

## The Application of Adaptable Housing Method under the Chinese Context

LI Shanshan

Beijing University of Civil Engineering and Architecture, Beijing, P.R. China

### Abstract

Adaptable housing has a long history of theoretical research and practice. This article summarizes the most common design approaches and discusses their current and possible application in the Chinese context.

With the method of literature review and case study, it explores adaptability in the aspects of community and single suite. In the former, it summarizes the design strategies of 'shared garden and balcony', 'enlarged communal circulation', 'combinable unit', and 'exchangeable space', which are proposed as a response to the indifferent neighborhood relationship in contemporary community and the trend of satisfying all demands inside the door. In the later, it concludes the approaches of 'changeable layout', 'multi-use room' and 'changeable pipeline and partition', following a suggestion of confining the spatial adaptability and expanding the scope of adaptable building components.

The objective of this article is to sum up the practical approaches of adaptability, and to explore the opportunity of their application in China. This research will also provide a reference to other countries.

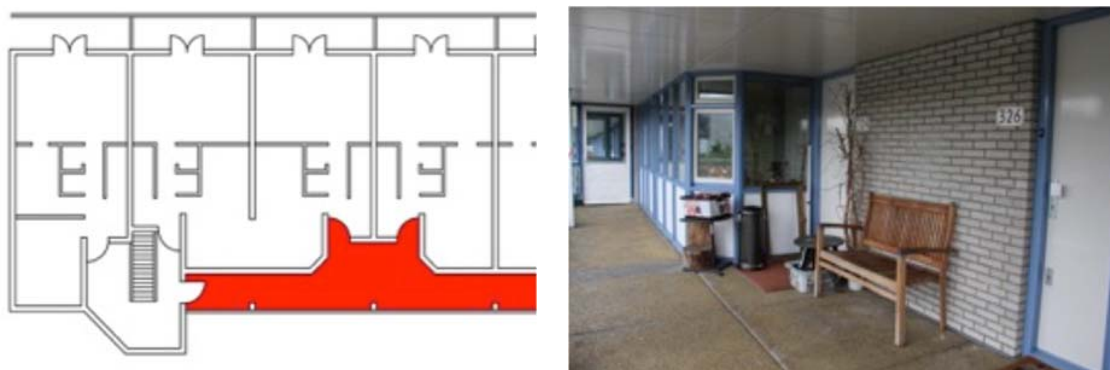
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### 1. Introduction: Cause, Research Scope and Methodology

The term of 'adaptability' in this research is defined as the pre-arranged response to the post-built change.

Influenced by the Open Building research, China began the systematic study on adaptability in the 1980s. The existing achievements can be organized as two main branches. The one dominated in the 1980s and 1990s. It was generated by the shift of housing property from farewell to commodity, and correspondingly emphasized people's individuality. The theoretical study in this stage was recognized as 'Support Housing' and 'Open Housing', and the experimental projects emphasized the adaptable suites capable of various subdivision. The other started in the 2000s, when the limited service life of residential building drew increasing attention and industrialization was strongly advocated by the government. This branch, which was called as 'long-life sustainable housing' focused on the separation of building components with different durability, and encouraged to adapt industrialized and prefabricated products.

Two characteristics can be found through the history of adaptability: 1) the existing research pays much more attention on the single suite; 2) In the recent years, as tectonic study increases, the pursuit for individuality fades. However, the two items show to be questionable: people's living environment is never confined in the private interior space, while their individuality is clearly revealed in the inevitable decoration activities. This study is initiated by the limitation of current research. It focuses on adaptability in the community and the way to achieve people's personal demand. The following text is organized as introducing the specific concept, summarizing the existing



(a) Extended corridor. (Source: by author. According to original design in Architectural Archives in Rotterdam.)  
 (b) Photo of the extended space. (Source: by author.)

Figure. 1: Extended corridor in Flexibele Woningbouw (Rotterdam, Holland).

methods, and discussing the future application. The main research methods are literature review and case study.

## 2. Adaptable Community

### 2.1 Concept

A well-designed community serves not only for the residents' primary living requirements of safety and comfort, but also establishes a convenient community life and compensates the function of individual suite. Adaptability at the community level provides appropriate collective space, which can be interpreted by the inhabitants' common requirements. It also concerns the changeable relationship between adjacent suites.

### 2.2 Methods and realized practices

1. Shared garden and balcony. In 1990s, Herman Hertzberger has recognized the effect of the boundary type on neighborhood relationship. A shared garden and/or balcony are suggested in the meantime, but with the clue for separation, and accordingly they can be divided when the relevant families reach a consensus. In the design of Diagoon Dwellings, he provided a shared terrace for two families but with a low base of perforated block in the middle. It can be used as a common bench by adding a wooden surface, or as a support for a low fence, or even as a foundation for a brick wall which separates the two families entirely.<sup>1</sup> The different uses also interprets the inhabitants' various comprehension and actual situation towards neighborhood relationship.

2. Enlarged communal circulation. It is normal that vertical and horizontal circulation is extremely compressed to a minimum in most Chinese housing project. However, plenty of researchers advocates a small increase in the size of communal circulation in order to make it much more adaptable in use.<sup>2</sup> The enlarged rest platform and corridor indicates that the neighbours may stay and chat there when they encounter; while the spacious entrance space allows a space in which to communicate. In the project of Flexible Woningbouw in Rotterdam, the corridor is extended at intervals so that an entrance space is created. Plenty of inhabitants arrange it with sofa, bench and small table for recreation and chatting (Figure 1).

3. Combinable units. In 1956, area extension has been proposed in Professor Peng Yigang's design<sup>3</sup>, while Professor Jia Beisi developed the concept to the capacity that small units can be combined, as well as big units can be divided into smaller ones.<sup>4</sup> In practice, horizontal combination is normally achieved by opening a reserved hole between units, or re-organising the entrances. The great majority of multi-generation dwelling in China practises in this way<sup>5</sup>. Vertical combination is found in Yueyahu Community, where area extension is reserved in the attic and underground space. By adding an interior staircase in the storage room, the related dwelling can be connected with suites below or above.<sup>6</sup>

4. Exchangeable space. In the 1970s, plenty of social housing was built in China, in which all

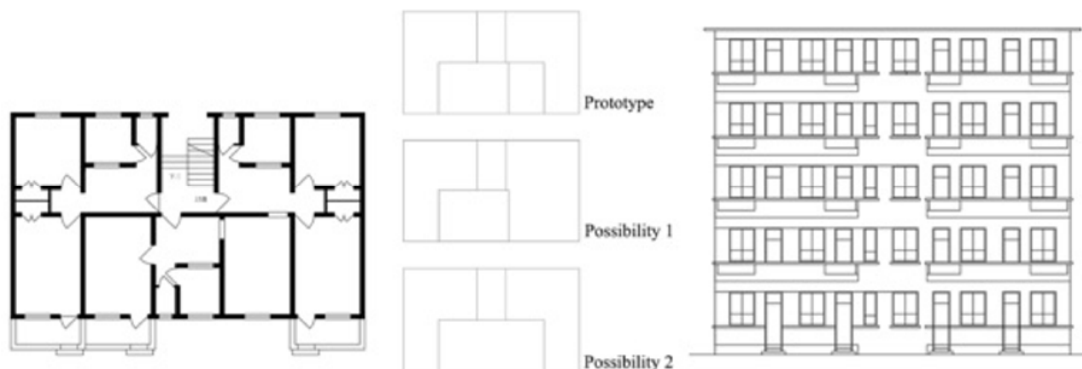


Figure 2: Design for Flexible Allocation in Shandong. (Source: by author according to material provided by the architect.)

dwelling were with the same area. This method was proposed correspondingly to modify the dwelling area according to users' family size. It was widely adapted and even recorded in the collection of standardized drawing in Shandong Province<sup>7</sup>. The specific method is to reserve an additional door on the splitting wall in most cases so that the space connecting two suites can potentially be included in any of the suites (Figure 2). The exchangeable space can be a single room, an individual suite or suites.

### 2.3 As strategy to indifferent neighborhood relationship

The indifferent connection between neighbors, which is probably generated by the faster pace of life, diversified amateur activities and a trust crisis in society, damages both sociological and architectural field.

To the former, an indifferent neighborhood isolates individual families from the integrated community, and weakens any mutual assistance. People living in the modernized dwellings have to struggle with every trial by themselves, but certain problems are difficult, if not impossible, to solve. The most prominent phenomenon is that most primary schools close around 4 p.m., while the parents usually finish work no sooner than half past five. Who picks up the children and takes care of them is a common problem suffered by working families. Numbers of working staff are crying for their intense schedule, while in the meantime, the retired, some of who are intellectuals, are complaining about their boring life and the feeling of no longer being needed.

To the later, the architects tried to satisfy all the living demands within an individual unit, which

generated plenty of inappropriate decisions. A typical example could be found in the design for the "sociable family" in the 1990s in China. It emphasizes inhabitants' requirement of accommodating guests at home, and advocates a spacious living room for parties. However, the daily use of the extended living room was seldom discussed. The other phenomenon could be found in the fitness room at home. According to a family who prepared a special fitness room, they bought a complete set of fitness equipment with great earnestness, but seldom used it.

Architectural strategies should be conceived to encourage people stepping out of their dwelling that is where shared space and enlarged circulation work. Besides, a further suggestion is given for the adaptability on the ground floor as a shared space for the entire community. Ground floor location means that the space can be used for public or semi-public functions without disturbing the upper levels and it can be half opened to accommodate outdoor activities. Plenty of social activities are expected. For example, the collective library may be located here; special care may be provided for the elders; and parents may chat to each other when their children are playing outside. Furthermore, it also indicates the accessibility of vehicles, which helps to deal with the insufficient parking spaces especially in the old communities.

The effectiveness of combinable units and exchangeable space are limited by the private property of related space. It is suggested correspondingly to insert some indeterminate-property space in the private dwellings, to accommodate the common but occasional requirements of the related families. It can be a rental kitchen, a meeting room, a mini-hotel, or

a fitness room. According to the frequency of use, it can also be kept, sold to new inhabitants, or connected with adjacent dwelling.

### 3. Adaptable Suites

#### 3.1 Concept

The quality of interior space has direct influence on people's living experience. The concept of adaptable suites refers to both the spatial method, which is specified as changeable division of the whole unit and multiple use of specific rooms, and the constructional method, which is interpreted as changeable pipeline and partition.

#### 3.2 Methods

1. Changeable layout. It can be specified as the external appearance and the scope of each unit were defined by the architect, while the subdivision was entirely or partly left to the user's decision. This method was supposed to be practised in both pre-occupancy and post-occupancy stage. But practically, most of Chinese cases subdivide the living space with non-load bearing partitions before the inhabitants move in. In addition, the location of bathroom and kitchen is normally fixed due to the complicated organisation of pipelines for water and gas, and the construction requirement of descending floor.

2. Multi-use room. The multi-use concept primarily focuses on more than one appropriate arrangement of furniture that can be embodied in each room. In addition, an individual room is supposed to accommodate various functions concurrently or diachronically without changing its shape and size. European architects' designs of minimal housing in the 1910s can be seen as an extreme interpretation of this concept. Most of them arranged bedroom and living room into a single space. With folding furniture, the two functions can be exchanged conveniently. Similar design is also found in China which was developed by Vanke company in 2011. It is with 18m<sup>2</sup> in size with the targeted client of new graduates who is not able to afford an ordinary dwelling. (Figure 3)

3. Changeable pipeline and partition. In the recent twenty years, the huge gap of service life of pipelines and structure has been increasingly recognized. The inevitable change of pipelines has negative effect on the safety of structure, in the meantime causes noise and pollution. Correspondingly, the separation of pipelines from structure is advocated. The most common

method is to adapt raised floor, suspended ceiling and metal frame partition. The pipelines are no longer connected with the structure by concrete, but arranged in the cavity.<sup>8</sup> In addition, the application of metal frame partition also aims at simplifying its own refurbishment process.

#### 3.3 To the confined adaptability and expanded adaptability

The principle task of 'changeable layout' and 'multi-use room' is to find the characteristic and dimension of space capable of various spatial subdivision or diversified ways of furniture arrangement. An extreme emphasis on unlimited spatial adaptability encourages the architects to design with the clients. However, the idealized attempt is difficultly accepted by both the investor for its worse economic performance and the users for the higher price of the customized products. Consequently, it has only been sporadically practised in particular experimental case like the renovation of Kashgar city center of China<sup>9</sup>. In the meantime, the partial emphasis on spatial adaptability is challenged by the fact that the frequency of people's refurbishment is over-estimated by the researchers. It was revealed in plenty of post-occupancy investigations that the realized renovation is compressed in a limited and rational scope while a complicated renovation normally forces people to move. Even in the well-designed adaptable housing project, people still try to escape from decoration work as the troublesome.

Based on the above findings, this research suggests to substitute the 'changeable layout' of the whole suite by a limited number of possible change schemes. The scheme of the predicted change stems from the study of people's relatively common requirement of living and refurbishment. Its objective is to find the most possible change and make proper preparation. Take metal frame partition for example. Its change requires the demolition of the whole panel and some metal frame, the installment of clip on the floor, the build of new frame and panel. It is difficult to be realized by the layman. However, if the future change has been assumed, and the one-piece panel is pre-cut, the clip is pre-cast correspondingly, both the construction efficiency and the waste of material will be obviously saved. Compared to the existing method which assumes an unforeseen change, the adaptability is much compressed,

but the achievement of the change is much simplified.

The target of ‘changeable component’ is to separate the short-life components from the main structure, so that renewing the obsolete can be simplified and structural harmless. The existing study is confined to a limited scope of pipeline and partition. However, is the change initiated by the inhabitants confined as the current research assumes? According to an investigation of 176 family in 2017, the achieved refurbishment touches at least 21 items, the most popular five of which are specified as: whitewash the ceilings, lay the floor, change the equipment in the bathroom, change the equipment in the kitchen and change the heaters<sup>10</sup>. Consequently, this study suggests that the ‘changeable component’ should include an extended collection which is frequently touched in the realised decoration and refurbishment processes. The change of the components can be initiated not only tectonically but also sociologically and to reflect the inhabitants’ aesthetic preference and economic selection. As the encouragement of industrialization and refined decoration, the common preference and differentiated requirement in/between the target clients have to be found as the basis of design and product development, and in the meantime as the basis of the necessity of user choice.

#### 4. Conclusion

This article explores the application of adaptable housing method in the field of community and single suite.

In the adaptable community, it summarized the practical methods of shared garden and balcony, enlarged communal circulation, combinable unit, and exchangeable space. As a response to indifferent neighborhood relationship and the trend of satisfying all demands inside the door, this study tentatively apply the existing strategies to simulate neighborhood communication and to rationalizes the arrangement of public and shared space.

In the adaptable suites, it analyses the approaches of changeable layout, multi-use room and changeable pipeline and partition. Based on the analysis of the limitation of existing researches, this article suggests to confine the spatial adaptability and expand the scope of adaptable building components.

#### Endnotes

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