

# Support-Infill Revisited: The increasing say of occupants

**Conference Paper**

**Author(s):**

Priemus, Hugo

**Publication date:**

2015

**Permanent link:**

<https://doi.org/10.3929/ethz-a-010578851>

**Rights / license:**

[In Copyright - Non-Commercial Use Permitted](#)

## Support-Infill Revisited: The increasing say of occupants

Hugo Priemus

OTB Research Institute for the Built Environment, Delft University of Technology, Julianalaan 134, 2628 BL Delft, the Netherlands, Email: H.Priemus@tudelft.nl

### Abstract

In his book 'De dragers en de mensen' (Support and people) John Habraken (1961) launched his idea to make a distinction between support ('drager') and infill ('inbouwpakket'). 'Infill' is defined as a product of industry and as a matter of individual decision-making; 'support' is defined as a product of the construction industry and a matter of collective decision-making. I challenge this distinction and amend it: the distinction should be between support, indeed as a product of the building industry and tied to a fixed location, and infill as a piece of home furniture, owned by the occupant. A support could be the property of an owner-occupier, the property of a social or commercial landlord. They rent the support out to tenants who make use of it. Infill is owned by the owner-occupier or by the tenant, and is indeed a product of an industry of home furniture. Beds, cupboards, kitchens equipment and bathroom equipment have moved or are moving from construction to furniture, from the dwelling to the properties of the occupant. This has to go together with an increasing neutrality, flexibility and adaptivity of the support, which is composed of floors, structural walls, facades and roofs. It can go together with differences of finance and life-time between support and infill. As far as governments see reasons to stimulate the supply of housing and/or to make housing affordable, this relates to the land and the support. Infill, like traditional furniture, is a matter of demand and supply on a free market, which includes also the second-hand market. In this paper I shall elaborate this view, which follows the spirit of John Habraken, but is based on different definitions and institutions.

**Keywords** Habraken, support, infill, home furniture, adaptability

### Author Biography

Hugo Priemus (1942) is professor emeritus of Delft University of Technology. He was educated as an architect (Delft) and as an economist (Erasmus University Rotterdam). In the period 1977-2003 he held the chair of Housing. Since 2003 his chair moved from the Faculty of Architecture to the Faculty of Technology, Policy and Management and was reframed as 'System innovation spatial development'.

### 1. Introduction

In his 1962 book *Supports: an Alternative to Mass Housing* John Habraken introduced the idea of making a distinction between support (*drager*) and independent housing units, and later between support and infill (*inbouwpakket*). 'Infill' is defined as a product of industry and as a matter of individual decision-making; 'support' is defined as a public investment completed by the construction industry and as a matter of collective decision-making. I challenge and amend this distinction: the distinction should be between support, as a private investment, indeed as a product of the building industry and tied to a fixed location; and infill as a piece of home furniture, owned by the occupant. A support could be the property of an owner-occupier, or a social or commercial landlord. Infill is owned by the owner-occupier or the tenant, not related to tenure, and is a product of an industry, in particular of home furniture.

Beds, cupboards, kitchen and bathroom equipment have moved or are moving from construction to home furniture, from the dwelling as property of the owner to the dwelling as property of the occupant. This has to go together with an increasing neutrality of the support, which is composed of floors, structural walls, facades, roofs, and energy and water infrastructure. It can go together with differences of finance and life span between support and infill. As far as governments see reasons to stimulate the supply of housing and/or to make housing affordable, this relates primarily to the land and the support, and to household income. Infill,

like traditional home furniture, is a matter of supply and demand on a free market, which also includes the second-hand market. Here public interventions are limited.

In this paper I shall elaborate on this view, which follows the spirit of John Habraken, but is based on amended institutions. Both Habraken and I present the distinction between support and infill first of all as the avenue to increasing the say that occupants have.

Section 2 presents a summary of the book *Supports: an Alternative to Mass Housing*. Section 3 recapitulates the distinction between 'support' and 'infill'. Section 4 introduces two other distinctions: owner-occupation as compared to renting and public as compared to private. Section 5 illustrates the ongoing transformation from construction to home furniture for beds, cupboards, kitchen and bathroom equipment, cellars, and interior walls. Some conclusions are formulated in Section 6.

## 2. Supports: an Alternative to Mass Housing

### *Mass housing without the 'natural relationship'*

Habraken (1961) argues that the housing system is in a state of crisis because the power balance has been upset. One player has clearly been eliminated from the process in the current system of mass housing: the individual occupant is no longer allowed to influence the process or the outcome of the housing development. The current mass housing process reflects this elimination of the individual. Occupants are not housing themselves, but are housed by others. People cannot express their preferences. What happens in practice is "putting people into barracks" (Habraken, 1961: 23). But it is human activity, the activity of housing, which determines the character of the housing unit and the housing environment. Habraken (1961: 29) defines the relationship between people and their housing environment as the 'natural relationship', which he considers indispensable. "Living is inextricably intertwined with building, with creating a sheltered environment" (Habraken, 1961: 29). In some ancient languages, the word for 'living' is even the same as the word for 'building' (Priemus, 1970). "Living in a dwelling is the most normal thing in the world" (Habraken, 1961: 35). But the practice of mass housing is an expression of 'statistics in stone' with separate blocks for singles, small families, large families, couples, the elderly, the socially handicapped, older couples, and artists. Habraken argues that when occupants' preferences change, they can only adapt their housing situation by moving house. This continuous residential mobility in the system of mass housing is turning people into modern-day nomads.

### *Standardisation of building components*

"The factory does not care what the housing looks like, whether the units are identical or not, as long as the components can be turned out in series large enough to warrant mass production" (Habraken, 1961: 68). Mass housing cannot cater to such demands. Habraken cites the modular construction of kitchen and storage systems as inspiring examples. Habraken argues that dwellings should possess a certain independence. It should be possible to change, refurbish, demolish, and build a dwelling without encroaching on other dwellings: "The dwelling of the natural relationship is the independent dwelling".

### *Support: accommodating independent dwellings*

Habraken assumes that there is a need for high rises in which independent dwellings are built on top of one another. He elaborates on the concept of 'support' as follows: "We need to make constructions which, not being themselves dwellings or buildings, lift the dwelling above the ground. These constructions will accommodate independent dwellings in much the same way as a bookcase accommodates books, which can be individually removed and inserted. They will take over the task of the ground floor in supporting the dwellings; they will form building sites in the air and be as permanent as streets. Habraken calls these constructions *supports*, on the basis of their function and without wanting to know what they look like. Hence, every construction that enables us to build dwellings that can lead an independent life and do not stand on the ground is a support. "A support is a construction which can accommodate several (prefabricated) dwellings, which can each be built, refurbished or demolished independently of the others".

### *Supports: urban infrastructures in the air*

A support is a shell: “It falls into the same category as bridges, viaducts, canals, and streets: constructions that are closely connected with the ground and which, being subject to all manner of weather conditions, tend to be relatively sluggish and laborious. But they can also withstand the ravages of time.” Habraken takes the view that supports should be financed by the government as part of the public investment policy in urban development, while the dwellings would be manufactured in the private sector: “The support is, basically speaking, the building site. Preparing a building site in the air is as much a government task as preparing a building site on the ground”. Habraken therefore sees supports solely as a high-rise facility, even though 71% of the housing stock in the densely populated Netherlands consists of single-family homes. Habraken’s discourse has an urban bias and leaves barely any scope for villages. He sees the three-dimensional city as an enticing prospect via the creation of supports.

#### *Supports: meandering through urban landscapes*

Habraken does not neglect his vocation as an architect and suggests that the supports meander in long ribbon-like formations through the landscape. Supports presuppose a totally unique urban layout: “In the support city urban planning itself gains a further dimension. A support is not a skeleton for a building, but all supports together form the skeleton for a city, a living and complex organism”. The support belongs to the domain of the urban planners. It places people at the centre of the city. Supports are the exclusive terrain of pedestrians, who walk not only on the ground but also above the ground along walkways, corridors and footbridges. Habraken also envisages opportunities for constructing buildings on poles and keeping the ground as free as possible.

#### *Home-ownership and industrial design*

Habraken assumes that residents will have a say in the development of urban areas outside their homes. Members of the public and the government might even form a ‘new relationship’.

He further contends that the introduction of independent dwellings in a support will make the prospect of home-ownership more enticing. The industry in support and prefabricated dwellings will feed the desire to own property. The role of the architect will gradually change and become more akin to that of industrial designer. We can conclude that Habraken (1961) presents a revolutionary new division of responsibilities in the development and management of housing; as a designer he also shows specific architectural forms and urban visions.

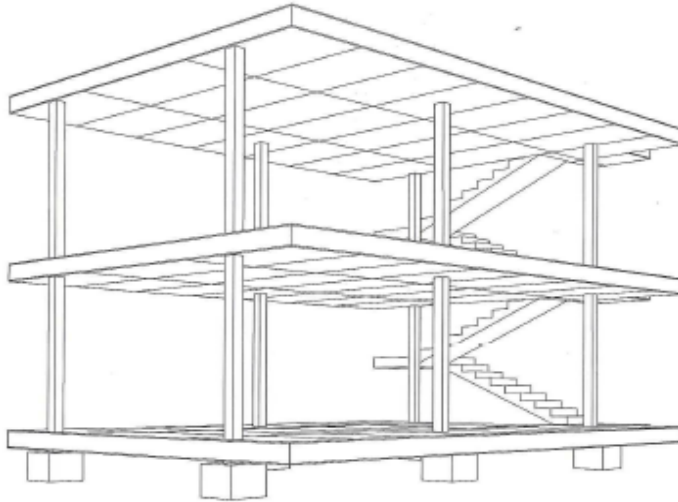
### **3. Support and infill**

Habraken (1961) has presented a revolutionary view on housing. He suggests that a neutral design is necessary to allow for flexibility and adaptability of the housing units, so that people can change the way they use their home. A neutral support and flexible housing units could combine stability and dynamics, the two basic characteristics of housing processes (SAR, 1966). In this train of thought the distinction between structure and infill is not defined by technological criteria, but by considerations of *use*. Structure incorporates everything that serves communal use. Infill incorporates everything that serves individual use.

The support-infill combination was not entirely new.

Le Corbusier tried to make these two elements independent in 1914 in his *Plan Maisons Domino*, which consisted of concrete plates and pillars which could be used in combination with infill to design many different layouts (see Figure 1). Six years later, in 1920, Le Corbusier made a second attempt when he launched *Les Maisons en serie Citroën, pour ne pas dire Citroën*, in which he discussed the two separate elements in greater detail. The idea of a difference in life span became part of his vision of dwellings. The elements that made up the support construction and the interior layout were both manufactured in an industrial context.

#### **Fig. 1 Plan Maison Domino (1914)**



Under normal circumstances, the occupants will continue the ‘building activities’ by laying carpets, plastering walls, hanging blinds and curtains, fitting lights, and installing equipment – all things that we generally rank under *interior layout*.

I identified three main groups (Priemus, 1969: 114-115):

1. *support structure*: The part of the construction that transmits the force generated by pressure and its own weight to the ground (supporting walls, anchors, floors, foundations).
2. *infill and installation*: All other work that is carried out prior to delivery, and which cannot be removed, shifted, or altered without professional knowledge. Infill covers the interior architecture (inside walls, non-load-bearing facade elements, built-in cupboards); installation covers plumbing and drainage, energy supply, ventilation, heating, waste disposal, vertical transport, lighting, lightning protection, aerial systems, glass fibre networks, etc.
3. *layout*: Everything that belongs to the living environment and which can be removed, shifted or altered without expert knowledge or skills. When a dwelling is delivered with furniture we say that it comes with a *co-delivered interior*.

According to Habraken, support is financed by the public sector and is aimed primarily at high-rise buildings and at cities. In my vision support is financed by the private sector and is aimed at low-rise as well as high-rise buildings and at rural as well as urban environments. Unlike Habraken, I do not make any suggestions as to shape or form. I certainly do not see support as public terrain for pedestrians.

The question regarding optimal adaptability of the dwelling raises three questions (Priemus, 1970: 115-116):

- Where is the dividing line between support and infill?
- Where is the dividing line between infill and co-delivered interior?
- Where is the dividing line between co-delivered interior and no co-delivered interior?"

The preliminary answer is that a progressive shift takes place from infill as part of the dwelling to home furniture being the property of the occupants, and no longer an integral part of the construction. In general there is no need to co-deliver the interior. The crucial distinction is that between a neutral support and an interior of home furniture, provided by the occupant. Infill as part of the construction can be reduced as much as possible.

#### 4. Owner-occupation and renting; public and private

John Habraken's basic idea was sound and has been followed more and more in the practice of housing development and housing management. However, the proposed scheme of support-infill has some flaws which could be repaired, not to destroy the ideas of John Habraken, but to strengthen them. The first flaw is that John Habraken did not make a distinction between owner-occupation and renting in his vision. This distinction can be observed in housing all over the world. Within renting there is mostly a distinction between social and commercial (or: market) renting. Within owner-occupation the distinction is sometimes made between cooperatives and other forms of collective ownership, and individual owner-occupation. Associations of owner-occupiers can be seen as a combination of individual and collective ownership: the housing units are individually owned, while the collective components (like roofs, elevators, and walkways) are collectively owned. This distinction of tenure is crucial to the allocation of responsibilities and risks, in the development, management and use of housing properties. The distinction between individual and collective decision-making, as it was proposed by John Habraken, has no legal meaning. That is the reason to amend the definitions of support and infill in this paper.

## 5. From construction to home furniture

My basic idea is to transform infill from a piece of the construction to a piece of home furniture owned by the occupant (Priemus, 1993). This type of transformation took place in the 1930s for beds (in the past the bed was a component of the housing construction, in the form of the box bed). When the box bed was forbidden for health reasons there were several Dutch housing associations which rented out iron beds to the tenants because they still considered beds to be part of the housing construction. Priemus (1970: 119) elaborates on this phenomenon:

### *Beds*

In 1855 the Royal Dutch Institute of Engineers (KIVI, 1855: 12) announced that: "under no circumstances can box beds be used for sleeping in. To relieve the residents of the need to provide their own sleeping arrangements, and to encourage cleanliness and prevent vermin, we regard the provision of iron bedsteads in all bedrooms as a necessity" (in translation). At the end of the twentieth century the box bed lost favour, but people still regarded the bed as an integral part of the house. Kruseman (in *Beter Wonen*, 1938: 37) says that, in 1854, the Haagsche Woningbouwvereniging (housing association in The Hague) was actually ahead of its time when it banned box beds and started renting out iron bedsteads. In the 1930s modern steel (often fold-away) beds were provided in many social housing complexes. It was not until later that it was thought better for the occupants to provide their own beds. That was the moment when the bed became a manufactured piece of furniture, totally separate from the building process.

Occupants are happy now to buy beds in shops or second-hand from other occupants.

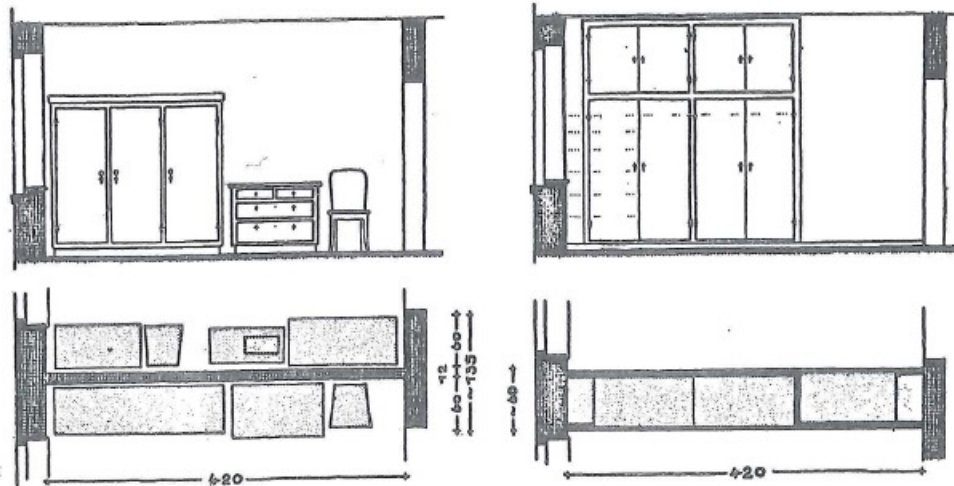
### *Cupboards*

The same has happened and is still happening with cupboards. Cupboards were generally produced as part of the housing construction, often partly in bricks and partly with wooden components.

Beyer (1958: 187) regarded cupboards as part of the construction:

"Built-in storage walls have many merits. Not only do they save the construction of a partition and replace the need for conventional storage furniture, but they give a psychological feeling of greater spaciousness to the room." Tiedemann (1956: 16, 28; see also Weissbach and Mackowsky, 1910: 27, 99) (Figure 2) agrees with this; in particular when the built-in storage are one storey-high.

## Fig. 2 'Unfair' comparison of use of space between built-in cupboards and cupboards as home furniture



Source: Weissbach and Mackowsky, 1910.

(Hole & Attenburrow, 1966: 27 and Rosenmayr, 1957: 411) see built-in cupboards as a hindrance and therefore argue for free-standing cupboards. Van Tijen (1967: 19. see also: Blackshaw, 1951: 25) says, "That is why built-in cupboards should be kept to a minimum in kitchens and other space. Furniture manufacturers are constantly producing new lines in kitchen furniture which existing dwellings must be able to accommodate. They also produce modular furniture that offers countless possibilities for flexible storage along walls. Fold-away work space can provide further opportunities for almost any job or activity (...)" "Only wardrobes, which need to be extra high and deep, can be advantageously combined with wall cupboards" (in translation).

As in the case of beds, the occupants were perfectly able and willing to provide their own cupboards. They could then match their choice with the rest of their furniture and decide on the finishing themselves.

The argument fielded by the Scottish Housing Advisory Committee for providing essential pieces of furniture such as cupboards in dwellings is long outdated (1944: 73): "If local authorities were to provide a furniture supply service on comprehensive lines they would be able to ensure that their tenants procured good quality furniture at reasonable cost and that the payments for such furniture were not an undue burden on the home." If ample space for free-standing cupboards in the home is guaranteed, the next logical step is to stop providing cupboards – whereupon the cupboard wins status as a piece of furniture. Only in cases where large amounts of storage space are needed and in some concrete design dilemmas is it possible to justify built-in cupboards.

#### *Kitchen and bathroom equipment*

We are now witnessing similar developments with the interior of kitchens and kitchen equipment (including ovens, microwaves, freezers, food processors, washing machines and dryers; see Figure 3), and bathroom equipment, including baths, washbasins, and showers. The production of all these components is not located at the construction site. Very often these pieces of furniture are assembled with a large number of components, sourced from many parts of the world (global sourcing). The occupants make their choices based on their functional and aesthetic preferences, the current fashion, and the price. They express their taste in the selection and combination of pieces of home furniture. This is a private matter, mostly without a specific responsibility of the government.

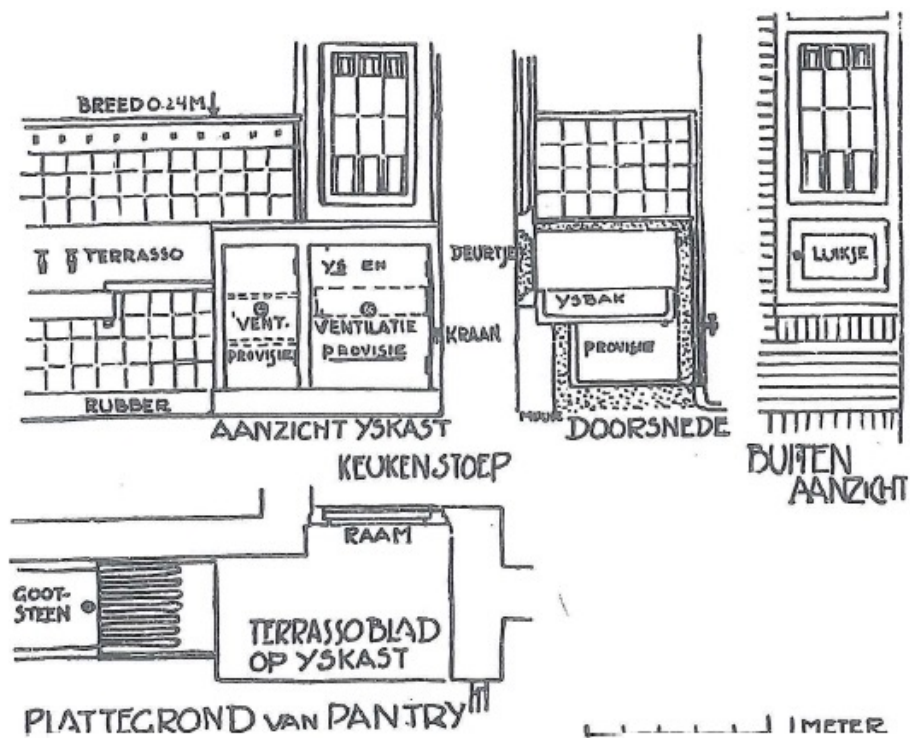
**Fig. 3 Modern kitchen equipment**



### From cellar to ice box

Priemus (1970: 121-122) refers to the transformation from cellar to ice box: “One absolutely crucial facility in a single-family home – far more important than now – was the *cellar*, which was part of the support structure. The advent of ice boxes, refrigerators, and freezers created new opportunities for keeping food fresh and dispensed with the need for a cellar or a larder. Often, the cellar disappeared and space was created for pieces of kitchen equipment which were not the result of the building process.” We found an excellent example from this transitional phase in Wegerif’s detailed drawing of an ice box (1924: 51-52) in Figure 4.

**Fig. 4 Built-in ice box**



Source: Wegerif, 1924.

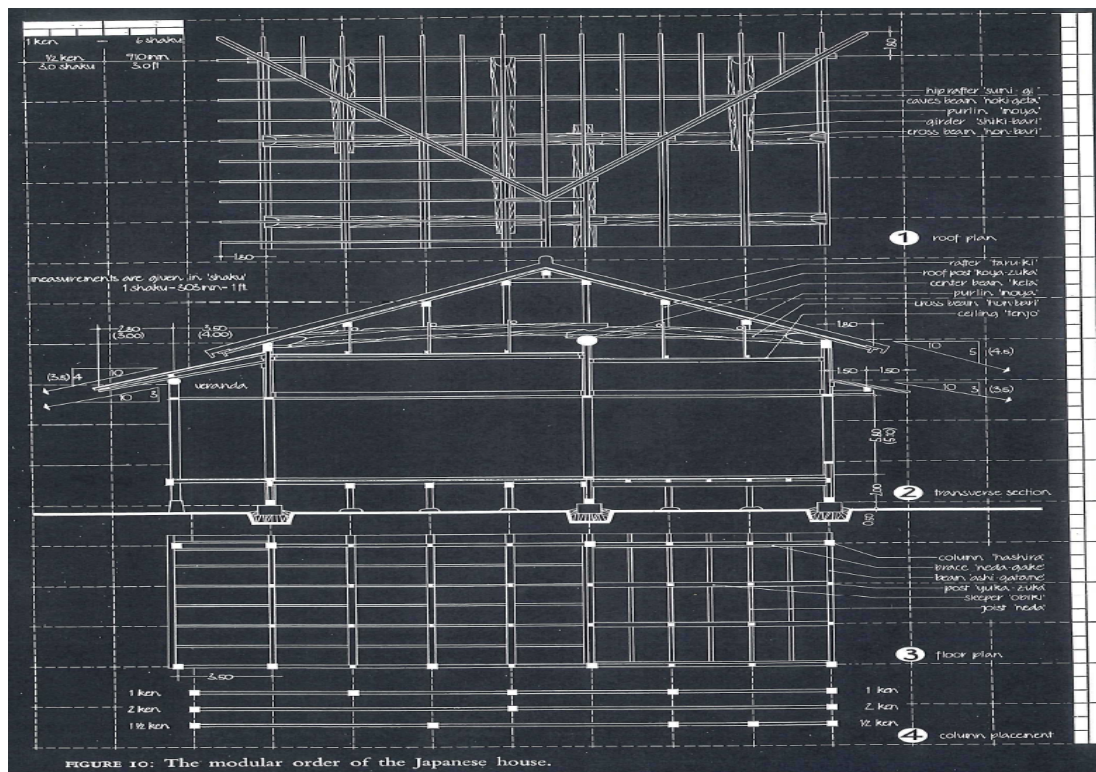


A monstrosity like this demonstrates how dangerous it is to anchor elements that depend on technical and other developments so firmly in the home. Van Tijen (1967: 19) was right to say: "... especially no built-in refrigerators or other equipment. Refrigerators, dishwashers, and washing machine combinations are subject to rapid technological developments and should be easy to replace when they are out of date" (in translation).

### Interior walls

Traditionally, walls between housing units and some interior walls belong to support, while other interior walls belong to infill. There are no clear guidelines on which walls belong to one or the other. In the Japanese tradition, almost all the interior walls are incorporated in a taut modular coordination, and *tatamis* (serving as seat, bed, walkway, and table) belong to the co-delivered interior (see Figure 5 and 6). The Chinese room dividers may or may not be part of the co-delivered interior. Both housing traditions have never found an inroad in the western world. Probably noise insulation regulations have played a key role in this.

**Fig. 5 Modular order of the Japanese house**



Source: Engel, 1964.

**Fig. 6 Typical forms of translucent Japanese paper panels**

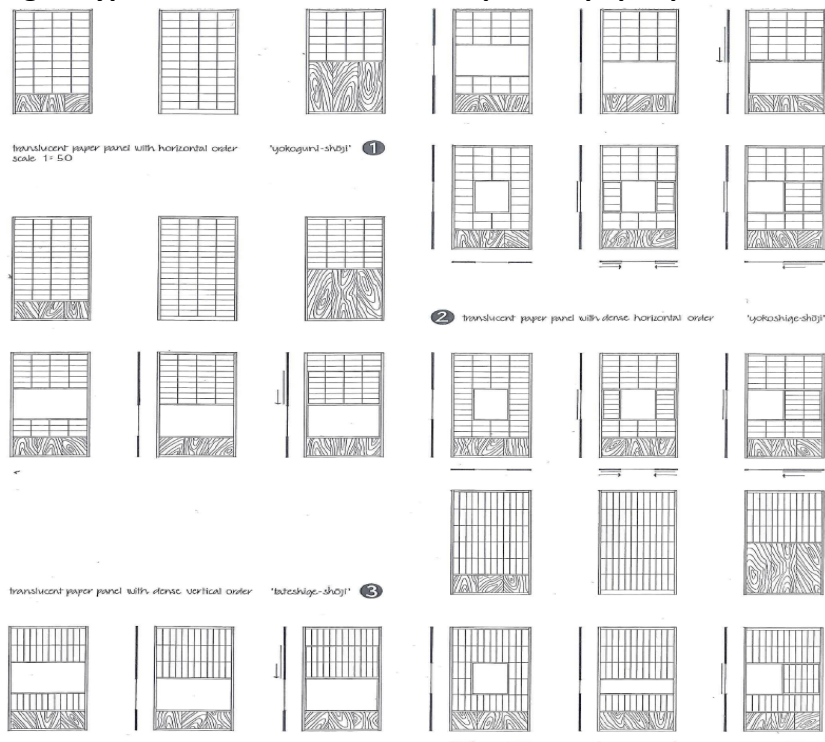


FIGURE 39: Typical forms of translucent paper panels, *shōji*.

Source: Engel, 1964.

Following trends in office design some interior walls can be designed in such a way that they can be added to the construction at a later stage, replaced, and even removed by the occupant. In that case interior walls could also have the status of a piece of home furniture, owned by the occupant.

Inspiration could be provided by the traditional Japanese housing culture with sliding walls and draught screens. This transition would increase the role and responsibility of the occupant and would strengthen housing culture. Habraken and I draw different distinctions between public and private. In my opinion the support is not owned by the municipality, but will always be the ownership of the owner-occupier, the association of homeowners (in the case of homeownership) or the property investor or commercial or social landlord (in the case of rented accommodation). Candidate occupants could play a role in the design and development of support.

## 6. Conclusion

Of course housing design and housing construction have changed dramatically in the world between 1961 and 2015. In the developing parts of the world mass housing has gained ground. Often the recommendations of John Habraken were neglected. But in the advanced economics we observe a spectacular development of modular coordination, computer aided design, housing equipment and modular housing furniture. Supports are more and more discovered both in new housing and in the restructuring of the housing stock. The influence of the occupants is still weak everywhere. The distinction between support and infill needs to be related to strategies to increase the influence that occupants have in designing, developing or redeveloping, and maintaining housing units and the housing environment. The support is not a public investment but an investment by a real estate investor, development company, or housing association. The support is owned by a landlord, an owner-occupier, or an association of homeowners. It is crucial to make a distinction between owner-occupation and renting. There needs to be a structural transformation from infill as a piece of construction to infill as home furniture. The input of occupants can be strengthened through a number of means, including a thoughtful separation of support and infill and improved flexibility of housing units as a result of extra space and neutrality of the support. All these strategies can intensify the relationship between

occupant and dwelling (defined as 'the natural relationship' by John Habraken). The stronger this relationship is, the higher the satisfaction of occupants with their housing situation.

## Acknowledgement

I thank two reviewers for their useful comments and suggestions.

## References

Beter Wonen, 1938, **Gedenkboek, gewijd aan het werk der woningbouwverenigingen in Nederland**, uitgegeven ter gelegenheid van het 25-jarig bestaan van den Nationale Woningraad, Algemeen en Bond van Woningbouwverenigingen 1913-1938, [Memory book on the occasion of the 25th birthday of the Nationale Woningraad, 1913-1938, about the work of the Dutch housing associations], Amsterdam (NWR).

Beyer, G.H., 1958, **Housing, a factual analysis**, New York.

Blackshaw, M.B.A., 1951, **A comparative study of the utilisation of space in current types of dwellings in 14 European countries (1948-1949)**, Genève.

Engel, Heinrich, 1964, **The Japanese house. A tradition for contemporary architecture**, Rutland VE/Tokyo (Charles E. Tuttle).

Habraken, N.J., 1961, **De dragers en de mensen. Het einde van de massawoningbouw** [Support: an alternative for mass housing], Amsterdam (Scheltema & Holkema) (in Dutch).

Hole, W.V. and J.J. Attenburrow, 1966, **Houses and people**, London.

KIVI, 1855, **Verslag aan den koning over de vereischten en inrigting van arbeiderswoningen**, [Report to the King about the requirements and the lay-out of dwellings for working people], The Hague (KIVI).

Priemus, H., 1970, **Wonen-kreativiteit en aanpassing**, [Housing creativity and adaptation], Amsterdam/Parijs (Mouton).

Priemus, H., 1981, Geef mensen meer te vertellen over hun woning en omgeving, [Give people more influence over their dwelling and environment], **Bouw**, **36** (25), 12 December: 6-8.

Priemus, H., 1993, Van inbouwpakket naar woninginrichting, flexibel bouwen: ontwerp- en beheersvraagstuk, [From infill to home furniture, flexible building: Challenge of design and management], **Bouw**, **48** (14/15): 16-17.

Rosenmayr, L., 1957, Neue Forschungen über Wohnbedürfnisse, **Aufbau**, **12**: 410-414.

Scottish Housing Advisory Committee, 1944, **Planning our new homes**, Edinburgh (Scottish Housing).

Stichting Architecten Research (SAR), 1966, **Woonkwaliteit en SAR-methodiek** [Housing quality and SAR methodology], Internal publication nr. 15, Rijswijk ZH (SAR), November 21.

Tiedemann, L., 1956, **Menschlich wohnen. Lebensvorgänge als Grundlage zur Wohnungsplanung**, Bonn.

Van Tijen, W., 1967, unpublished study.

Wegerif, A.H., 1924, **Van bouwen en wonen**, [On constructing and living], Rotterdam.

Weissbach, K. and W. Mackowsky, 1910, **Das Arbeiterwohnhaus**, Berlin.