

# THE TYPOLOGY OF ADAPTABILITY IN BUILDING CONSTRUCTION

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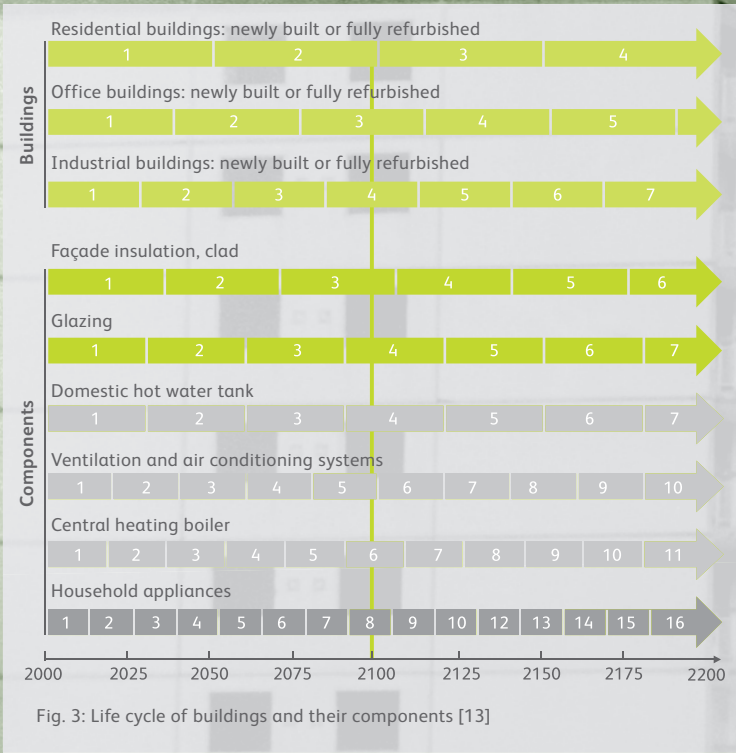


Fig. 3: Life cycle of buildings and their components [13]

## E.5 ADAPTABILITY & SUSTAINABILITY

Maintaining value retention during a building's entire service life is a major challenge: sustainable buildings must be able to react to changing requirements.

*'Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.'* [15, 16]

Adaptability and sustainability are closely linked; the appropriateness of the proposed or implemented adaptability is their linking element. However, adaptable measures can only be estimated to a certain extent with regard to their sustainability and adequacy, and this leads to 'unfortunate' situations:

### DILEMMA – SCENARIO AND FORECAST

Provided the building covers the users' needs, there is no necessity to adapt the building. However, should a situation arise which does not coincide with its current use, the building must be able to react accordingly with the aim of carrying out adaptations with the least amount of effort and resources possible. The following should apply: 'to guarantee value retention of the buildings, the quality of the building elements must be aligned to the building's life cycle and to user's requirements' [17].

Various scenarios must therefore already be developed in the planning phase. The spatial and structural consequences resulting from this process should then be assessed as to whether they are likely to occur. Some scenarios concern the building's service life and its elements, whereas others concern change of use or legal requirements. This is where both planners and clients reach their limits: Which scenario is likely to occur?

[15] Brundtland, 1987

[16] Hauff, 1987

[17] SIA 112/1, 2004

How will my client live and work in 10 or 20 years? What effect does this have on planning today's buildings? What are the appropriate measures?

### DILEMMA – PARTICIPANTS AND TIME RELEVANCE

Each of the participants involved in the building process has a need for adaptability at different moments, which means that the weighting of individual measures depends on circumstance, aim and time. Whereas the planner, for example, would like the greatest possible freedom of choice during the planning phase, subsequent users are mainly interested in adaptability during the use phase. The expected conflict of interests is to be identified and assessed primarily in view of appropriateness to the entire building system. The three elements of sustainability, social quality, and ecology and economy are linked to adaptability in many different ways and outlined in the following section.

### SOCIAL QUALITY – USERS

Social developments lead to changes in lifestyle. The percentage of tenant households representing the classic concept – a couple with child/children – now accounts for only 23% of all tenant households in Switzerland [18]. The percentage of elderly and single users is on the increase. Such developments call for constant reviewing of established patterns and design concepts. When planning for the future, the requirements and behaviour of future users must be considered. The imagined use scenarios should match their needs and behaviour, thus increasing the project's future acceptance.

[18] BFS, 2004

## Above the Existing Structure



### a. Above

Extension in the area directly above the existing structure.



### b. Above, set back

Extension set back in the area above the topmost standard floor of the existing structure (in case no further full storey is possible, for example because of building regulations).



### c. Above, as a cantilever

Extension in the area above the existing structure, whereby the new construction must be possible as an overhang or an externally appended structure.



### d. Above, as an attic conversion

Extension within the roof area of the existing building structure, but below the upper edge of the building.



### e. Above, as a fill-in within the existing courtyard


Extension incorporated in a courtyard of the existing building structure.




4 Extension as densification



5 Extension for additional exhibitions

4  Institute of Law Library, Zurich  
(Santiago Calatrava)

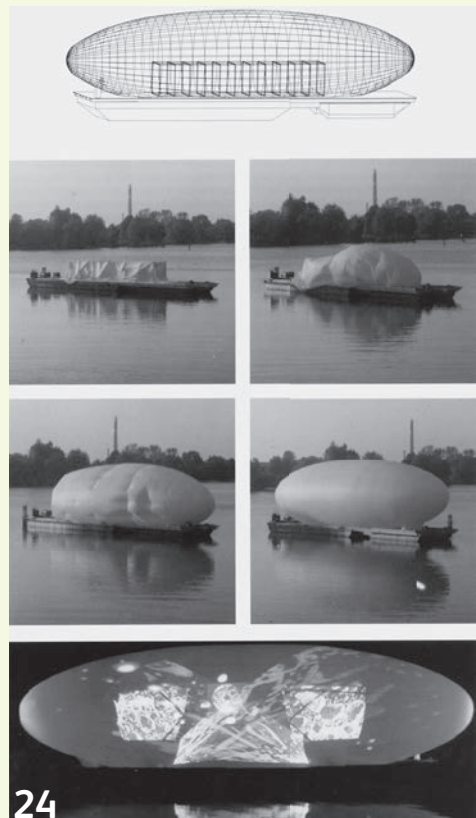
5  British Museum, London (Sir Norman Foster)

## PLASTIC SURGERY

The term 'plastic' derives from the Greek word 'plassein' and means: forming, sculpting, modelling. Corporate identity, which also includes the architectural design of the company's headquarters and production facilities, has gained considerable significance. As existing buildings are also subjected to this process, they often undergo 'plastic surgery' to convey the company's image. The question is: In which form and to what extent do different building types permit such changes? Architecture must also strike the balance between preserving a sense of the mature, but perhaps characterless building identity and aspiration to give each building its own character.

The façades are particularly suited to accommodate a quick and individual plastic change. A reversible change of image could be achieved by using new light technology (e.g. LED) on or near the surfaces or by integrating phase-change materials (PCMs), which change from solid to liquid and vice versa at specific temperatures.

Audio-visual projection surfaces assume a special role in the field of adaptability. They are designed to be adapted to changing requirements. An example of this is the Jubilee Ship developed at the University of the Arts in Berlin on the occasion of their 300-year anniversary. The floating artwork, consisting of a platform with an enormous inflatable form made of balloon silk, can be assembled and dismantled within a very short time and is not bound to any particular place. The audio-visual playability of the outer shell ensures its speedy adaptability.

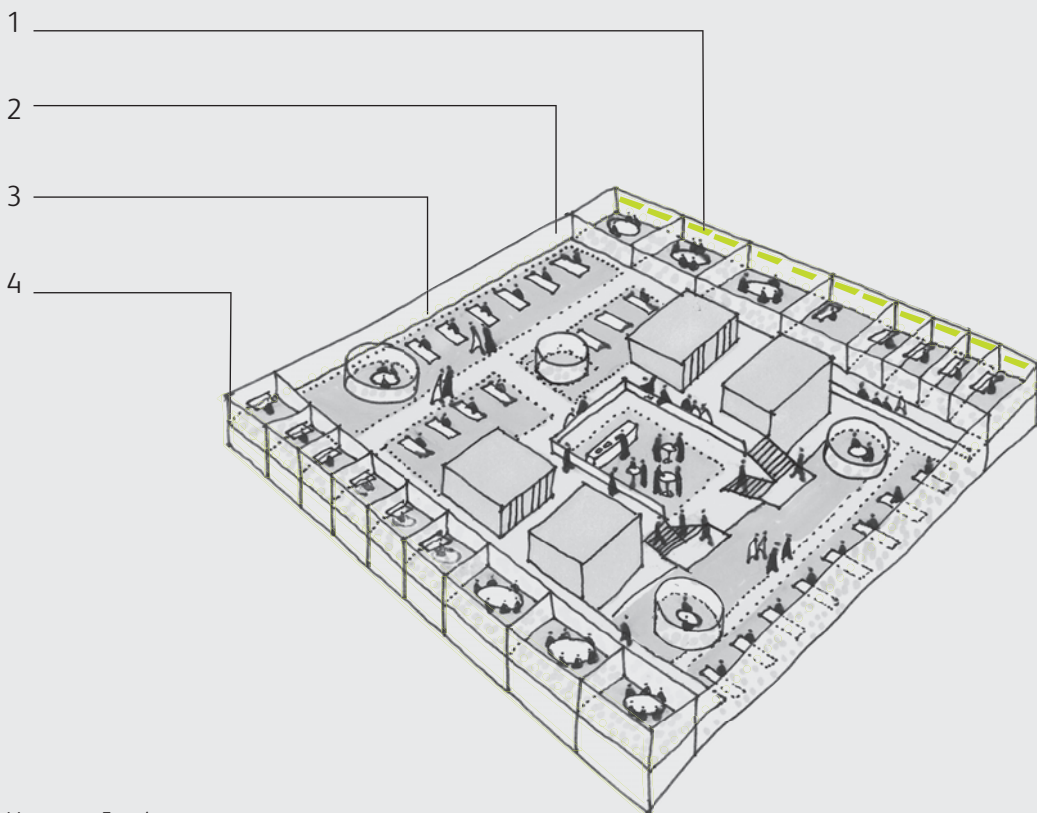


24 The transformable outer shell of the Jubilee Ship  
(University of the Arts (UdK), Berlin)

25 Its appearance can be transformed by adapting  
the outer shell



## MEASURES – FAÇADE



### Measures – Façade

- 1 Shading elements are aligned to the façade grid
- 2 Power cables and data lines are laid in the façade
- 3 Connectors are integrated into the mullions of the façade
- 4 The modules of unitised façades and mullion/transom façades are separable from adjacent elements

Fig. 7: Measures – façade

### 3.0 DETERMINING FACTORS FOR ADAPTABILITY

Adaptability can be planned and buildings can embody measures to allow for this in the future. Nevertheless, the future operation of the building may never require it. On the one hand, adaptability should be appropriate and, on the other, it is influenced by different factors. By establishing the relationship between these factors, it is possible to evaluate the adaptability degree of each building. This helps to assess future operational costs and subsequently to make long-term decisions. The aspect of sustainability and the related extension of a building's service life also benefit from this knowledge. Finally, the adaptability degree answers the question of how a property that is rented or bought today can be adapted to meet future requirements – whether they are simply possible or already consciously anticipated.

#### APPROPRIATENESS

As Aristotle explains in his *Nicomachean Ethics*, the golden mean (*mesotes*) between excess and deficiency must be found for every virtue. This is best illustrated by his example of courage. Courage lies between two extremes of cowardice (lack of courage) and recklessness (excessive courage), and neither cowardice nor recklessness is desired. Courage however, has the desired middle, 'the golden mean'. The same applies to other ethical virtues such as generosity, happiness, prudence, a healthy diet, etc. [30]

In an attempt to paraphrase Aristotle, this means: if adaptability is the desired middle, then unnecessary adaptability is the excess. And a rigid structure that does not allow easy adaption to new operational requirements would be a defi-

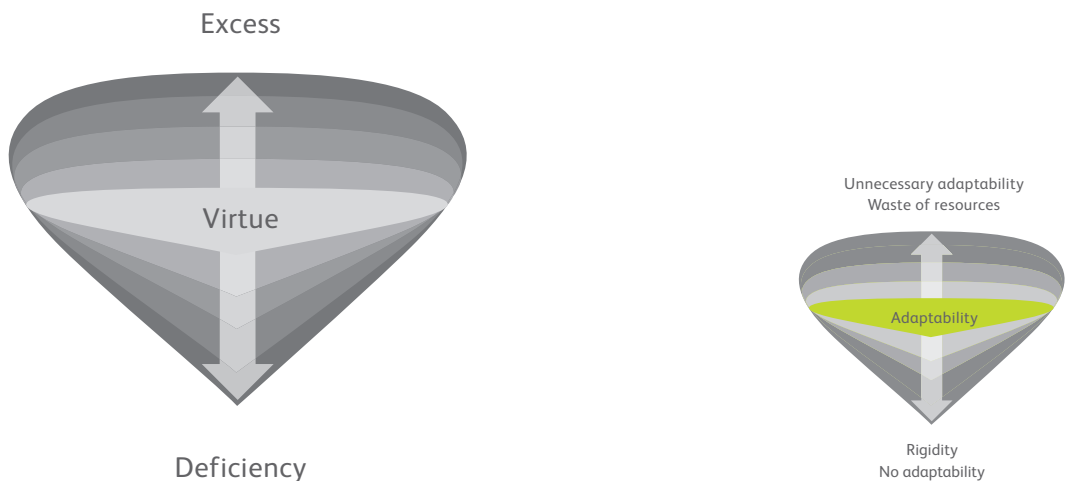


Fig. 1: Aspects that are closely related to adaptability, and their deficiency and excess

[30] Aristotle, 2000



ciency. It should be noted that excess (unnecessary adaptability) is certainly more advantageous in a building for a long service life than deficiency (the rigid structure), but it is obviously contrary to the concept of economic efficiency. Without doubt, excessive adaptability can be socially and/or ecologically more sustainable, but the cost factor will nevertheless always be problematic.

### THE KEY DETERMINANTS OF ADAPTABILITY

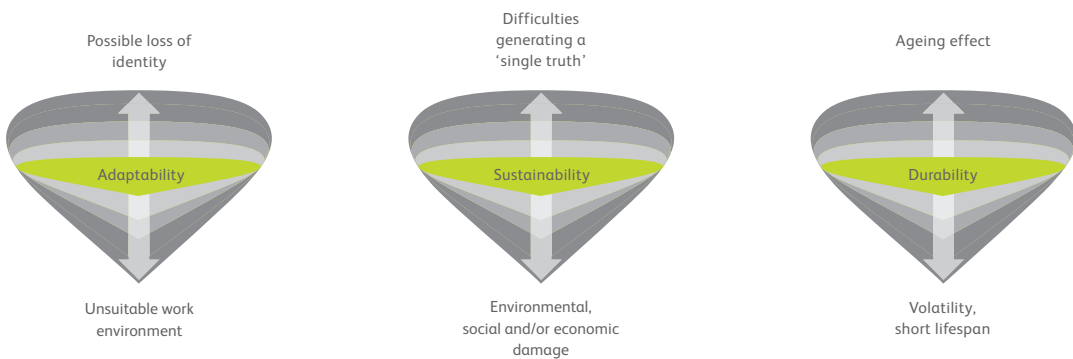
The following outlines a method that can be used to estimate the adaptability degree of a building. The method that has been developed makes it possible to evaluate adaptability, assess the pros and cons, and compare these results to other buildings. This process is based on the three key determinants of adaptability:

**Effort:** How much effort is required for the modification / change of use / extension?

**Costs:** How high are the investments needed to achieve the desired result?

**Time:** How much time is needed to realise the desired modification?

These key determinants, corresponding to the key areas of adaptability, are present in each building but to differing degrees. There might be sufficient financial means but not enough time, or perhaps the effort would be limited but the financial resources are limited, perhaps. . . There are numerous possible scenarios because the key determinants are also a combination of several key factors used for evaluating adaptability.



# THOUGHTS FOR PLANNING ADAPTABILITY:

