breaking out of the static dwelling:
redesigning the triple-decker

by

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abstract

Society’s definition of family is continuously evolving, creating a need for urban housing to accommodate an ever-changing variety of household types. By investigating the limitations of the triple-decker, a deeply integrated housing typology in Cambridge, MA, this thesis proposes that the dwelling, and in particular the multi-family dwelling, be re-conceptualized to be more flexible and adaptable to meet the changing needs of its inhabitants.

Adaptability is explored on several time scales: diurnal, seasonal and life stage, so that environmental changes such as varying weather conditions, as well as a household’s lifecycle changes, can be accommodated.

By designing a system of fixed and transformable components (where the latter are commercially available) one is able to customize and re-customize one’s home affordably throughout the lifecycle of a household and also enjoy a closer connection with the outdoors through the daily operability of interior and exterior components.

A system that is compatible both with existing triple-deckers and new construction allows for maximum flexibility in its application – a must for a building typology that exists in a variety of conditions. Moreover, a system that allows a family to adjust their home to its current needs will effectively eliminate the costly need to move for reasons related to unit size, and benefit them financially long-term.

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introduction

Architecture should offer an incentive to its users to influence it wherever possible, not merely to reinforce its identity, but more especially to enhance and affirm the identity of its users.

- Hertzberger, Herman, Lessons for students in architecture, p.148.
Can one housing typology accommodate the ever-increasing variety of households and their continuous modifications, while providing a healthier and more personal relationship with the environment?

Where modern Rationalism placed the collective interest over that of the individual, the Situationists argued that genuine social progress could only be achieved through the maximization of the freedom and potential of the individual\(^1\). In providing the occupant with increased control over his environment, through the ability to perform the modifications to his home required for fluxes in living conditions, the occupant’s potential and freedom is encouraged and maximized. Simultaneously this control over flexibility fosters the “natural relationship” between building and dwelling, described by N.J. Habraken as being the basis for what must be done to allow for successful human habitation.\(^2\)

There are 110 million households in the U.S. and Canada and over 1.4 million are added to this count each year.\(^3\) While this number increases, the size of households is shrinking.\(^4\) “Over the twentieth century, the distribution of Americans across different types of households has changed a great deal, with a shrinking share of the population living in extended family and married with children households, and a rising share living alone, as married couples, or with own children exclusively.”\(^5\)

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4 Ibid.
The nuclear family, for which most existing housing was designed, now represents only two thirds of households. As the definition of family continues to evolve, as the form of households fluctuates throughout the life of a household, and as technology affects lifestyle, the use of our homes changes. Urban housing design must accommodate and reflect these changes.

Single-family residences can generally accommodate change through additions and renovations without affecting other structures. The same is rarely true of multi-family residences, which are even more likely than single-family homes to have been built for an anonymous market, consequently restricting occupants of this type of housing from adjusting their homes to their current lifestyle or economic situation without moving to new premises. Moving is generally undesirable for economic, social and psychological reasons (the strain of moving ranks parallel with divorce and death of a loved one in terms of stress and trauma)\(^1\), and for people of low income it is often impossible.

The paradox of habitation is described by Jos van Eldonk and Helga Fassbinder as the constant conflict between “the static character of a dwelling-house and […] the dynamic character of its inhabitants with their different and ever changing wishes and demands.”\(^2\) Their solution is a flexible dwelling where an intrinsic degree of changeability ensures that a building does not outlive its use.

Flexibility within the unit has been explored via two different avenues: indeterminacy in layout vs. a highly determined yet flexible layout. The former provides the user with the opportunity to modify the plan according to their needs, with the designer’s role being limited to that of creating a framework. This typically demands slightly more space and can result in some redundancy. In the case of the latter, the designer determines how spaces can be used over time, where rooms are typically smaller and multifunctional.

The concept of the ambiguous plan in modern architecture finds its roots largely in the vernacular house,\(^3\) and particularly in the Japanese dwelling house, where the fixed functions and limits of rooms are replaced by zones non-specific to use.

At the beginning of the 20th century, adaptable and free floor plans were made technically possible through new construction systems. These allowed for a) greater spans between columns that had already replaced load bearing walls and b) plans with increased ambiguity, such as those exhibited in the model housing at the Weissenhofsiedlung in Stuttgart (1927).

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During the housing crisis of the 1920’s and 30’s some architects argued that this form of flexibility could provide housing for a greater variety of users. Services, such as bathrooms and kitchens were relegated to a particular zone, where rooms with undefined use occupied another zone. The 1937 Letohradská project by Evzen Rosenberg in Prague exhibits this strategy through the configuration of equally sized rooms around a central space.\(^1\)

A more recent investigation of the use of ambiguous plans for flexibility is the ADP Architektur und Planung’s 1991 Helmutstrasse project in Zurich. Here, zones for individual similarly-sized rooms, services and living spaces are separated. The scheme allows for the modification of unit walls in order to accommodate different arrangements for differing household sizes, including the creation of a studio apartment within the ‘living space’ zone.

The De Stijl principles highlighted in Theo van Doesburg’s manifesto Tot een beeldende architecture (16 points of a Plastic Architecture): “The new architecture has to be open, connecting the interior and the exterior, while the layout must be movable... The party walls can be replaced by movable screens or panels...” were implemented in Gerrit Reitveld’s design for the Reitveld-Schröder house (1924)\(^2\), and Corbusier’s 1928 Maison Loucher. The designs acknowledged that many functions are not required simultaneously and therefore provided for the reconfiguration of space through a system of sliding panels and movable components.\(^3\)

Studies such as H. Priemus’s 1968 dissertation published in Wonen - kreativiteit en aanpassing (Housing – creativity and flexibility) discussed the study of the many external and internal, cyclic and non-cyclical “changes involved in the adaptation of a house.”\(^4\) This concept has been experimented with by many architects and designers including Ludwig Mies van der Rohe, Erich Mendelsohn, Victor Bourgeois Carl Fleiger and Van den Broeck through floor plans as well as transformable and movable components.\(^5\)

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3. Ibid, 11.
4. Ibid, 57.
5. Ibid.
These studies were complemented by J. Trapman’s article in the 1964 *Forum* journal which suggested that small, switchable, industrially manufactured building elements would ensure that the occupant would be responsible for the layout and possible changes, providing a flexible house or apartment that was more likely to retain its value.¹

The notable presence of a greater number of examples of the less prescriptive approach to unit flexibility suggests that the more successful approach is one where the occupant is not encumbered by the need to transform furniture on a daily basis, and where flexibility is an option as opposed to a constant necessity.

the system

Flexibility within the unit must be supported by a system that includes structure, construction technique and services. As with the unit, there are two variations on the approach for providing flexibility within the system; one allows for adaptation to occur, the other is explicitly designed for flexibility. Whether considering the first or second approach, one must maintain an awareness of the layering of construction and the various life spans of the following layers – structure, skin, services, internal partitions and finishes. The difference in the consideration of these layers is in the degree of control of the designer maintains over future adaptations.

In the first approach, the design does not ultimately control the outcome of any adaptation. For example the structural system, in Brandhöfchen project, designed by Rüdiger Kramm in Frankfurt in 1995, as well as in Otto Steidle and Doris + Ralph Thut’s 1972 design for the Genter Strasse in Munich are designed to accommodate changes in unit size throughout its life span. In the second, a prefabricated frame has allowed for many changes, both exterior and interior, over the past 30 years.²

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The second approach, which is much more prescriptive, has led to the development of the open building movement and the Danish Flexibo system. Although these movements are based on N.J. Habraken's notion of flexibility, of the few built examples not many represent any flexibility on the part of the user. N.J. Habraken and SAR 65 believed that in order to achieve flexibility, a restructuring of housing production was necessary, such that the design and production of support and infill package kits could take place separately. This approach necessitated a form of modular coordination that was opposed by many architects who felt that the rigidity of a dimensional agreement system encroached upon the freedom of design.

Habraken states that “the uncertainty of the future itself must be the basis on which present decisions are taken,” which suggests that in order to achieve flexibility in housing a less prescriptive approach is most valuable: An open plan without load bearing walls, allows for internal flexibility, while the design of a roof that does not incorporate pitched trusses permits vertical expansion. A straightforward construction system that does not require the expertise of many different parties simplifies the process for future modifications. The careful arrangement of components, generally through the incorporation of zones, such as services, stairs and entrances allow for flexibility at lower cost. And finally, the consideration of the layers of construction throughout the design process will extend the life of the building.

Investigation into flexible housing has taken place mainly in Europe, where public housing was being designed en mass and was not fulfilling the needs of the variety of existing households and lifestyles. In North America, the lack of variety in units is a result of the way in which private developers attempt to maximize the value of their property while abiding by the local codes and zoning regulations. Despite the ‘standardization’ of building types, such as the triple-decker, and the need for greater variety, flexibility in housing has barely been addressed in North America.

2 Ibid, 63.
Cambridge, MA: project neighborhood and site highlighted
Over the past several years, The City of Cambridge, MA has experienced significant demographic and economic changes, such as an increase in immigration, an aging population, housing price increases, condominium conversions, and low vacancy rates.¹

Similar to the rest of the nation’s cities, the makeup of the Cambridge population is becoming progressively diverse in terms of race, ethnicity, incomes, ages, and aspirations, while household size is decreasing and becoming less complex.² Cambridge is unique in that despite its vibrant immigrant community life, ethnic communities do not isolate themselves³. This suggests that any housing development should not be geared to one particular group but to the diversity and changing nature of the Cambridge population as a whole.

Despite this city’s impressive level of density, housing demands are not being met. As office and commercial developments continue to increase, so do the prices and the demand.⁴ In response to the housing shortage in neighboring Somerville, the Mayor’s office of strategic planning and community development has indicated that a wider range of units and the development of infill properties are required.⁵

The neighborhood of focus for this thesis is Wellington-Harrington. Sharing a border with Somerville, it is more similar to it than to the rest of Cambridge in terms of the scale, density and condition of housing. This neighborhood lends itself to an investigation in flexible and adaptable low-rise housing due to its demand for high density, a greater variety of units, new construction, and diversity.

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¹ Cambridge Community Development Department. Demographics & Socioeconomic Profile, Cambridge, MA: 2006.
² Ibid.
³ Ibid.
Wellington-Harrington:
project site highlighted
The majority of existing Cambridge housing is contained in two and three-family homes (53.4% of the city's residential buildings). While these structures have successfully housed thousands of households in New England for over a century, their design dates back equally as long. Such lifestyle changes as car ownership, technology, and the changing structure of households demand that their design be revisited.

The aging housing stock of Wellington-Harrington provides added incentive to reconsider the city's housing. Two- and three-family structures offer a very limited number of unit sizes, therefore, the three-family home (the triple-decker) represents an ideal testing ground for the development of a housing typology that can be flexible in order to provide a variety of units, as well as a layout that can be easily modified by the occupant according to their needs and desires.

Due to the demographics (immigrants, students, seniors and other low income households), redesigning the triple-decker so it has the capacity to expand and contract in unit size will also provide the necessary variety in unit type.

Wellington-Harrington, as in most of Somerville, lacks open spaces, both public and private. Multifamily residences have either a small common outdoor space, or nothing at all. Gardens, particularly private gardens, are scarce. Although this might seem to be a trivial fact, private gardens play an important role in the preservation of both physical and mental health. Gardens personalize one's environment; they provide for active participation with nature to take place; and they are a place where the processes of nature can be observed and consumables can be gown. They are places of retreat, to control, to own, to exert creativity, that reflect personality, and that develop over time.

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1 Cambridge Community Development Department. Demographics & Socioeconomic Profile, Cambridge, MA: 2006, 47.
existing outdoor spaces: Wellington-Harrington
One’s capacity to direct one’s attention fatigues and requires restoration. Rachel Kaplan argues that “the quintessential microrestorative environment, the one that most closely brings together the multiple themes of the restorative experience into a single, small, intensely meaningful space, is the garden.”

In addition, as evidenced by the City of Cambridge Climate Protection Plan, Cambridge is looking for strategies for educating its population about climate change and actions that can be taken to improve the city’s situation. As described by Mark Bhatti, in his chapter of Ideal Homes? entitled The Meaning of Gardens in an Age of Risk, the garden is “an important loci for everyday understanding of natural processes […] and a place where people can learn the basics of reducing their impact upon the earth.”

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Outdoor spaces are used differently depending on the desires and needs of the individual. In addition to creating a sense of safety, privacy and tradition, gardens provide flowers, food and space to socialize, work and eat. Reinventing the relationship of the occupant of the triple-decker with the private and communal garden will improve health and allow for self expression, while acting as a gifted space.
catalogue of potential outdoor spaces
The image above illustrates the condition of the buildings in the immediate surroundings to the chosen site. Most are in poor or moderate condition, with only a few in good condition or recently constructed. As a result, there exists an opportunity for redevelopment of this area at several scales: the individual building, adjoining lots, or entire blocks.

Many of the triple-deckers in Cambridge, and in this neighborhood in particular, are over 100 years old and must either undergo large scale renovations or complete rebuilding. This thesis therefore investigates the redesign of a triple-decker on two different levels: large scale renovations to triple-deckers in moderate/poor condition and new construction designed for a vacant lot.
The site for this project is located on a small triangular block in Cambridge, MA. The block is bordered by a public sports field on one side and residential blocks on the others. A few commercial buildings dot the surrounding area. One building on the block in question is occupied by a mechanic – an old residential garage acts as his auto shop. An unpaved lot on the site has been left vacant and is currently being used for parking paid for monthly by the residents of the block. New construction will be designed for the currently vacant lot and renovations will be designed for buildings 1 and 2.
site elevations
vacant lot

auto shop

variety store

sports field
triple-deckers: problems and possibilities

This thesis proposes that the dwelling, particularly the multi-family dwelling, be re-conceptualized as more flexible and adaptable in order to accommodate the changing needs of its inhabitants.

The nuclear family, for which most existing housing was designed, now represents only two thirds of households.¹ As the definition of family continues to evolve and as the form of households fluctuates throughout its lifecycle, the way in which we use our homes changes. Urban housing design should accommodate and reflect these transformations.

Formulating a system that recognizes the continuous changes present in our daily lives will alleviate the stress and inefficiency that we experience due to modifications required by both the growth and reduction in household size.

Single-family residences can generally accommodate change through additions and renovations without affecting other structures. The same is rarely true of multi-family residences. These are even more likely than single-family homes to have been built for an anonymous market, thereby restricting their occupants from adjusting their homes to their current lifestyle, household size, or economic situation without moving to new premises. Moving is generally undesirable for a number of economic social and psychological reasons. For people of low income, it is often impossible. This thesis proposes the introduction of the expanding and contracting house to multifamily living.

Environmental changes, such as varying weather and seasonal conditions, also present opportunities for adaptation. This thesis proposes that through an increased level of interaction with the outdoors, inhabitants will become more aware of the natural processes occurring around them and thus be inclined to participate in adapting their home to varying weather conditions. This adaptation will lead to increased energy efficiency within the home, while benefitting the occupants both physically and psychologically.

The Cambridge triple-decker housing typology was chosen as the case study within which to investigate these concepts. While triple-deckers have been successful in housing thousands of New England households for over a century, their design dates back equally as long and, as such, requires revisiting.

In addition, in studying the city, and in particular this neighborhood, the dearth of community spaces became evident. As a result, the design for this project will incorporate community space with a connection to the private outdoor and indoor spaces.

Existing triple-deckers are generally plagued with the following problems:

- interior inflexibility
- poor light due to few small windows
- no or little outdoor space
- poor ventilation
- no access to vegetation
- minimal storage space
- no off street parking

The system developed through this thesis proposes the following:

- Reconfigurable interior partitions to increase interior flexibility
- Larger openings with better placement opportunities for the redirection of light and transparent clear stories in the internal partitions to improve light quantity and quality throughout the units
- Perforations in the exterior envelope to allow for inhabitation of the outdoors, both private and communal
- Rotating clearstory panels in the interior partitions to allow for ventilation throughout the unit
- Green wall technologies incorporated into the exterior envelope to provide access to vegetation
- Expandable interior partitions to provide additional storage space
- Half level below grade parking for vehicles as well as bicycles
The system devised for this thesis is based on two different types of components: fixed and transformable. The fixed components comprise the structure, the stairs and the wet cores. The system requires a basic structure with as few interior load bearing members as possible. The wet cores and the stairs are placed to allow for the greatest number of possible configurations.

The transformable components comprise the reconfigurable interior partitions, the snap on storage components, the bathroom and kitchen components, and the exterior panels. These components follow a set of standard dimensions in order for them to be commercially available at home building department stores.
The interior panels transform not only in their configuration but, depending upon the environmental conditions and occupational needs of the inhabitants, they allow for the modulation of light, air and privacy.
The exterior panels will fit into standard sized openings created in the exterior envelope of the building. Many different types of panels – ranging from a 5’ opening with vegetation covered sliding doors, to a 12’ wide opening with a 6’ deep balcony which is tied back to the building with cables. The insertable panels are also transformable. Like the interior partitions, they modulate light, air and privacy, with the additional feature of providing the possibility of inhabiting an outdoor space.
The vegetation covered doors also come in two different options: the greenwall technology option, and the vegetation shelves option. The first involves an opaque surface to which cages filled with moss and planted with horizontally growing vegetation are mounted.

The second is a frame that supports several aluminum shelves filled with soil and planted with conventional vertically growing vegetation.
buildings 1 and 2
In order to implement the devised system into Buildings 1 and 2, the first step was to remove as many interior load-bearing members as possible. This allows for maximum flexibility in the floor plan to reconfigure the interior partitions. The modification for both buildings is designed to maintain most of the existing structure and to insert beams into the existing floors system to be supported by columns every 8'-10', where load bearing walls had stood.
inflexible configuration
little access to light
little access to outdoor space
poor ventilation
no interaction with vegetation
little storage space
no off street parking
no bicycle storage
inefficient heating

proposed solutions
reconfigurable interior partitions
larger openings, light redirection, transparent transoms
openings will allow for inhabitation of balconies, communal outdoor space
ventilation flaps in interior partitions and exterior panels
green wall incorporated into exterior envelope
snap on storage to interior partitions
where possible half level below grade parking
bicycle storage to be included in below grade parking
radiant baseboard heating to be replaced with radiant floor heating

building 1

existing
modified
Inflexible configuration
Little access to light
Little access to outdoor space
Poor ventilation
No interaction with vegetation
Little storage space
No off street parking
No bicycle storage
Inefficient heating

Proposed solutions
- Reconfigurable interior partitions
- Larger openings, light redirection, transparent transoms
- Openings will allow for inhabitation of balconies, communal outdoor space
- Ventilation flaps in interior partitions and exterior panels
- Green wall incorporated into exterior envelope
- Snap on storage to interior partitions
- Where possible half level below grade parking
- Bicycle storage to be included in below ground parking
- Radiant baseboard heating to be replaced with radiant floor heating
building 1
possible units

2 x 1 bedroom
1 x 2 bedroom
(only option for top floor)

possible interior panel configuration

The stairs for both buildings will remain in the same location to minimize structural modifications. Two wet cores have been inserted in building 1 to allow for the possibility of 2 units to exist on each level. Four wet cores have been inserted to building 2 to allow for a maximum of four units on each level. The party wall in building 2 must remain for fire code reasons and therefore two is the minimum number of units per level in building 2.
possible interior panel configuration

building 2
possible units

1 studio
1 x 1 bedroom
1 x 2 bedroom

2 x 1 bedroom
1 x 2 bedroom

2 x 2 bedroom
(only option for top floor)
building 1

possible 2nd and 3rd floor plan

possible 1st floor plan
Design suggestions for the implementation of this system have been provided for the user’s convenience:

- Living / dining / kitchen to be located at either front or back of units
- Reserve 8’ and 12’ openings for less private rooms, such as living rooms, dining rooms and kitchens
- Reserve accordion doors for opening larger than 8’ or for bay windows
- Allow for a minimum 1 opening for every room (except bathrooms which can be fitted with a smaller window sufficient for ventilation purposes)
- Where possible, arrange doors of interior partitions such that they swing into rooms
- When placing doors in interior partitions, it is typically desirable that adjacent rooms have doors on either side of their dividing wall
- Leave 3’ for circulation space
- Green wall panel and window box panel to be employed on either south, east or west facing elevations. To be installed on north facing elevations only where a reflective surface is located opposite (eg: neighboring building sided with white or metallic siding)
- Space dedicated to storage should be as long as possible to minimize the number of storage units through the creation of storage zones, while maximizing the total amount of storage space.
- Zones of movement should be straight in order to economize space
- Where there is little space and privacy is not paramount, storage elements may be used as space dividers
building 2
possible 2nd and 3rd floor plan

- operable exterior panels
- reconfigurable interior partition
- inhabitable private outdoor space
- fire stair
- inhabitable common outdoor space
- wet wall expansion
- wet wall
- snap on storage
possible 1st floor plan
Learning from the limitations of the existing triple-deckers, the following changes have been implemented in the design of the new building.

The structure has been designed such that it free spans the entire unit while providing space to run mechanical and radiant floor heating within the floor system. This, in turn, allows for maximum flexibility in the reconfiguration of the unit. This building has been designed with the vertical circulation placed such that it can be shared by a greater number of units, in order to provide the required two means of egress, while occupying a less privileged position in terms of light and ventilation.
In addition, the central stairs have been designed to provide much needed communal space, while allowing for natural light and ventilation to benefit all units. Outdoor space has been designed into the form of the buildings through terracing and roof gardens, as well as through the activation of the space between the buildings through their pulling apart in plan.

The new construction has been designed to accommodate programmatic elements that extend beyond residential, to occupancies such as commercial or work activity.
rear balconies

warm months

accordian doors closed for privacy
garage doors open for ventilation

accordian doors open for inhabitation of balcony
garage doors open for ventilation

cold months

sunny day condition

accordian doors open for inhabitation of balcony
garage doors closed to allow for passive solar heating of balcony

night / overcast condition

accordian doors closed for insulation
garage doors closed to provide secondary skin
The terracing of the building in the rear has allowed for the design of an optional component that can transform a shaded balcony space in the warm months, to a sun room during cold days and as a secondary insulating skin during cold nights. (see image opposite)

Parking for the residents of the three buildings has been accommodated on the basement level (half a level below grade). It is accessible by car from the west side of the new construction. The two enclosed staircases on either side of the building extend into the parking level below.

The Community outdoor space behind the building has been designed as an extension of the communal moments that occur on the central stair. Building 1, 2 and the new building come together in this outdoor plaza, where trees provide shade in the summertime for the community to enjoy. Below this space, on the parking level, space has been provided to accommodate Joe, the mechanic mentioned earlier who currently occupies space on the site, and his auto shop, as well as other programmatic elements such as a day care, a café, an artist’s studio, etc. A pedestrian entrance to the parking area is also provided between these two sunken commercial spaces.
section: new building and community space
seasonal changes : new building
possible 1st floor plan
possible 2nd floor plan
Additional design suggestions have also been provided for the new construction:

- In some configurations one opening must be placed to provide a secondary means of egress.
- When accordion doors are placed at both the front and rear of the units, a separate swing door must be provided for single use as an entrance/exit.
zooming out

The design for the new construction is a prototype that can be reproduced on a single lot but is most successful when occupying double or larger lots.

Due to the poor condition of so many triple-deckers in this neighborhood alone, adjacent lots will soon become available for new construction.

This diagram illustrate how sites in this neighborhood, where the existing buildings are in poor condition, might be replaced with one, two or five ‘new buildings’. This prototype lends itself to developers as a tool, while providing the neighborhood with communal space, green space, parking and the opportunity for more commercial activity.
matrix: kit of parts

The figure opposite illustrates how a family might utilize this system to customize and re-customize their home throughout the lifecycle of the household.

As an example, a young couple might purchase an entire level of one of the buildings. They might occupy only a portion of the level and rent out the rest. As time goes on, they may have children and require more space. In the case of the new building, they might even decide that they need space to set up an office or a studio, and therefore occupy the entire level. Later on, as their children move out, they will be able to shrink their occupied space to allow for others to again rent the rest of the space.

As their household structure and financial means change, the inhabitants will be able to invest in different options from the kit of parts with which to outfit their home. For example, a young couple may not be able to afford more than the basic 5' opening, small kitchen, and small bathroom, but as their family grows and their income changes, they may be able to purchase the 8' wide 2' deep balcony insert with green doors, larger kitchen and bathroom with bathtub and two sinks.

This matrix of options is meant to provide a plethora of options to suit the needs and means of any household, whether it’s the traditional family depicted in this image or a less traditional family.

The economic benefits of a system that allows a household to remain in the same building throughout its lifecycle are substantial. Limiting oneself to one house purchase leads to the need for only one mortgage. This in turn reduces closing costs and real estate agent fees, while providing the opportunity to lock into low interest rates. Not having to move eliminates moving costs, and allows one to benefit from long term investment appreciation in a stable urban market. Rental income potential can help cover initial mortgage payments, allowing one to gain equity more quickly. Not having to move to the suburbs can lessen commuting costs substantially. And finally, the reconfiguration costs, depending on the components chosen, would be comparable to renovation costs that one might encounter when moving from house to house.
matrix: kit of parts

- Exterior panels
  - 5' Opening
    - Basic panel
    - Green wall
    - Window box
    - 1' balcony
  - 8' Opening
    - Basic panel
    - Green wall
    - 1' balcony

- Interior panels
  - Storage
    - Basic panel
    - 2' standing storage
    - 2'-6" hanging and shelving storage
    - 2' hanging storage
  - Wet wall
    - Bathroom w/ shower
    - Bathroom w/ bathtub
    - Washer and dryer
    - Kitchen sink with cabinets

- Balconies
  - Rear Balconies
    - 4' balcony
    - 6' balcony
transformation over time: building 1
transformation over time: new building
1 mortgage = fewer closing costs
1 mortgage = ability to lock into low interest rates
1 investment = fewer real estate agent fees
1 investment = ability to benefit from long-term appreciation in a stable urban market
not moving = no moving costs
not moving to the suburbs = lesser commuting costs
rental income potential = substantial contribution to initial mortgage payments
reconfiguration costs = renovation costs of new home
conclusion

This system provides a basic structure that can be adapted to the variety and changing needs of an evolving household. It simplifies the home improvement process for a mixed demographic, while maintaining an aesthetic continuity and the possibility for community interactions.

This thesis has set as its goal to redesign the New England triple-decker, a deeply integrated housing typology in Cambridge, MA. By increasing the interaction of the inhabitants with their indoor and outdoor environments, the design of this system reconsiders the perception of the home as a static structure to which its occupants must adapt. Instead, this thesis suggests that the home can and should adapt to its occupants.
process models

conceptual exploration : transformability of the unit
conceptual exploration: between buildings
conceptual exploration: between buildings
site exploration: community space
conceptual / site exploration: transformability / community space / new building
light study: rear balconies
formal studies: new building
formal studies : new building
architectural exploration 1 : new building
architectural exploration 2: new building
architectural exploration 2 : new building
final model


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