AN OPEN BUILDING STRATEGY FOR ACHIEVING DWELLING UNIT AUTONOMY IN MULTI-UNIT HOUSING

Stephen Kendall

Abstract

In the next 20 years, increasing numbers of American families will choose to live in urban areas for reasons such as proximity to work and cultural amenities. In light of that trend, this article reported on a model of a service-oriented building industry to help produce housing suited to individual household preferences in environments where the detached house is not possible. It specifically addressed the critical need to achieve autonomy of the individual dwelling in mulit-unit buildings to reduce social and technical conflict under conditions of change and distributed control.

Introduction

Multi-unit housing (elevator, walk-up, and row house types) is becoming an attractive alternative to detached housing sprawl in many regions of the U.S. Given this trend, the work on which this article is based has focused on rethinking the whole building process in housing with the goal of giving greater autonomy to the individual unit in multi-unit buildings. For that to be accomplished, physical and organizational entanglement (characteristics of multi-unit buildings) need to be overcome. The examples reported here demonstrate how an open building strategy can accomplish this goal.

It is well known that condominium and other multiple occupancy residential projects are more prone to legal conflict and difficult remodeling, renovation, and upgrade processes than any other residential occupancy type (Butt, 1993). This can be attributed largely to physical entanglement of the common elements, the limited common elements, and the individual elements. That is, the physical parts constituting the individual dwelling unit are not unambiguously autonomous.

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Technical and spatial decisions about one unit (having to do with resident preferences, income, technical upgrades, etc.) are not clearly decoupled from decisions involving other dwelling units, producing conflict and overlapping claims.

Buildings are increasingly complex, and social change is accelerating. Given these circumstances, it is important to design and construct multi-unit buildings in new ways. Chief among the goals are to avoid conflict and to reduce dependencies among and between parties and the parts of the building they control, and thus achieve maximum autonomy or freedom of decisions for each individual unit. The point of fundamental importance is to make a clear distinction between the shared parts and the individual parts (Habraken, 2000/1972). In large projects, this distinction would help make living in multi-unit buildings more attractive to households who now enjoy the relative autonomy of living in detached houses in typical suburban developments, which traditionally give the most freedom of any housing option.

The approach reported in this article—given the name *residential open building* in international theory and practice (Kendall & Teicher, 1999)—can be one part of the effort to make urban living attractive to a variety of households, thus contributing to the bundle of strategies serving as an antidote to sprawl. This approach can also be seen as a tool for achieving the goal of income mixing and community stability over time in a given building. That is, instead of designing housing according to household income (often assuming fixed incomes over time), an open building approach enables a more dynamic balance between physical assets and changing household income and status over time. It helps to avoid the trap of real estate development and building practices based on (income) class. It is also a tool in adjusting our practices from a scrap-and-build approach in urban development to a sustainable-stock approach.

Historical Overemphasis on Technology

The detached house has long been the preferred type in many regions, in large measure because it affords independence and freedom of action. Recognition of the importance of autonomy of the individual unit in multi-family buildings is not new. Yet the overemphasis on technical solutions has, paradoxically, doomed efforts to accomplish this dream. LeCorbusier's provocative diagrams first captured this idea in his Unite projects (Girsberger, 1967). Archigram's plug-in city showed dwellings moved from one place to another with cranes (Cook, 1967). Operation Breakthrough had the Townland scheme (Bender, 1973). The Metabolists in Japan worked on this idea of manufactured dwelling pods (Ross, 1978). Herbert (1984) told the story of the failure of brilliant architects, Gropius and Wachsmann, to harness manufacturing in the service of housing. Site later pictured "vertical real estate" (*Site*, 1989).

The lessons from these efforts should include several points that may be self-evident to some but have been largely absent in much theorizing and academic discourse: (a) housing is not only about bricks and mortar, (b) housing is not only about professionals given that users are a vital part of the housing process, (c) housing must fit into its local fabric, and (d) housing is about processes that extend over time. The propensity of architects and others to focus on technical fixes seems shortsighted in light of these lessons.

Open Building: Balancing Technology and Control

An international network of practitioners and researchers (CIB Commission W104 Open Building Implementation) has studied these phenomena and, based on 30 years of practical developments, has come to understand a number of related ideas about the making of the built environment. For instance:

- The idea of distinct levels of intervention in the built environment, such as those represented by support and infill, or by urban design and architecture, as indicated in Figure 1.
- The idea that users/inhabitants may make design decisions.
- The idea that, more generally, designing is a process characterized by distributed responsibility.
- The idea that the interface between technical systems allows the replacement of one system with another performing the same function, as with different fit-out systems applied in a same-base building.

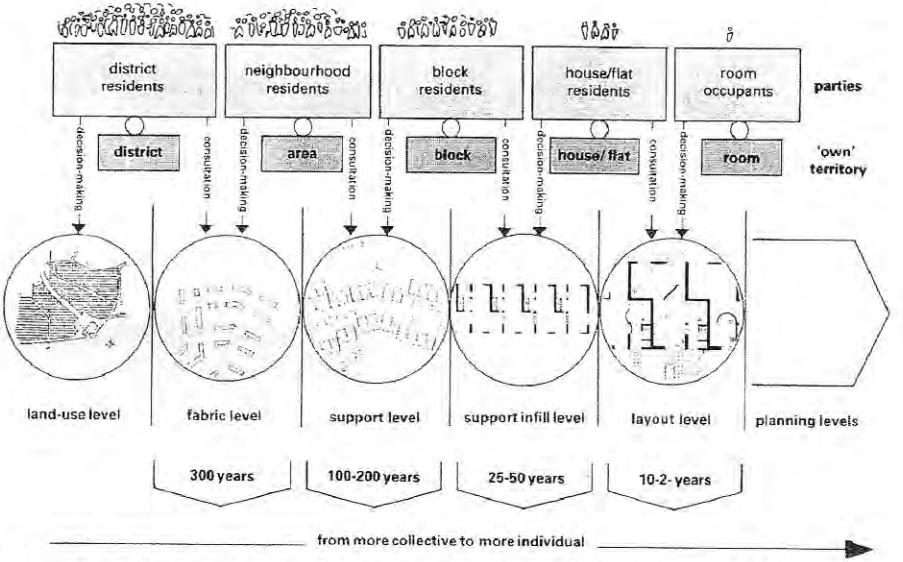
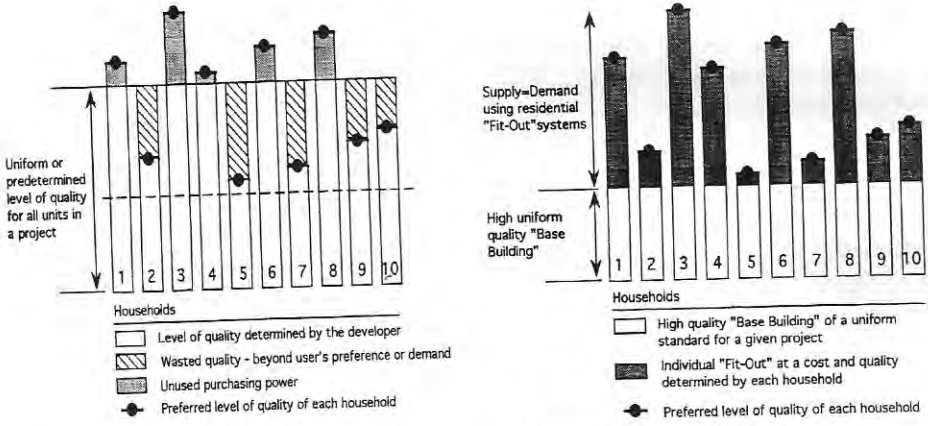


Figure 1. Principle of Levels, from Open Building Research Group, Technical University Delft (1990)

- The idea that the built environment is in constant transformation and change must be recognized and understood.
- The idea that the built environment is the product of an ongoing, never-ending design process in which environment transforms part by part.

Those who subscribe to an open building approach seek to formulate theories about the built environment seen in this dynamic way and to develop methods of design and building construction that are compatible with it (Habraken, 2002). Two diagrams, shown in Figure 2, capture the basic principle of the distinction between a shared part of a building with a long life and a more individualized part. These diagrams also illustrate the idea of diversity of demand in a given building and how such a building can meet diversity effectively.



A Conventional Project:
Mismatch Between Supply and Demand

An Open Building Project:
Matching Supply and Demand Exactly

Figure 2. Matching Supply and Demand (Dekker & Kendall, 1994)

Cases of Open Building

Hundreds of buildings containing thousands of dwelling units that are explicitly and intentionally designed and constructed on open building principles have been realized in the past 30 years in The Netherlands, France, Switzerland, Finland, Japan, the U. S., and China (Kendall & Teicher, 1999). Every year more projects come to light around the world. Many have been realized without any knowledge that they are developments toward open building. This fact is important since their implementation is the result not of imported ideas nor idealogy, but of local necessity. Following are descriptions of four diverse projects, three from The Netherlands and one from Japan, each showing the basic principles of residential open building.

Papendrecht, Molenvliet, The Netherlands, 1977

Figure 3. Scenes of a Courtyard and Home Interior of Molenvliet Project
(Left photo by S. Kendall; right photo by K. Minami)

The winner of a competition for 2,800 dwellings at a density of 30 units/ha (1 ha = 100 acres) is shown in Figure 3. This project won on the combined merits of its urban design, architecture, and participatory process. The project's 124 dwellings surround courtyards in two- to four-story blocks. The base building (the structure, roof, main utility systems, etc.) consists of a highly uniform concrete framework of walls and slabs, with regularly placed openings in the slabs for vertical mechanical chases and stairs. The design of the base building allows for a wide variety in unit sizes and floor plans. A prefabricated wooden facade kit was also used. Specific characteristics of the facade (e.g., the arrangement of doors and windows and the color of panels) were decided by individual occupants and have changed over the years as have interior layouts.

The fit-out, or infill (the parts and spaces decided for each individual dwelling unit), was determined after dwelling units of required floor area were laid out, and building "demising walls" (a term familiar in the U.S. office market, meaning the fire and legal separating walls between adjacent tenant spaces) separating them were erected. The fit-out includes interior partitions, doors and trim, bathroom cabinets and fixtures, kitchen cabinets, and sanitary equipment, as well as electrical, piping, and mechanical systems for heating for each unit.

The project includes many traditional elements of Dutch urban design and housing: pitched roofs, wooden windows, a traditional color palette, "Dutch" doors into courtyards, and mixed uses. Other uses include a doctor's office, small shops, and commercial offices. Recently a team of Japanese researchers conducted a post-occupancy survey and found that the project remains in excellent condition (Minami, 2001).

Split Hendrick Nord, Amsterdam, The Netherlands, 1996

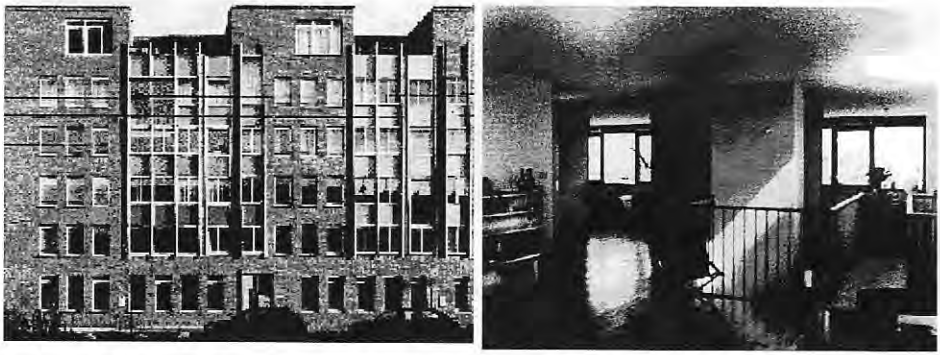


Figure 4. Street Facade and Dwelling Unit Interior of the Split Hendrick Nord Project (Photos by S. Kendall)

Within the older sections of Amsterdam, there is often no possibility to move to better accommodations if a family wants to stay in its neighborhood to maintain social networks. This situation led a number of families to organize a process, the result of which is this building of 28 apartments (Figure 4). The building has 16 government-subsidized units and 12 free-sector units. The design process was organized in two phases. The group of families worked with the architect to design the building, leaving the layout and details of the individual units to be decided by each individual family. In the second stage, apartments were assigned and individual preferences discussed. No two dwellings are alike.

Since the building was constructed in 1996, several households have altered their unit interiors. This project was one of the early examples under the new government policy of stimulating builders to build for the market and was recently recognized in a national awards program. Importantly, the architects were not aware of the worldwide open building movement and literature, but solved problems as they found them in concert with the user group.

Wenswonen, Zaltbommel, The Netherlands, 2001

This project of 38 townhouse dwellings has two opposing rows of units facing a residential park. Each unit has two or three floors. The floor plans, facades, and extensions can be designed by the residents using the Wenswonen (Desirable Living) concept. The project uses a systematic base building design and construction process, with a combination of factory production and on-site construction. The goal is to provide capacity in several respects. To assist home buyers, a simple user interface software was developed using libraries of elements from which buyers can "compose" their homes (see Figure 5).

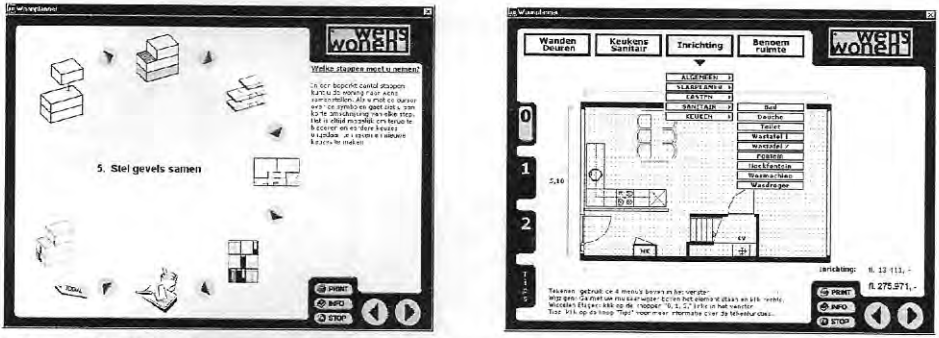


Figure 5. Two Screens of the Wenswonen Customer Decision Support Software (Permission by IBC Vastgoed, The Netherlands)

For each townhouse, users can choose a small dwelling or can extend it with the addition of a third floor or a rear extension (Figure 6). Following this decision, floor plans are designed. Because the base building electrical, plumbing, and ventilation systems have been carefully designed with multiple points of attachment, buyers can select a variety of positions for bathrooms and kitchens. Following these decisions, further choices are available for style of cabinets, finishes, and other details.

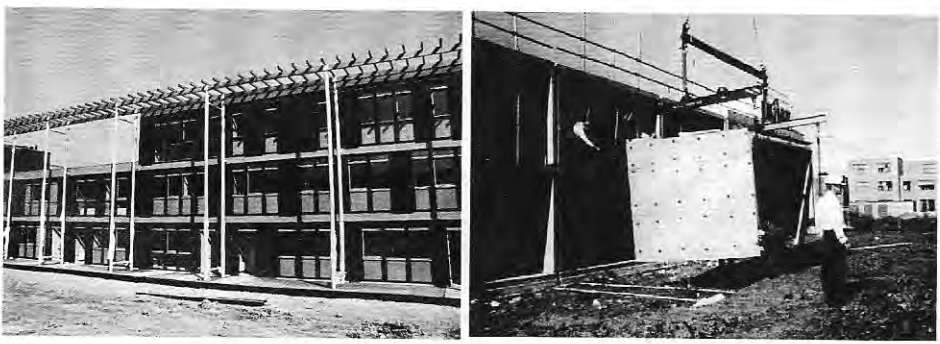


Figure 6. Front Facade and Optional Rear Add-on Space of the Wenswonen Project (Photos by S. Kendall)

Based on a view of social responsibility balanced with the demands of corporate profitability, this project (not government subsidized but operating in the market) is an attempt to find solutions to the issues that emerge in a changing society. A purchasers' association (homeowners' association) has been formed for the project, in which each homeowner becomes a member at the time of purchase of the home. The purchasers' association is responsible for, among other things, the maintenance of the pergola, the plantings, the paintwork of the exterior, the sun blinds, and the public circulation and parking area (Wenswonen, 2000). Other projects are planned.

Next 21, Osaka, Japan, 1994

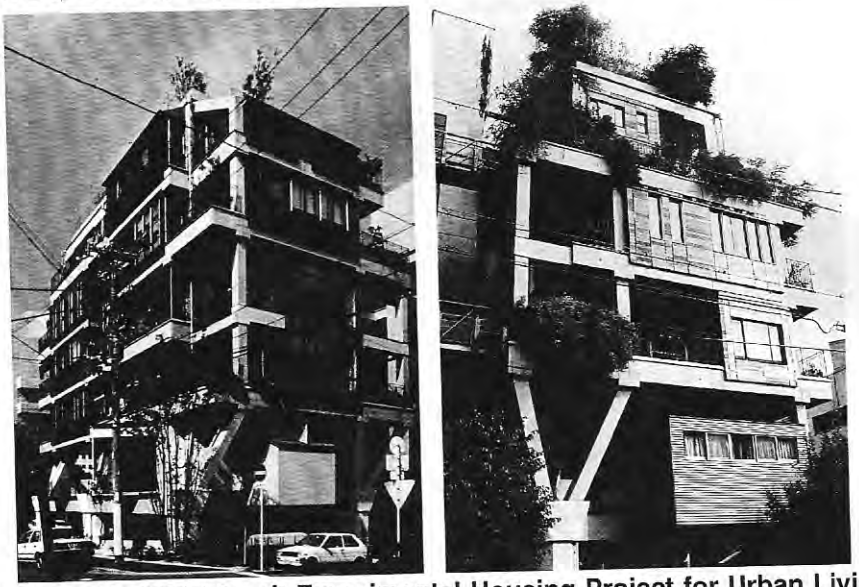


Figure 7. Next 21 18-unit Experimental Housing Project for Urban Living in Japan (Photos by S. Kendall)

Next 21 is an experimental 18-unit housing project, built in anticipation of the more comfortable life urban households will characteristically enjoy in the 21st century in Japan. Conceived by Osaka Gas in collaboration with the Next 21 planning team, the project includes experiments in new energy- and waste- handling equipment, new changeable facade systems, and dimensional coordination agreements used to organize the high degree of flexibility available in unit size and layout planning.

The base building, or skeleton, was designed by one team and the facade system by another. Thirteen different architects designed the 18 units, each using the facade "kit-of-parts" in respect to the highly individualized interior layouts and user preferences. Common piping is routed below the "streets in the air," and the mechanical systems within the dwelling units are hidden below the raised floor. Since the building was completed in 1994, several units have been completely reconfigured, including their facades (Kendall & Teicher, 1999).

Issues of Concern

Organizational Issues

These case studies are indicative of the importance of the organizational dimension of housing processes, demonstrating that housing is not only a technical matter but also involves agreements and distribution of responsibility among a variety of parties. Legal issues are relevant here (Barton, 2003) and

include problems familiar in condominiums that are, as noted above, technically and legally contentious (Butt, 1993).

A number of housing experiments that touch on similar issues are notable. Cohousing, a popular organizational housing alternative pioneered in Denmark and now relatively widespread in the U.S., demonstrates the value in certain circumstances of this hybrid condominium form of ownership, where the distinction between common and separate, individual territories is being rethought. In The Netherlands, the BuyRent scheme has come into its own, promoted by Het Oosten, a large development company in Amsterdam. There, a developer makes available for rent an empty space in a building. This space is then filled by an occupant who purchases the fit-out needed to inhabit the space (Kendall & Teicher, 1999). In Japan, a complex formula to solve the organizational dilemma of insufficient land being available for residential development was developed in the Tsukuba Method. It addressed a number of problems related to the right-to-use laws concerned with land development, land ownership, and household control (Kendall & Teicher, 1999).

In all cases, the basic question is: What should be decided by the higher level (the group) and what should be decided by the individual? This is the question Habraken framed in 1960 (Habraken, 2000/1972) and which open building seeks to address in various ways today.

Technical Issues

While organizational issues—dealing with distributed control—are key, technical issues nonetheless present significant hurdles. One dimension of the technical issues that has been a focus of detailed studies deals with new thinking about routing the cabling, plumbing, and ductwork within multi-family buildings to avoid territorial and technical entraglement. Another new focus is on nascent developments in the building industry called *kitting* or *product bundling* (Kendall, 2003). Shifts from a product focus to a service focus in the building industry have also been studied (Yashiro, 2002), as well as research in work structuring (Tsao, Tommelein, Swanlund, & Howell, 2000) and lean supply chains (Ballard & Howell, 1995). In addition, studies are being conducted on alternatives in supply channel management, as exemplified in the Matura Infill System brought to market in The Netherlands 10 years ago but no longer in use (Kendall & Teicher, 1999).

Conclusions

There are two powerful motives in the developments discussed here. One is to reintroduce the individual into housing processes too often dominated by corporate or bureaucratic goals, in which the individual is excluded on the mistaken assumption that variety is necessarily inefficient. The other motive is to harness the full capacity of industrial production in support of better and more agile housing environments and individual decision making focused on "the act of dwelling" (Habraken, 2000/

1972). Doing so requires that more of the "value-added" in housing processes and products be decoupled from the part of the house known as "real property." Real estate is deeply political and is related to local geotechnical and climatic conditions and to the local sense of place and urban design, as it should be. But an increasingly large part of the whole house can be safely uncoupled from these constraints. This formulation is the open building approach: distinguishing the decisions and systems made by and for the public from the decisions and products made in respect to individual occupants' preferences. This potentially means two distinct markets and two distinct processes. A parallel is found in highways and the vehicles using them, the former being public, shared, and with the capacity to accommodate a range of vehicles, and the later being the private investment using the shared system and obeying its rules.

Studies on the implementation of the open building approach in the U.S. indicate that the design knowledge needed to provide architectural services in tune with accommodation capacity is not difficult to learn. We are teaching graduate students and are demonstrating the principles in cooperation with developers, architects, and engineering consultants. Developers find value in the decision deferment benefits of distinguishing a base building from its more variable fit-out. Contractors understand issues of pricing and logistics. Engineering consultants can design mechanical, electrical, and plumbing systems in line with the principles of open building.

The Achilles' heel facing the industry is the absence of hybird business organizations who can manage the bundling of skills related to kitting or product bundling in the service of just-in-time residential fit-out. To implement open building we need to organize multi-skilled teams of trained installers who do not organize their work along the traditional lines of carpenter, electrician, plumber, sheet rock installer, tile setter, etc. We recognize, as the automobile industry has learned in the production of the Saturn, that fit-out installation teams are now needed. This, in addition, to new hybrid businesses that can offer single-source responsibility for turn-key, just-in-time interior fit-out, with the associated adjustments to the regulatory review process, may constitute one of several needed paradign shifts for better housing. Open building is, perhaps, one of the next frontiers in the reorganization of the decision process for a more agile, sustainable 21st century housing stock in tune with new social and technical realities.

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