

Adaptable Housing or Adaptable People ?

Experience in Switzerland gives a new answer to the questions of housing adaptability

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Summary

Although many adaptable housing examples have been realized, the reactions of the dwellers to their adaptable surroundings have seldom been adequately evaluated. In this article the user reactions from four completed housing projects in Switzerland are analyzed giving consideration to the potential qualities of adaptability, the exchange of information among architects, owners and tenants, and the management methods to achieve adaptable housing. It will be demonstrated that adaptable housing is much more than a matter of design. It will be shown that consideration should be given to user instructions and the distribution of knowledge in conjunction with skillful design.

Résumé

Même s'il existe de nombreuses réalisations de logements flexibles, la réaction des usagers à leur environnement adaptable n'a que rarement fait l'objet d'évaluations. Dans cet article les réactions d'usagers de quatre projets d'habitations construits en Suisse sont analysées. Les qualités potentielles de flexibilité, l'échange d'information entre architectes, propriétaires et habitants ainsi que les méthodes de gestion pour mettre en oeuvre un habitat flexible sont discutés. Il est démontré que l'habitation flexible est bien plus qu'une question de projet. Il est montré qu'il faut accorder de l'attention au mode d'emploi pour les usagers et de manière générale à la distribution de l'information en conjonction avec un bon projet.

Research Purpose and Research Methods

The social background of housing has changed in Switzerland since the 1970s. The dominance of the nuclear family has been replaced by a variety of household types. Life-styles have become more individualized, while at the same time different types of social groups live together. Housing has become more important to daily life

because the amount of time at home, for relaxation, work, even for education, tends to be longer than ever before. With the changes of the world economy and the Swiss society, housing requirements in Switzerland will increasingly change. Adaptability is regarded as one of the necessary qualities for housing in the future (Kurth, 1970; Albers, Henz & Jakob, 1980).

Adaptable housing is not a new idea. In the beginning of modern architecture the Maison Domino (1914) by the architect Le Corbusier consisted of concrete slabs and pillars in which a large number of floor plans could be created using built-in packages (Fig. 1). Many experimental flexible apartments based on the same concept were built during the 1960s in Europe. It was noted that their potential flexibility was not well utilized, but the actual user reactions and what one could learn from the experience of adaptability was seldom documented.

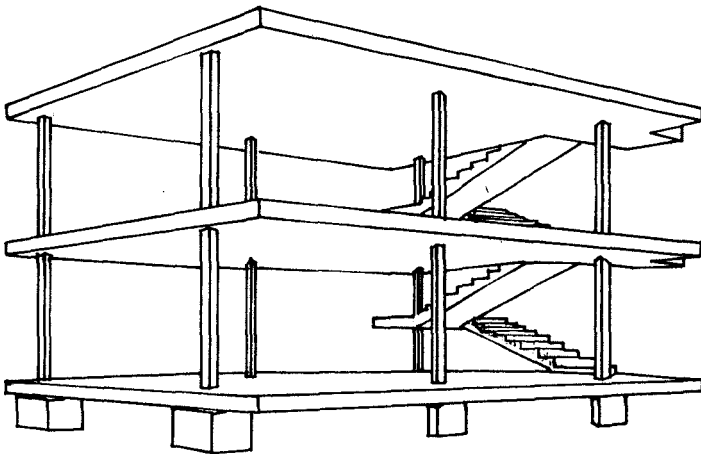


Fig. 1 : Structure of the Domino project

In the last decade new housing projects based on fresh concepts of adaptability have been realized in Switzerland. Unfortunately, the experience of the architects, owners and inhabitants about the use of the adaptable provisions has remained unknown.

The purpose of this research is to provide guidance for applications of adaptability in future housing design through the analysis of both the usage of, and the related influence factors on, the recent adaptable apartments in Switzerland.

The research began with a definition of adaptability: Adaptability is a way to fulfill a large variety of needs and change of needs of housing users (dwellers and owners) within the same building by using the potential means which the building techniques

and management system offers (Jia, 1993). Given this definition this research moves from two assumptions. First, adaptability is seen as the possibility of usage. A potential physical adaptability and the possibility of using adaptability are two different things, although they interact with each other. Physical adaptability may not be well utilized, although it is provided. In fact, housing adaptability is not only a physical factor but also a matter of knowledge and management. Therefore "usable adaptability" is a better term to describe the whole picture of adaptable housing than "physical adaptability" only. Second, adaptability is seen as a process. A history of any apartment building can be abstracted into five phases: programming, design and planning, construction, inhabitancy and renewal. A concept of adaptability appears during the programming phase and is applied and used during the following four phases. Providing adaptability is not a one-time strategy, but should guarantee the long-term possibilities of use.

This research is based on four existing examples which were chosen from several adaptable apartment buildings in Switzerland. These four examples are named *Wohlen*, *Hellmutstrasse*, *Dauidsboden*, and *Brahmshof*. Several conditions made the comparative research possible: they are all rented multi-household apartments, the construction costs were at an average level or even lower at their time of construction, they are all excellent housing examples of their time not only because of adaptability, but due to other qualities as well. This research is based on available documents, both published and unpublished, as well as interviews. For each example one chief architect (except in *Dauidsboden*), one owner representative and three households were interviewed separately. The owner representative of *Dauidsboden*, who initiated the architectural competition and later assisted tenants participation in design, provided information and material about the architectural design. In conjunction with observation on the sites, the households were interviewed in their apartments.

General Description of the Four Examples

The four examples have different characteristics: a different form of ownership, they have been constructed at different times and under a different management system, and each example exhibits different kinds of adaptability. We now give an overview of each example, which includes the basic information, the chosen means of adaptability, and particular special features.

1. *Wohlen*

This adaptable apartment building in *Wohlen*, Aargau, was designed by METRON Architektengruppe and built in 1966. The eight-storied free-standing slab block with 49 apartments is owned by the private firm *Tunau Immobilien AG* and managed by the firm *COSMOS* at present. The owner as well as the manager have changed several times since the building was constructed.

The original intention of the architects was to build apartments which can be adapted

to the changing needs of one family and to changing lifestyles in the future (Werk, 1966). The overall size of each flat is fixed, as well as the kitchen, bathrooms and the entrance stair. The rest of the interior space can be divided within a 30 cm grid with light and easily movable partitions made of chipboard in 60cm and 90cm widths. These flexible divisions can be removed or reinstalled, but they did not meet sound insulation standards even in the 1960's. Theoretically, the layout of rooms can easily be changed according to the wishes of the tenants (Fig. 2).

The architects prepared an introduction booklet for the tenants in order to encourage them to use the potential possibilities. The booklets reached only some of the initial tenants. The adaptability has been utilized, but not as well as was expected by the architects, primarily because of the lack of cooperation among the architects, the owner and the manager. Among the four examples Wohlen has the longest history of inhabitancy.

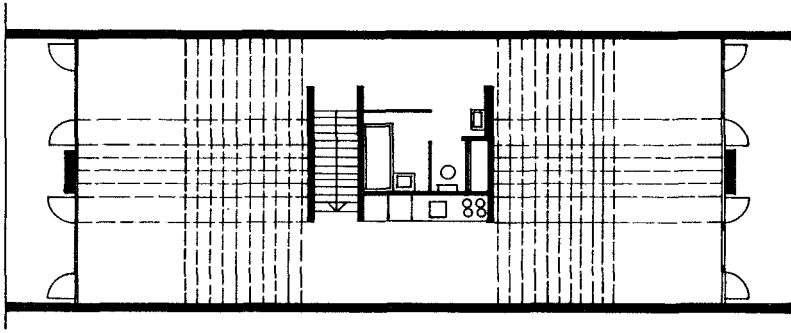


Fig. 2 : Wohlen : Plan of the major type of flats with 30cm grid showing the positions of flexible walls

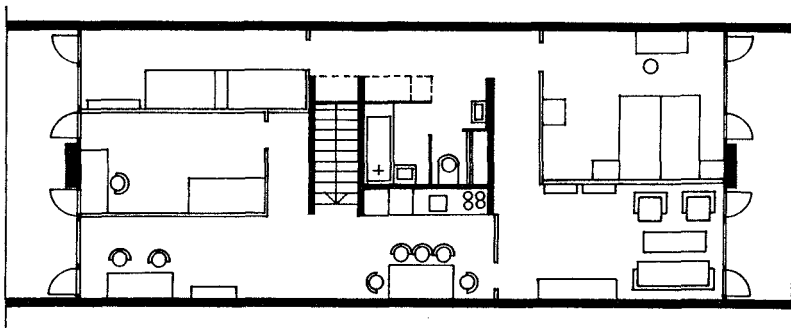


Fig. 3: One of the possible floor plans

2 Hellmutstrasse

The slab block is located on Brauerstrasse 75 near the center of Zürich. It was designed by the office ADP (Architektur Design Planung) and built in 1990. The four-storied building with 32 flats (at present) is owned by a housing-cooperative and self-management community (WOGENO). The tenant association (Hausverein) was formed in 1984 and began to develop a building program together with invited architects. Meetings between prospective tenants, architects, representatives of WOGENO and authorities were held during the design process. ADP, who won the resulting design competition, envisioned an adaptable system as a way to accommodate the different wishes of the tenants (Loderer & Siffert, 1991; Loderer & Frey, 1992).

Adaptability is achieved by three measures: introducing a plan divided into three zones, locating fixed openings in load-bearing walls, and providing moveable wall cabinets. The installation zone in the center of the building gives any apartment unit several possibilities in changing size with few restrictions from the position of the kitchen and the bath. Openings in the load-bearing walls, which throughout the whole zone of rooms can be closed or opened, allow the apartment size and room relations to be changed. The entrance zone gives any potential unit an entrance. Wall openings were filled with gypsum-panels constructed carefully to meet sound insulation standards. Cabinet divisions can be installed or removed with the aid of professional workers. Dimensions of rooms are either 4.0m or 4.5m which are anticipated to adapt to different ways of furnishing (Fig. 3).

Hellmutstrasse is an excellent example showing how structure and function combine in a systematic way to provide many possible flat types. Several kinds of adaptability are provided together and using the adaptability requires relatively limited physical change. But in fact, even the initial tenant group did not use the potential adaptability in full.

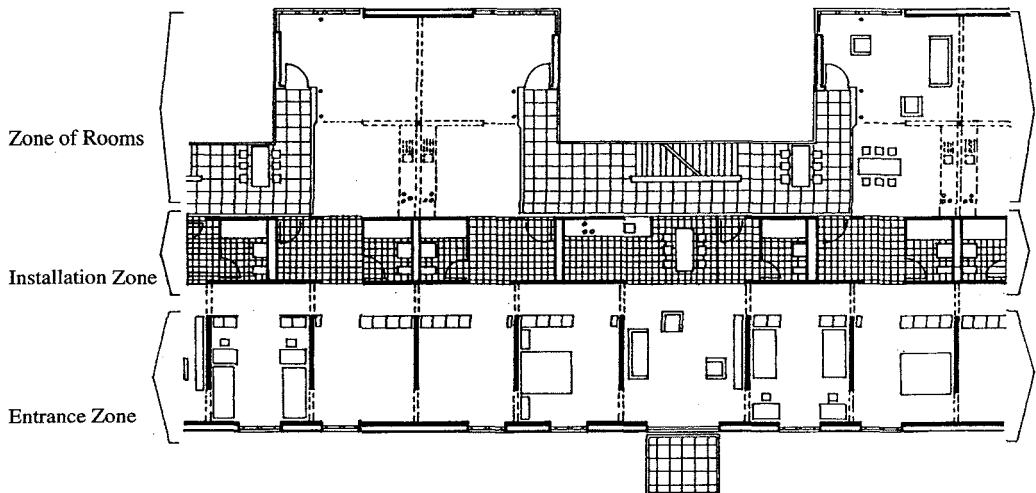


Fig. 3a: Floor plan showing the primary structure, as well as the variety of furnishing in rooms with the same dimension, and the different ways of installing the wall cabinets.

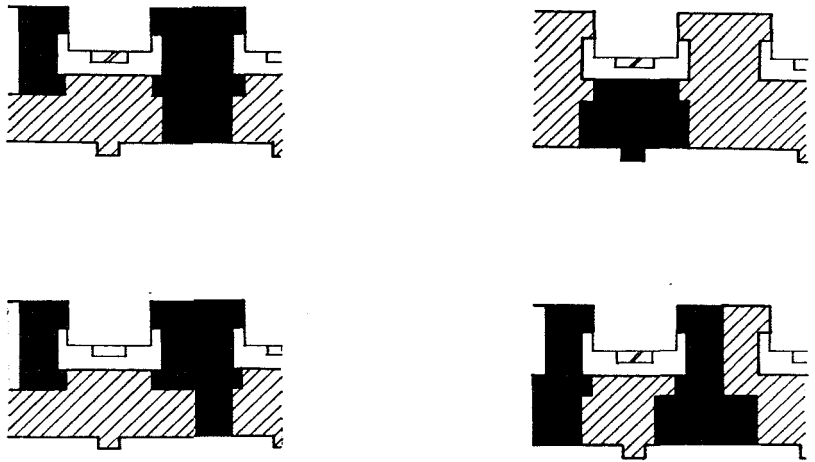


Fig. 3b: Possible apartment types within the major structure

3 *Davidsboden*

This apartment block surrounding a semi-public courtyard was built in an old industrial quarter in Basel in 1991. A tenant self-management and adaptability concept was given as a program requirement in a competition held by the Basler Christoph-Merian-Foundation (CMS) and Patria, an insurance company. The architects Erny, Gramelsbacher, and Schneider won the competition. Half of the building is owned by CMS, the other half by Patria. In the part of the building which belongs to CMS the tenant association and a participatory design process were carried out with the help of two social workers and the building manager. In the part belonging to Patria, the tenant association began late and the participatory design process did not take place. This research is focused only on the part owned by CMS. (Christoph Merian Stiftung, 1989, 1992; Büro für Soziale Arbeit, 1989-91; Baumgartner *et al.*, 1993)

The potential adaptability works on two levels. First, apartment combinations are possible only among the flats on the same floor and accessed by the same staircase. Second, the interior of each flat provides the greater extent of flexibility. The partition walls, kitchens, and a part of the bathrooms are changeable. They were built after the major structural construction using tenant participation. The partition walls are made of gypsum-board. The installation systems were specially constructed allowing for changes in the future (Fig. 4).

Among the four examples Davisboden is the only case where the initial tenants organized and participated in the design of their own flats by using the potential adaptability to its fullest extent. The initial tenant had possibilities to arrange his own flat according to his own decisions that went to such an extreme in Davidsboden, that

they resulted in future adaptability becoming partly limited.

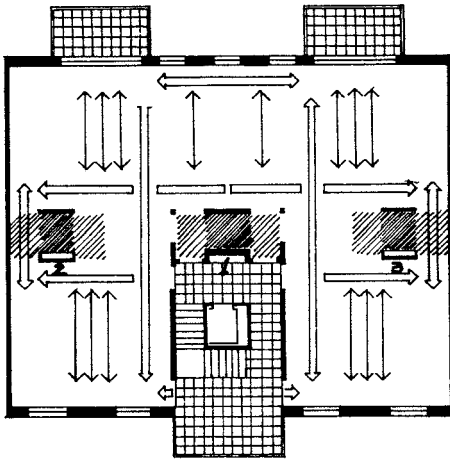


Fig. 4: Davidsboden :
Plan of the major structure

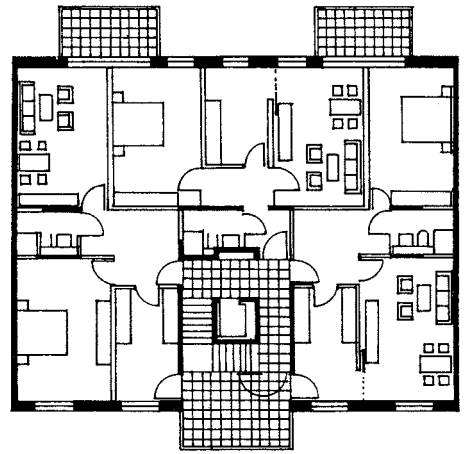
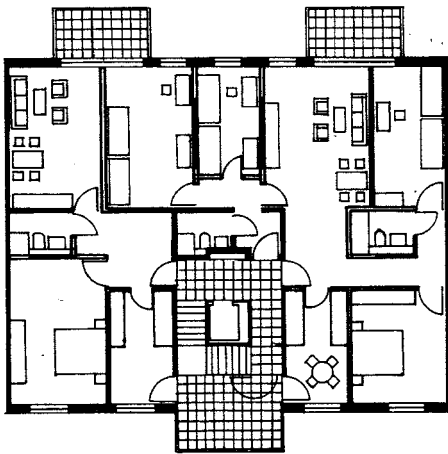
-thin arrows indicate the positions of the flexible wall divisions

-shaded areas are the possible positions of the WC and Bathrooms

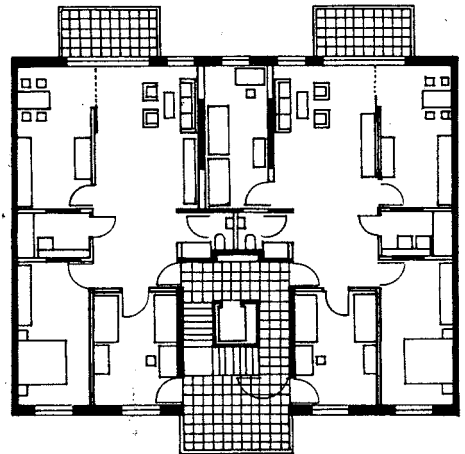
-white arrows show the possible connections of spaces

Positions 1, 2 and 3 are the fixed sanitary and ventilation shafts

Position 1 is where the hot water and the heating system can be arranged according to the combination of apartments on the floor.



Examples of actual floor plans after initial tenant participation



4 Brahms Hof

The Evangelischer Frauenbund Zürich (EFZ, Protestant Women's Association), which was founded 106 years ago, owned a piece of land in Zürich-Albisrieden, for which social housing was planned. Consultation meetings attended by several housing organizations, city authorities, and specialists were held for three years before EFZ initiated a project competition. The competition program drawn from these meetings carried the central spirit of the EFZ, to "strengthen our capability and encourage ourselves, to think openly and to act with determination". "Housing for differing persons, as well as for permanence" was listed in the program as the primary requirement. Walter Fischer from Kuhn, Fischer, Hungerbühler Architekten AG won the competition with a concept for a 5 story building around a common courtyard. It was built in 1990 (Evangelischer Frauenbund Zürich, 1992).

The adaptability of the interior space is possible on three levels. First, the openings in the walls of the central zone of the building make it easy to adjust the flat size, especially during planning and construction phases. Second, most of the rooms are the same size and proportion which allows adaptation to many different functions. Third, the living room and kitchen can be divided or combined according to the tenants own wishes with the arrangement of moveable cabinets. The fixed walls are built with lime-sand bricks and painted white. The filled openings were built with the same material but after the major structural construction. The related technical solutions for changes to the size of the flat in the future, for instance the sound insulation of the potential apartment wall divisions in the future, were not provided (Fig. 5).

In Brahms Hof the techniques and materials for the changeable parts are relatively simple. The building offered a high flexibility during the planning phase and construction phase. After construction, changes to the size of the flat are difficult. The equal sized rooms and moveable cabinets are very practical and well used by the tenants.

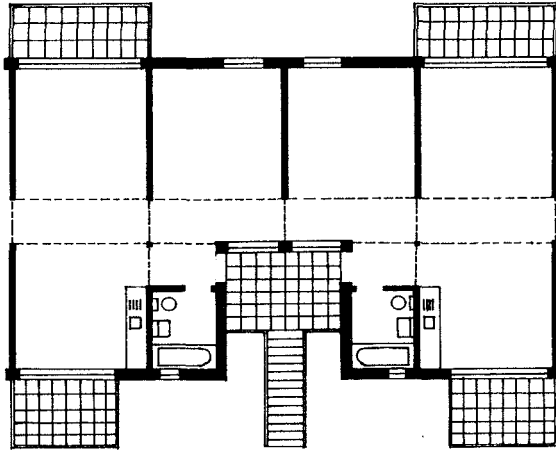


Fig. 5a: Plan of the major structure

The openings in the cross-wall were filled with brick after the major structure was built. The rooms sharing the same dimensions are meant to adapt to different ways of furnishing

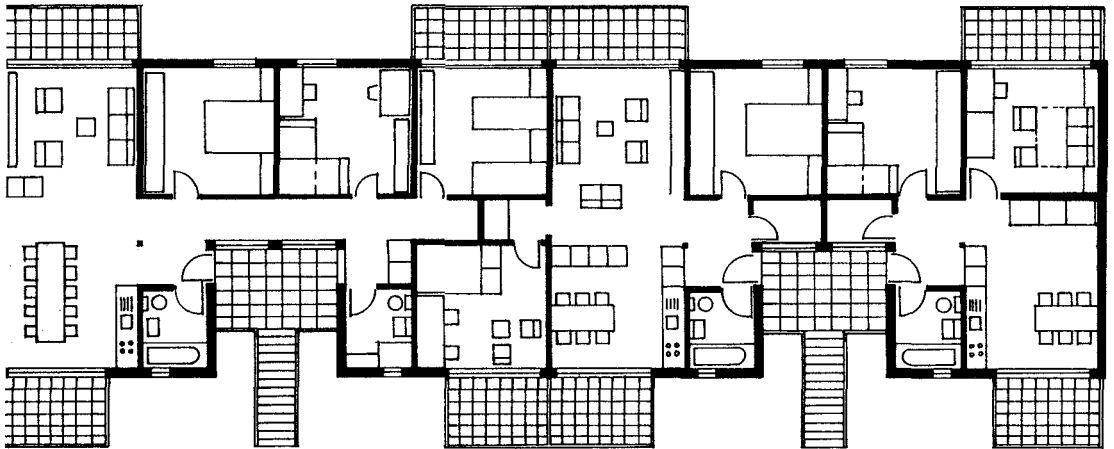


Fig. 5b: Typical plan after the apartment size was decided upon (Moveable cabinets allow different types of kitchens).

Table 1 : An overview of the potential physical adaptabilities of the four examples

Adaptability	Wohlen	Hellmutstrasse	Davidsboden CMS	Brahmshof
Exchange of rooms	no possibility	many possibilities	some possibilities	some possibilities
Varying number of apartments	no possibility	many possibilities	many possibilities	some possibilities
Multi-functional Room	some possibilities	many possibilities	some possibilities	many possibilities
Change in room relationships	many possibilities	some possibilities	many possibilities	few possibilities
Change in room quantity and size	many possibilities	few possibilities	many possibilities	some possibilities
Change in accessories	none	wall cabinets	fixtures, location and types of kitchen and bathroom	wall cabinets

Exchange of rooms: the apartment can be enlarged by taking rooms from the neighboring apartment, or the apartment can be reduced in size by giving rooms to the neighboring apartment.

Varying number of apartments: the amount of apartments can be changed by changing the sizes of apartments within the building structure.

Multi-functional room: the room function can be changed without changes to the room dimension.

Change in room relationships: the rooms inside each apartment have several possible connections among each other.

Change in room quantity and size: The room divisions can be changed by moving the flexible or moveable walls .

Change in accessories: Apartment accessories can be chosen by tenants or replaced easily.

A Comparative Analysis of the Uses of Adaptability

Introduction

The use of potential adaptability is a very complex process. It depends on many factors, both physical and social. Any of the special conditions, when not sufficiently applied, could make the adaptable features underutilized. In this research most of the important factors were analyzed under four categories.

The first is the *Uses of Adaptability*. It is a general description of the actual adaptable uses in the four examples. The relations between adaptability and the housing process will be analyzed.

The second category is the *Technical Approach for Creating Adaptability*. Adaptable housing has physical solutions which adjust to differing living requirements. The

specific physical solutions for adaptability in these examples will be compared and evaluated.

The third category concerns the *Distribution of Knowledge on Adaptability*. The concept of housing adaptability within the rental market is not well known yet, because adaptable housing is a new way of using space. It is necessary to let users know the advantages of adaptable housing features and their methods of use. The methods of communication among architects, owners and tenants of the four examples will be compared and evaluated here.

The last category is about *Management for Adaptability*. The ability to utilize adaptability in rental housing is dependent on how the use is managed. All the examples have differing management experience which will be described here.

Each of the four parts includes a short introduction to the main questions, the primary conclusions, and a table in which the information on the four examples is shown in a comparative way.

The Uses of Adaptability

Adaptability can be implemented during any of the four phases: project design and planning, construction, inhabitancy, and renewal. In the analysis presented here the inhabitancy phase is subdivided into two sub-categories: inhabitancy phase I--change of household needs, and inhabitancy phase II--change of tenants. A comparison of the reality of using adaptability is described in the table (Table 2). The following are the primary conclusions from the comparative analysis.

(1) *Adaptable features in all the examples have been utilized, although the extent of use with respect to the physical potential is very different.* The owner and the first tenants in Davidsboden, which possesses the largest extent of physical possibilities of change, made full profit from adaptability during the design and construction phases. In Brahms Hof the multifunctional room and moveable cabinets were well utilized in all the phases given otherwise limited possibilities of change. In Wohlen and Hellmutstrasse the physical possibilities of change were well provided, but were underutilized. Changes to the flexible divisions were few in the inhabitancy phase I. At Hellmutstrasse even the first tenants were not encouraged to make decisions on the position of the wall cabinets. Additionally, the various room connections inside the apartments were not realized.

Table 2 The reality of using adaptability

Wohlen	Hellmutstrasse	Dauidsboden CMS	Brahmshof
1. Design Phase			
Not Applicable	<ul style="list-style-type: none"> - The number of flats increased from 24 to 34 in the same structure. - Adjustments to apt. sizes according to household types. 	<ul style="list-style-type: none"> - The apt. sizes and numbers changed according to new requirements, changes of building technology and financial conditions. 	<ul style="list-style-type: none"> - Some 2 story flats changed into 1 story flats and the number of flats increased. - Changes to the stairs in 2 story flats. - Adjustment to the size of flats according to household types.
2. Construction Phase			
<ul style="list-style-type: none"> - A part of the initial tenants decided on the layout of their flats using the flexible walls. 	<ul style="list-style-type: none"> - Adjustment to apt. sizes according to household types. - Tenants chose finish of kitchen counter. - Tenants decided to close or leave open the openings in the walls of the same size rooms, but almost all of them chose the same solution. - Tenants decided the door position in the cabinet wall. - Tenants decided if the cabinets face to the room or face to the corridor 	<ul style="list-style-type: none"> - Adjustment to apt. sizes according to household types. - Tenants determined the layout of flats. - Tenants decided the location of kitchen and the type of WC. - Tenants chose the finishes of floors and walls, the cabinets, the fixtures in bathrooms and the number and position of electrical outlets. 	<ul style="list-style-type: none"> - Adjustment to apt. sizes according to household types - Tenants decided moveable cabinet location and quantity, relationship of kitchen and living space. - Tenants chose between two given colors of tiles in kitchens and baths and the surface of kitchen equipment.
3. Inhabitancy Phases I --- Change of Household Needs			
<ul style="list-style-type: none"> - Some changes to flexible walls happens when household become larger or become smaller 	<ul style="list-style-type: none"> - One tenant removed a cabinet division - One large flat for a collective household was divided into three smaller flats 	No change	<ul style="list-style-type: none"> - About four or five households changed the finishes of the floors and stairs - One woman divided the large living room into a sleeping room in order to rent out one room.

4. Inhabitancy Phase II --- Change of Tenants

- Changes occurred two or three times each year when new tenants moved in.	(no change of tenant yet)	(no change of tenant yet)	- One handicapped tenant moved in and the rooms and accessories were rearranged
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5. Renewal Phase

Flexible divisions have not been renewed. They are not planned to be renewed in the near future	The building has not been renewed	The building has not been renewed	The building has not been renewed
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Remarks

The adaptability inside the apts. is underutilized	The adaptability between the apts. was well utilized during the planning phase and that inside the apts. was underutilized	The adaptability between the apts. and inside the apts. was fully utilized during the construction phase	The adaptability inside the apts. was very well utilized
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(2) *During the planning and construction phases, the option of having different sizes of flats was well used by the owners who wanted to offer many different size apartments, as well as the dwellers who changed their own requirements during the application period.* In Hellmutstrasse many different household types could live together because different flat sizes and types were provided with adaptable features. As it was foreseen by the owner of Brahmshof, the advantage of providing different flat sizes and types in the same building is that tenants have more chance to adapt to their new requirements by moving to other apartments without moving out of the neighborhood. In Davidsboden adaptability is even used for other functions, such as a clinic and a mentally handicapped children's group. This feature of adaptability is expected to be used in the renewal phases by the owners, when apartment types have to be changed according to changes of housing demands in the future. The changeability of flat size at Hellmutstrasse was useful for the different initial households during the planning phase. But the tenants of Brahmshof and the owner of Hellmutstrasse foresee little chance to exchange rooms between two flats during the inhabitancy phase I, when one tenant will want to give up one of his rooms, at the same time his neighbor will want to utilize it.

(3) *Adaptability inside the flats is usable during the construction phase, when the initial tenants moved in, and during the inhabitancy phase II. The flexible divisions are not well used during the inhabitancy phase I. Whether they will be used in the renewal phase or not is still unknown.* The initial tenants in Davidsboden had more individualized flats because they had more adaptable features within their flats. It is also noticeable that changes inside the flats through the use of the adaptable features in Wohlen occurred when the new tenants moved in. Changes using flexible wall divisions are few during the inhabitancy phase I in any of the four examples. If the flexible divisions will be used during the renewal phase or not is still unknown. In

Wohlen the original low quality flexible wall divisions have not been improved since it was built in 1966, except in certain cases done by tenants. The other three examples could not provide definite information concerning the renewal phase, because the inhabitanacy period is still recent.

The Technical Approaches For Creating Adaptability

Technical methods are very important because they provide the potential possibilities for the users to adapt their apartments. The technical methods include space and functional arrangements, dimensions of space, materials and techniques for both the flexible and in-flexible components, colors and installation systems (Table 3). The following are the primary conclusions from the comparative analysis.

(1) Changes to the size relationship between two apartments can be done using complicated methods as well as very simple ones. Only in Davidsboden are all the technical details provided for changes in the future. Not only the division walls can be moved, but the electrical, water, and heating systems were especially designed for future changes with little cost increasing. Hellmutstrasse and Brahmshof both use a solution in which the wall openings between rooms can be open or filled in, but the methods used are different. In Hellmutstrasse openings are filled with flexible material, whose cost became more than the owner anticipated. The Brahmshof solution is cheaper, but changes are difficult to achieve after construction: the openings are filled with bricks and a sound insulation layer must be added when the present interior walls are utilized to separate flats.

(2) The varying quantities of apartments require well designed space. The apartment size can be easily changed if it can combine a small apartment nearby or give up a small apartment which can be rented separately. Compared with the other examples, Hellmut-strasse is an excellent example because of the arrangement of the entrance zone and sanitary zone, which offer many possibilities for apartment arrangement.

(3) If the building materials and colors are neutral and similar on the same floor, then the adjustments among apartment sizes are more easily accomplished. Wohlen, Hellmutstrasse, and Brahmshof are good examples in this respect because the same materials and colors are used throughout the whole building. In Davidsboden the color and materials of floors, walls, and built-in accessories are different from flat to flat following the tenant participation in design. The disadvantage is that changes in apartment size become difficult and the cost of this adjustment will increase.

(4) A change of room functions and/or space relationship is achieved by two totally different solutions: flexible or removable walls and multifunctional rooms. With Wohlen and Davidsboden interior divisions can be changed at any time. In Hellmutstrasse and Brahmshof fixed walls give all the rooms a relatively similar size which is carefully dimensioned for different functions. The former solution is more dependent on techniques, materials, and management but can provide more apartment types. The latter solution is easier to use by tenants with few technical aids and little extra cost.

Table 3 : The technical approach for creating adaptability

<i>Wohlen</i>	<i>Hellmutstrasse</i>	<i>Dauidsboden CMS</i>	<i>Brahmshof</i>
1. Change of flat size			
Not Applicable	<ul style="list-style-type: none"> - Provides openings in the walls between flats - Sanitary spaces are planned as one zone in the whole building - the entrance zones are large and provide many possible entrances - The openings are filled with two layers of gypsum boards with insulation in between. - the same materials and colors (grey floor and white-grey walls) throughout the whole building - All the room division walls are built with 18cm bricks to meet the sound insulations standards. - Electrical connections for exchange of rooms between flats and combinable flats are prepared. 	<ul style="list-style-type: none"> - Flat division walls built after the main construction with brick. - Four possible entrances on each floor. - Five possible kitchen positions on each floor of each staircase. - Interior finish materials and colors are different from one flat to another. - sound insulation layer added to interior walls when they become division walls -Specially designed electricity, hot water, and heating systems can be easily switched on or off for exchange of rooms between flats and combinable flats . 	<ul style="list-style-type: none"> - Provides openings in the walls between flats. - The openings are filled with brick. - Same material and colors (dark grey floors and white painted walls) throughout the whole building. - Sound insulation layer to be added to interior walls when they become division walls. - electrical connections are pre-prepared - In some areas of the building the entrance zones are larger and provide more than one possible entrance so these flats can be combined or divided.
2. Multifunctional room			
Not Applicable	<ul style="list-style-type: none"> - The rooms have similar width - Most of the rooms are on the same side of the building. 	Not Applicable	<ul style="list-style-type: none"> - Same size of rooms - Large kitchen/living room open to both sides of building - Dark grey color floor
3. Change in room relationship			
- By change to position of the flexible walls	- By change of the openings in the fixed walls	- By change to position of wall	- Flexible cabinet wall in the living-kitchen-dining room

4. Change in room quantity and size

- Flexible walls, built with wood-chip panels used for almost all rooms, so the relation, size, and number of rooms can be changed	- Most rooms have one cabinet wall which can be taken away or set-up, so the size of rooms can be slightly changed. - Quantity of rooms are not changeable	- moveable walls for almost all rooms, the size and numbers of which can be changed. - moveable walls built with gypsum-board -Part of the walls in the kitchen and bathroom areas are moveable.	- Room quantity and size can be changed only in the living-kitchen- dining space, where flexible cabinet divisions can create a room separation
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5. Change in built-in accessories

Not Applicable	Cabinets in rooms provided	Cabinets and accessories in kitchen and bathrooms	Cabinets in kitchen-living-dining space.
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Remarks

Adaptability is created by interior flexible walls using simple techniques	Adaptability in several types : changeability of flat size, room relations, moveable cabinets, and multi-functional room	Moveable walls and well-prepared installation systems provide many possibilities of change	Adaptability with few necessary changes to the building
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(5) *The technical methods providing adaptability also affect other qualities of housing.* The sound insulation in Wohlen is a problem because the flexible walls were built using wood-chip panels with little sound insulation. The costs of Hellmutstrasse became high because the sound insulation of almost all interior walls is the same as those between two flats. In Brahmshof the interior walls are left unfinished showing the difference between the fixed parts and the changeable openings very clearly, but appear cold and rough from the aesthetic point of view. The interiors of most flats in Davidsboden express the normal feelings of a home, but the structure and material becomes invisible and the changeable system is difficult to understand for new tenants.

The Distribution of Knowledge on Adaptability

Adaptable housing can be utilized when architects, owners, and tenants share the knowledge on how to use the potential flexibility. Adaptable housing is a new concept. Since it is new, many tenants who have had no introduction do not know what it is. All new products in our society need introductions when they are brought into the marketplace. Adaptable housing should also have its own introduction. In all four examples there were many means of communication among architects, owners, managers and tenants (Table 4). The following are the primary conclusions from the comparative analysis.

(1) *The goals set for the building dominate the types of adaptability and its usage.* Adaptability to differing needs and changes in the future were the main goals listed in the building programs of all four examples. It proves that physically adaptable solutions are closely related to the goals which were set before design. The advanced technology used in Hellmutstrasse could be applied because both the tenant association and WOGENO saw the building as an experiment and an opportunity to realize their theory of living. In Brahmshof the technical solutions were much simpler because the ecology of building and the ecology of technique was one of the goals of the building program. In Davidsboden the primary goal was to lower the rate of tenant turn-over by giving each flat its own identity.

(2) *The owner's identification and attitudes towards the necessities of adaptability play an important role in the types and uses of adaptability .* The goals for Davidsboden and Brahmshof came from the owners. The owners EFZ, who work helping unprivileged people, sees adaptability as a necessary quality for different people, for instance the handicapped and young single persons, to live together. In Hellmutstrasse, the adaptable housing project proposed by the architects was accepted because it was seen by the tenant association and WOGENO as the necessary means for having different household types live together, and for each household to have a flat for its own individual needs. In Wohlen the goals for adaptability were initiated by the architects. Unfortunately, the former owner did not continue supporting tenant usage of the provided flexibility .

(3) *Architects, owners, and tenants need to communicate among each other, or the adaptability cannot be fully utilized.* In all these examples some form of communication was attempted. In Wohlen, the architects made a usable introduction booklet for the tenants to understand the quality of the building and the way to use it. Unfortunately, the booklets did not reach every tenant even at the beginning. The best example of communication was done at Davidsboden where plans, models, interior finishing materials and accessories were shown to tenants. Meetings and personal discussions were organized by the building manager. A newsletter was published regularly during the construction, and participation in management coordinated by two social workers. The adaptability was fully utilized by the first tenants. For the future tenants, owner and manager communication will be more difficult. The present manager of Wohlen does not have the introduction booklet and has little knowledge of the quality of the building. At Hellmutstrasse and Brahmshof the flexibility is visible for tenants because of the exposed materials and the structure. At Davidsboden another recommendable example is how the rules of change of the moveable walls are written in the tenant contracts.

Table 4 : Methods of knowledge distribution

Wohlen	Hellmutstrasse	Davidsboden CMS	Brahmshof
1. The original goals			
<ul style="list-style-type: none"> - Adaptable housing for changes in one family's needs and/or changes in life style in the future - Inexpensive construction - Tenant participation with the owner - Written definition of rights and obligations for the owner and tenants (set by the architects) 	<ul style="list-style-type: none"> - Experimental integration of a favorable home and office environment (set by the tenant association) - A chance to realize a self-management cooperative project in an urban context (set by the owner) - A chance to fulfill very different tenant requirements and future changes (set by the architects) 	<ul style="list-style-type: none"> - To combine long-term adaptability with better living quality for present tenants - Tenant self management as a way of raising the quality of living in a difficult neighborhood - A chance to have different kinds of people living together - A chance to lower tenant turn-over rates by offering personalized flat (set by the owner) 	<ul style="list-style-type: none"> - Housing for different people, particularly those who have special difficulties. - Providing tenants many possibilities of privacy and security - Building technology and materials chosen with ecology considerations. - To offer many housing possibilities for the handicapped (set by the owner)
2. Owner's attitude			
<ul style="list-style-type: none"> - The former owner accepted the building program at the beginning, but did not encourage tenant participation. - The present owner (TIAG) knows only a little about the building's adaptability and experiences difficulty in management 	<p>WOGENO</p> <ul style="list-style-type: none"> - Accepted the adaptability idea from the architects and let the project be realized. - Now sees that the flexible features are over-instrumented - Is willing to promote limited flexibility in new projects 	<p>CMS</p> <ul style="list-style-type: none"> - Generated the idea of tenant self management and adaptability during the programming phase - Is positive about working with other partners to find ways to put the idea into practice - Now tries to promote the idea for other projects 	<p>.EFZ</p> <ul style="list-style-type: none"> - Generated the idea of adaptability during the programming phase - Sees adaptability as a necessary quality for housing at present and for the future

3. Communication methods

For the first tenants:	For the first tenants:	For the first tenants:	For the first tenants:
- Several meetings between the architects and owner during the programming phase	- Many meetings of the tenant association and architects during the programming phase.	- During the programming phase the owner worked together with other housing specialists	- For three years during the programming phase the owner consulted with housing and social specialists and future tenants
- A well illustrated guide booklet, about the potential uses of adaptability, delivered to only a part of the first tenants .	- Eight congresses and innumerable meetings attended by the architects, representatives of tenants, and WOGENO	- A contact office was directed by social workers	- Tenant introduction to adaptability was done through meetings and by showing plans
For the new tenants:	For the new tenants:	--Communication done through tenant workshops and thematic activities	For the new tenants:
- Oral introduction for the new tenants	- Oral introduction for the new tenants	- News letters published four times each year.	- Oral introduction for the new tenants
	- By leaving the materials and construction methods exposed, the flexible parts of the building are visible and can be identified by informed tenants .	- Participatory design meetings organized by the building manager (owner) and tenants	- By leaving the materials and construction methods exposed, the flexible parts of the building are visible and can be identified by informed tenants .
		- Scale working models prepared for tenants	
		For the new tenants:	
		- Brief introduction is written in tenant contracts together with an oral introduction	

Remarks

The well prepared introduction booklet did not function well because of the lack of owner cooperation	The tenants and owner appreciated the basic idea of the architects, but a detailed introduction was missing	The owner's initiatives generated many intensive communication channels for both the first tenants and the future tenants	The owner generated the idea of adaptability which was properly distributed to the first tenants
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Management for adaptability

Adaptability involving changes to a building requires a special form of management which is different from that for normal housing. This form of management should include consultation, supervision for changes to the building, definition and enforcement of restrictions, provision of material and technical assistance, and cost control.

When adaptable housing is well managed, the adaptable qualities will be well utilized. The experiences show how the degree of management influenced the use of adaptability (Fig. 3.4). Following are the primary conclusions from the comparative analysis.

(1) Adaptability which necessitates physical changes requires a new kind of service management. Most of the management work described in the following table does not exist under normal rental housing conditions. It seems that more management services provide greater opportunities of using adaptability, especially in comparison between the cases of Davidsboden and Wohlen. One owner representative of Hellmutstrasse experienced a greater burden of work when tenants wanted to express their ideas and make changes. It is also interesting to compare the different kinds of management with the different extent of adaptability usage during the construction phase and the inhabitancy phase(I+II). The degree of management for using adaptability during the inhabitancy phase tends to be much less than that during the construction phase. During the inhabitancy phase tenants have less of a chance to have an introduction or to receive building materials and technical help. New tenants usually have to pay the cost of work and materials for changes which were free of charge to the first tenants. This is one of the reasons that make the adaptabilities, especially those requiring physical changes, not well used after the initial tenants have moved in. In Wohlen, management problems occurred when some of the new tenants asked the owner to pay for repositioning the flexible walls, which for them are part of the building and therefore included in the rent, while the owner insisted that tenants should pay as they would pay for their furniture. So it is necessary to clearly define the ownership rights and cost responsibilities between owner and tenant.

(2) Appropriate adaptability has to be developed according to different ownerships and different management methods. In Davidsboden tenant self-management was initiated with the help of social workers during the construction phase. Assistance, experience, methods, and staffs were readily available at Davidsboden to carry on such a large range of participation activity. For the EFZ, Brahmschhof was a special opportunity to develop a new building on their own land following many years of experience with social work. The preparation of the adaptable concept began three years prior to the project competition.

(3) Management should include both the instruction of how to use the adaptability and the control of using the adaptability. It is clear that for later tenants, using adaptability, especially involving physical changes, is more difficult than for the first tenants when considering the necessary knowledge required. On the other hand, the changeable parts can give problems to the management if restrictions on using adaptability are not formally declared. For example at Hellmutstrasse, the cabinet division was designed to be changed by professional workers only, but this requirement was not part of the contract. In one case a tenant tried to move the cabinet divisions himself and partly damaged them. Both the architects and the owner think stricter

control of the tenant's changes to the building is necessary to prevent damages in the future.

Table 5 : Comparison of management for adaptability

Wohlen	Hellmutstrasse	Davidsboden CMS	Brahmshof
1. Management Body			
* COSMOS, Immobilien. Treuhand AG	* WOGENO and Tenant Association **WOGENO and Tenant Association	* Building Administration of CMS **Tenant associations and CMS	* Building committee of EFZ **Tenant association and EFZ
2. Consultation and Supervision			
* Delivered the introduction booklet to part of the first tenants * Supervised the tenant changes of the flexible walls ** Supervised the flexible wall changes by the tenants * * Restrictions are not declared in the contracts. The manager had difficulty resolving the confusions of construction payment and the resulting number of rooms.	* Organized the conference in which the adaptable concept was introduced * Made decisions on apartment sizes according to the changes of household needs * Helped tenants choose the materials of the kitchen counters and make decisions on the positions of doors, cabinets, and wall openings. * * Explained the use of adaptability to new tenants ** Supervised the changes of flexible parts of the building by tenants, but not very successfully * * Restrictions are not declared in contracts and flexibility is misused.	* Organized tenant workshops * Organized the contact office * Helped each household to participate in design * Helped and offered consultation for tenants to make decisions on the finishes of floors, walls, cabinets, bathroom fixtures and electrical connections. * * Explained the use of adaptability to new tenants ** Supervised the changes of flexible parts of the building by tenants * * Restrictions are declared in the contracts and the owner does not experience management difficulties.	* Made decisions on apartment sizes according to the changes of household needs * Helped tenants divide the living/kitchen space with flexible cabinets and to choose between two given floor colors for the kitchen and bathroom. ** Explained the use of adaptability to new tenants ** Supervised the changes of flexible parts of the building by tenants ** Restrictions were not declared in the contracts and the owner did not experience management difficulties.

3. Materials, Techniques and Cost

* The flexible wall elements were provided	* Cabinets and materials for filling the wall openings were provided	* Standard gypsum elements were provided	* Certain number of cabinets were provided.
* Technical help was organized	* Technical help was organized.	* Technical help was organized	* Technical help was organized
* The work and materials were offered free for the first tenant group	* Tenants paid only the extra cost for higher than standard finishes	* Tenants paid only the extra cost for higher than standard finishes and accessories	* Extra cabinets paid for by the tenants
** Used wall elements were offered free to the later tenants as needed.	** Later tenants must self-organize the construction changes.	** Owner offered recommendations for finding materials and workers when tenant needed.	** Later tenants must self-organize the construction changes.
** Later tenants must self-organize the construction.	** Later tenants must pay the cost of the new materials and work.	** Later tenants must pay the cost of the new materials and construction	** Later tenants must pay the cost of the new materials and work.
** Later tenants must pay the cost of the new materials and work.			

Remarks

<i>Managed by the management company without basic information on the adaptability concept</i>	<i>Correspondent methods for adaptability, which are seen as necessary by WOGENO, do not exist at present.</i>	<i>The management for adaptability was well provided during the construction phase and inhabitancy phase</i>	<i>Management by the owner did not experience particular difficulties</i>
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* The management during the construction phase and for the first tenants.

** The management during inhabitancy phase

Conclusions

Housing adaptability is a complex topic which can be observed from different view points. In this article adaptability is seen as a potential of possible uses and as a process of use. By doing so it is proved that adaptability in its physical aspect is only a part of the story; even within this aspect the technical approaches are varied and complicated. Communication, ownership and management are all important factors which define the success of adaptability. When designing adaptable housing, at least the following recommendations should be taken into consideration:

- *It is very important to develop the idea of adaptability early in the building programming phase.* Certain solutions of adaptability are useful only in certain situa-

tions. Application of any ideas of housing adaptability should be combined with careful consideration of the specific requirements and conditions. The appropriate solution should be found only after several questions are answered, such as: Adaptability for whom? For which time-period of usage? With what kinds of possibilities and constraints, for instance, materials and costs? How should the adaptability be managed? Etc.

- *Cooperation among architects, owners, managers and tenants is necessary for successful application of adaptability.* The knowledge of adaptability as a quality and the way of using this quality must be shared by all the people involved. The understanding and support from the owner, as was the case at Brahmschhof and Davidsboden, is especially important.

- *The adaptability which is more interesting for the owner should be applied together with that in the tenant's interest.* There are some forms of the adaptability that are very usable for the owner; the size changeable flats, for instance, at Hellmutstrasse and Brahmschhof. Since the success of adaptable housing depends much on the owners attitude, providing the adaptability in the owner's interests is one important step towards adaptability.

- *Several adaptability approaches should be possible in one building.* Some adaptability is used during the construction phase, the changeable flat size, for instance; some in the future, changeable apartment layout, for instance. Some adaptability for changes in the inhabitancy phases, changeable cabinets for instance.

- *Adaptability should be easy.* Adaptability tends to be well used when the tenants can do-it-themselves. The kinds of adaptability which need many physical changes are usually difficult to do and difficult to manage. Adaptability without physical changes or with few physical changes, the interior adaptability in Brahmschhof, for example, can be well utilized.

- *Individualization of apartments through initial tenant participation should be limited.* Personalized flats are difficult to adapt to needs of new tenants, difficult to maintain and difficult to change in the future. Unfortunately in some adaptable projects, such as Davidsboden, tenant participation in design is encouraged mostly at the beginning. In consequence the potentials for future changes are almost used out.

- *The management for housing adaptability should be well prepared especially for forms of adaptability which need physical changes.* The flexible elements, whether a partition wall or a cabinet, belong to the building, which is usually controlled by the owner, unlike the furniture, which belongs to tenants. Misunderstanding and misuses of these flexible elements can happen, if the management fails to make clear how to use them by tenant contract. Appropriate management not only puts restrictions on how to use the flexible elements, but gives also proper introductions and technical assistance.

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