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# Space Modification and Personalization in Public Housing: Case of Walk-Up Apartments in Sri Lanka

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**Abstract-** Public housing programs are critical in developing countries such as Sri Lanka where Governments' aim to accommodate housing affordability through a dynamic housing market addressing the desired housing mobility and choice of housing solutions. The process of public housing production lacks end-user participation in its design stage and instead provides a typical layout to communities with similar needs and requirements. Nevertheless, the end user inhabits the house by a process of modifications addressing their changing needs and requirements. But such process has no involvement of an Architect, thus modifications done without space planning and design knowledge, results in inhabitable spaces and poor quality of the living environment. This study explores the personalization strategies of the public housing process taking two 'walk-up apartments' type of public housing schemes as a case study.

**Keyword-** Personalization, Modification, Public housing, Walk-up apartments

## I. INTRODUCTION

Housing environment has long been an area of interest for architects and planners. Further, they have operated under the premise that such environments are important to the well-being of individuals and society. Quality of the housing environment is a recent focus of government officials at a national and local level.

The building process as a whole consists of a process of design, a process of construction and a process of repair [2]. Within this process, satisfying human needs can be assumed as a fundamental goal in designing. Therefore, buildings must at least work at a level which satisfies basic needs of its users. A house can only be considered a "home" to the extent that the occupiers can give it their own meaning... It may even be said that "homes" develop "in spite of" rather than "because of" the house design [19]. The users, in the process of making their living environments to cope with their real time activities, try to modify or alter the

surroundings. Therefore, the ultimate goal of housing provision could be seen as home making provision through housing.

However, the current process of public housing production lacks user participation in its design stage, which eventually creates "designer-user gaps". Thus, current production of public housing design addresses a typical user with typical abilities in mind and their typical current needs. Therefore, if designers are concerned with housing attributes of its users from initial stages, users could be supported with the intervention process during the building's use. Identifying the patterns of user interventions in current public housing projects to consider those interventions at the design process, in order to facilitate those in future projects is critical for the future housing performance and well-being of its inhabitants. Therefore, the objectives of this study are to identify modifications and personalization in living environments.

## II. Nature of human needs in housing

Every human being has needs and aspirations, which differs from one to another. Throughout every human being's lifespan, they try to fulfill needs and aspiration such as Food, safety, health, well-being, education etc. Within these broad needs and aspirations, some basic needs such as physiological needs, safety needs, love and belongingness needs, esteem needs and self-actualization are clearly identified.

**Maslow's classification:** Culture, as viewed by Maslow [20], is a reflection of a person's motivations in response to the effects of external agents imposed from natural and built environment. Accordingly he describes, satisfying the basic needs of a person is important for developing and actualizing potentialities and capacities of the person in society. Maslow's theory of human motivational factors describes the different levels of human needs without the superficial differences they have from one to another, using a concrete and tangible approach and a specific classification. This theory highlights a pervasive and

universal definition on the human motivations, which focuses toward the origins of human needs.

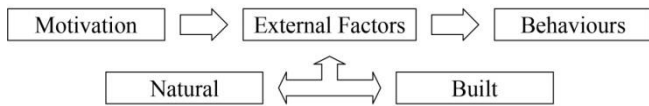


Figure 1: External fields as a transition between motivations and behavior [20].

Maslow's [20] classification of needs consists of five levels of cognitive needs, which are physiological needs, safety needs, belongingness and love needs, esteem needs and the need for self-actualization. In addition to these five levels, two interrelated levels of self-actualization needs were discussed: the first is a level of conative needs, which he termed desire to know; and the second is a level of both cognitive and conative needs known as aesthetic needs.

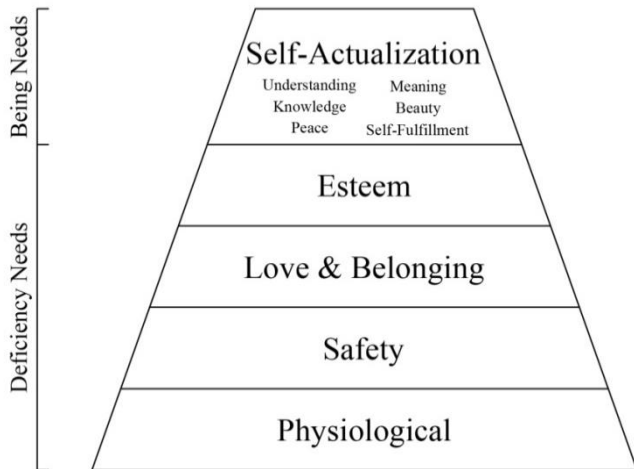


Figure 2: Maslow's hierarchy of needs [11].

Basically, a perfect and healthy human being according to Maslow: is a person who is appropriately satisfied in terms of these basic needs in equal measure. The origins of every humanistic issue occur with these basic needs [20]. Fulfilling these different levels of needs has a considerable influence on human characteristics. Gratification of these needs helps to reduce psychological and physiological disorders, contributing to human health and personality formation [20]. All of human needs and aspirations have a value, which will differ from person to person [11].

According to Maslow's hierarchy, housing is one of most essential human needs. Therefore, in the context of housing provision, if decisions can be made with reference to the inhabitant's different levels of needs, the process of designing a living environment from planning to operational stage can be more relevant in terms of user's expectations.

### A. Housing Needs

Housing is a term loosely employed to mean a broad spectrum of activities, and is mistakenly identified with house design, or housing projects. But housing goes beyond the mere provision of house units [9]. Housing is seen as providing just the units or having housing units within the modern society. But it could be seen in a broader picture of housing provision towards home making. At the most rudimentary level, housing is the process enabling the act of dwelling: establishing one's existence as appropriate for his living on earth, in the form of making homes [9]. Accordingly home is an organism in direct relationship to man. Home is identified as the emotive bond built between the person and the environment around them.

According to Zavei and Jusan [29], housing is an essential need for a person. Further they explain the impacts of it, if the housing needs are not satisfied. On the other hand it is important to fulfill the housing needs of the society in order to achieve other benefits such as economic development, environmental sustainability etc. Human beings' way of achieving the need of housing would differ from one to another with social, cultural and economic factors as those are affecting one's choice of housing. Maslow [20] explains it with the impact of external forces. Because of this, from a person to person, their needs and aspirations will be limited.

**Psychological variables:** To make one's life comfortable, they expect certain characteristics through their living environments. These could be mainly identified in the context of territoriality, identity, privacy and security.

- **Territoriality:** The place that a person marks as their own place and defense against outsiders can be defined as the territory. House is the center of the territory of human being [28]. People try to demarcate their boundaries in a visible manner to express them to the society.
- **Identity:** Identity can show the belongingness and the differences from others [21]. In the housing context, people try to maintain the housing identity by being different from others. The factors affecting the identity could be seen as education level, economic level, social and cultural aspects, class, status, power etc. and specially the personal idea.
- **Privacy:** Privacy can be identified as the selective control of access to the self, involving dialectic, optimization and multimodal process [3]. People like to socialize as well as to be alone sometimes. This does not mean isolation hence controlling unwanted external forces and interaction. Nature of the society they are in, social class etc. are factors affecting once privacy expectations. Privacy could be influenced to a society in two ways, which are aurally and visually.
- **Security:** People try to do several things in order to achieve security for themselves such as building up physical barriers. Factors such as social, economic, political etc. are influential for one's security.

**Physical variables:** The minimum standards in physical comfort level to be a habitable space is defined as physical variables. Room sizes, heights, relationship from one space to another in order to create functional efficiency, factors affecting functional needs etc. could be seen as physical variables.

**Socio-cultural variables:** Culture and social norms are deeply attached to some communities where they try to achieve those needs and requirements in their living surroundings and similarly with their housing environments as well. House affects from cultural variables at first place as it is their closest and smallest unit within the society. Therefore, elemental details, use of colours, any other architectural components etc. which are related to cultural background and religious beliefs, eventually could be seen getting into housing environments. On the other hand, social variables could be identified as trying to cope with neighbourhood changes and changing as neighbours do. However, social and cultural variables could be varied from elemental decorations to spatial changes.

**Socio-economic variables:** One part of economic variables could be identified as house becoming family's economic center by giving it an economic aspect. On the other hand, personalization due to economic status of the inhabitants could also be identified as an economic variable.

### III. LIVING ENVIRONMENT PERCEPTION AND ITS CONSEQUENCES IN PUBLIC HOUSING

Public housing designs change a number of times within a short period of time than a personalized house design mostly due to negligence on perception on ones living environment. Most of these modifications are done in order to satisfy their qualitative human needs which, are identified as psychological, physical, socio-cultural and economic, after fulfilling the basic needs they expect from a house. Process of adaptations, modifications, personalization etc. could be seen in satisfying various needs in living environments.

#### A. Housing perception

Houses are constructed to accommodate different levels of inhabitant's expectations. Banham [5] and Oliver [24] suggest that residential space can be classified into three levels namely shelter, house and home. Shelters are provided to protect people and house is a form of physical enclosure. Home is expected to be much more than a physical structure, whereas the creation of "home" represents deep social structure. It is important to note that the distinctions are not trivial, sentimental or romantic, but fundamental. According to Oliver [23], "house" is a denotative concept, which is a "small dwelling" describing the physical structure of the building, whereas "home" is a connotative concept. Home symbolizes the lives spent within it, which has connotative deep social system it

reflects and the spaces within it reflect the family's relationship and connection to them.

According to Bachelard [4], intimacy, daydream, imagination and memories are the personal factors affecting the establishment of a home. Further he describes house as a "large cradle" that is a human being's first world. Supporting this notion, Schulz [22], describes that a dwelling functions as a place to meet others for the exchange of the products, ideas, feelings, coming to an arrangement with others, accepting a set of common values and also being oneself. An individual would see the dwelling he or she lives in as the small chosen world of themselves. Therefore, it highlights that the one's living environment has to be provided by direct connectivity and participation of its occupants.

Israel [12] focused specially on housing design by developing the technique; "sociogram exercise" based on Maslow's hierarchy of needs and studies on how to translate the user's image about his or her living environment to a specific type of territory. Israel's [12] methods are more suitable in studying psychological attributes in design process for a particular user who is directly communicating with the designer.

MacCray and Day [18] attempted to identify housing related values, aspirations and satisfaction based on Maslow's hierarchy of needs. These studies identified that the public housing units can only provide for physiological needs of the inhabitants. Further it suggests that the user's satisfaction in housing is related to the gratification of the user's higher psychological expectations such as intimacy, love, sense of belonging and freedom, even though the housing satisfaction is dependent on economic or social status. Therefore, identifying one's housing preference in the design phase of the initial housing unit and the future personalization works by the inhabitants are important in order for home making provision in public housing.

The model established by Rapoport [26], suggests that the evaluation of built-environment depends on evaluative variables that arise from culture.

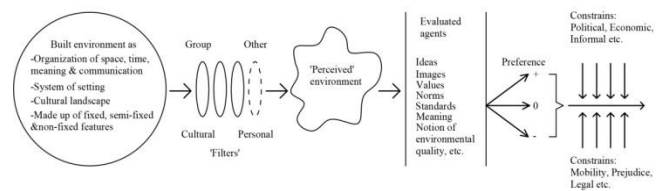


Figure 3: Model of evaluative process based on user's perception [26].

Expanding on Rapoport's [26] model, Jusan & Sulaiman [15] have developed a model on evaluating personalization, which leads by person-environment congruence. Jusan & Sulaiman's model facilitates the process of categorization and classifying living environment attributes based on their response to user's values.

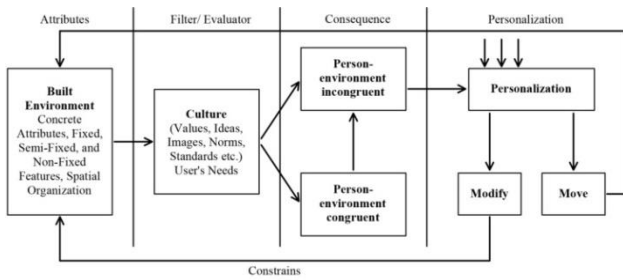


Figure 4: Theoretical model of personalization in built environment [15].

Personalization according to Jusan [14] is the act of making one's territory relevant to his/ her values. Due to the continuous changes of user's needs throughout his/ her life span, personalization is seen as a continuous process, which supports user's needs and in that the form of modification or movement tends to be inevitable.

User's cultural values are seen as the most significant determinants of their housing preferences. Although cultural values are significant, the most critical and fundamental stage is to specifically highlight the users' exclusive motivational level and the relation between architectural attributes and the users' needs. Cultural interpretation leads to identifying a set of tangible and concrete architectural attributes to properly satisfy the motivational factors, once the motivational levels and the relations were clarified. Otherwise, the diversity of the motivational factors and the ambiguity of the relations with architectural attributes make it impossible to apply them properly. Therefore, a model of personalization which would address the issue from a basic needs perspective is significant. This model of personalization framework should be able to explain how the different levels of needs filter the built environment and eventually suggests how architectural attributes can be associated with the users' motivations.

Further, Jusan & Sulaiman's [15] model of personalization is modified with considering Maslow's hierarchy of needs as the origins of cultural elements and the different levels of needs are shown in the model as evaluating agents.

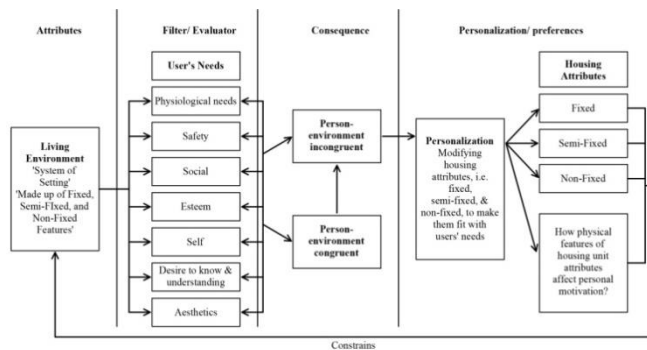


Figure 5: Theoretical model of personalization in built environment [29].

Jusan [15] discovered that the attributes for fulfilling a user's design expectations are more likely to be in the form of concrete attributes. According to the above figure, the outcome of the filtration process is personalization by meeting user's preferences, which they tend to express through the housing, attributes choices.

### B. Human Satisfaction and Dissatisfaction in Housing

The satisfaction of housing needs to create incentives for balanced growth, improve living standards, and provide conditions of security and happiness, thereby increasing efficiency of the productive population [17]. According to Maslow [20], human needs and aspirations are not just to be fulfilled in order to satisfy a person. It has to be satisfied in the best way for a person to be satisfied with their needs. Further, Zavei and Jusan [29] explained that the provided environment will not be able to respond to complete the more basic needs of the users. On the other hand, mismatch between housing and users would cause problematic situations within the society. Housing dissatisfaction would lead the users to housing adjustments or re-modeling or moving to new places.

### C. Personalization of housing (significance of personalization)

Personalization is an act of making one's territory [7] [16] [6], which is mechanism to achieve privacy, hence user control of their environment [16]. Personalization is mostly referred to as non-structural modifications such as houses' interior layout, finishes and decorations. But basic theory of personalization may also relate to structural modifications of the houses. House extension, renovation, modification, transformation, remodeling etc. are the terms used to express this process of personalization. Moving can also be an act of personalization, as the theory that led to moving from or modifying the place in same.

Personalization is a way to establish user meaning of built environment [25]. It also leads toward achieving one's values and goals in a process of generating environmental meaning to the surroundings. Needs are created and determined by the values that comes from culture. This is significant in determining one's housing choice. A wide gap between users' and designers' values can be seen in current public housing production due to various reasons such as, end user participation, varying of need in its use, identifying the end user etc. Therefore, personalization is particularly essential in housing because of the wide differences between users' and designers' values, and the difficulty to meet the precise need of the users by the designer [8]. User values and meanings play a major role in housing, which the testimony of this fact could be seen in the current scale of adaptation and modification towards the personalization for user's perception.

Individual's values and goals emerge with time and new needs and they tend to proceed with personalizing. Therefore, personalization could be identified as a

continuous process. Changing surroundings towards personalization does not always mean that the existing living environments are not properly designed but the naturally changing needs and the behaviour of human beings continues the personalization process. Personalization guides user towards the home making process. The environment is an extension of man's being and personality; hence man is an agent of environmental change and not merely a recipient of environment influences. He should be able to manipulate, shape and alter his environment [3]. Being directed by his goals as man's instinct and to achieve this, he has to involve and change with his physical environments [13]. Involvement of users has the potential for producing environments, which are not only safer and cared for, but also tailored to the needs of users due to the fact that the residents were involved in making decisions related to their house and their immediate residential environment [1].

#### D. Forms of personalization

Personalization of houses can take several forms with its own unique characteristics, opportunities and constrains. Friedman [10] explains that personalization could be achieved by changing of an entire building or simply a component of the building. Further he identifies four main areas of interventions, which are critical in achieving personalization of a dwelling. In order to identify the modifications in housing, Friedman's classification is further developed into five areas of interventions by identifying growth and division as two major areas.

- **Manipulation of volumes**, which refers to the consideration that an occupant will utilize the entire volume they have within their boundaries.
- **Spatial arrangement**, which considers the way in which the spaces are used within the volume. An entire floor or a single room of that floor can be a space.
- Growth and division, which refers to the expansion or reduction of volumes or spaces.
  - **Growth** can be identified as an add-on, which is considered as extensions beyond the original envelope of house.
  - **Division** can be identified as an add-in, which are considered as modifications of space within the perimeter of the original volume of the house.

In the event of both growth and division, the added spaces need to be independently functioning along with the existing spaces.

- **Manipulation of sub components**, which are the elements employed in the use of the building. These elements can be as large as structural components or as small as a light fitting.

## IV. FINDINGS OF THE STUDY ON SELECTED PUBLIC HOUSING PROJECTS

### A. Introduction to case studies

Two public housing schemes done in the category of 'walk-up apartments' by National Housing Development Authority of Sri Lanka, Veluwanaramaya housing scheme in Colombo 06, Sri Lanka and Soyzapura housing scheme in Moratuwa, Sri Lanka were selected for the study. The study explores underlying attributes of inhabitants' interventions in selected public housing category and the data is analyzed within a theoretical framework for a qualitative discussion of the study. Theoretical framework is built up on two stages for the study, which are attributes behind user interventions and personalization behaviours of the dwellings.

The data gathered via systematic observations, interviews and questionnaires of 11 dwellings and families were observed and discussed under two stages of theoretical framework generated by the literature review. The overall discussion identifies the critical factors of user interventions in walk-up apartments and highlights what are the critical areas to be considered within the selected category of housing development.

### B. Analysis of Case Studies

- First stage discusses the forms of personalization. Findings of the study indicate that all units in the selected cases have undergone major modifications to its original layout.

**Manipulation of volumes:** A housing unit being provided within a one level restricts the vertical links and manipulation of volumes. Therefore, modifications carried out vertically in levels, is a rare form of personalization. But in the case of units on the topmost floor of the building, vertical manipulation is a possibility.

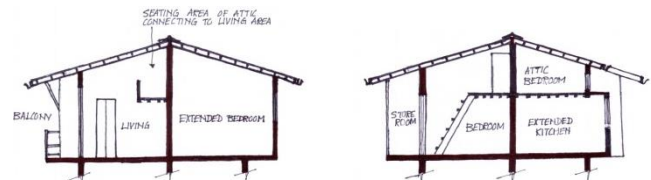


Figure 6: Vertical growth within a unit in the topmost floor.

Vertical growth/expansion within the unit has major restrictions such as light and ventilation, access, construction and material use and structural stability. However, the study clearly shows that manipulation of upper volumes for the purpose of services and storage functions is a possibility as such spaces are not provided for in these types of housing units.

**Spatial arrangement:** Modifications done through furniture arrangements and conversion of one functional space to another functional space could be distinguished under this scenario. Functional alterations of entire spaces

are identified mostly with conversion of service areas which are semi-private to private areas of the unit. It is identified from the study that service areas such as kitchens are given less attention and private areas such as bedrooms are given priority. But with modifications done in service spaces, operating within the space, inhabitants' involvement within the space and considering hygienic issues, inhabitants have come-up with another form of modification to the service areas. It can be identified mainly as an addition to the existing space which is a form of growth.

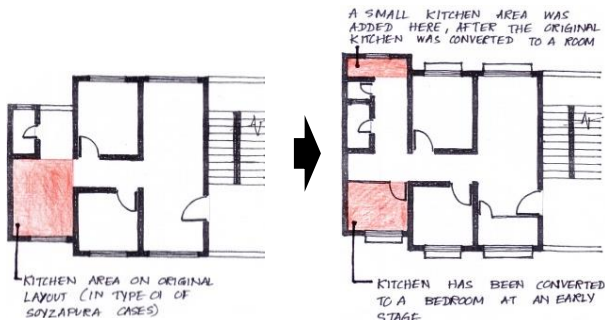


Figure 7: Conversions of Kitchen.

The major emphasized form of spatial arrangement has been the addition of dining areas. Accordingly dining area is the most functioning, active space in middle income dwellings. Therefore, in most of the units, they have tried to alter the functions in order to have this semi-private space to their dwelling unit. Thus, the space allocation for dining and the linkage of other spaces are a critical aspect under spatial arrangements. However, spatial arrangement is a possible method of personalization within a demarcated layout and has fewer restrictions in terms of negative implications of modification. Thus, through functional changes, the linkages between common, semi-private and private areas within the unit as well as the linkages of service functions within the unit are modified.

**Growth:** Growth has been the major form of personalization which is evident in most of the cases. However, mostly ground level units were observed showing horizontal growth.



Figure 8: Growth in ground level.

Within the category of growth, most of the units observed, show evidence of major patterns of modification in spaces such as bed rooms, kitchen and living rooms. In both cases, it was observed that widening of living area as a common form of modification done in order to arrange the necessary space for another function within the common

area of the unit. Such modifications have systematically created a semi-private area such as dining, TV lobby or working area. The need for semi-private areas, which separates the common and private functions of the unit, can be identified by these interventions. Similarly separation of service areas from the common area was another important observation. The linkage between common and private areas or common and service areas has also been systematically improved with the addition of a semi-private area to the unit.

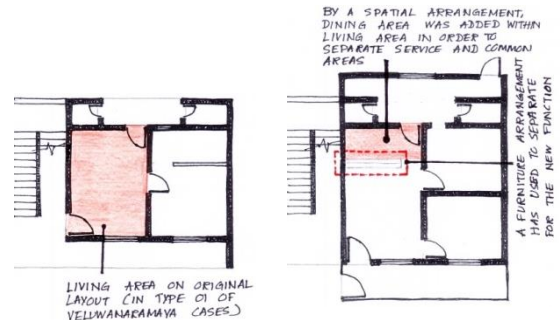


Figure 9: Common area separation with new function

Additions of service functions such as kitchen, bathroom and store areas have been observed in the cases. Use of kitchen or the functioning within the kitchen, hygienic matters, occupancy within the kitchen is identical issues related to the kitchen, which has triggered its widening or re arrangement. In general, it was observed that the alterations made to service functions over time, has been a major concern of the inhabitants.

In general, the addition of “private areas” has taken place such as widening of bedrooms to create more space. Only one case out of all can be identified that has an addition of a new bedroom, whereas in all the other situations it has been the case of expansion through widening of the bedrooms. The major reason for such expansions and additional space has been the need for functional use within the room such as a space for work or study rather than to “sleep”. These functional uses are in response to the growth in family structure and age of children etc.

Apart from widening of the main functional areas, additions of supportive functional space such as inclusion of closet spaces are also observed. In some cases it was observed that “balconies” were incorporated to gain more connection with the outside – responding to a need for inside-outside connection for practical and functional needs. However, there are much more restrictions and issues in relation to form of “growth”. Units which are situated in the upper floors have been restricted due to the placement itself, such as structural support which can't be vandalized, construction issues, use and transportation of construction materials etc. In most cases it was observed that the lack of

natural light and ventilation is a major negative implication after new additions and modifications.



Figure 10: Growth in upper levels.

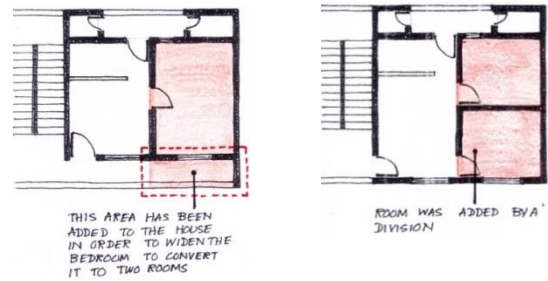


Figure 13: Addition of a room after growth.

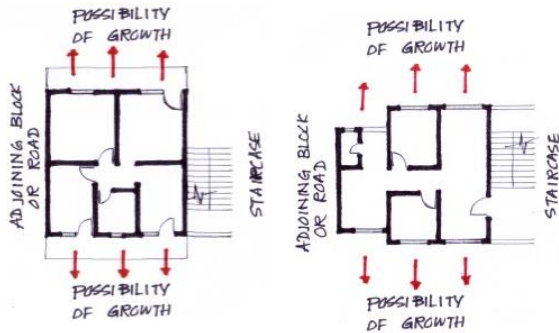


Figure 11: Possibility of growth only to one direction.

**Division:** Two types of divisions were identified as temporary division by using temporary materials in partitioning and permanent divisions such as a wall construction using brick or block work. Demarcation of kitchen space is a common observation in most cases in the form of “division”. Requirement of maintaining the hygiene and separating service functions from other functions within the house has triggered the need for separation of kitchen from other functional spaces within the unit.

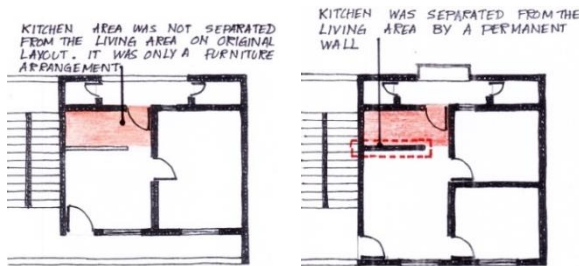


Figure 12: Division of Kitchen.

Room separations by division are also observed in both cases. It has been in the form of demarcating an area following the addition of space due to growth.

Even though, “divisions” are the least observed form of modifications, it is a possible method to achieve personalization with minimum effort, less restrictions and damages. Division has occurred almost in all the situations following the growth to a layout area. It is observed that, the form of division requires the necessary area for it to be of functional use. Therefore, the requirement of sufficient habitable “area” is a major restriction and challenge in the form of division.

- “Spatial arrangement” and “division” can be identified as the forms of personalization which can be achieved within the demarcated layout. Thus, irrespective of the floor level, both of these forms of modification can be implemented within the existing layout. Hierarchy between common and private functions, linking common-private and common-service functions through a semi-private functions can be achieved through spatial arrangements and divisions.

The form of “growth” requires addition of space which has much more restrictions and challenges as opposed to the add-in and arrangements within the layout. Findings show that, even though “growth” has many restrictions and challenges, it has been the common form of modification in the selected cases. Spatial additions by widening and addition of entire functional spaces can be identified as the most common form of “growth” observed in the study. Growth can add a dynamic character to the monotonous facades of the walk-up apartments and also create connections with the external setting.

Therefore, possible provision for “growth” should be a critical concern in walk up apartments. On upper levels, interventions on spatial arrangements and division are a possibility with minor effort. Therefore, possible provision for add-in can lead towards higher range of personalization with fewer issues in walk-up apartments.

- Second stage discusses about the attributes of personalization. In most of the cases, at the beginning of occupancy, inhabitants seem to have the basic need for a house for a family unit. Fulfilling the changing needs and requirements of inhabitants, personalization has differed from layout changes to detailing, which were identified as major modifications and minor modifications.



**Psychological variables:** This can be identified as a major underlying attribute behind the personalization of their dwellings to fit the intangible aspects of the inhabitants. Thereby, inhabitants try to create their dwelling's identity, create the privacy of occupants and territorialize their living environment.

- Identity has been a major reflection of the space additions to the house for functions and activities. Supplemental spaces created mostly by spatial arrangements or divisions, inhabitants try to fulfill their intangible needs for psychological satisfaction. However, level of identity inhabitants try to achieve through modifications differ from the level of expectation on achieving their psychological satisfaction. In some cases inhabitants require the identity of their house and in some cases inhabitants try to achieve an identity within the society through their dwellings. Minor modifications such as refurbishing, detailing, door and window changes etc. can be identified in most of the cases. Minor modifications to the exteriors can be identified as inhabitants try to achieve a different identity from the neighbourhood and look for better aesthetics for their dwellings. Minor modifications to interiors have tried to achieve aesthetics preference of inhabitants responding to their cultural background, education level etc.

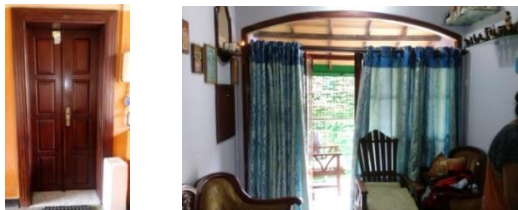


Figure 14: Front door and window changes.

- Territorializing the living environment can be seen as an attribute behind the space modification mostly with the inhabitants' interventions to additions, modifications and refurbishments to kitchen area. Interventions to spaces happen in response to the needs of its inhabitants. On the other hand, it can happen in order to get others involvement with the activities. And in some cases, specifically one's most used area within the dwelling has been personalized to fit into their level of use, level of expectation towards ideal space etc.

- Privacy has been a major concern in most number of modifications. Inhabitants require privacy at different levels with their activity systems. The need for social interaction at both private and common functional levels also differs. Inhabitants try to limit unwanted social interaction in order to support private and semi-private activities, parent's intimacy etc. through personalization and modifications to space. Several space modifications are observed showing evidence in achieving required privacy levels. Accordingly, separation of private areas in order for seclusion of both parents and adolescent children can be identified with children reaching adolescent. However,

privacy can result in negative aspects to the family bonds as well by wrongly identifying the privacy needs. Achieving the required level of privacy needs can be identified as a critical area to be noted, since households requirements for privacy evolve and change with the growth of the family.

**Physical variables:** Within physical variables, functional requirements and inadequacy of space has been the major concern in most cases. Family's and children's growth has influenced the functional requirements and inadequacy of space. With the growth of children, their purpose of use and needs for space has changed.

Addition of storage spaces has occurred in many cases due to inadequacy of space. Inhabitants have tested different approaches to find the required space. Using existing volumes can be identified as a major intervention listed under the minor modifications inhabitants have done. Thereby, households have made use of upper volumes of the private spaces for the purpose of adding service and storage spaces.

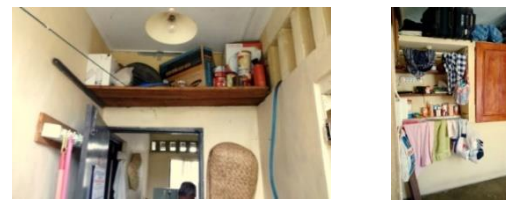


Figure 15: Storage spaces in upper volumes.

**Socio-cultural variables:** Despite the interventions for major modifications, cultural background, inhabitants' social norms and their vernacular experience of spaces have influenced them in several minor interventions. Elemental modifications such as detailing, addition of elements etc. are identified. The most common form of personalization is the use of colour in the housing units to reflect cultural differences.

**Socio-economic variables:** In some cases, addition of spaces has occurred to support the economic status of the family. Thereby families have created spaces that generate an income to the inhabitants in the form of commercial, work spaces etc. Thus, these modifications aiming economic contributions through their dwellings have occurred once the families have settled down. In few cases, increase in income has influenced modifications. Even though modifications occur due to economic gaining, modifications have mostly undergone in response to achieving territoriality and identity.

- Psychological and physical variables can be identified as most critical areas where inhabitants have tried to achieve, by personalizing their dwellings. Thus, physical variables are more related with spatial requirements, where inhabitants have tried to fulfill their functional and space requirements. Data reveals that room additions have been a common observation of physical variables, which is parallel

with the growth of family structure and children reaching adolescence. Despite from additions to the layout, space widening has occurred in facilitating similar psychological variables.

Hence, psychological variables have been important in achieving identity, territoriality and privacy through personalization of dwellings. Data reveals that identity has been a major aspect, which inhabitants were concerned of, with both layout and elemental modifications. Reflection of identity can be revealed in different levels, where inhabitants have tried to establish the identity of their living environment and trying to establish their identity within the society through dwellings. Inhabitants have tried to achieve the identity of their living environment by adding necessary spaces for the functions and activities where they have used mostly common areas as multifunctional use before modifications. These supplemental space creations were mainly done by spatial arrangements and divisions. On the other hand, identity within the society through their dwelling was achieved by aesthetics, trying to achieve differences from the neighbourhood etc.

According to the data, territorial needs were also identified in different levels. In this scenario some personalization has been on making one's territory within their most active space. Territorializing the kitchen as mother's desire and private area personalization as inhabitants needs can be identified as examples. On the other hand, inhabitants have tried to territorialize their living environments with time and with use of the dwellings.

Privacy requirements were also identified in different levels, where inhabitants have looked for privacy with common and private functions. Mostly, privacy needs were related to limiting unwanted social interactions and supporting activity system. Privacy needs are a much critical area than others, where a wrong approach could negatively impact with intangible aspects of a family.

Socio-cultural and socio-economic aspects have not been a much concerned area on this case. Though some personalization reflects cultural background and social norms, it has not been very consistent. Some economic factors influencing personalization can also be identified with data. But it has been very minor influence as well.

However, by all these intangible aspects, families have tried to fulfill psychological satisfaction of inhabitants.

## CONCLUSION

This study identifies that growth has been the identical form of personalization in most of the cases. Nevertheless, add-on to the layout has much more restrictions than add-in and arrangements to the layout. Therefore, growth has resulted in negative effects on habitable spaces with issues such as lack of natural light and ventilation, links to

circulation, privacy from neighbouring blocks etc. However, growth in a proper approach has possibilities in giving a dynamic character to the monotonous facades of walk-up apartments and to break the introverted house form, in creating connections with the external setting.

Nevertheless, spatial arrangements and divisions have a possibility to personalize with minor effort since, both methods can be achieved within the demarcated layout. Case studies reveal that, through both spatial arrangements and divisions, inhabitants have created a hierarchy within the common and private areas of the house. A systematic link has been achieved by adding a transitional space with a spatial arrangement or a division. However, provision for add-in by the layout design can lead towards higher range of personalization with fewer issues than add-on in the walk-up apartments.

The study identifies that psychological variables have been the major motivational factor behind personalization in most of the cases. Hence, families have looked for psychological satisfaction of inhabitants and to provide a more supportive living environment for inhabitants through different intangible aspects. Therefore, identity, territoriality and privacy have been identical aspects that inhabitants have strived to achieve. Among these aspects, identity has been a major reflection on both layout and elemental modifications.

However, identity can be revealed in different levels such as inhabitants looking for identity of their dwellings and trying to establish their identity within the society through their dwelling. Modifications have resulted in establishing the dwelling's identity by making additions to the necessary spaces for functions which the family has used other areas as multifunctional areas before. On the other hand, inhabitants have experimented aesthetics, making the dwelling look different from neighbourhood etc. on establishing their identity within the society through their dwellings.

Accordingly, territorializing was identified in different levels such as building up the dwelling's territory and territorializing one's most used space within the dwelling. Territorializing the dwellings, results in a systematic manner with the family getting stable on living environment. One's territory within most used space is built-up with the occupant's desire on supporting their activity system.

Inhabitants' privacy requirements have different level of expectations, where inhabitants have looked for privacy with common and private functions. Avoiding unwanted social interactions and supporting activity system has been majorly identified with the privacy expectations. However, satisfying privacy expectations are a much critical area than others, since it can negatively affect intangible aspects of family and its deep social system.

Interventions to the dwellings have provided more supportive living environment for the families and have resulted in psychological satisfaction of inhabitants. However, some have resulted in negative consequences with lack of knowledge in space modification, lack professional guidance in the process of building use and failing to provide provision for personalization with designing.

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