**Theories of Architectural Synthesis**

* [Universal Metatheories](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/13l.htm&usg=ALkJrhgpM7Avxj_ExUKsUkHG2U3uuN-DDA#objsynt)
* [Design theories for Building Types](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/13l.htm&usg=ALkJrhgpM7Avxj_ExUKsUkHG2U3uuN-DDA#intersub)
* [Procedures for Subjective Arbitration of Goals](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/13l.htm&usg=ALkJrhgpM7Avxj_ExUKsUkHG2U3uuN-DDA#esis)

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In the section [Thematic Theories of Architecture](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/13k.htm&usg=ALkJrhht1UqZXsEE93fvzyD_WGa2lo2Jjg) , we have presented a series of theories of architectural design. Each of these thematic theories of architecture is aimed at the fulfilment of one certain type of goal which is different in each theory. These theories have thus little in common, and they do not give much help if the problem is to find a resolution which fulfils *several* contrasting goals as far as possible. Such a divergence between goals is an obstacle to the work of an architect, and it is likely to complicate and slow down the design task. It would be advantageous to remove or settle down these divergences already before the design phase.

Could research help in the problem of conflicting goals? When each of the goals is well accounted for in a specific theory, could we not go a step further and create a theoretical link between these sub-theories, a **meta-theory?**

Such attempts have been made. No one of these has been a complete success, but some of them are serviceable enough to be used in practical design projects. Therefore it is motivated to give them, too, the name of "design theory". Below, some of them are presented, grouped as follows:

* [Universal Metatheories](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/13l.htm&usg=ALkJrhgpM7Avxj_ExUKsUkHG2U3uuN-DDA#objsynt)
* [Design theories for Building Types](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/13l.htm&usg=ALkJrhgpM7Avxj_ExUKsUkHG2U3uuN-DDA#intersub)
* [Procedures for Subjective Arbitration of Goals](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/13l.htm&usg=ALkJrhgpM7Avxj_ExUKsUkHG2U3uuN-DDA#esis)

These **theories of architectural synthesis** do not encourage creating such unique monuments or architectural styles as do the [thematic theories](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/13k.htm&usg=ALkJrhht1UqZXsEE93fvzyD_WGa2lo2Jjg) , each aiming at one goal. Instead, they can help at producing practical and useful buildings for average people.

**Universal Metatheories**

Sciences can sometimes merge seemingly separated areas of knowledge into one larger theory, as explained under the title [Maturation of a New Branch of Science](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/124.htm&usg=ALkJrhi589NSxzeG6YMDNZNL_nOKTJp_Lg#santayan) . In the beginning, any field of science consists of only a few studies and the knowledge produced by them contains just *detached* islands. Later, when the number of studies grow, the researchers cannot avoid using common definitions and recurrent methods of measurement.This creates bridges between the studies. Eventually one of the researchers perhaps succeeds in presenting a more extensive theory which then includes most or all of the earlier findings.

Could a similar process eventually unify some or all of the [thematic theories](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/13k.htm&usg=ALkJrhht1UqZXsEE93fvzyD_WGa2lo2Jjg) of architecture? One can think of several possible ways of achieving it.

One alternative would be uncovering a higher, more compelling general goal which includes the all normal goals of building.

Indeed, during history several authors have professed having found such higher goals. During the Middle Ages most authors agreed that there is only one goal for all human activities: the religious salvation of man. All the arts, and among them architecture, were supposed to serve only this purpose. See eg [St. Augustine](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/155.htm&usg=ALkJrhhvYeQSj6dxWbb3S3sCKdlMgGfOVg#uskonto) .

In 18C and 19C there were several philosophers who tried to explain all the human activities on the basis of a few general laws. One of the first was Immanuel Kant. The basic force in his system was the conscience of man, the "categorical imperative" as he called it. Other proposals for general philosophies were made by Hegel and Marx, among others, although no one of these "generalists" discussed architecture in any length.

Many architects, too, felt a similar desire to clarify all the parallel goals of building and arrange them into a system. For example, Alvar [Aalto](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/x50.htm&usg=ALkJrhiNcRJGspF16ZM5FL0h_QjrLqZaOw#a) writes in 1935 (published 1970 p. 37...38):

"We shall have to analyse more characteristics of objects that we have done so far. All the different requirements that could possibly be made with respect to the quality of an object constitute in a sense a scale, perhaps resembling the spectrum. Social aspects fall in the red field of the spectrum, matters concerning construction in the orange one etc. up to the ultraviolet field that is invisible to the human eye; all the requirements which shun any rational definition may be hidden there, those that could be called individually human mostly. ... Taking the psychological requirements into consideration, as soon as we can do it, will widen the rational approach and help us to prevent inhuman results."

In 1972 Arne [Nevanlinna](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/x50.htm&usg=ALkJrhiNcRJGspF16ZM5FL0h_QjrLqZaOw#n) made an attempt to deduce the goals of architecture from the basic values of modern Western culture, which he defined as (p. 108):

* Humanism, or appreciation of man. This gives man a privileged position in respect to other nature,
* Objective truth,
* Prosperity (which materializes as technology), and
* Balance of the whole system.

Likewise, Ilkka [Niukkanen](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/x50.htm&usg=ALkJrhiNcRJGspF16ZM5FL0h_QjrLqZaOw#n) (1980, p.20) arranged the goals of building into a logical tree:

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| **SATISFACTION / FIT** |
| **Inputs** | **Outputs** |
| Costs / Resources | Usefulness / Function | Experience / Perception |
| Building costs Costs of use Decrease to output | Spaces Indoor environment and climate Equipment and durability | Environmental factors Exteriors Interiors |

Some researchers have tried to explain human goals with the concept of *need* . The " [hierarchy of needs](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/120.htm&usg=ALkJrhgCvtdLgxvypJQ-xv3nxtMQ6tWmUg#maslow) " suggested by Abraham [Maslow](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/x50.htm&usg=ALkJrhiNcRJGspF16ZM5FL0h_QjrLqZaOw#m) (1954) has often served as a model. Pertti [Vuorela](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/x50.htm&usg=ALkJrhiNcRJGspF16ZM5FL0h_QjrLqZaOw#v) (1970) has tried to outline a sequence of the goals of building. His proposal lists first the critical needs and then the other, less and less significant needs which become important only when the first mentioned ones are satisfied:

1. **Physiological needs:** Dwelling and its equipment. Shops. Health services. Privacy. Air. Sunlight. Heating.
2. **Needs of security:** Traffic hazards. Police, fire guard etc. Risk of unemployment. Communications. Absence of excessive noise. Hygienic conditions of the area. View out of the windows. Contacts to nature.
3. **Need to belong and be accepted in a group:** Social values prevalent in the area. Physical distance between dwellings. Functional distance between dwellings. Segmentation of leisure time. The social organizations.
4. **Need of self-fulfillment:** Possibility to spend leisure time in the area. Timing of free time. "Democracy" of the area.
5. **Cognitive and aesthetic needs:** How easy it is to find your way in the area. Schools. Communications.

Others have tried to exploit Frederick [Herzberg](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/x50.htm&usg=ALkJrhiNcRJGspF16ZM5FL0h_QjrLqZaOw#h) 's findings, where the human [factors of motivation](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/120.htm&usg=ALkJrhgCvtdLgxvypJQ-xv3nxtMQ6tWmUg#myers) are classified into two groups: "dissatisfiers", and "satisfiers". These are not simply opposites, but rather like sensations in the same way as pain and pleasure. If there are strong dissatisfiers present, they are not compensated by strong satisfiers: both must have an adequate level for the person to be contented.

Herzberg's study did not concern building but motivation in work. Briitta [Koskiaho](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/x50.htm&usg=ALkJrhiNcRJGspF16ZM5FL0h_QjrLqZaOw#k) (1974 and 1977) has used an analogous model for the evaluation of environments. She (1974, p. 84) declares as **positive** factors eg the "basic possibilities of activity" such as easy access to work, school and shops; nearness to nature; beautiful, pleasant and stimulating environment. **Negative** factors are eg pollution, noise and the hazards of traffic. The common resultant of all factors can be called *the human welfare* . A subjective appraisal of it is satisfaction or happiness.

Summing up, it seems that since Middle Ages no philosophical structure for the goals of building has reached universal acceptance. The few proposals that were made in this direction also seem to have stayed somewhat detached from the customary ambitions of man and do not cover *all* the targets of the previously discussed [thematic theories](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/13l.htm&usg=ALkJrhgpM7Avxj_ExUKsUkHG2U3uuN-DDA#arkktema) of architecture let alone all the ordinary practical targets of modern building. Some of the typical goals of building today can be systematized through them, but not all.

**Design Theories for Building Types**

The preceding paragraph shows that no one has yet been able to construct an objective synthesis of *all* the goals of building which would be acceptable to *all* people. The reason is that people have incompatible opinions and targets for building, and the same is true for individual building projects, if we take a total view on all of them.

As a contrast, arbitration and endorsement of dissenting goals in any *single* individual building project is seldom very difficult. In fact, it is everyday practice for any architect, and there are well-proven methods for it (see [later on](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/13l.htm&usg=ALkJrhgpM7Avxj_ExUKsUkHG2U3uuN-DDA#esis) ). In other words, arbitration is possible for one project, but not all of them together.

The question now is, are there classes of buildings, or classes of people, for which the structure of goals is homogeneous enough to allow writing contradiction-free design theory specifically for this group?

Such classes of buildings can, indeed, be devised. Because the majority of requirements for a new building usually pertain to the intended *use* of the building, it is reasonable to select this for a basis for the classification. The usefulness of classifying buildings on the basis of their use is further enhanced by the fact that also the *users* of a given building type often belong to a definite category of people, in other words most of the users of buildings are classified at the same time.

Classes of buildings for which now exist substantial amounts of design theory, include residential buildings (further divided into houses and flats), schools (of different types), industrial and commercial buildings of various types, and several others. In practice, many authors of design theory are explicitly or tacitly thinking about buildings in their own countries, which means that beside the division to building types there is sometimes an additional sub-division on the basis of country. This sub-division is less definite and the user of the design theory can often elect to apply it in another country.

The format of design theory for building types does not much differ from the [general pattern of design theory](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/123.htm&usg=ALkJrhhY1p1HL8cZdMn2tys4k-XqBHHQ4A#types) and includes thus following items:

* governmental regulations,
* standards,
* tools to assist design, like algorithms, advises and rules of thumb,
* exemplars, ie descriptions of existing meritorious buildings or their details,
* prefabricated components for buildings in the case that they are based on research and they thus can be said to "contain" theoretical knowledge.

[Standards](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/123.htm&usg=ALkJrhhY1p1HL8cZdMn2tys4k-XqBHHQ4A" \l "stand) for a building type sometimes define an entire building, like a house for one family. More often they specify only smaller segments usable in the buildings of the particular type, like typical bearing constructions, rooms or furniture. These standards are usually voluntary. They can be endorsed by regular organizations for standardization, or simply written by solitary researchers and published as guides and handbooks bearing names like "The modern office building", "The flexible school", "Your solar heated home".

An example of voluntary standards or recommendations for design, for one type of buildings (residences) is *A Pattern Language* (1977) developed by Christopher [Alexander](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/x50.htm&usg=ALkJrhiNcRJGspF16ZM5FL0h_QjrLqZaOw#a) et al. It is based on rather extensive research both with regard to practicality and to comfort. Alexander's "pattern language" consists of 253 design instructions although the writers cautiously state that they, too, are only an example: each single community of people has a pattern language of its own, and so does even each individual. On the other hand, many patterns are archetypal, or common to all human beings.

Every pattern of Alexander follows the same formula which has been described on page x of the book:

The first picture shows an archetypal example and a list of those other patterns that it is related with.

This is followed by a caption that clarifies what this pattern is all about. For example, Pattern no 133, *Staircase as a stage,* has the following heading:

"A staircase is not just a way of getting from one place to another. ... Changes of level play a crucial role at many moments during social gatherings; they provide special places to sit, a place where someone can make a graceful or dramatic entrance, a place from which to speak, a place from which to look at other people while also being seen... The stair is one of the few places in a building which is capable of providing for this requirement" (638).

After this, an account is given of the empirical knowledge about the pattern and the variations of its application.

Finally, a general solution of that particular pattern is given together with a clarifying picture. In the case of a staircase, it is the following:

"Place the main stair in a key position, central and visible. Treat the whole staircase as a room (or if it is outside, as a courtyard). Arrange it so that the stair and the room are one, with the stair coming down around one or two walls of the room. Flare out the bottom of the stair with open windows or balustrades and with wide steps so that the people coming down the stair become part of the action in the room while they are on the stair, and so that people will naturally use the stair for seats" (640).

**Prefabricated components** of building are often based on research and in this case they can be said to "contain" theoretical knowledge.For example, there are heavy concrete slabs and other structural parts where theory of stability has been applied to produce exactly optimal bearing capacity for each type of building (heavier components for industrial buildings, lighter ones for apartments). Once selected, the set of structural components tells the architect how much load the structure can bear, and the architect needs no more do the theoretical calculations himself. The prefabricated parts become thus a substitute of theory.

Other sets of prefabricated components for buildings include the surface elements like floorings and light walls, doors, windows, furniture elements for kitchens etc., most of which have been designed on the basis of research findings.

**Tools for design** are those advises, rules of thumb, tables, diagrams, algorithms, checklists and other material which can be found in the handbooks of architects and building engineers. Another, more modern way of presenting them is to integrate these tools in the CAD programs for architects and other designers. In this way some elementary procedures of design can even be made automatic, which saves time.

Finally, [exemplars](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/123.htm&usg=ALkJrhhY1p1HL8cZdMn2tys4k-XqBHHQ4A#exemplar) are earlier produced meritorious buildings or their details. They are published in professional journals and exhibitions, and they are also much used in the education to the profession. They are still used as a complement of theory in architecture and other artistic design professions for topics for which it is difficult to develop more explicit doctrines, especially in questions of style and taste. They can provide useful points of reference in various stages of product design project, particularly when preparing a [detailed product concept](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/13a.htm&usg=ALkJrhjnMDFTPy9lQipJPEaT0iMXmUVSQQ#detail) .

**How to Make Design Theory for a Given Building Type**

When developing design theory for a building type, the [population](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/15a.htm&usg=ALkJrhhrb-szz9Ya2mtDnUUv6Y89fSpiFw) to be studied is in principle equal to the class of existing buildings of this type. This class is often very large, and for practical reasons you may have to restrict it, for example by defining the size, age, material, country etc. of the buildings. Moreover, it will often be necessary to use a [sample](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/152.htm&usg=ALkJrhikzFaaMEWdQNJLgwc_XAvzUfsApg) .

Another population that the study often necessitates, are the users of the building type, a sample of which are often invited to assess alternative proposals from the researchers, with the methods of evaluation described in [Normative Analysis](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/178.htm&usg=ALkJrhiOibXch__gW9F5WJPHUBeUMzu2fA) . Real future users are almost never available, and you have to content yourself with the users of existing buildings and try to evaluate the possible difference to the future ones (cf. [How to evaluate a thing in the future](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/178.htm&usg=ALkJrhiOibXch__gW9F5WJPHUBeUMzu2fA#tomorrow) ).

When making product-oriented design theory the object is often regarded as a holistic entity, from which you should not extricate some of its characteristics (variables) as is usual when making goal-oriented design theory (for usability, beauty etc). Methodologically this means that [Normative Case Study](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/171.htm&usg=ALkJrhhWHVPmMpW1TG2mcTqBqwydsIXNFQ#norm) and [Normative Comparison](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/172.htm&usg=ALkJrhjZS7EvuQWKYtKr3xoHwZy7Mrf6fw#norm) are relatively often used, as a contrast to [Normative Study of Variables](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/180.htm&usg=ALkJrhiHYEgDJJVkjPwNM2szSmPhiiuUWQ#norm) which suits better to the study of goals.

**Procedures for subjective arbitration of goals**

It seems to be impossible to combine the inconsistent goals of building on a *universal* level. As a contrast, on the level of a *single building project* it is everyday practice. On this level, the goals are estimated simply from the subjective viewpoint of the builder. If an architect and other experts are used, even they are supposed to adopt a matching perspective.

Because most buildings are relatively large, complicated and expensive products, it is normal that they must fulfil quite a number of goals and requirements. It is unusual that a satisfactory compromise between all the goals could be found as one operation, and the normal process therefore consists of three or more successive phases in which the future building takes shape, first as a list of rooms and requirements, then as preliminary drafts and finally as detailed drawings and specifications. Each of these phases includes analysis of requirements, a proposal for fulfilling them, and evaluation, and the process thus resembles a spiral (on the right) which repeats itself but all the time approaches the final resolution.

The methods used in arbitrating the goals and preparing the proposals can be divided in two broad classes, depending on how much the future users of the building participate in the design activity:

* [Professional Design](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/13l.htm&usg=ALkJrhgpM7Avxj_ExUKsUkHG2U3uuN-DDA#prof)
* [Collective Design](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/13l.htm&usg=ALkJrhgpM7Avxj_ExUKsUkHG2U3uuN-DDA#yhteiss)

**Arbitration of Goals in Professional Design**

In professional design the architect, together with a team of engineers, prepares the proposals without daily contact to the customers. The proposal is then evaluated at a meeting with the customers, and the architect prepares renewed outlines until the customers and other involved parties become satisfied with them. The principle does not much differ from normal industrial design (see [Synthesis in Product Development: Professional Design](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/13b.htm&usg=ALkJrhh2iVfSAPhfhNZtckvHerCKGy5iGQ#muotoilu) ) though the number of products is only one.

The exact procedure of building design is a little different in each country. It is usually documented by the professional associations or by research institutions related to these organizations.

The task of combining the goals into a synthesis is initially carried out by the architect while he creates his proposal, and at the next meeting the customers have the option of endorsing or rejecting it. The architect's tasks are, however, arduous already in itself, and they should not be burdened with such extra operations that can be done separately. It is therefore usual that as much as possible of the work of defining and arbitrating of goals is done already before the architect begins with the design. This initial phase of the building project is often called a **feasibility study.**

Typical results of a feasibility study include:

* lists of the intended activities that are to take place in the future building; lists of people to be accommodated; lists of the rooms or spaces for these; positioning and connections of the spaces,
* definitions of quality level. These can relate to eg safety, durability, finishing, intended life-time of the building
* time-table,
* calculation of costs.

It is not unusual that goals of quality and cost, or other targets for the future product, are more or less in conflict. Sometimes it is possible to arbitrate the goals that are ostensibly conflicting by uncovering their mutual relation. An example of this method is finding the optimal thermal insulation for a building. When selecting the thickness of the insulating layer, the cost of building materials (B, in the figure on the right) and the future heating costs (A) seem to conflict. Nevertheless, the *annual* values of both of these expenditures can be added up and the minimum of the sum A+B is easily found.

The science of *operations analysis* includes other comparable analysis methods like for example the algorithm of *linear programming* which can be used to find the common optimum of several quantifiable attributes of a product. Most of these methods accept only quantitative variables. Of course, it is possible to "operationalize" any qualitative attribute and transform it into a quantitative variable; but the conversion often overlooks some subtler aspects of the attribute and an optimum between the goals is then never found.

When it turns out that the objectives are in real conflict, it can be useful indicate the priority of the goals. This can be done with words or with a table which indicates the mutual weights of goals (see [Scales of weights](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/156.htm&usg=ALkJrhg_D8WP3o17URLjoIpCxBJ7CN5S0Q#arvoanal) ).Altogether, the methods have much in common with the ones of product design, see eg [Product Concept](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/13a.htm&usg=ALkJrhjnMDFTPy9lQipJPEaT0iMXmUVSQQ#vaatimus) or [Evaluating a Design Proposal](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/13c.htm&usg=ALkJrhhdB1OUHUsHinRYljED7esZupPEyg) .

Feasibility study can seldom point out all the conflicts between the goals of a building project. More usual is that some conflicts become visible first when a proposal for a building is at hand. For this reason the normal practice is to make the proposals at least twice, ie as first preliminary sketches and then as detailed drawings, but it is not uncommon to make several successive proposals until a satisfactory one is found.

The more detailed the architect's proposal is, the more laborious is to make changes to it. The reason is that every proposal to a building is *holistic* in the sense that its parts constitute an entity, ie they contain innumerable mutual relationships. When a detail is changed, you will have to change several other things, too. Therefore modifications often take time and are expensive, especially in the later stages of design.

**Arbitration of Goals in Collective Design**

In some cases it is possible to arbitrate the contrasting goals of a building project by the method of *collective,* or participating design. It is of course possible only when the users of the buildings are known already in the beginning of the design, and it is thus particularly relevant in alterations to existing housing, or in new building projects where the builders have already organized themselves.

The first theoretical studies and experiments of collective design were made in large town planning projects. Their methods are characterized by the assistance of a "technical team" -- a group of professionals that shall produce studies of available alternatives. The technical team may be a governmental or local agency, or a consulting firm.

Typical phases in participatory planning are:

1. **Initial survey** . The technical team finds basic data and develops an understanding of the interests, needs and desires of all potentially affected interest groups. It creates an initial statement of issues and goals. It assembles data that will later help generating some initial, alternate project ideas.
2. **Issue analysis.** In this phase, both the team and the interest groups shall develop a clear understanding of the general goals, interests, and problems. The technical team shall develop alternatives that may represent widely different assumptions of the project's objectives. These help the various interest groups to clarify their own objectives.
The technical team shall present the evolving alternatives and their impacts several times to the interest groups (and perhaps also to the general public).
3. **Design and negotiation.** The objective of this phase is to produce "substantial" (= not necessarily total) agreement on a single alternative. To reach an agreement, it may be necessary to include compensating actions that do not strictly belong to the initial project.
In this phase, the technical team produces basically similar alternatives (to the ones in the preceding phase) but with minor variations to help the negotiations.
4. **Ratification.** The participation process normally finishes with a public hearing, where the technical team presents the final proposal, the main interest groups present their views, and a possible agreement can be confirmed.
If there is no agreement, the technical team presents its own recommendations and its views of the advantages and disadvantages of the alternatives.
The final decision is then up to the legal (or commercial) authority responsible for the project. (From: Marvin L. Manheim, in Man-made Futures, ed. by [Cross](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/x50.htm&usg=ALkJrhiNcRJGspF16ZM5FL0h_QjrLqZaOw#c) .)

The above described process is typical of town and land use planning projects where a single decision affects the lives of a great number of people. Another variant of joint decisions is appropriate in the smaller scale projects of product development. They are discussed under the title [Collective Design](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/13b.htm&usg=ALkJrhh2iVfSAPhfhNZtckvHerCKGy5iGQ#yhteiss) .

In the scale of buildings, a pioneer work was the concise book *Toward a Scientific Architecture* (1975) by Yona [Friedman](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/x50.htm&usg=ALkJrhiNcRJGspF16ZM5FL0h_QjrLqZaOw#f) . The writer states that to assist self-design, the designer must, in advance, prepare a *repertoire*that shows the user all the possible alternatives he has. Moreover, the repertory must contain *warnings* pertinent to every choice, eg its benefits, inconveniences and costs. But it is not up to the designer to criticize the choices of the user any more than the waiter of a restaurant criticizes the dishes his client chooses.

"The future user encounters a repertoire of all the possible arrangements (solutions) that his way of life may require. This repertoire, which is necessarily limited, must be presented to him in a form he can understand. Thus, for each item in the repertoire there is a warning. It tells the future user -- again, in terms he will understand -- the advantages and disadvantages, in terms of use, of picking a particular item. (The warnings ... are not based on any particular value system, but on the intrinsic properties and the logic of the projected solution; it may happen that the same warning can represent an advantage to one user and an inconvenience to another...)" (p. 8).

"It is really not the architect or planner who has been eliminated from the process, but rather his old role. He has a place, a new role, in the new system: he constructs the repertoire" (p. 9).

Friedman emphasizes one advantage of collective planning: it changes architecture into a self-correcting and developing science. Another benefit is that teaching architecture also becomes more effective (see [Logic of Development](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/124.htm&usg=ALkJrhi589NSxzeG6YMDNZNL_nOKTJp_Lg#tietkeh) )

"Architectural repertories" intended to laymen are nowadays for example the sales brochures of factories producing prefabricated houses. One disadvantage of them is that they are seldom based on profound research, so it is quite possible that none of the given alternatives satisfy.

To understand and process theoretical models and plans, participants need certain training and practice, and to make this easier, methods using a television picture have been developed. In addition to the TV, Yona [Friedman](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/x50.htm&usg=ALkJrhiNcRJGspF16ZM5FL0h_QjrLqZaOw#f) (1975B) and Nicholas Negroponte have tried to use a computer and design algorithms programmed into it. They use the name *architecture machine* for this computer. Their purpose is to develop some sort of "design maker" (cf. coffee maker).

Another usual way of collective planning is based on collective meetings of the builders and the designers. A common "design language" is needed so that technologically unskilled inhabitants could describe things that they expect from the plans and so that they could to some extent even design houses themselves. In Finland, this kind of language has been developed by Marja [Granlund](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/x50.htm&usg=ALkJrhiNcRJGspF16ZM5FL0h_QjrLqZaOw#g) (1981) and especially by Heikki [Kukkonen](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/x50.htm&usg=ALkJrhiNcRJGspF16ZM5FL0h_QjrLqZaOw#k) (1984). In the method proposed by Kukkonen, the common language of design meetings consisted of two systems of miniature models:

* miniature model system in the scale 1:100; this was used to place the buildings on the plot (picture on the left)
* miniature model system 1:15, for the design of the interior of the dwelling (picture on the right). This scale has the additional advantage that ready made doll house furniture could be used in it

The design language was completed with a series of instructions concerning the process in which each phase of the *self-design* process (as Kukkonen called it) was described, as well as the initial information required for each phase and the results that were expected.

In practice, Kukkonen's project produced a group of terraced houses in Helsinki. Results of self-design are seldom published in architectural magazines, maybe because they usually lack the inclusive perspectives and sweeping lines that are appreciated within the profession as showing the skill and strength of the architect. So it is not surprising that the method has been underestimated among architects so far.

Collective planning is by no means contradictory to any of the theoretical paradigms explained above; on the contrary, in collective planning, it is perfectly all right to base the work on any accessible theoretical knowledge, in the same way as architects always have done. For the benefit of collective planning, theory provides models and formulas. Moreover, theoretical definitions of concepts facilitate discussions between the parties involved.

A special advantage of collective planning is also the fact that the theory which is applied does not even have to be objective or exact: in collective planning, all [kinds of human knowledge](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/148.htm&usg=ALkJrhi5hkv-G04LbJn07zqzYTD1eU__fQ) can be exploited: besides theoretical, explicit knowledge also knowledge gained through experience, subjective values and beliefs may be useful. Even in cases when the conjectures proposed for a basis of design were outright erroneous, these mistakes are mostly eliminated during the discussion. Thus the principle of *self-correction,* so important to the progress of modern science, is in a way put to practice also in architectural design.

**Pages about architectural theory:**

1. [Overview of architectural theories](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/135.htm&usg=ALkJrhjarphdTvHbLXRFEQv5-HK3ws75OA)
2. [Thematic theories](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/13k.htm&usg=ALkJrhht1UqZXsEE93fvzyD_WGa2lo2Jjg)
3. [Theories of synthesis](http://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=de&rurl=translate.google.com&sl=en&sp=nmt4&tl=de&u=http://www2.uiah.fi/projekti/metodi/13l.htm&usg=ALkJrhgpM7Avxj_ExUKsUkHG2U3uuN-DDA) (this page)

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