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REVERSE PLANNING OF THE BUILT ENVIRONMENT

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INTRODUCTION
Planning and constructing the built environment influences the environment over a long period of years. Adaptations are possible after some years or decennia, but the possibilities are limited.

Flexibility of the environment is one of the central ideas in Open Building or Support-Infill. On every level of planning the ideas have to be realised within a structure, which already exists—in the case of rehabilitation—or has been planned—in the case of new-construction. The planning of a support-structure should take into account the planning of different infills now and in the future. It has to be discussed whether—on different levels—the support-structure should be the basis for the planning or the other way around; planning and reverse planning. In the reasoning has to be incorporated different kinds of buildings (residential and non-residential building) and the role of the individual and the collective in the planning procedure. This article discusses the main principles for ‘two ways of planning’ and focuses on the differences between different types of buildings.

DIFFERENT USERS–CHANGE IN DEMAND
The expected frequency of changes in demand for building services determines the support structure of a building and way in which it will be dressed with infill and shell elements. The adaptation of the building is the response to changed demand. This change can concern a change of user, but as well a change in demand of the same user. Change in demand is decisive, not a change of user. This point can be used to make clear the difference between residential buildings and other kinds of buildings.

A factory building and an office building are most of the time designed according to the demand for housing services of a new user. This user will use the building over a well defined period of time. After this period usually the building will be adapted. Even if the same user will continue to use the building—as owner or hirer—after some time he will adapt the building because of changes in his own production process. The changes will concern the parcellation as well. The elements concerned have a relatively short life and usually are relevant to one kind of production process. The change in the using process is decisive for the moment and kind of adaptation.

Dwellings remain unchanged over a relatively long period. For one family the demand for housing services will change every 5 or 10 years, but on an aggregated level the changes will be rather slow. Within a region the moving of families to other dwellings can solve to a large extent the problem of the meeting of supply and demand. A heterogeneous stock of dwellings needs less changes, when the moving of families is considered, then an individual dwelling which has to meet the changing demand of one family. The furnishing and finishing usually has to be planned by the individual family and hardly has to be considered as a part of the building which needs a real design. The other parts need a design which is useful for different succeeding families over a period of 15 or 20 years. The planning is the responsibility of some kind of collective: corporation or local authorities.

It can be stated that the collective is responsible for the use of space. In principle this counts as well for factory buildings as office buildings, but the level of responsibility is different.

CONVERGENT AND DIVERGENT PROCESSES
To solve design problems well, the spatial world has to be structured in a hierarchical systems of elements. In 1961 Habraken introduced the levels ‘support’ and ‘infill’. The parts differ as far as competence of decision is concerned. The idea has especially been elaborated for residential buildings, A more detailed classification can be given in terms of generality.

Boekholt distinguishes six levels: grid, block, cluster, dwelling, room and detail. He stated, that the dynamic concept of building should be a case for non-residential building as well.

Actually a design process is jumping back and forwards from one level to another, because all partial designs on the different levels influence each other. To start a process at the bottom of the hierarchical level system means going from specific to global and gives insights in how the parts influences the whole. This convergent (Bax®) process starts with a great amount of points (possible variants) and ends up in one point. The variants have a very close connection to the specific individual functions for which a new spatial artifact must be designed.
In a divergent process every element of a certain level has to be worked out in variant solutions on a lower level. It's specifying process in which elements become more and more detailed.

In the processes of more general planning or detailed designing the circumstances force the decision makers to combine the two ways of operation. For the combination of the two ways, another description of the levels is necessary.

REVERSE PLANNING

The various components will be replaced at different frequencies. Some components will last a long period and give constructive possibilities for the assembling of components with a short life. The future demand for infill elements determines to a large extent the shape of the supporting elements. Some information on the future is essential. However, it has not to be known in which way future demand will change, but information is needed about the components that probably have to be removed. In fig. 1 is visualised that information about future adaptations is—at least partly—the basis for the planning of a new building.

The higher the frequency of removing elements on a low level, the more often the elements concerned will have to be disconnected from elements on a high level. The future realisation dictate the sequence of realisation of elements in new building.

Consequently the built environment has to be split in levels according to the rehabilitation frequency connected to the life time of the components. From the point of view of the user the furnishing and the finish will have his attention rather often. Less often the parcellation—the creation of the space of one dwelling or working unit—will change. The outside dressing of the support usually will be changed more often than the support structure but less often than the parcellation. Above this we find the infrastructure. To some extent our levels can be compared with those from Boekholt, but our levels can be connected more easily to the use in the present and in the future.

The operating process which uses the building determines the demand for and the shape of at least some infill components. Depending on the process the planning can go up to the support (Fig. 1). No we can see that future information about ‘bottom’ elements determines the bottom-up way of the planning of a building. We should, however, not neglect the importance of the top-down planning as far as the infrastructure is concerned.

TWO OR THREE DIMENSIONAL PLANNING

The planning of an industrial or business area means that an infrastructure has to be created. This can be considered as two-dimensional space planning.

In the case of business area sometimes rules are given for the maximal dimensions of the buildings to be designed. In the case of planning a residential area, the society tries to plan much more. As stated, the support structure and at least the parcellation, but usually an important part of the infill as well, will be used by several succeeding families. As a consequence the housing corporation or the local authorities will plan in such a way that the space can be used as efficiently as possible over a long period. As soon as the individual user or owner plans the support and the parcellation it will not be guaranteed, that the three dimensional space will be used in an optimal way. Especially in circumstances of increasing demand for housing services, in terms of space it will be possible that a re-parcellation of the structure is necessary to get acceptable space at realistic prices. A three dimensional planning in the long run is important.

We can state that in the case of the planning of the using process by the operator of the process, the society will only be responsible for a two-dimensional planning. This is the fact for non-residential processes. In residential processes the planning of the process can be done at an aggregated level, and should be done on that level when the stock of dwellings should be used efficiently. In that case a three-dimensional planning has to be made by the society. (fig 2).

TYPES OF BUILDING

In all circumstances can be stated, that the building utilisation in a building should—at least partly—be the basis for the planning of the building. However, it is true as well, that the planning of the available ground surface is necessarily a basis.

The planning starts from two opposite points. Their confrontation point depends on the type of building which has to be realised.

In a simply organised society the planning will nearly only take place on the level of the building process itself, while in a very socialised society it will be possible that most of the planning will be done by the community. But also in that case the building utilisation will play its role in the

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Fig. 1. Planning directions: future-present and bottom-up
planning process. In nearly all circumstances we can recognize planning and reverse planning. The meeting point for different kinds of processes and building will be described in the following.

FACTORY BUILDING
The place of a factory depends on the market for production factors and on the market for the products. Besides that some infrastructure is needed. The supply of energy and traffic facilities are the most important factors of the infrastructure. Everything else will be dictated by the production process. The process in industrial production can be planned over usually rather short periods. Technological change and market changes result in a rather rapidly changing demand for housing facilities. However, this does not mean that the building should have a short life. It can only be stated, that most of the dressing of the support structure will have a short life. The infill should be considered as a part of the production process and less as building components delivering housing facilities. Since the investor in the support structure wants to have a return on his investment as high as possible, he tries to design it in such a way that it can be used for different succeeding processes. This does not mean that the future processes should be known. The only claim will be that the space is easily dividable and that installation can easily be changed. In this way the design of the structure is the result of process planning as well. Only the planning of the infrastructure is the result of the collective planning.

OFFICE PLANNING
Office buildings partly are planned like factory buildings; this depends on the kinds of operating processes in the office building. Processes which use information systems that change very often need buildings in which new communication systems can easily be incorporated. The change in system will give the same adaptation activities as a change in user, using advanced systems as well.

More simple processes in office buildings use well finished and furnished space and relatively simple communication facilities; e.g. lawyers, accountants, etc. Changes take place frequently in the finishing and furnishing, but less frequent in the parcellation. To keep those buildings usable at their specific location means that the support should give enough options for adaptations. Although in simple and ‘smart’ office buildings the adaptations will be different, one can state that within the support structure frequent changes will take place. Space and facilities for general use will be the same. The construction of the support largely depends on the demand from the processes probably rated in the future in the building.

On the other hand however, these types of buildings are located in regions where the design of buildings is under control of the (local) authorities. This means, that the dimensions of the support structure and the materials for the shell should meet government rules on the one hand and requirements from the future processes as well. Support and shell are the meeting point of individual and collective planning; the meeting point of top-down and bottom-up planning.

HOSPITAL PLANNING
Hospitals have to be split in two parts; the clinical part and the nursing part. Technological change takes place in both sectors, but will be faster in the medical sector itself than in the nursing sector. The support structure of the clinical part will more or less be like the structure in the case of ‘smart’ office buildings. In the nursing department the finishing and furnishing need adaptations, but this will hardly have any influence on the support structure. However, a change in demand for different specialities can
change the desired use of space, so some provisions for easily reparrellation will be fruitful.

Hospitals usually have their own special shape and their own environment. The governmental rules focus more on the shape of the building. One can state that the support and the shell are the result of a planning based on the process operated inside the building. Hospital buildings will be planned in a way like factory buildings.

SCHOOL PLANNING
The education process is in a materialistic sense a simple process. Computer aided education needs some facilities, but they are not very advanced and the user of the system does not have to follow every new step in the market. More change takes place in the population of the schools on different levels of education. But the wishes of the teachers and pupils will change less than in the case of dwellings. As a consequence it can be stated that school does not have to be very flexible, at least compared with factory and office buildings. The way of planning can, however, be compared with office buildings, since only the shape will be influenced by collective influence. The infill depends on the wishes of the school concerned, which at least partly will be based on collective ideas.

RESIDENTIAL AND NON-RESIDENTIAL
A support structure can service for different kinds of infill in the course of time. Most of the time the market segment for which the support will be used is unchanged: A factory remains a factory and a dwelling remains a dwelling. However, some options should be created to use the three dimensional space in a more flexible way. On the one hand we see, that sometimes schools or hospitals are used as dormitories, yuppi-apartments or senior houses. The school buildings are not useful any more in an area, while hospitals cannot be adapted any more to new standards in quantitative and qualitative sense. Above that we can see that in the centre of cities the residential function becomes more important. As far as possible the existing support structures will be used for another function.

The reverse planning problem seems to be reduced to three groups of buildings: residential buildings, semi-residential buildings and factory buildings. Factory buildings are located and shaped in such a way, that they can hardly be used in another direction. All components—including the support structure—will be designed just for material production processes. The other types mentioned are located in areas which are used as well for residential purposes or probably will be used in that sense in the future. Besides that the shell and the constructive parts are designed in such a way that residential use is possible in a realistic way. Even the parcellation is basically useful for residential purposes. So, residential and semi-residential buildings will be planned in a comparable way. In fact the building types turn out to be a dichotomy. Non-residential buildings will totally be planned from the point of view of the individual user, as shown in the fig. 3. 

(Semi-) residential buildings will partly be planned by the collective. This seems to be contradictory with school, hospital and office buildings, since the decision maker is the user as well. However, when the owner wants to change the function in the direction of residential use he will represent the collective. He will be responsible for the shell and the parcellation, while the individual (dwelling) user will create his finishing and furnishing. The only change in the planning procedure, when the function has been changed seems to be the finishing and furnishing. A slight change in the definition of 'collective' solves the
problem.
In fig. 3 the planning process of the two building types has been shown.

**REVERSE PLANNING**

From the description of different types of building it can be learned, that 'planning from future to present' is always the best basis, while planning 'from bottom to top' is preferable until the infrastructure, including the support structure and shell. Only in the case of residential building collective decision making will be responsible for nearly all components of the building. But in this case as well can be stated that the demand has to be formulated in an aggregated sense on the infill level.

The bottom up approach will be the best in all circumstances, all the influence of the individual decision maker can be different.

**LITERATURE:**


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