

## The Polyvalent Dwelling



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### Introduction

The word 'polyvalent' has been known for years in the context of the *multi-purpose hall* or *salle polyvalente*, the kind of building that is to be found in every French village or small town, which can be used for weddings and parties, for musical and theatrical performances and as a cinema. The word was introduced into the architectural debate by Hertzberger, some of whose ideas on polyvalence can be seen in the Diagoon houses he designed for Delft (1967-71). Here too polyvalence means that the building can be used in different ways without adjustment to the way it is built. There is a difference, however: the various uses of a *salle polyvalente* take place consecutively, but a dwelling must be able to provide space for all the different activities which it is capable of accommodating to take place at the same time. Polyvalence in the context of housing relates primarily to the interchangeability of activities between different rooms.

### Palladio etc.

Until the 1920s people built homes with a relatively high degree of interchangeability in the use of space. It could be said that homes always used to be polyvalent to some extent. Rooms derived their meaning more from their status than from any precise definition of their function. If we look at the ground plan of the *piano nobile* of Palladio's Villa Rotonda we see large and small rooms alternating, rooms that by virtue of their decoration are all equally prestigious. You cannot tell from the plan what activities are supposed to take place where. In practice the use was defined by the occupant's preferences. A room was furnished as a bedroom or living area based on whatever was convenient, and this could change with the season or mood. Nor did the presence of a bed necessarily rule out using a room for the receptions that took place regularly at the villa. The nineteenth-century bourgeois house is also made up of a series of large and small rooms whose dimensions do not necessarily define their functions. Their siting in relation to service areas such as the kitchen and bathroom, of course, betrays what they are intended for: the dining room is adjacent to the kitchen and connected to it by a serving hatch, and the parental bedroom is next to the bathroom, to which it has direct access by way of a door.

### Determinism or changeability?

At the beginning of the twentieth century architects seized upon the problem of providing homes for the working classes. The urbanization that had taken place in the nineteenth century had produced rapidly growing world cities with inexpensive housing. The housing developments built there purely for profit were notorious for their poor hygiene and cramped conditions. This was the first time that progressive architects took on building homes for the masses as their responsibility. Neither the various types of nineteenth-century workers' dwellings nor the houses of the bourgeoisie provided the basis for a good

solution to this problem. The new homes for the working classes had to be developed from scratch—and on a scientific basis.

Time and motion study was the right tool for this: in the Netherlands, for example, Willem van Tijen analysed the activities that take place in the home. He recorded home life in terms of dimensions and motion diagrams (Tijen, 1966, p. 44). In Germany Grete Schütte-Lihotzky similarly developed the Frankfurt Kitchen, based on ergonomic studies. After World War II this research led to such things as the *Functional Principles of Dwellings* (Bouwcentrum, 1958) and the 'Regulations and Tips' (MVRO, 1965) in the Netherlands. The latter document, with which every subsidized Dutch home had to comply during that period, provided the general specifications for the homes built as part of the post-war reconstruction programme.

The ergonomic studies, and above all the way they were translated into building regulations for subsidized housing, provide a snapshot of the typical post-war family. When building many of the homes for post-war reconstruction these requirements were for a long time set in reinforced concrete. The dimensions complied with the minimum sizes laid down in the building regulations. The space is squashed in between a large pipe duct and a reinforced concrete load-bearing wall, and thus unchangeable.

As set out in *Frame and Generic Space* (Leupen, 2006, p. 18), we are faced with the following contradiction in terms: the more precisely we are able to decide what requirements a dwelling should meet at the start of its life, the greater the likelihood of a discrepancy arising between the dwelling and its future use. The more precisely architects were able to define the measurable aspects of living and convert them into a design, the more the design neglected the uncountable and unmeasurable aspects. Instead of freedom of design, ergonomic studies brought determinism, leading to a deterministic functionalism. Hertzberger says of this type of functionalism: "if there was anything to which these concepts were not resistant, it was time" (Hertzberger, 1991, p. 146). Later on in the same book Hertzberger proffers a solution.

*"Flexibility therefore represents the set of all unsuitable solutions to a problem. On these grounds a system which is kept flexible for the sake of the changing objects that are to be accommodated within that system would indeed yield the most neutral solution to specific problems, but never the best, the most appropriate solution.*

*The only constructive approach to a situation that is subject to change is a form that starts out from this changefulness as a permanent - that is, essentially a static - given factor: a form which is polyvalent. In other words, a form that can be put to different uses without having to undergo changes itself, so that a minimal flexibility can still produce a optimal solution." (Hertzberger 1991, pp. 146-7).*

### **Six basic activities**

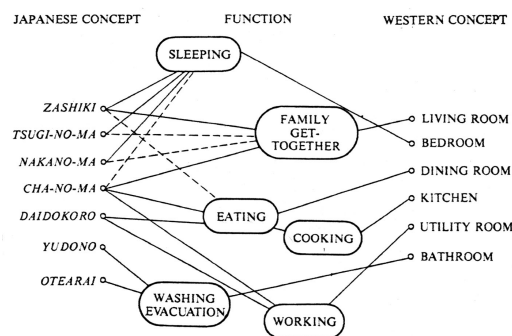
If we are to gain a better understanding of polyvalence, we need to know about the activities that a home generally needs to accommodate, since it is these activities that need to be able to change places in order for it to be polyvalent, as I argued in the Introduction. As a general rule, all living, irrespective of culture or degree of wealth, can be reduced to six basic activities. The differences between cultures, stages of development or degrees of wealth can be seen in the relationships between these basic activities and how they are carried out. As regards the latter, the nature of the objects required (furniture, appliances, crockery etc.) plays an important role: while one person may cook on a wood fire and another on a six-ring electric cooker, there will be cooking taking place.

In the diagram shown here (Fig. 1) Nishihara compares traditional Japanese domestic culture and Western domestic culture in terms of six activities (Nishihara, 1968). In present-day domestic culture we find particular rooms being set aside specifically for particular activities, whereas the traditional Japanese house has a number of multi-purpose rooms which derive their meaning from the objects used there. If the box of tea ceremony paraphernalia is brought out, the room is the tea ceremony room; if the sleeping mats are rolled out and the tea ceremony box put away again the same room becomes a bedroom.

The case we analyzed aims to provide an understanding of the polyvalence of dwellings, and in addition to test the hypothesis that the polyvalence of a dwelling depends on its spatial organization. We can examine the first point by seeing to what extent the six basic activities can be located in different ways.

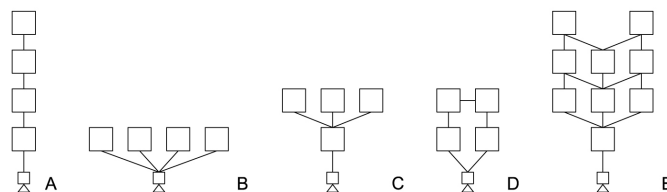
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This was done by applying various programmes to the dwelling. These various situations can be expressed in an activities graph, based on the six basic activities. The analysis identifies the following six basic activities: **Sleeping, Get Together, Eating, Cooking, Bathing and Working.**<sup>i</sup>



### 1. Comparison between the traditional Japanese house and the Western house (Nishihara, 1968)

For four thousand years now dwellings have provided a place about four by four metres in size where people can get together. Only single-person flats and temporary accommodation such as hotels do not have a space of this kind for each unit; this space is often found at a different level, e.g. the foyer of a hotel, or the communal kitchen-diner in a student hostel. In practice this means that a house must at the very least have a room where this four-metre space fits, in other words a room at least 4m x 4m. To test the hypothesis that the polyvalence of a dwelling depends on the pattern of relationships between the living/sleeping areas we show the spatial organization of the dwellings in a graph to permit comparison.<sup>ii</sup> For the case study below two kinds of graph were drawn, one of the spatial system and one of the activities and their interrelations<sup>iii</sup>. A number of activity graphs can be drawn for one and the same spatial system, depending on how polyvalent that system is. As a general rule we can identify five basic models: A Chain, B Star, C Star with central room, D Circle, E Grid (entrance = Square + arrow). These are shown here in graph form (Fig. 2).



### 2. Graph of dwellings. A Chain Model, B Star Model, C Star Model with central room, D Circle Model, E Grid Model (entrance = Square + arrow).

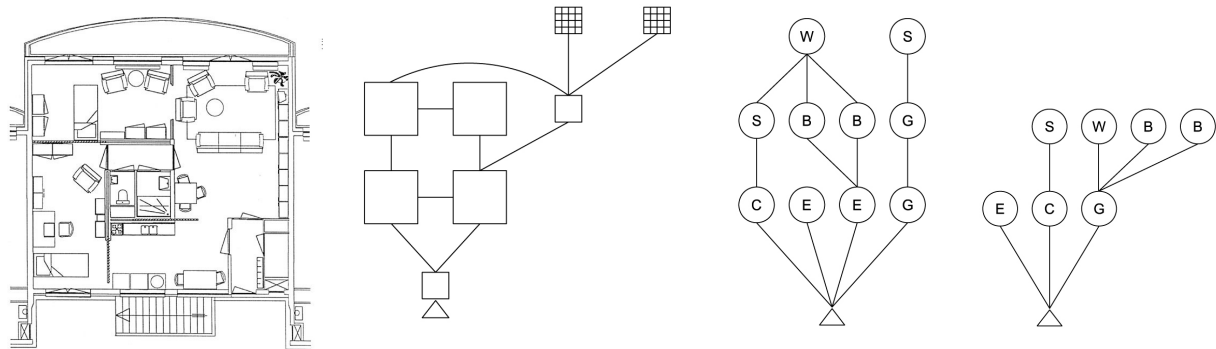
Say there are six basic activities and six rooms where they can be located, and assuming all the rooms are the same size, then all the models of spatial organization (star, circle or chain) are equivalent as regards the number of possible arrangements of activities. Theoretically this is 6 factorial = 720. If we lay down rules on the arrangement of activities, however, (e.g. the activity Get Together must not be accessible only via the activity Sleeping) or on the location of specific activities (the room for Cooking and the room for Bathing are fixed), we find differences between the six basic models in the possible arrangements, or the degree of polyvalence. We find that, when specific conditions are laid down, the star model has a larger number of possible arrangements (i.e. it scores better on polyvalence) than the chain model. This number can be calculated arithmetically, but the essential factor is the conditions laid down, which are culturally determined (we are not used to entering the living room via a bedroom) and differ from one domestic situation to another.

The projects we analyzed have been selected for their unusual spatial organization. All of them are to some extent polyvalent, enabling them to be lived in in various ways. In most cases the polyvalence only applies to some of the rooms, and the place where people get together—the living room—is determined by its place in the organization and its size. For this study we made analysis of the following five projects: MVRDV Ypenburg, Diener and Diener IJ-burg Amsterdam, Pantillon Rotterdam (Student

project<sup>iv</sup>), Duinker and Van der Torre Dapperbuurt Amsterdam, Riegler and Riewe Graz. As an example we show her an abstract of the analysis of de Duinker and Van der Torre project.

### Duinker & Van der Torre

The project designed by the firm of Duinker & Van der Torre for the Dapperbuurt district is a classic of polyvalent housing. Here too doors play an important role in manipulating the spatial system, in this case two-way doors and sliding doors. Large doors and sliding walls can increase polyvalence. Although the sliding doors change the spatial system to some extent the dwelling is still polyvalent, as it can be used in different ways without moving a single nail (Leupen, 2006, p. 191). Duinker & Van der Torre's dwellings have a circle structure (model D), which in principle enables a room to be accessed from two directions. This increases the polyvalence, provided the circle is not too large, as otherwise it turns into a chain structure (each room is only accessible from the next one). To reduce this effect Duinker & Van der Torre have provided a shortcut between two of the rooms in the circle: the centrally situated vestibule that forms the shortcut also provides access to the bathing and toilet facilities. The polyvalence of this dwelling is restricted to a large extent by the fact that only one room is large enough to accommodate the activity Get Together. If the three rooms were all large enough for this purpose the dwelling would be far more polyvalent.



### 3. Duinker & Van der Torre, Dapperbuurt district, Amsterdam, Grafe of the spatial system and two grafes of possible activities

#### Conclusions

In theory every dwelling has the capacity to be used in various ways: a room defined as a bedroom, for instance, can be used equally well as a study or hobby room. Things get more interesting, however, if a dwelling can accommodate different living patterns. A home that can be occupied, without modification, by either a family with two children or three or four singles can be described as highly polyvalent. Clearly there are degrees of polyvalence, a scale of polyvalence. The extent to which a dwelling is polyvalent could be said to depend on the number of possible arrangements or combinations of activities it permits. This number is related to five factors:

1. The size of the rooms
2. The number of large rooms
3. The underlying spatial structure of the dwelling
4. The relationship to rooms with fixed activities such as the bathroom and kitchen
5. The kind of relationships between the rooms

Ad 1. Living/sleeping areas larger than 16m<sup>2</sup> have the potential to accommodate any basic activity.

Ad 2. The more rooms larger than 16m<sup>2</sup>, the more freedom there is to distribute the basic functions among them.

Ad 3. The case study shows that e.g. a star or circle structure has more potential than a chain structure. Rooms that provide access to other rooms with no alternative route are less suitable for basic activities such as sleeping.

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Polyvalence is restricted by having only one large room. In a domestic situation with two adults and one small child, for example, Diener & Diener's design and Duinker & Van der Torre's are equally polyvalent. Systematic research into how a large number of dwellings regarded as more or less polyvalent actually function in practice could increase our understanding of this fascinating phenomenon. Putting knowledge of polyvalent dwellings into practice could result in a new generation of homes with interesting spatial organizations and substantial expectations (sustainability) as regards changing and unpredictable uses.

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i I differ from Nishihara in using *Get Together* rather than *Family Get Together*, as living in a home does not by definition involve a family. Instead of *Washing/Evacuation* I use *Bathing* for short.

ii The method of drawing has been developed from that used in *Decoding Homes and Houses*. (Hanson 1998)

iii Analyses by Esther Stevelink and Sophie Pfeiffer

iv Daniel Pantillon graduated from the *New Concepts for the Dwelling* studio at the Faculty of Architecture, Delft University of Technology.