Transforming to variety: lessons from self-built neighborhoods in Dhaka

Tareef H. KHAN, M. Arch ¹
Beisi JIA, Ph. D ²

¹ Ph. D Candidate, Department of Architecture, The University of Hong Kong, roopak@hkusua.hku.hk
²  Associate Professor, Department of Architecture, The University of Hong Kong, jia@arch.hku.hk

Keywords: Self-built neighborhood, spontaneous transformation, housing supply, Dhaka

Abstract
People, either owners or tenants, defy frequent move from houses they live, as well as from neighborhoods. However, housing consumptions change in time. Owners need to transform their houses, and tenants search for better options. Formal housings around the world, no matter how big the supplies are, and whatever effective their efforts are to reach all income groups, have frequently been suspect to cope with people’s ever-changing housing consumptions. Owners have often been handicapped with no choice to transform accordingly and tenants do not have many options around either. These eventually lead people to move out from their neighborhoods. Lower income people, the biggest economic sub-group, and usually the left-outs from the formal housing supply mechanism, are more engaged in informal self-building primarily because it is cheaper. However, more interestingly, their houses transform continuously to offer various housing solutions that are dynamic, flexible and fit to various needs. They not only offer solutions to the owners, but also offer various options for the tenants. Tenants, who usually outnumber owners, often need to move out since they cannot transform the houses they live. Considering the variety collectively offered within these neighborhoods of self-built houses, there are many choices for existing tenants as well as newcomers which eventually keep neighborhoods alive.

1. Introduction
Residential built forms comprise the bulk of our urban built environment. Depending on the supply mechanism, there are two kinds of housings. One is formal and the other is informal. Formal housings can be delivered either by public authorities or by private developers. They mostly target two extreme income-groups i.e. the poor and the rich respectively, with some differences in their qualities around the globe. The main reason is that poor people are unable to build by their own due to lack of capital, while rich people consider housing as a commodity in the market, thus reluctant to invest the labor and time required if they have to build by themselves. However, inarguably the biggest housing supply comes from the informal sector, which is entirely privately developed. Other than a small sub-group inside, where rich individuals engage contractors or developers to build, the informal housings are built by middle-income and mainly the lower-middle-income people, who together constitute around 70% of population (wikipedia 2007), but are left-out from the formal housing supply mechanism. Interestingly, not enough study was done on the housing needs for this major group. However, several countries like Japan, Hong Kong, have set examples to reach out for this group with the help of substantial government resources. Nevertheless, whatever the size of the supply is, one major point was persistently ignored that built form is a human and social act, and both human and social needs change continuously along the period of inhabitation (Franklin 2006). It is more evident in residential built forms
as human basic needs are developed and changed through a near infinite number of reasons and more importantly, within shorter time intervals. Whatever aesthetic or engineering skills are manifested, those built forms need to go through transformation, small or big, if they are to cope with the needs of the inhabitants. Seek (1983) stated that the reasons create ‘housing stress’ and argued that people always crave to overcome this stress and to reach a stage of equilibrium. They tend to adjust and re-adjust their level of tolerance but eventually reach a critical point at which they have either to improve or to move (Carmon 1987). Habraken (1998) added that people’s search to establish control over the territory of his abode also ignites to transform their built form frequently. However, in formal housings, there is not much freedom to exercise transformation even the public authority is generous enough to deliver housing to all groups. Added to this fact, most of the individual housing units in formal public housings as well as in informal housings (referred to as self-built neighborhoods), are rental units. The tenants there have little or no authority to make housing adjustments resulting from their housing stress. To be precise, they can only adjust their furniture, but cannot change the partition walls or any part of the building. If tenants reach critical point but fail to transform, obviously the only other remedy is to move out. In many places around the world, there are instances where public housings offer much interest at the beginning by attracting a target group of tenants with homogeneous housing needs, but along time needs became heterogeneous and the houses do not offer the freedom to transform accordingly. When moving out is the only choice, they have to leave the neighborhood because of lack of variety. With sharp contrast, the self-built neighborhoods can firstly offer a continuous supply of housing units through transformation without extending the city, and then they also offer a wide range of variety regarding two major architectural qualities i.e. layout and size (Tipple 2000). Thus they can keep tenant’s interests sustained inside the same neighborhood even though they need to move from their current abode. Each house there starts with its own unique initial built form depending on the plot sizes, shapes and the individual requirements of the owners, and then achieves its own unique momentum to grow and transform along time. Previous studies showed how transformation can offer variety, but concentrated only on owner-oriented situations and on houses with homogeneous start point (Tipple 1999). This study further exemplifies what more transformation can offer in owner-tenant situations and in situations with heterogeneous start point. We do not negate the achievements of public housings, but suggest that lessons can be learnt from self-built neighborhoods in order to design or regenerate large scale public housings around the world which involves huge resources but can lose their attractions along time.

2. The Context: Self-built neighborhoods Dhaka

Self-built neighborhoods (SBN), as the term suggests, represent neighborhoods which contains houses built by owners themselves, and in most case even without formal engagement of contractors or developers. Owners usually spend their leisure time for the management of the whole construction and they do it in phases so that they do not burden their limited resources (Carmon 2002). Invariably the owners in SBN represent the lower income group in the society. In SBN, public authority usually plans the street networks, and publish building regulations with the buildings are being inspected after construction. There is not much role of public authority on partition walls i.e. on internal layouts, except for few parts of the world. However, in Dhaka, as in many other places in the world, there is also another type of SBN, where street networks also generate informally i.e. resulting from land ownership legacy. The special characteristics of these SBN include heterogeneous sets of plot sizes and shapes, very complicated, organic web-like pattern of street networks, and limited car access at the deepest ends of the webs. Though this study represents a particular vernacular SBN, our findings can fit any SBN, as our results concentrate on layouts of individual houses in an abstract way.
3 Spontaneous Transformation
Spontaneous transformation (ST) in houses is defined as the alterations of either any or both the external and partition walls occurred during house improvement. For the convenience of the study, ST refers to only actions involving construction works such as constructing or demolishing walls, constructing floors, making door openings etc. From literature, we selected layouts and sizes of housing units as determinants of variety inside neighborhoods. Dominant reasons behind ST were analyzed in order to concentrate on particular transformed units. Qualitative data reduction methods were applied to categorize those units. We used theoretical sampling in order to get ‘useful’ samples. Our 61 house-owners were at post-family stage (no children less than 18 years old), and have been expected to experience all significant reasons of ST.

3.1 Reasons of transformation
In owner-oriented houses, ST usually result from demographic issues such as increase in number of children, growing up of children, increase in household members, changing demands of family members etc. (Seek 1983). However, in tenant-oriented houses, economic issues also govern ST decisions as many economic activities revolve around a house. Table 1 shows the major reasons behind ST. We have accumulated different reasons from studies on ST all around the world (Seek 1983, Tipple 2000, Davis 1999, Carmon 2002), and used only those which are found in our context.

<table>
<thead>
<tr>
<th></th>
<th>Reasons</th>
<th>3%</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Demographic</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increase in rental income through tenancy</td>
<td>88</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>To get more rental income through tenancy</td>
<td>88</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>To get more financial income through tenancy</td>
<td>88</td>
<td>53</td>
</tr>
</tbody>
</table>
|   | To respond to changes in bylaws             | 4    | 2%
|   | To overcome cramped condition               | 0    | 0%
|   | To exploit alteration in access areas or plot size | 0 | 0%
|   | Total                                       | 167  | 100%

We have found that increase in rental income through tenancy is the major reason behind ST. 88 of 167 cases (53%) of ST occurred in order to increase income through tenancy (Table 1). This is achieved by increasing the number of rental units. So, our study refers to only rental units which evolved through ST.

3.2 Categories of transformation
The major two categories of transformation in our study are building level (BL) and partition level (PL) transformations. The former involves alteration works which affect the overall shadow area of the built form, and the latter involves internal alteration works with the overall built form unaffected. In our context, the significant instances of ST at BL mainly resulted addition of vertical floors, while ST at PL resulted reorganization of internal spaces. The following figure is a schematic diagram to explain these two types:

Fig. 1 Conceptual sketches of building and partition level transformation

4. General characteristics of houses before and after ST:
Statistical methods such as medians and quartile values are used to find different representative values because they are not influenced by outliers. Remarks were based on those values. Results of the survey
show an average median value of 195 m² area of individual plots, the first and third quartile values (Q1, Q3) suggest that most of the plot sizes range from 167 – 223 m² area. Site coverage is usually 2/3rd of land area (fig 2e), thus around 130 m². Individual plots are generally quadrangular, if not exactly rectangular, with two bigger arms and two smaller arms. In fig 2, a particular plot (no.21) deep inside one of these SBN is highlighted in order to illustrate this characteristic.

**Table 2 Characteristics of houses after transformation**

<table>
<thead>
<tr>
<th>% of Area</th>
<th>Number</th>
<th>% of Area</th>
<th>Number</th>
<th>% of Area</th>
<th>Number</th>
<th>% of Area</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%–20%</td>
<td>5</td>
<td>10%–20%</td>
<td>5</td>
<td>10%–20%</td>
<td>5</td>
<td>10%–20%</td>
<td>5</td>
</tr>
<tr>
<td>20%–30%</td>
<td>10</td>
<td>20%–30%</td>
<td>10</td>
<td>20%–30%</td>
<td>10</td>
<td>20%–30%</td>
<td>10</td>
</tr>
<tr>
<td>30%–40%</td>
<td>15</td>
<td>30%–40%</td>
<td>15</td>
<td>30%–40%</td>
<td>15</td>
<td>30%–40%</td>
<td>15</td>
</tr>
<tr>
<td>40%–50%</td>
<td>20</td>
<td>40%–50%</td>
<td>20</td>
<td>40%–50%</td>
<td>20</td>
<td>40%–50%</td>
<td>20</td>
</tr>
<tr>
<td>50%–60%</td>
<td>15</td>
<td>50%–60%</td>
<td>15</td>
<td>50%–60%</td>
<td>15</td>
<td>50%–60%</td>
<td>15</td>
</tr>
<tr>
<td>&gt; 60%</td>
<td>10</td>
<td>&gt; 60%</td>
<td>10</td>
<td>&gt; 60%</td>
<td>10</td>
<td>&gt; 60%</td>
<td>10</td>
</tr>
<tr>
<td>Total 100%</td>
<td></td>
<td>Total 100%</td>
<td></td>
<td>Total 100%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 2 Characteristics of houses after transformation**

<table>
<thead>
<tr>
<th>Number</th>
<th>% of Area</th>
<th>Number</th>
<th>% of Area</th>
<th>Number</th>
<th>% of Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–4</td>
<td>10</td>
<td>5–8</td>
<td>20</td>
<td>9–12</td>
<td>30</td>
</tr>
<tr>
<td>10–14</td>
<td>30</td>
<td>&gt; 14</td>
<td>20</td>
<td>&gt; 14</td>
<td>10</td>
</tr>
<tr>
<td>Total 100%</td>
<td></td>
<td>Total 100%</td>
<td></td>
<td>Total 100%</td>
<td></td>
</tr>
</tbody>
</table>

**Fig. 2 Characteristics of built area usage and a typical plot inside self-built neighborhoods in Dhaka**

Usually one of the smaller arms abuts the street in order to give frontage to a greater number of plots. Efforts are made to achieve twin units with the stair at the center of one of the bigger arms (Fig 3a), though geometrically they are rarely precise. Since the entry should lead to the staircase, an obscured passage is common in order to access the staircase, which is by the way, the main entrance of the building. However, ground floors often have different entry points and different solutions than typical floors. Exceptions happen especially on smaller and bigger than average plots. Smaller plots cannot have more than one unit at each floor, so stair can be at front (fig 3b); and bigger plots can enjoy the privilege of having the staircase at the middle of the front façade (fig 3c). Anyway, there are plenty of exceptional cases depending on the individual complexity of the location, frontage, and orientation of the plots.

**Fig 3 Typical conceptual floor layouts in plots**

We have seen from table 1 that the main reason behind transformation is to get as many rental units as possible in order to increase rental income. The houses are mostly occupied by tenants. From table 2a, we find that a median average of 25% (1/4th) of the total built area is occupied by owners, and the rest 75% (3/4th) is occupied by tenants after all transformations. (Q1, Q3) values suggest that owners tend to occupy 20% - 33% of the total built area of the house.
The average number of flats after all transformations in a house is 7 (total distribution in table 2b), out of which one is usually occupied by the owner, or other members of the family (married children in most cases). Considering the owner occupying one-fourth (1/4th) of the total area, and the rest of the 6 rental units sharing the rest three-fourth (3/4th) with each getting around one-eighth (1/8th) of the total area, the owner’s flats are twice in size than the tenants’ flats (Fig 3f).

Since transformations lead to the increase in the number of rental flats, smaller areas suggest appearance of smaller rental units after transformations. The average increase of number of rooms after transformations is 7 (total distribution shown in Table 3c), with (Q1, Q3) as (4, 14). Considering 6 rental units evolved through ST, the ultimate smallest independent rental unit consists of approximately 1 or 2 rooms (Bed or Liv+Bed), with is no hint of individual rooms being subdivided (Explained more in 5.2.2).

5. Spontaneous Transformation create variety in layouts

There are different methods to increase the number of rental units through ST. When ST is at BL, i.e. when new floors are added, we can see two methods: new improved layout, and appearance of smaller units. We exclude the ones where existing layout is repeated. In ST at PL we find two methods: to subdivide existing unit, and to rent individual rooms to different tenants with toilets and kitchens being shared.

5.1 Building level transformation

ST at BL consists of 77% (68 out of 88) of the total incidents responsible for increasing number of rental units. The rest 23% (20 out of 88) are by ST at PL. The two methods of ST at BL are discussed below.

5.1.1 New layout

‘New layout’ is defined as newer solution of layouts in floors built in later phases of the house with replicating the boundaries of previously defined units in other previous floor(s) (Fig 4).

5.1.2 Smaller units

‘Smaller unit’ is defined as appearance of smaller sized rental units in newer floors built in later phases, which may or may not be same or mirror to each other (Fig 5).

The popularity of ‘new layout’ (69% among ST at BL) suggests that owners learn from the experience with the previous layouts and try to introduce improved solutions very often when any new vertical floors are added later on. The houses experience transformation for a quite long period of 8-16 years, it is not unusual to go through that kind of learning process.
We also see that ‘smaller units’ (12%) appear mainly at newly added 4th or 5th floors rather than in lower floors. It suggests that owners learn that walking up 4 or 5 floors does not bring popularity to bigger units at that level so they cannot fetch higher rental income. This is supplemented by the fact that if necessary the number of units at lower levels can be increased through other methods, i.e. ST at PL discussed below.

5.2 Partition level transformation

5.2.1 Sharing

‘Sharing’ is defined as the redistribution of usage of spaces by renting out separate rooms in a current big unit to separate families, only by closing/ opening some doors, or by mutual co-habitation (with the help of shared toilet and kitchen), with no partition wall constructed or demolished.

5.2.2 Subdivision

‘Subdivision’ is defined when a certain unit is divided into two or more number of units involving construction works in partition wall(s). Here, the existing layout goes through some sort of ‘surgery’. Generally, new units emerge in the simplest of ways, for example, dividing along a longitudinal or transverse axis (transverse in fig 7b) around the middle of a unit, where the existing configuration of maximum number of rooms can be retained (only two walls shown in dotted lines). Comparing figure 7c, 7d, and 7e, we can find that the branches remain untouched as much as possible. Only an introduction to a new kitchen is necessary in lower right 1/4th unit (fig 7d). Usually the level of depth is increased due to transformation (in this case from 5 to 6 shown in fig 7d). Apparent decrease of levels in fig 7e is actually deceiving since there is an increase of one level at the leftmost branch where a toilet is introduced through transformation of verandahs (see also the lower right 1/4th unit in fig 7b). Actually, transformations in verandahs are very common even without any subdivision as we can find it in the left 1/2nd unit of fig 7b.
These two methods usually happen after houses already experience the BL transformations. For example, a ‘new layout’ can be effective for several years after when, the owner may want to subdivide it into smaller units because the cumulative income of smaller units is usually more than a bigger unit could offer. Moreover, the ‘attractiveness’ of the plot, a term best explained by its proportionate distance from main street and its easy accessibility to vehicles, is important to make the decision whether to keep bigger units or not. Therefore, if a plot is not attractive, it is more likely that ST at PL would appear sooner. It is also interesting to find a bigger number of ‘sharing’ incidents (70% of ST at BL) than ‘subdivision’ incidents (30%). Most of our ‘sharing’ cases actually occurred to sites which are not ‘attractive’: while ‘subdivision’ occurred in more plots that are attractive. Subdivision is a more sophisticated method, and is only practiced if the payback though rent is expected to be profitable. For unattractive plots there is no reason to invest money on construction when that does not guarantee effective payback.

### 6 Spontaneous Transformation can create variety in sizes of rooms

Other than variety in layouts, ST can also create variety in sizes of rooms. From our study we find a wide variety in the size of the rooms. We divided the rooms into two categories. The first category is the habitable rooms (living and bedroom). The second category is the service rooms (toilets and kitchens).

#### 6.1 Habitable rooms

The average median value of the area of both living and bedroom remains at (12.0 – 15.0) m$^2$ range. But a lower (Q1, Q3) values of (11.25, 16.25) in bedrooms suggests that sizes of bedrooms vary less than that of...
living rooms (11.25, 18.75). In fact the higher value of Q3 for living rooms shows that living rooms are usually bigger than bedrooms. However, the statements show a higher range of sizes in habitable rooms.

Table 5: Areas of rooms

<table>
<thead>
<tr>
<th>Area of living rooms</th>
<th>Area of bedrooms</th>
<th>Area of toilets</th>
<th>Area of kitchens</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6.2 Service rooms</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| In case of service rooms, toilets with an average area of 2.75 m² with (Q1, Q3) as (2.25, 3.25) suggest that values concentrate around the average. However, several consequent subgroups are simultaneously significant leaving all of them dominantly present in the population. Thus a wider range of 2.0 - 4.0 m² is common for toilets (see Table 5c for the total frequency distribution). The average size of kitchen has a median value of 3.5 m² with (Q1, Q3) at (3.5, 4.5) suggesting that a range of 3.0 – 5.0 m² is common for kitchens (see Table 5d for the total frequency distribution). Both these statements show that various sizes of toilets and kitchen exist in the neighborhoods.

7. Conclusion
This study clearly shows that transformations in self-built neighborhoods can generate a wide range of varieties in both arrangement of spaces and in their sizes. Even at same sizes, transformation provides variety in layouts. More importantly, different houses remain at different phases of transformation offering a continuous heterogeneity in the housing stocks inside the neighborhoods. This study can be complemented by a social survey which gives the picture of the heterogeneity in family structures inside these neighborhoods, a criterion which might be the basis of keeping a place alive. A combination of these two studies can enlighten architects and planners how to offer heterogeneity in layouts of housing units in large-scale formal housings in order to sustain their overall liveliness.

8. Acknowledgements
Thanks to the graduate school of HKU to provide the grant of this research. Thanks to endless list of names who gave information and materials of this research during field survey and data documentation.

9. References