents and architects regarding current adaptability practices, preferences, and prioritization of strategies. Findings revealed that the ability to upgrade and have versatile spaces was one of the most valued principles among residents. The architect's responses were used to quantify the adaptability principles, forming the backbone of the adaptability framework. This data was then used to create a systematic structure that assigns an adaptability score to a house, serving as a foundational model for future assessment tools.

**Keywords:** *Adaptable architecture, Residential Architecture, Middle-Income Housing, Personalization in Housing, Design assessment framework*

## 1. Introduction

Adaptability refers to the capacity of a building to be modified or adjusted to meet the evolving needs of its occupants over time. This includes buildings designed to evolve with changing family sizes, lifestyles & trends, allowing for upgrades without costly or time-consuming construction. An adaptable home can have features like movable walls that create dynamic layouts, or the ability to expand and shrink the building. This concept is best explained by O'Connor (2004) as "rather than attempt to predict the future and design permanent structures with an infinite lifespan, we are probably better off acknowledging our inability to make such predictions and instead design for easy adaptation and material recovery."

In the context of the rapidly urbanizing Sri Lankan economy, this study defines the middle-income segment as households with an average salaried employment who seek permanent ownership in urban or suburban areas. In Sri Lanka, there is a severe lack of middle-class housing in areas like Colombo, where there is a much greater demand for homes than there is supply (Samaratunga, 2013).

It is also evident that multigenerational living is common in Sri Lanka, where two to three generations live in the same house (Scroope, 2016). Furthermore, when family life cycles evolve, housing requirements also change, requiring different layouts to suit different stages, such as raising children or providing more accessibility for seniors (Hirudini & Yamada, 2024).

Adaptable houses can be a solution to this problem, by providing a way to lessen the need for expensive modifications and frequent moves (housing of the future, the livable and adaptable house). While there is a global recognition of adaptability and its importance, there is a significant gap in knowledge specifically focused on the adaptability needs of homes in Sri Lanka. Existing adaptability frameworks are often overly generalized and lack consideration for specific contexts such as housing in Sri Lanka. There is also a lack of identification and prioritization of adaptability strategies that are both effective and feasible for this demographic.

This research aims to answer the following questions: (1) Why is Adaptability important in middle-income Sri Lankan households & what are the key adaptability strategies identified in existing literature? (2) How can these principles be used to assess adaptability?

\*Corresponding author: Tel: +94 710918494 Email Address: binurawe@gmail.com

DOI: <https://doi.org/10.31705/FARU.2025.6>

## 2. Literature Review

### 2.1. ADAPTABILITY IN BUILDINGS

#### 2.1.1 What is Adaptability & the need for it

The concept of building adaptability refers to the ability to alter, repurpose or enhance buildings to accommodate new situations, contexts and individual tastes. This goes beyond the regular maintenance and renovations. This can include spatial, structural and operational aspects of buildings to adapt to evolving demands. By embracing this concept, buildings are regarded as dynamic entities that can be continuously improved, allowing for flexibility in functionality, technology, and aesthetics as societal advancements unfold. (Douglas, 2006; Schmidt, 2010a). Throughout history, adaptation has frequently denoted a shift in purpose or enhancement efforts, including alterations to enhance accessibility for individuals with disabilities or the elderly (Douglas, 2006).

Technological advancements can make homes more flexible & better equipped to adapt to shifts in family size, lifestyle, & everyday needs. The financial implications of maintaining buildings are substantial. The cumulative cost of changes within a building over fifty years can exceed three times the original construction cost (Brand, 2012). Therefore, designing buildings that can adapt to evolving needs and preferences is crucial for reducing the need for costly renovations and ensuring long-term financial sustainability.

Multigenerational living is prevalent in Sri Lanka, with three or more generations often residing together. This arrangement requires flexible housing designs to accommodate the needs of working-age adults, children, and aging parents under one roof (Scroope, 2016). Caring for elderly family members is a pressing social challenge in Sri Lanka. Modifications such as wheelchair ramps, grab bars, and wider doorways are necessary to enhance the living environment for the elderly, promoting their independence and safety (Perera, 2018). We can already see that layouts in Sri Lankan homes have developed to mirror the diverse necessities of families, being influenced by changes in family life cycles and backgrounds. Factors such as the family's economic status, parents' employment, and the education levels of children play a significant role in shaping the design of housing. Furthermore, the different stages of the family life cycle – from independence to retirement – also impact housing layouts. In the early stages of independence and marriage, the emphasis may be on compact, practical living spaces. However, as families expand and move into stages such as childbearing and school-age children, there is a growing necessity for larger, adaptable layouts that can accommodate changing activities and relationships. In the later stages, like the empty nest and retirement phases, homes may be adjusted to provide greater privacy and accessibility, reflecting the shrinking household size and the need for convenience (Hirudini & Yamada, 2024).

But adaptable homes are not just a current trend; this is the future of housing. The topic is gaining global attention as communities and governments recognize the importance of resilient and flexible living spaces. By prioritizing adaptability, we can create homes that meet future needs while ensuring they remain functional, sustainable, and supportive of occupants' changing lifestyles in the present as well.

### 2.2. CONCEPTS OF ADAPTABILITY

Adaptability spans from multiple dimensions, such as structural and physical elements, to the functional and operational aspects. Several core theories underpin the systematic design of adaptable environments.

One foundational idea is the concept of building layers, established by Brand (2012). This framework helps us understand and plan for how various parts of a building change over different time scales—from the *Site* and *Structure* (which change slowly) to *Space Plan* and *furniture* (which change quickly). Recognizing the various rates of change for each layer allows for better planning of maintenance, repairs, and future modifications.

Building on this, the concept of adaptive capacity refers to a building's ability to adjust to changing conditions and requirements while maintaining functionality throughout its technical life cycle sustainably & profitably. (Geraedts et al., 2014)

The Open Building concept by Habraken, highlights the importance of designing adaptable environments that can accommodate unforeseen future developments. As Cuperus (2001) quotes Habraken, "We should not forecast what will happen, but try to make provisions for the unforeseen." This is done by designing buildings with separate systems, which creates distinct lines of accountability among stakeholders and simplifies both assembly and disassembly.

A related concept is the transformable building (Durmisevic and Dorsthorst, 2006). This refers to a structure made of components designed to allow for easy maintenance and the interchangeability of individual parts.

Finally, Design for Disassembly (DfD) focuses specifically on optimizing the eventual disassembly procedure of a building to promote material reuse and minimize waste (Kissi et al., 2019). DfD is guided by principles such as proper documentation of materials, designing accessible connections and jointing methods, standardization of components, and the separation of non-recyclable items.

### 2.3. ADAPTABILITY FRAMEWORKS

Adaptability frameworks can act as a guide for architects and help make design choices. A building's ability to adapt is evaluated and developed using performance indicators and guidelines found in adaptability frameworks. These metrics include things like ease of disassembly and reconfiguration, structural adaptability, spatial flexibility, etc. Most frameworks rely on hierarchical aggregation techniques, which score or grade building features based on how significantly they contribute to adaptability.

### 2.4. DESIGN STRATEGIES FOR ADAPTABILITY

Existing literature on adaptability in architecture has proposed various principles and strategies that can be implemented to enhance the flexibility of buildings. These principles explain the different ways buildings can adapt to evolving needs and conditions.

There are generally accepted adaptability principles from studies like Schmidt (2010), which identifies six fundamental techniques, called "ables," that encompass different aspects of adaptation, Itma (2019), which proposes five key approaches to adaptation in home design necessary to increase the overall adaptability and long-term usability of residential spaces and Geraedts et al. (2014) who outlines seven key indicators for adaptability dynamics in buildings.

More context-specific studies were also considered, like those by Bensouda et al. (2024), which investigates how housing units have evolved in the Jnanat 2 resettlement site in Kénitra, Morocco.

Yasmin & Nilufar (2022) explore how residential spaces in government worker housing in Dhaka, Bangladesh, evolved over time, & how those original designs are adopted to meet the changing needs of their occupants.

Table 1: Comparison of Adaptability principles

Schmidt (2010)	Itma (2019)	Geraedts et al. (2014)	Bensouda et al. (2024)	Yasmin & Nilufar (2022)
Extendable (Scalable)	Ability for Merge	Redesign	Temporary spaces	Partition/Divisions
Flexible (Versatile and Convertible)	Ability for Division	Reallocate Internal	Adding rentable spaces	Multifunctional Spaces
Retrofittable	Ability for Growth	Relation Internal	Horizontal Extensions	Subletting
Moveable	Ability for Changing Use	Quality	Vertical Extensions	Privacy Enhancements
	Ability for multi-use	Facilities	Divisions	Configuration Changes
		Expansion	Adaptive Living Spaces	
		Rejection		

When comparing these various principles, it is evident that there are similarities, often with the same concepts described using different terminology. Hence, they were used to identify the basic principles that are supported by most existing literature. These principles have then been summarized and compared to develop a set of core adaptability principles for this study. The table above presents a comparison of Adaptability Strategies identified from the above-discussed studies. The strategies that share similar meanings or functionalities have been colour-coded for clarity. Five such strategies have been identified.

### 2.5. THE FIVE CORE ADAPTABILITY PRINCIPLES

From Table 1 above, we can observe recurring themes and similarities across various studies. This analysis allows us to identify and derive five principles that are consistently emphasized throughout previous literature.

The following can be classified as the five (5) Core Adaptability Principles.

- Expandability ■
- Divisibility ■
- Versatility ■
- Upgradeability ■
- Rentability ■

Every principle consists of a set of subcomponents that help in defining the elements that make up that principle. Best and worst-case scenarios of how these components are implemented in a building can be considered. These scenarios help to establish benchmarks for assessing adaptability, creating the basis of a framework to evaluate and improve the adaptability of housing in Sri Lanka.

### 2.5.1 Expandability

Expandability refers to a home's capacity to expand (or contract). An example might be homeowners increasing the size of the kitchen or adding extra bedrooms to accommodate a growing family.

Listed below are the subcomponents of expandability,

Table 2: Subcomponents of Expandability

Sub-Component	Description	References
Space Availability	The available space within and around the building.	(Andrade & Bragança, 2019, Becker et al., 2020, Geraedts, 2016)
Spatial Flexibility	The ease with which existing infill elements can be reconfigured without major structural changes.	
Structural Capacity	The strength and stability of the building's foundation and structure to support new loads.	
Service Compatibility	The ease of integrating the existing utilities (like plumbing, electrical, and HVAC) with new expansions.	

### 2.5.2 Divisibility

Divisibility refers to a building's ability to divide or merge spaces inside a building to create distinct areas that can work together or separately as needed. This is advantageous for large families who might eventually want to split up into different units. Large units may seem underutilized at first if small families live there, but in the long run, there are a lot of benefits to being able to simply rearrange spaces.

Listed below are the subcomponents of divisibility,

Table 3: Subcomponents of Divisibility

Sub-Component	Description	References
Partitioning Flexibility	The ease with which interior partitions such as walls or screens can be added, removed, or repositioned.	(Andrade & Bragança, 2019, Becker et al., 2020, Geraedts, 2016)
Spatial Design	The spatial layout features, like its area and shape which support how divisible or mergeable a space is.	
Accessibility	The ease of movement and circulation to new spaces is created by dividing larger areas.	
Support Systems	The adaptability of support infrastructure and utilities such as plumbing, electrical systems, HVAC, daylighting and ventilation features to support newly created spaces.	

### 2.5.3 Versatility

Versatility refers to a building's ability to accommodate different uses, activities, or user requirements often within the same spaces. This tactic promotes the design of living areas that are adaptable to meet changing needs without taking up extra space.

Listed below are the subcomponents of Versatility,

Table 4: Subcomponents of versatility

Sub-Component	Description	References
Furniture Flexibility	The adaptability of furniture to support different functions and configurations.	(Basu, 2024, Kieft, 2021)
Surface Adaptability	The ability of surfaces (floors, walls) to support different uses or activities.	
Spatial Character	The size and shape of the space, and its ability to support multiple functions.	

### 2.5.4 Upgradeability

Upgradeability is a building's ability to make modifications, upgrades, or replacements without the need for major reconstruction. Some examples of the upgrades are changing kitchen countertops, replacing the flooring material, upgrading bathroom fixtures, or even installing completely new systems.

Listed below are the subcomponents of upgradeability

Table 5: Subcomponents of Upgradeability

Sub-Component	Description	References
System Accessibility	The ease of access to systems, connections and sources for maintenance or upgrades.	(Andrade & Bragança, 2019, Geraedts, 2016)
Connection Type	How the various components within a system are connected to each other, and how the system itself is connected to the building.	
System Flexibility	The ability of systems to accommodate upgrades, changes and future technology.	

### 2.5.5 Rentability

Rentability is the ability to rent out spaces within a house. Elderly couples may choose to downsize, for example, by renting out a section of it.

Listed below are the subcomponents of Rentability

Table 6: Subcomponents of Rentability

Sub-Component	Description	References
User Access	The ability to provide separate access to the rented spaces.	(Andrade & Bragança, 2019, Becker et al., 2020)
Utility Distribution	The ability to provide separate utilities with individual metered connections for each rental unit.	
Space Availability	The availability of space for facilities such as a kitchen and bathroom within each rental unit.	
User Privacy	The ability to ensure privacy and minimize disturbances between rental units and home residents.	

## 3. Methodology

### 3.1. RESEARCH METHODOLOGY

The five (05) core principles and their subcomponents make up the adaptability framework. To make this framework more practically applicable, the study aims to quantify this framework. This will allow a user to measure and compare the adaptability principles in the design stage or in an existing building, where the framework will act as a scoring system.

1. **Scoring Subcomponents:** Each of the Subcomponents will be given an individual score. The best and worst conditions of how these subcomponents are implemented can be used as a criterion for scoring.
2. **Summing Subcomponent Scores** ( $S_{\text{subcomponent}}$ ): The scores of the subcomponents can be summed up to give a total score for its relevant Adaptability Principle. This score shows how well that principle can be achieved in the particular house or design.
3. **Assigning Weights:** To ensure that the scoring system is not just a summation of all subcomponents but a nuanced reflection of their importance, a weight must be assigned to each subcomponent and the key principles. ( $w_1, w_2, w_3$  etc)

So, calculating the score of a particular core principle (S) would be multiplying each of its subcomponents by its assigned weight (w) and then adding those values for a final score.

$$S = (S_{\text{subcomponent1}} \times w_1) + (S_{\text{subcomponent2}} \times w_2) + (S_{\text{subcomponent3}} \times w_3) + (S_{\text{subcomponent4}} \times w_4) \tag{1}$$

Considering the data needed, two separate online questionnaires were made, one for architects and another for residents. Data on residents' perceptions of adaptability, along with the relative importance assigned to its core principles and subcomponents, were utilized to derive weighted values for analytical evaluation. The inclusion of residents' experiences and articulated needs provided valuable empirical insight into the practical dimensions of adaptability within residential architecture. Data is collected on their thoughts on adaptability, how they have adapted their homes and the importance of each adaptability principle, which gives a value to create a weight for each core principle.

To obtain the weights of subcomponents and principles, architects and other industry professionals were asked to rate the importance of each subcomponent on a scale from 1 to 5. Then the mean scores are normalized to ensure that the weights all sum up to 1 or 100.

### 3.2. SAMPLING, PARTICIPANTS AND LIMITATIONS

Data for this study were collected from two distinct populations, residents and architectural professionals. A snowball sampling method was utilized via online distribution to recruit both samples from their respective networks, leading to a larger, more diverse sample than random sampling would have permitted under practical constraints.

Consequently, this study faced specific limitations that may impact the applicability of the findings. The final number of participants was limited, particularly among more experienced architects. The reliance on online distribution methods for the snowball sampling may have introduced inherent sampling biases. Additionally, time constraints during the data collection process may have affected the comprehensiveness of the responses.

## 4. Data Analysis

### 4.1. EMPIRICAL FINDINGS ON CONTEXT AND USER NEEDS

#### 4.1.1 Demographic Context and Observed Needs

A total of 205 responses from residents were collected. The sample primarily reflected an urban or suburban context, with most respondents situated in the Gampaha (38%) and Colombo (22%) districts. Many respondents live either **with their parents (61%)** or **with a spouse and children (30%)**, reflecting a high prevalence of **nuclear family structures**. Furthermore, 62% of respondents live in households comprising four to five people, confirming that housing solutions must primarily accommodate medium-sized families.

#### 4.1.2 Residents' Prioritization of Adaptability

Overall, **77% of residents** indicated that adaptability in housing is important. The most implemented principles are expandability & versatility. Furthermore, when asked about future needs, upgradeability & versatility had the highest rating as shown in Figure 2.

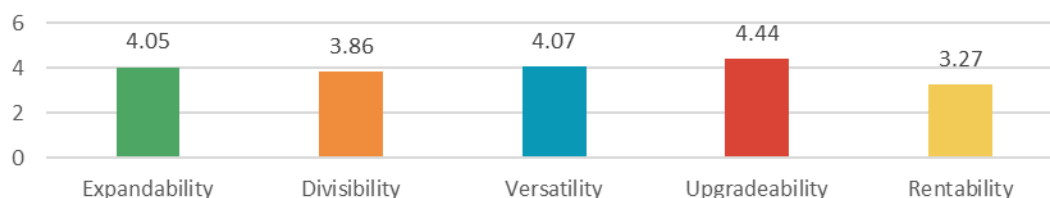


Figure 1: Distribution of Resident Ratings of Adaptability Principles

#### 4.1.3 Data correlations between demographic and adaptability principles

The analysis of demographic sub-groups showed specific, context-relevant correlations:

**Living situation:** the results show that regardless of age and living situation, people have similar views on adaptability principles.

**Land size:** people with land less than 10 perches rate Expandability" and Divisibility lower than those with more than 50 perches, highlighting how they consider land size as a constraint.

**Property age:** Expandability and Divisibility are ranked slightly higher by residents of newer houses. And notably, versatility is more prioritized by residents of newer homes, which suggests that modern consumers are aware of the need to integrate technology and non-structural changes into their homes

### 4.2. DATA FROM ARCHITECTS

**72** responses were received from Architects, out of which 81% said they have incorporated or considered adaptability features in their projects, which shows that there is a strong trend towards designing flexible spaces. Architects placed the highest value on Upgradeability and Versatility, while rentability has the lowest rating.

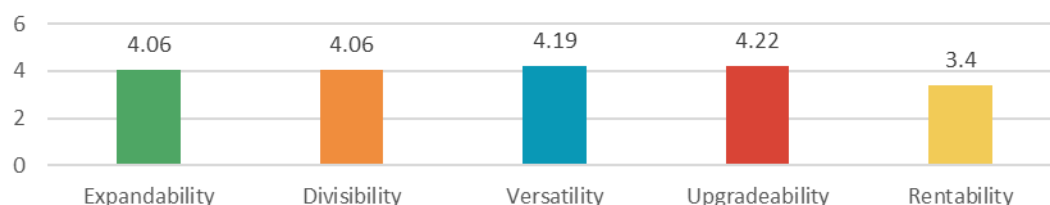


Figure 2: Distribution of Architect Ratings of Adaptability Principles

### 4.3. ANALYSIS OF ARCHITECT AND RESIDENT PERCEPTIONS ON ADAPTABILITY

The comparison between ratings from both architects and residents shows that both parties have a similar view about each principle. Both groups highly value **Expandability**, confirming these two principles as the non-negotiable core of adaptability. **Versatility** is also similarly rated. However, there are notable differences in the ratings for **Divisibility** and **Upgradeability**. Architects rated **Divisibility** at **4.06**, while residents rated it lower at **3.86**, suggesting that architects place more emphasis on the ability to reconfigure spaces than residents. In contrast, **Upgradeability** is rated higher by residents (**4.44**), suggesting that users place greater value on low-cost, non-structural modifications. Both groups give **Rentability** the lowest importance.

### 4.4. THE WEIGHTED ADAPTABILITY MODEL

The weights were derived from data collected from architectural professionals. These values reflect their importance in contributing to overall adaptability. For instance, within Versatility, *Spatial Character* (36.2) is the most influential factor. Similarly, *Structural Capacity* (27.2) under Expandability and *System Accessibility* (34) under Upgradeability are critical attributes. These weightings serve as the foundation for a practical evaluation tool that enables architects to assign adaptability scores to existing or proposed designs. By facilitating measurable assessments, the framework supports decision-making in housing design, especially within the Sri Lankan housing context.

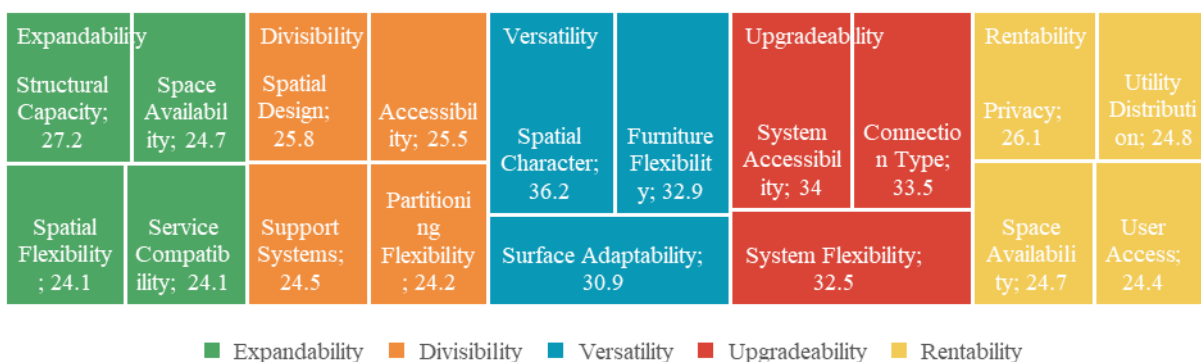


Figure 3: Adaptability framework weight distribution

### 4.5. OPERATIONALIZATION OF THE ADAPTABILITY FRAMEWORK

The final output of this study is the operationalization of the weighted scoring system into a usable tool, demonstrating the practical application of the framework.

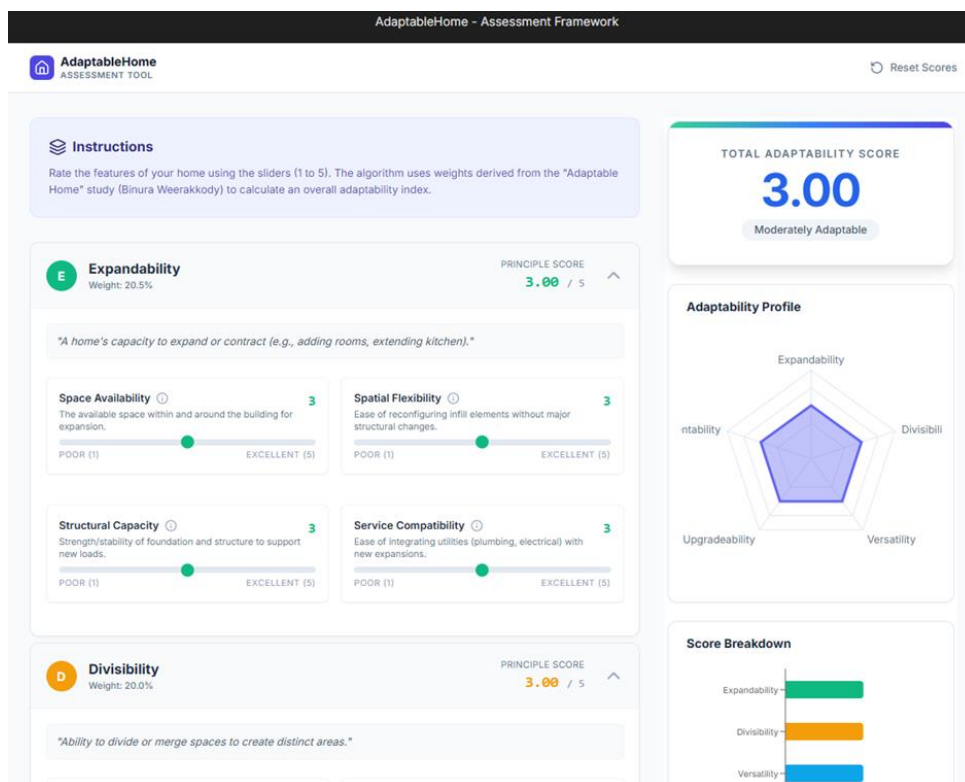


Figure 4: Sample Interface of the Interactive Adaptable Framework

This interactive model allows users to input a rating (1 to 5) for each subcomponent. The system then automatically applies the **weighted values** to instantly calculate the house's total Adaptability Score. This model, as seen in Figure 4, provides a user-friendly mechanism for evaluating design choices in homes.

While this digital model successfully fulfils the objective of creating a quantifiable scoring system, its current deployment serves only as a **foundational model** which needs practical field validation.

The model can be accessed at: [https://ai.studio/apps/drive/1yupX5\\_IDhPPw5KEni9rVpEZN6Kml2YUV](https://ai.studio/apps/drive/1yupX5_IDhPPw5KEni9rVpEZN6Kml2YUV)

## 5. Conclusion

The study on adaptability in middle-income Sri Lankan houses has produced several insights through a comprehensive review of existing literature and survey data. The need for adaptability in Sri Lankan middle-income homes was found to be mainly aspects such as multigenerational living, co-living, elderly needs, family dynamics, and financial sustainability. The study also explored various concepts of adaptability & analysed existing frameworks.

A study of literature was done to synthesize a set of core principles and subcomponents: **Expandability, Divisibility, Versatility, Upgradeability, and Rentability**. These principles are the foundation of this study. The data for this study were gathered through an online questionnaire, given to both residents and architects. The findings revealed that, from the residents' viewpoint, **Upgradeability** and **Versatility** were the most valued principles, emphasizing the importance of easily maintainable and multifunctional spaces. **Rentability** received the lowest score.

This study faced several methodological and practical limitations that impact the applicability of the findings. Specifically, the number of participants was constrained by time and resource constraints, resulting in a limited sample, particularly among experienced architects. Furthermore, the use of online snowball sampling introduced potential biases, reducing the overall generalizability of the findings to the broader middle-income population.

To provide a functional system, the data was operationalized into an interactive digital scoring model. This tool allows a user to input ratings for subcomponents, which are automatically processed using the derived weighted values to generate a total Adaptability Score, thereby providing a practical output for preliminary design evaluation.

The Adaptability Scoring Framework developed is a theoretical model as it has not yet been tested in actual case studies, which limits its real-world validation. To build upon this foundation, future research should broaden the participants to include a greater number of experienced professionals and practically test the framework in real-world design scenarios. It is also recommended that the results of the framework are compared to those given by a professional with an understanding of the topic to see whether any deviations are made.

Finally, further studies should explore additional adaptability principles, consider the broader applicability of the framework to different income groups, and establish a mechanism for its continuous review and update to incorporate evolving user needs and technological advancements.

## 6. References

- Andrade, J. B., & Bragança, L. (2019). Assessing buildings' adaptability at early design stages. *IOP Conference Series. Earth and Environmental Science*, 225, 012012. <https://doi.org/10.1088/1755-1315/225/1/012012>
- Basu, A. (2024). Versatile Style: Embracing Transitional Pieces, Mix and Match, and Multifunctional Furniture for Adaptable Design. *Artisan Furniture UK*. <https://www.artisanfurniture.net/news/versatile-style-embracing-transitional-pieces-mix-and-match-and-multifunctional-furniture-for-adaptable-design/#:~:text=By incorporating elements such as, can evolve with your changing>
- Becker, A. K., Ross, B. E., & Albright, D. (2020). EVALUATING THE WEIGHTED-SUM APPROACH FOR MEASURING BUILDINGS' ADAPTABILITY. *Journal of Green Building*, 15(3), 37–54. <https://doi.org/10.3992/jgb.15.3.37>
- Bensouda, O., Benkirane, I. M., Becue, V., & Cenci, J. (2024). Adaptive housing mechanisms within resettlement sites: a case study of Ouled M'Barek resettlement program, Kenitra, Morocco. *Urban, Planning and Transport Research*, 12(1). <https://doi.org/10.1080/21650020.2024.2304595>
- Brand, S. (2012). *How buildings learn what happens after they're built*. Penguin Books.
- Cuperus, Y. (2001). AN INTRODUCTION TO OPEN BUILDING. *Delft University of Technology*.
- Durmisevic, & Dorsthorst. (2006). SERVICE LIFE VERSUS USE LIFE CYCLE A WAY TO MEASURE THE ENVIRONMENTAL IMPACT OF DIFFERENT TRANSFORMATION SCENARIOS. *Delft University of Technology*.
- Douglas, J. (2006). *Building adaptation*. Routledge.
- Geraedts, R., Remøy, H., Hermans, M., & Rijn, E. (2014). ADAPTIVE CAPACITY OF BUILDINGS A determination method to promote flexible and sustainable construction. *International Union of Architects World Congress*.
- Geraedts, R. (2016). Flex 4.0, a practical instrument to assess the adaptive capacity of buildings. *Energy Procedia*, 96, 568–579. <https://doi.org/10.1016/j.egypro.2016.09.102>
- Hirudini, S. M., & Yamada, K. (2024). Dynamism of house plans with reference to family conditions of lower-middle-class families in suburban western coast of Sri Lanka. *Buildings*, 14(2), 522. <https://doi.org/10.3390/buildings14020522>
- Palmer, J., & Ward, S. (2013). *Housing of the future, the livable and adaptable house*.

- Itma, M. (2019). Strategies of Adaptability: An Approach for Affordable Housing Design. *European Journal of Advances in Engineering and Technology*.
- Kieft, H. (2021). GUIDANCE TOOL FOR ADAPTABLE HOUSING DESIGN. *Faculty of Architecture & the Built Environment, Delft University of Technology*.
- Kissi, E., Ansah, M., Ampofo, J., & Boakye, E. (2019). Critical Review of the Principles of Design for Disassembly. *Modular and Offsite Construction (MOC) Summit Proceedings*, 251–258. <https://doi.org/10.29173/mocs101>
- Perera, R. (2018). *Accessible Facilities in Home Environment for Elderly Family Members in Sri Lanka*.
- Rathnayaka, B., Ariyawansa, G., & Endagamage, D. (2020). FACTORS AFFECTING TO BUYING DECISION OF MIDDLE-INCOME HOUSE BUYERS: STUDY ON SELECTED MIDDLE-INCOME HOUSE PROJECTS IN COLOMBO. *International Conference on Real Estate Management and Valuation (ICREMV)*.
- Samaratunga, T. (2013). Reflections on over 100 years of urban housing policies in Sri Lanka. *Social Sciences*, 2(1), 14. <https://doi.org/10.11648/j.ss.20130201.13>
- Schmidt, R. (2010). *WHAT IS THE MEANING OF ADAPTABILITY IN THE BUILDING INDUSTRY?*
- Scroope, C. (2016). *Sri Lankan - family*. Cultural Atlas. <https://culturalatlas.sbs.com.au/sri-lankan-culture/sri-lankan-culture-family#:~:text=In collectivist cultures such as,the family connecting the relations>.
- Yasmin, D., & Nilufar, F. (2022). Morphological adjustments of domestic spaces: Spatial adaptations in the apartments of the lower-middle-income group in Dhaka. *13th Space Syntax Symposium*.