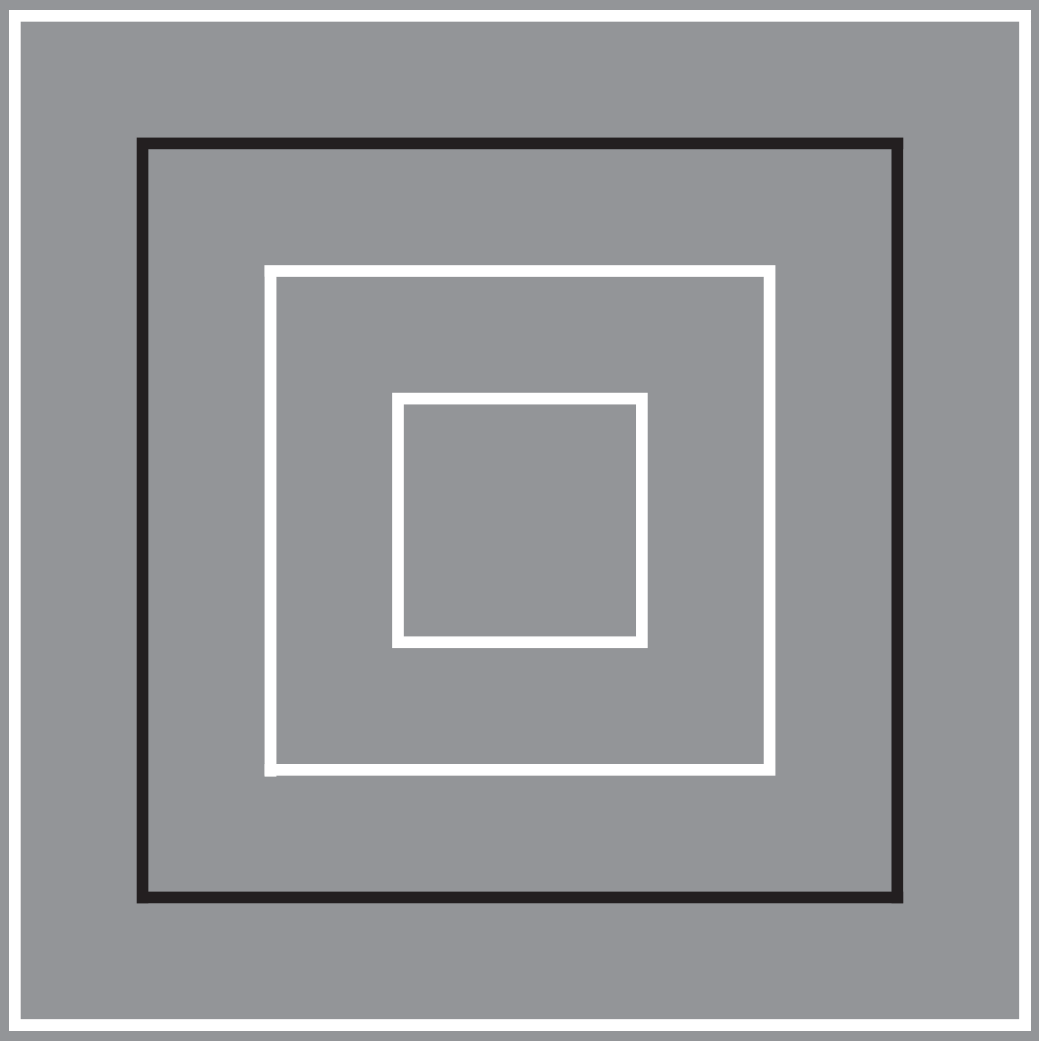
EVALUATING



C EVALUATING

In addition to the intended effects of a design as they are formulated in the programme of requirements many effects not intended and further consequences may become manifest. This part of the book discusses if and how these effects can be predicted ex ante or be measured ex post.

Ex post evaluation of buildings

The effects of a design can be ascertained in the most simple and precise way after the building process, when the object has been taken into use. By that time circumstances in terms of policy, culture, economics, technicalities, ecology and space are also known. In these fields the effects must be evaluated seperately, and, furthermore, social debate determines the weight of each field. In the contribution of Van der Voordt en Van Wegen methods and techniques of evaluating research ex post are discussed. A lot of experience has been gained in this both nationally and internationally. The contribution focuses on a discussion of relevant themes for evaluation, linked to quality assessment and optimal matching between demand and supply. A combination is advocated of comparative description and analysis of precedents and the empirical measurement of the achievements of the building. Utilisation study in the form of Post-Occupancy Evaluation (POE), site visits and checking the design against the programme of requirements, norms and results from evaluative study done elsewhere are the most important sources.

Ex ante research

It is crucial to be able to make already during the development stage of the plan a guess into the effects of the programmatic choices and design decisions. Prophesying these effects before the object is realised (ex ante) is not simple. Hulsbergen and Van der Schaaf show that systematic analysis of effects in the form of evaluative study ex post may serve well. Such an evaluation necessitates formulation of a perspective within which the effects will manifest themselves; in political, cultural, economical, technical, ecological and spatial terms. Results from evaluating research ex post are an important source for so-called ‘pre-design research’. An excellent means to discover critical uncertainties is the study of scenarios wherein alternative views of the future are thought through with regard to spatial impact and their relationships to possibilities, desirability, and likelihood.

Ex ante performance evaluation of housing

Thomsen discusses an instrument to evaluate the quality of housing. This so-called cost-quality test is an important tool for evaluation of plans; both ex ante and ex post. Thus, not only the most important qualities in terms of usage are unveiled; also criteria for evaluation and assessment of the planned or realised achievement of housing and individual dwellings are highlighted. By relating quality to costs a motivated estimate can be of the optimal ratio between both.

Evaluating prototypes

Some of the advantages of ex post evaluation could be realised ex ante by making a prototype. Van der Voordt describes some criteria for that kind of research, illustrated by a study by design of prototypes of correctional facilities and health care facilities.

Comparing and evaluating drawings

In the final contribution De Jong shows how drawings can be used as a means to evaluate designs ex post and ex ante. He emphasises the importance of a clear legend and a transfor-

mation of different drawings to the same scale in order to be able to compare designs in different contexts.

Conclusion

The different contributions show that a long tradition exists in evaluating of designs ex post and ex ante. However, most evaluations of functional aspects are prepared and executed by researchers with a background in social sciences, whereas designers or architectural critics do most evaluations of formal aspects. Integrative evaluations including functional, formal, technical and economical effects might lead to a better mutual understanding of different parties involved in the design and building process and lead to a growing body of knowledge of architectural, urban and technical design.

17 EX POST EVALUATION OF BUILDINGS

THEO VAN DER VOORDT
HERMAN VAN WEGEN

Literally, 'evaluating' means to assess something's 'value'. It would seem that the term orginated in the banking world, where evaluation stands for appraisal in terms of the stock exchange, and for determining prices in cash. In the case of evaluations in the discipline of architecture, it is relevant to distinguish between product orientated evaluations – for instance, of a commission, design, contracting or realised building – and process orientated evaluations: for instance, of the course of the process from initiative up to and including usage and maintenance; or solely honed to the design process. In this contribution we are concentrating on 'ex post' (afterward) evaluation of buildings. For a study of an 'ex ante' (before) evaluation we refer to the contribution by Hulsbergen and Van der Schaaf

Important questions include: is a building used in accordance with the intentions of all involved parties? Are daily users satisfied with their accommodation? To what extent does the actual energy consumption fit the expected energy consumption? To what extent do laymen and experts agree on its architectural quality? Is the building designed and constructed according to the standards of the Building Code?

In order to understand the design and be able to interpret the results of a product evaluation, it is important to include the implementation process in the evaluation. How has the planning process come about? On which considerations are the design decisions based? What kind of expertise was used in the programming phase, the development of the architectural concept, and other stages of the process? Is it characterised by an inter-action of design and research and an effective participation by clients and users? To what extent did legislative prescriptions and economic constraints act on the design?

From ex post evaluation, one can learn a lot about the building's positive and negative aspects. These lessons may be used to improve the building itself. Furthermore, the results can be used in new building processes, provided that they are presented in an accessible way, one that is attractive to designers, clients and consultants. Examples include an annotated typology of design solutions, briefing and design guidelines, does and don'ts, a database with well-documented and annotated projects, or a decision support system. These instruments can be used in ex ante evaluation of architectural concepts, preliminary and final designs in so-called pre-design research. (figure 132). In the present contribution a survey is given of relevant aspects of judgement; and of methods and techniques to measure these aspects.

17.1 THEMES FOR THE EVALUATION OF BUILDINGS

First one has to decide *what* ought to be evaluated. Ever since the '60s, so-called *Post-Occupancy Evaluation (POE)* or building-in-use studies have come to the fore.[a] POE is the process of systematically collecting data on occupied built environments, analysing this data, and comparing them to performance criteria. POEs are particularly aggravated by users' needs, preferences and experiences.

The main themes for Post-Occupancy evaluation are usage and experiencing. Sub-themes are, for instance, appraising the main structure and separate spaces, the experiencing of the form in which the building is appearing, complaints corning inner climate and behavioural aspects (lack of space, privacy, social contact etc.) Technical aspects (carrying structure, facilities and their likes) are often only taken into account as far as they are influencing the use and well-being of the users.

Architectural magazines tend rather to see buildings from the designers' perspective. Publications like *'The Architect'* and *'Archis'* are concentrating on the design concept and the design

a. Project orientated knowledge development

- Ascertaining whether expectations have been honoured
- Determining whether objectives have been attained
- Signalling of unintended and unforeseen effects
- Hunting down bottle-necks
- Blowing off steam
- Providing guidelines for the desirable programme and design (ex ante)

b. Project transcending knowledge development

- Theory building
- Development of decision-support systems
- Formulating designing guidelines and performance requirements
- Charting advantages and disadvantages of variants of the solution
- Preventing mistakes
- Formulating guidelines for spatial policy
- Providing guidelines for the making of laws and rules
- Building a database of reference projects
- Insight in factors of success & of failure

132 Objectives of evaluation

a Preiser, W.F.E., H.Z. Rabinowitz et al. (1988) *Post-Occupancy Evaluation*. See also Voordt, D.J.M. van der and H.B.R. van. Wegen (1989) *Van gebruik naar initiatief*.

a. *Functional aspects*
- availability
- accessibility
- effectiveness
- ergonomic safety
- social safet
- spatial orientation
- territoriality, privacy and social contact
- physical well-being (light, sound, temperature, draft, humidity)
- potential for change / flexibility / adaptability

b. *Aesthetic aspects*
- quality of image
- beauty
- originality
- order and complexity
- representation
- cultural-historical value
- meaning

c.. *Technical aspects*
- fire security
- constructive safety
- material-physical quality
- environment safety
- sustainability

d. *Economical and judicial aspects*
- budget
- costs of investment
- running costs
- time investments and time planning
- laws & legislation

133 Themes for evaluating buildings

tools employed; like spatial working, proportional relations, colour, materials, inter-dependence between components, or the lack thereof. The design and approach of the individual designer is often compared to reference projects from architectural history (the 'precedents') and visions of other designers. These subjects are also central in the study within the course Architectonic Designing of the Faculty of Architecture at Delft University. Examples are the study by Risselada of the designs of Loos and Le Corbusier and the one of Saariste *et al.* of projects never executed by Loos; the collection of building plans of, amongst others, Risselada and Barbieri *et al.* and the Architectonic Studies by Van Duin and Tettero.[a] Many of these studies are rather plan analyses than evaluations ex post, in which it is endeavoured to attain a valuation as objective as possible on the basis of explicit yard-sticks of judgement.

Over the years, growing awareness emerged about regarding the importance of *Total Building Performance Evaluation*, abbreviated BPO.[b]

In this contribution, an attempt is made to find integration between usage, technique, aesthetics and technology. Various surveys may be found in the literature of relevant evaluation themes.[c] Although each source is mentioning different themes, while compartmentalising them differently, many similarities may be observed. In figure 133 it is tried to find a common denominator. Although focusing on the evaluation of realised buildings, many of these themes are also useful for evaluating a brief, commission or a design.

For ease of survey the aspects are ordered in four categories:

- Functional aspects like accessibility, efficiency, health and safety, spatial orientation, territoriality, flexibility, thermal comfort;
- Aesthetic aspects, for instance beauty, originality, complexity, cultural values, symbolic meanings;
- Technical aspects like lighting, acoustics, fire safety, building physics, sustainability;
  Economic and legal aspects: investment costs, exploitation costs, legislation.

This classification can be traced back to the tripartition of Vitruvius: utilitas, venustas, firmitas, extended by costs and judicial aspects. It also refers to the definition of architecture as a synthesis of function, form and technology. Elsewhere the category 'behavioural aspects' is occasionally discerned. Themes like territoriality, privacy and social contact are then grouped under that heading. Figure 133 shows them in the box describing functional aspects.

This survey is an elaboration of evaluation criteria for quality, costs and time. Costs and time are relating to economical aspects. What did the building cost? Was cost-cutting needed in order to stay within the budget? How much time was needed for programming, design and realisation? Quality is comprised of all three aspects and refers to the reality of the building's qualities – in this to be characterised objectively – as well as to valuation of these characteristics; often along subjective lines. Along them it may be ascertained objectively what the sizes are of the building, which material was used for its front and roof and what colours were used – for instance – for walls and doors. Next, it may be ascertained whether this is functional. aesthetically responsible, or 'friendly' in terms of the environment.

17.2 MATCH BETWEEN DEMAND AND SUPPLY

An evaluation can be interpreted as an assessment of congruence between objectives and means, and between demand and supply. The demand consists of desires, preferences, expectations and goals of the parties involved, partly laid down in the brief. The supply is the building itself. Three different levels can be distinguished: site, building and rooms. Site refers to the location of the building, its position in the immediate surroundings, and aspects like traffic access, available amenities, image and synergy of a mix of functions. The relevant characteristics of the building include layout, number and nature of entrances (main entrance

a Duin, L. van (1985-1991) *Architectonische studies 1-7;* Risselada, M. (1988) *Raumplan versus Plan Libre: Adolf Loos and Le Corbusier 1919-1930;* Tettero, W. (1991) *Ministerie van Sociale Zaken en Werkgelegenheid;* Saariste, R., M.J.M. Kinderdijk et al. (1992) *Nooit gebouwd Loos; plannenmap van huizen ooit door Adolf Loos ontworpen nu door studenten uitgewerkt;* Barbieri, S.U., L. van Duin et al. (1997) *Plannenmap: bibliotheken;* Barbieri, S.U., L. van Duin et al. (2000) *Plandocumentatie theaters*. See for a brief discussion the submission of Lans en Van der Voordt on descriptive research.

b Preiser, W.F.E. and U. Schramm (1998) *Building Performance Evaluation. Time-Saver Standards for Architectural Data.*

c Preiser, W.F.E., H.Z. Rabinowitz et al. (1988) *Post-Occupancy Evaluation;* Benes, J. and J.K. Vrijling (1990) *Voldoet dit gebouw? Het bepalen van functionele kwaliteit, SBR Rapport 222.;* REN, Stichting (1992) *Real Estate Norm. Methode voor de advisering en beoordeling van kantoorlocaties en kantoorgebouwen. Tweede versie;* REN, Stichting (1993, 1994) *Real Estate Norm. Bedrijfsgebouwen. Eerste versie;* REN, Stichting (1994) *Real Estate Norm. Quick Scan Kantoorgebouwen. Eerste versie*.

or side-entrance, public or private), and spatial configuration, e.g. clustering of related functions (figure 135). Relevant characteristics of rooms are shape and size, materials applied, interior/exterior relationships, facilities etc. A tool for an integrated analysis in post-design research may be to use a matrix, with spatial and functional features indicated in the columns, and goals and values in the rows. According to the items in figure 134 their inter-relations can be recorded in the cells.

An example: we want to ascertain functionality of a hospital. To that purpose we have first to determine and describe characteristics of the building and its location; its place on the map of the city, gross size of floor-surface, compartmentalisation, proportions of rooms. On the basis of all these characteristics, readily available for objective measuring, we are trying to come to a judgement on availability, accessibility and usability of the building for staff, patients and visitors. With this in mind we analyse routing, the frequency with which a route is used, requirements in terms of space and location for beds and bedside-cupboards. On the basis of a confrontation between both type of data, we evaluate whether the location, or building, characteristics have been tuned adequately to requirements, wishes and preferences.

A careful linking of the judgmental aspects to straightforward characteristics of the location and the building is essential for the possibility of applying the results of evaluation study in the practice of building. It makes no sense to state that there are problems – say, in terms of spatial ordering, or social security – when no suggestions can be derived from there for planning, programming, designing, building and maintaining buildings!

Analysis figure 133	Description		
	Local characteristics	Characteristics of the building (figure 135)	Characteristics of the different spaces
- Suitability			
- Accessibility for users and visitors			
- Related functions together concerning short running lines			
- Needed user space and room for attributes.			
- Etc.			

134 Matrix for evaluating the matching between ends and means

17.3 QUALITY ASSESSMENT

Evaluating means determining the value of something. This is closely related to ascertaining quality. Quality is usually defined as the degree to which a product meets one's requirements.

Strictly speaking, according to this definition a building should be rated as sound as soon as it is obeying its programme of requirements; for in that document the demands of the principal have been recorded. However, checking a design or a building against a brief is not good enough. Many wishes of the principal will never be voiced; partly while they are supposed to be self-evident; partly while he is not conscious and aware of them; for instance by lack of knowledge of today's possibilities. The judgement of the daily users and visitors is relevant as well. Often their demands and wishes have not been recorded in the programme of requirements at all; or to an insufficient degree. The same applies for demands of government or private ruling by lobby organisations. Along with the programme of requirements other yardsticks should be used.

With reference to Burt[a], we use a more comprehensive definition of quality:

'Quality is the totality of attributes which enables to satisfy needs, including the way in which individual attributes are related, balanced and integrated in the whole building and its surroundings.'

According to Van der Voordt and Vrielink[b], four steps are needed for ascertaining the quality of a building:

- Determining which aspects should be taken into account
- Measuring relevant variables
- Evaluation of the outcome of measuring
- Weighing the importance of the various aspects.

- External skin (façade, roof)
- Load-bearing construction
- Services and ducts
- Arrangement
  - Floorspace (net, gross, rentable, division per function, etc.)
  - Compactness (proportion surface of the façade/floor)
  - Main scheme of the building
  - Number of floors
  - Opening up (entries, hall, passage, stairs, elevators)
  - Spacial arrangement (relations between rooms, zoning)
- Separate rooms
  - Function (destination, activities, number of users)
  - Form, sizes and floor space
  - External relation (view, daylight, sunlighting, distance to the entrance)
  - Internal climate (lighting, heating, ventilation)
  - Finishing (material, colour) of walls, floors and ceilings
  - Interior design
  - Character of the boundaries (open / closed, bearing / non bearing, fixed / flexible)
  - Position in relation to other rooms (distance, barriers)
- Investment costs
- Running costs

135 Characteristics of the building

a Burt, M.E. (1978) *A survey of quality and value in building*.
b Voordt, D.J.M. van der and D. Vrielink (1987) *Kosten-kwaliteit wijkwelzijnsaccomodaties*.

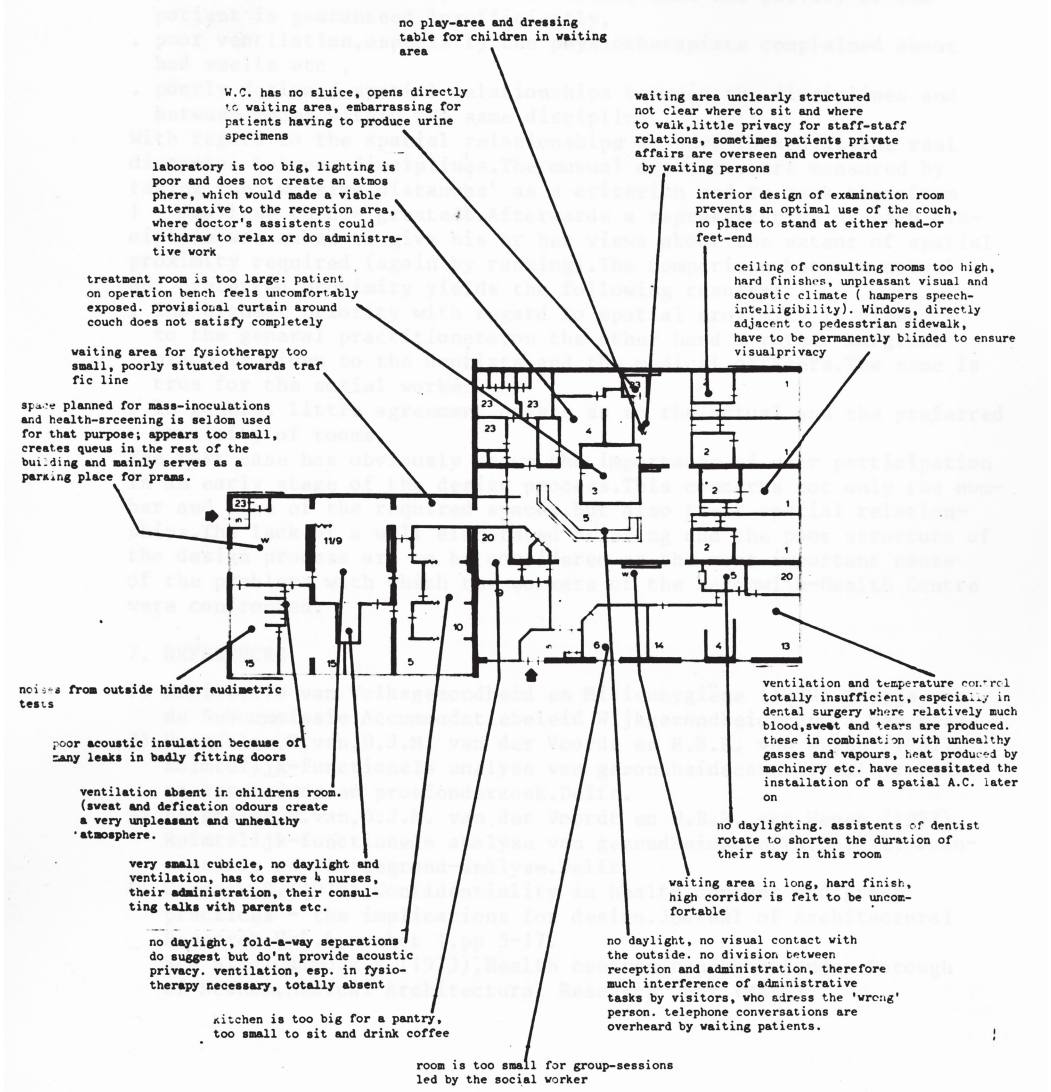
a. Selection of themes for evaluation

The list of themes for a product orientated evaluation, presented earlier, may serve as a checklist of what aspects should be included in the evaluation. This choice is also dependent on the purpose of the evaluation. Only by way of an exception, an all-encompassing evaluation will be the goal. In an evaluation linked to a project, there is often a down-to-earth reason; say, an immediately assumed vacancy, a 'misfit' between organisation and office-concept, an energy-bill running too high. Then, it is obvious to focus evaluation on a clear diagnosis of the problem and on directions towards solving it. While applying innovative solutions, the evaluation will be focused usually at evaluating the innovative measures. An example is the current bull-market in evaluating office innovations.[a] When guidelines for buildings with a specific function are concerned, it stands to reason to focus the evaluation to the spatial conditions in order to facilitate this function optimally. An example is the evaluations of buildings for housing and caring for senior people as made by the Faculty of Architecture.[b]

b. Measurement

When the themes for evaluation are known one has to ascertain how the aspects can be measured. Therefore, we need an unambiguous description of the aspects and clear instructions for measuring relevant variables.

In research jargon one talks about 'operationising'. If we would want to judge, for instance, the flexibility of a building, we could define that concept as 'the degree to which the



136 Results from an evaluation of Health Centre Merenwijk, Leiden.[c]

a See for instance Beunder, M. and P.J. Bakker (1997) *Innovatief werken in kantoorgebouwen, evaluatie van een hotelkantoor, wisselwerkplekken en activiteitgerelateerde werkplekken*.

b Breuer, G.S. and H. van Hoogdalem (1992) *Nieuwe woonzorgvoorzieningen voor ouderen;* Voordt, D.J.M. van der and D. Terpstra (1995) *Verpleeghuizen: varianten en alternatieven*.

c Hoogdalem, H. van, D.J.M. van der Voordt et al. (1981) *Ruimtelijk-functionele analyse van gezondheidscentra, onderzoekprocedure en proefonderzoek.*

building is able to accommodate, without breaking and fixing, changes in the organisation.' Next, it should be ascertained which variables are of importance in that respect; to wit, characteristics of the building (for instance carrying structure, modularity, sizes of separate rooms) and organisational characteristics (for instance employment changes, or different operations). These variables may be measured by questionnaires, observation, consultation of documents etc.

c. Appraisal

When the results of measuring are known, they deserve a statement of evaluation. In itself, a temperature of 30 degrees Celsius is saying nothing; it is significant only when there is a reference to a particular wish or norm (e.g.: not higher than 22 degrees). One is often working within qualitative classes: for instance a three-point scale (modest, average, good) or a five point scale (the same; extended by 'insufficient' and 'excellent'). A familiar example is the method employed by the League of Consumers in judging consumer products. It should be clear for each class which scale values are belonging to it. They may be based, for instance, on results of evaluative studies, or on norms, laws and rules. This values are not static but developing within time; also because of critical reflection by experts on existing buildings, comparison to other buildings and testing of new insights. Often it is not possible to measure quantitatively; for instance for variables like image quality or aesthetics. In that case the way out is qualitative description.

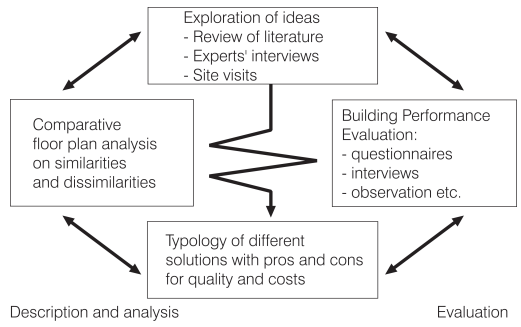
d. Weighing

In the experiencing of the observer not all aspects are equally important. Obviously, some aspects outweigh others. In order to give a balanced final judgement, it may be useful to give weighting factors to the various (partial) aspects. By this, a weighed addition is made of partial qualities, in which priorities can exercise their rights. Usually this weighing is part of a 'multi-criteria method'; for instance to select between locations.

Following these four steps enables the passing judgement on the quality of a building; differentiated per aspect, as well as in the form of a comprehensive assessment; in this case a weighed addition of evaluation of the aspects studied.

17.4 RESEARCH METHODS

There are numerous methods of data collection, like questionnaires, individual and group interviews, behavioural mapping and so on, each with its pros and cons.[a] Globally solid instruments like the Real Estate Norm, Serviceability Tools and Methods and other scaling techniques are used to measure functional aspects like usefulness, accessibility, health and safety, and flexibility (see figure 140). It is recommended to combine different methods in order to increase reliability and validity. The final choice depends on the research subject and constraints like time, money and available expertise. A 'quick and dirty' inquiry needs a different approach than a critical scientific study. An analysis of documents may also help to understand a building and evaluate its performance. A special application is the method of comparative floor-plan analysis.[b,c] By comparing a wide range of building layouts for similar organisations, one can obtain a good understanding how goals and values can be expressed in spatial solutions. It offers the opportunity for developing a spatio-functional typology of design solutions. The particular combination of comparative floor-plan analysis and ex post evaluation of representative cases is an excellent way of developing guidelines for programming and design. A POE gives insight into underlying arguments, user experiences with different design solutions, (dis)advantages for use and perception, and (dis)congruencies between spatial systems and social systems. The process of comparing floor plans and Post-Occupancy Evaluation has an interactive and iterative nature and may proceed in various steps. On one hand, hypotheses, questions, ideas of designers and their clients, review of literature and researchers' own hunches may guide the research. On the other, the plans themselves



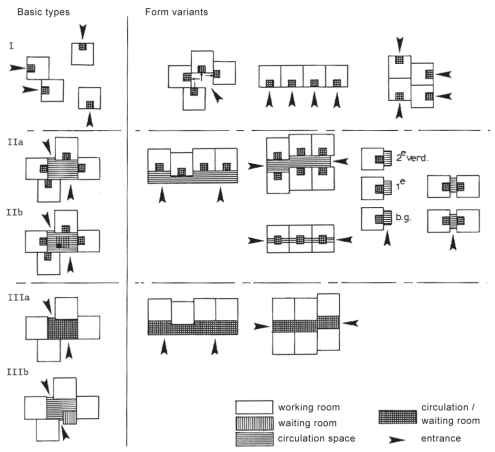
137 Comparative floor-plan analysis and ex post evaluation in design research

a Steffen, C. and D.J.M. van der Voordt (1978) *Belevingsonderzoek stedelijk milieu, methoden en technieken;* Zeisel, J. (1985) *Inquiry by design: tools for environment-behavior research;* Bechtel, R., R. Marans et al. (1987) *Methods in environmental and behavioural research;* Verschuren, P. and H. Doorewaard (1995) *Het ontwerpen van een onderzoek;* Swanborn, P.G. (1996) *Case-study's: wat, wanneer en hoe?;* Baarda, D.B. and M.P.M. de Goede (2001) *Basisboek methoden en technieken*.

b Hoogdalem, H., D.J.M. van der Voordt et al. (1985) *Comparative floorplan-analysis as a means to develop design guidelines*.

c Voordt, D.J.M. van der, D. Vrielink et al. (1998) *Comparative floorplan-analysis in programming and design*.

generate ideas and hypotheses to be checked against other sources. As a result, spatial architectural choices become more understandable, recognisable and debatable. Behavioural aspects can be connected to design variants, while sufficient freedom remains for independent conscious choices for the most suitable design.

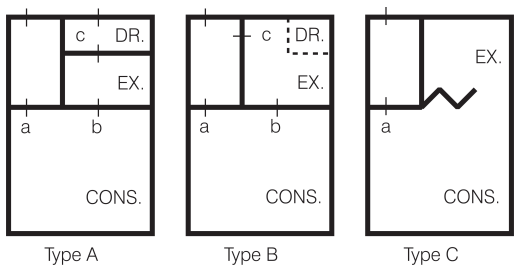


138 Typology of health-centres

An example of different design solutions for buildings with similar function is the variety in types of health centres. A comparative analysis of 50 health centres – co-operative ventures of general practitioners, neighbourhood nursing, physiotherapy and other disciplines – demonstrates that in practice three spatial-functional basic types have emerged, with an increasing degree of spatial integration:

Type I: location the only common characteristic
Type II: entrance as well as internal space for circulation shared
Type III: entrance and circulation space in common, as well as waiting room

Within this ordering form variants are discerned. Typology is a tool for making the parties concerned conscious during the stage of programming and designing of possible solutions. By adding the results of evaluative study – for instance advantages and disadvantages with regard to recognition, privacy and spatial conditions for co-operation – parties concerned can quickly come to a well-considered choice.



139 Different design solutions for the separation between consulting and examination

An example at room level is the separation between consulting and examination spaces of a General Practitioner. In practice, three basic types are found. In Type A, the suite is subdivided into a dressing cubicle (DR), an examination space (EX), and a consulting space (CONS), all separated by solid walls with soundproof doors. In type B, there is no dressing cubicle. Sometimes a curtain can be drawn to separate a dressing space. In type C, a curtain or a high bookshelf has replaced the solid wall with a door between the examination room and the consulting space. Door c has disappeared as well.

The meaning of this variation is related to emphasis on either efficiency or privacy. In the case of A, separate examination room with soundproof doors (a and b), the patient's 'flow' can be settled in a timesaving way. A patient is called into the consulting room through door a. If the need for closer examination arises during consultation, the patient is sent into the examination room through door b and asked to undress. In the meantime, door b is shut and the next patient can be called into the consulting room and asked to wait, while the doctor returns to the (now undressed) patient waiting in the examination room. Having finished the examination, he asks the patient to dress and leave the room through door c while he returns through door b to the patient waiting in the consulting room, etc.

Problems with this procedure may arise when relatives or friends escort the patients. Furthermore, doctors as well as patients increasingly consider this pipeline procedure impersonal. Although door c in type B still can be found in most practices, it is taken out of use by being locked, blocked by shelves, or even permanently sealed so as to improve acoustic insulation. The resulting relational pattern is similar to type C. But, objections still remain regarding combining consultation and examination into one room, even if they are separated by a curtain or bookshelf. A functional objection is that some examinations require complete darkness. Odours generated by undressing should be confined to, and extracted from, the examination room. From a psychological point of view, consultation and examination require a different 'decor': consultation needs a business-like 'office' surrounding or a more informal 'living-room like' atmosphere, while undressing and examination call for a clinical, 'bathroom like' atmosphere. Therefore, most doctors and patients prefer clear separation of the two atmospheres, as shown in type B.

Method	Sources	Aspects	Notes
Real Estate Norm (REN)	REN, Stichting (1992) Real Estate Norm. Methode voor de advisering en beoordeling van kantoorlocaties en kantoorgebouwen. Tweede versie; REN, Stichting (1993, 1994) Real Estate Norm. Bedrijfsgebouwen. Eerste versie.	functionality; convenience; comfort; safety; elaborated in 140 part aspects	developed for offices; seperate REN for industrial buildings
Real Estate Norm Quick Scan (REN QS)	REN, Stichting (1994) Real Estate Norm. Quick Scan Kantoorgebouwen. Eerste versie.	functionality, spatial-visual quality; technical quality; environment; elaborated in approx. 50 part aspects	developed for offices
Building Quality Assessment (BQA)	Baird, G. and N. Isaacs (1994) A checklist for the performance evaluation of buildings and building services; Bruhns, H. and N. Isaacs (1996) Building quality assessment.	company; location; construction; space; inner climate; installations; elaborated in approx. 60 part aspects	developed for offices
Serviceability Tools and Methods (STM)	Davis, G. and F. Szigetti (1996) Serviceability tools and methods.	places to work; real estate and managemant; laws and rules; elaborated in 108 part aspects	elaborates ORBIT-studies (Becker, F.D. and W.R. Sims (1990) Matching building performance to organizational needs in performance of buildings and serviceability of facilities.)
System of certification for offices (Certificatiesysteem voor kantoorgebouwen)	Centraal Beheer (1993) Certificatiesysteem voor kantoorgebouwen.	economical factors; technical factors; commercial factors; social factors; elaborated in 138 part aspects	developed for offices
Real Estate quality analysis (Vastgoed Kwaliteitsanalyse (VAK))	Feld, C.J.B. ten and F.J.M Huffmeijer (1997) Vak-analyse biedt inzicht in haalbaarheid herbestemmingsprojecten.	functional quality; technical quality; costs	elaborates REN
Healthy Building Quality (HBQ)	Bergs, J.A. (1995) De werkbare kantooromgeving.	air quality; heating comfort; available space; privacy; light; perception of work	continuation of the Building-in-use method (Vischer, J.C. (1989) Environmental quality in offices.); kindred to the Toets gezond kantoor (Rolloos, M., C. Cox et al. (1999)
Evaluating in architect's firms	Leenheer, R. (1997) Evalueren bij een architectenbureau, inclusief een evaluatie handleiding.	safety of use; orientation; social integration; user's convenience; social safety; view	developed for housing with care for the elderly
Elderly in hospitals	Lüthi, P., M.N. Niclaes et al. (1994) Ouderen in ziekenhuizen, problemen en oplossingen voor bouw en inrichting.	spatial orientation; sensoric qualities; safety; privacy; social contact	developed for the elderly in hospitals
Working paper evaluation methods	Wagenberg, A. F. van, et. al. (1992) Werkboek evaluatiemethode.	functionality; orientation; privacy; social contact	quality of use and perception of general hospitals
Manual for accessibility	Wijk, M., J. Drenth, et al. (1998) Handboek voor toegankelijkheid.	integral accessibility	formerly Geboden Toegang; applicable on buildings, dwellings and exterior space
Senior's label	Donk, D. van de (1994) Seniorenlabel, consumentenkeurmerk geschikt voor alle leeftijden.	accessibility; safety	consumer's hallmark suitable for all ages
Manual Upgrading ('*Opplussen*')	Scherpenisse, R., J. Singelenberg et al. (1997) Opplussen, aanpassingen voor bestaande woningen.	accessibility; safety	adapting existing dwellings for all ages inclusive the elderly
Delft Checklist Socially Safe Designing	Voordt, D.J.M. van der and H.B.R. van Wegen (1990) Sociaal veilig ontwerpen, checklist ten behoeve van het ontwikkelen en toetsen van (plannen voor) de gebouwde omgeving; Voordt, D.J.M. van der and H.B.R. van Wegen (1991) Sociale veiligheid en gebouwde omgeving.	public safety, objective and subjective	developed for buildings and exterior spaces; elaborated by SEV in a Police hallmark Safe Housing (Politiekeurmerk Veilig Wonen)
VAC-Quality indicator	Hilhorst, H.L.C. (1997) VAC-Kwaliteitswijzer, integrale visie op de gebruikskwaliteit van woning en woonomgeving.	usefullness; accessibility; safety; comfort	developed for housing and the housing environment
'*Woonkeur*'	Stuurgroep Experimenten Volkshuisvesting (2000) Woonkeur. Rotterdam, Keurmerk Integrale Woonkwaliteit.	usefullness; accessibility; safety; comfort	Integration of Senior's label, Manual for accessibility, VAC-Quality indicator and Police hallmark Safe Housing
Flexis	Stichting Bouwresearch (1996). Flexis, communicatie over en beoordeling van flexibiliteit tussen gebouwen en installaties	flexibility of buildings and installation	

140 Instruments for measuring the quality of buildings. For the complete description of the references – author(s), title, publisher, year and place of publication, we refer to the bibliography at the end of the book.

17.5 INDICATORS FOR FAILURE OR SUCCESS

In principle, the methods mentioned are all appropriate for finding out whether a building is complying with its objectives and expectations; and has, perhaps, qualities surpassing them. Focused on quality of use, the following data are especially important as indicators for failure or success:

- actual use of spaces and facilities (frequency of use, nature of activities, forms of shared and multi-functional use of space);
- appreciation by the day-to-day users, visitors and passsers-by, as such and as compared to other design solutions;
- the most positive and most negative characteristics of the building according to its users;
- the adaptations implemented in the building since the transfer from builder to owner;
- potential for letting (to be derived from data on empty floor-space, waiting lists, developments in real-estate);
- inclination to move;
- maintenance experience;
- data on maintenance, vandalism, burglary.

17.6 CONCLUSIONS

This Chapter devoted attention to the evaluation of buildings. Next to a survey of possible objectives and evaluation themes attention was given to ways of evaluating. Measuring methods and instruments were listed and commented upon. With this we demonstrated that there are many ways to judge the quality of a design or building in a reasonably objective way. Although thorough evaluations are still exceptional, we may conclude that the methodological aspect of Building Performance Evaluation and Post-Occupancy Evaluation has become a new professional area. Students as well as staff of the Faculty of Architecture may benefit from this; in design-studios as well as in (assisting to) graduation.

At the same time it should be stated that the emphasis has been put upon functional quality. Much more attention was given to this aspect of quality than to judging aesthetic quality. Although appreciation of aesthetic quality is strongly subjective, and will always remain so, further scholarly exploration of criteria, definitions, operationalisations and measuring methods would shed more light on this aspect and would make aesthetic quality a better topic for discussion. An example is the further development of the so-called ‘semantic differential’. This method consists out of a lot of dichotomies; like beautiful-ugly, exciting-boring, original-traditional, simple-complex. It would be interesting to have some recently realised and already slightly ageing buildings judged this way by users, architects, reviewers of architecture and other parties in the process. By relating the results of this study to the design decisions it should be possible to judge form more scholarly than can be done now. It is an important challenge for those who are studying from the vantage points of their separate working environments architectonic designing.

18 EX ANTE RESEARCH

EDWARD HULSBERGEN
PITY VAN DER SCHAAF

" … designers regard themselves as integrators, researchers do not see them in that rôle."

"Instead of regarding designers as practitioners who are supplied with knowledge by researchers, it is possible to see design as the study of potential or desirable futures, thus, putting researchers and designers on a more equal footing." [a]

18.1 EX ANTE AND EX POST

The design is ready. The explanation of the plan is clear and well founded, there are no mis-understandings about the functional programme, there is a clear relation with the adjacent scales, the strategic intervention is defined, the proposal is delineated, the legend is unequivocal. Deliberation, debate or realisation? How to continue?

In a competition different designs are made. Which design should be chosen?

A student shows his design to the teacher for judgement. Can the design be improved? What aspect is essential?

A design has been made to explore a possible future.

These are four cases in which ex ante evaluation can be used to discuss the qualities of a design. Ex ante means 'before'. It is the opposite of ex post, 'after'. With ex post research, a design can be judged on actual effects. Since ex ante research is done prior to the realisation of a design, *actual* effects can not be measured in this type of research. Therefore, in ex ante research evaluation criteria are chosen based on what is *expected* to be significant. Ex ante evaluation is regularly used in policy sciences to determine the *probable* consequences of activities. A well-known form of ex ante research is environmental impact analysis, where environmental consequences of proposed activities and alternatives are studied in advance.[b] Ex ante research can also be valuable to research-driven design in technical disciplines. In this context, the aim of ex ante research is to critically discuss and evaluate future consequences of a design, prior to realisation. One thing is certain: the future is uncertain. The uncertainty will only increase with the time-frame of the study. The more uncertain the future, the harder it is to forecast developments surrounding the design and the wider the variance of possible effects. When the time-frame is lengthened, more hidden effects will be revealed (see figure 141). It is obvious that this complicates ex ante debate.

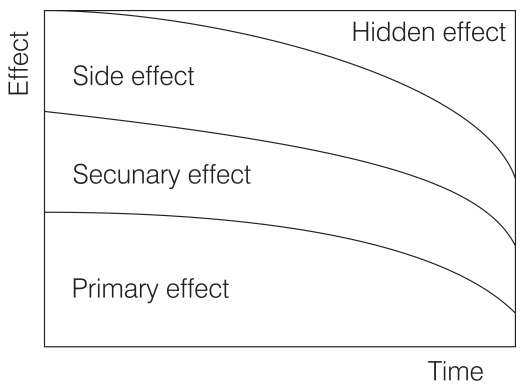
18.2 DIFFERENT FORMS OF EX ANTE RESEARCH

Within the research-driven design context two different forms of ex ante research can be defined. First, ex ante research may compare the quality of the design to the original brief.[c] A design should be a technical composition based on the original design assignment, unless the designer altered the original brief with good arguments (in consultation with the client). Anyway, during the design process, choices are made. Consequently, the design is just one of the possible operationalisations of the original brief. The second form of ex ante research is directed to testing consequences of design choices, with respect to aspects (contexts or perspectives) relevant, but not explicitly stated in the design brief. An example is the effect of design intervention on higher or lower scale levels, or on related sectors.

The second form of ex ante research concentrates not only on expected consequences, but also on not-expected or not-anticipated consequences. A distinction can also be drawn between desired and undesired consequences (see figure 142). Increasing insight in the effects of a design can result in adaptation of the brief and a new design.

18.3 EX ANTE EVALUATION IN ALL PHASES OF THE DESIGN PROCESS

The previous section shows that ex ante research can be useful in different ways when judging a design. Amongst designers there is much difference of opinion as to judging designs.

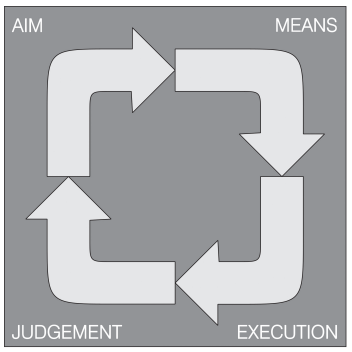


141 The relationship between time and effect[c]

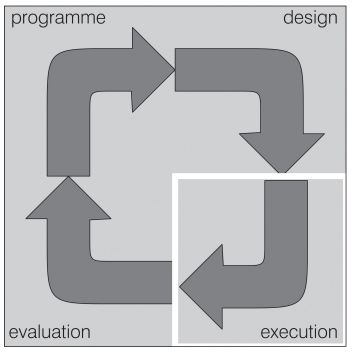
	desired	undesired
expected	1	2
unexpected	3	4

142 Framework to map consequences

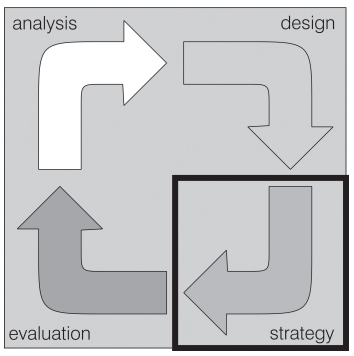
a Heide, H. ter and D. Wijnbelt (1996) *To know and to make: the link between research and urban design*.
b Lehning, P.B. and J.B.D. Simonis (1987) *Handboek beleidswetenschap*. p.121.
c Source: Peters, J. and R. Wetzels (1998) *Niets nieuws onder de zon en andere toevalligheden*. p.51, Figuur 2-5 Soorten effect.
d It is self-evident that the design also has to comply with legal demands (sizes, construction, environment, participation, etc.). Nevertheless it can be very interesting to check whether the designer has used innovative ways to deal with these demands. See page 1 for programming research.



base cycle



cycle in practice



cycle in education

143 Three descriptions of the planning cycle[c]

The first, most dominant, one is the opinion that work is done when the design is finished. The client then needs to judge and decide. Thereupon the designer can change rôles and becomes, for example, project manager. In this opinion ex ante evaluation can be an important tool for the client.

The second group is of the opinion that when a design is made, judging it is the responsibility of both client and designer, or at least of the profession. In this case ex ante research can be an important tool for both designer – during, and at the end of the design process – and client.

Moreover, any serious discussion about a design, no matter what stage of the process, contains elements of ex ante research. However a study only deserves the denomination 'research' if it is clearly embedded in the planning cycle and respects the demands of research (see figure 143).[a] Design as a process concerns all steps of the planning cycle. The relationship between a design and the cycle clarifies the place of different forms of evaluation research. *Ex ante* research helps to obtain insight into the selected effects prior to execution, while *ex post* research stresses actual effects. *Ex post* evaluation also contributes to the body of knowledge of the discipline to be used as input for new designs. The third form, *andante* (ongoing) research supports the design during execution, and is especially valuable in monitoring long-term processes, e.g. rehabilitation of city centres, districts and neighbourhoods.[b]

18.4 DIFFERENCES BETWEEN DISCIPLINES

Content of ex ante research is not the same for each discipline. The difference is caused by different interpretation of the word 'designing'. Generally designing means creating. In Architecture, Building Technology and Planning this is translated in creating space or the built environment. The product is something, say, a building, façade or city structure. On the other hand, in a discipline like Real Estate and Project Management designing can refer to creating processes or decision support systems (DSS). The content of ex ante analysis changes with the change in interpretation.

Secondly, the built-environment (sub)disciplines differ in object and scale. Evaluation of an architectural design will be more focused on building, while evaluation of an urban design will be more related to collective parties in society and the long-term.[d] The content of ex ante research (focus) will change correspondingly.

Thirdly, there are different products within the same discipline asking for a different accent in the analysis. For example, in architecture a difference can be made between buildings designed with certain qualities, like form or sustainability, and buildings that should be seen as statements. The latter is an artistic and intellectual activity: to give colleagues and the public something to look at and think about.[e] Both types of design are necessary for continuance of society, but evaluating the designs ex ante will result in different accents.

18.5 ONE-SIDEDNESS, PITFALLS AND SIMPLICITY

Discussion on design belongs to the discipline, as periodicals, books and public media show. However, from a scientific point of view, these judgements are limited in usefulness most of the time, as they are based on selective and implicit aspects.[f] Good evaluations, also ex ante, concern:

- positive and negative aspects;
- the object, the, the location and processes and values
- explicit quality criteria;
- contribution of all (future) actors;
- clarity regarding weighing of arguments by critics towards their final judgement.

Designers are familiar with a number of pitfalls when designing.[g] In order to learn from these, ex ante evaluation must pay thorough attention to:

- reciprocal relationship between the analysis and composition;
- relationship between parts of the design;

a Roozenburg, N.F.M. and J. Eekels (1991) *Designing is a special way of solving problems*, p.76. The authors connect designing with the empirical research cycle of A.D. de Groot.
b For a very good text about monitoring and evaluation, see: Moore, B. and R. Spires (2000) The development, monitoring and evaluation of urban regeneration strategies, Chapter 10.
c Hulsbergen, E.D. and I. Kriens (2000) *Planvorming*, Chapter 2
d In this sense the problem of earnings and costs is also different in urban building and in architecture.
e Dijk, H. van (1981) *Maak weer eens een meesterwerk*.
f Langdon, P (1990) *Urban Excellence*, Chapter 1.
g Lawson, B.R. (1990) *How designers think, the design process demystified*, Chapter 12

- relationship of the design to social and scientific questions;
- quality of the data used as arguments to design decisions;
- actual meaning of models used to explain the design;
- relevance of design images to approach the stated problems.

A design can also be evaluated by attention to recent developments; for example, to problems in urban areas.[a] Relevant criteria can be formulated in terms of the consideration the design gives to:

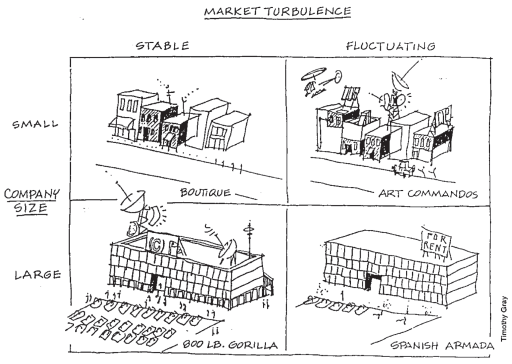
- integrated approach (versus simplistic problem definitions and mono approaches);
- multi-functionality (versus mono-functionality, e.g. only housing);
- mixed ground use (versus one sided use; alternating use of functions and groups, without conflicts; also against neglect);
- local synergy (versus isolated projects);
- public-private and other pp-partnerships (versus insufficiently supported, separate initiatives).

18.6 USING SCENARIOS IN EX ANTE EVALUATION

To determine the effect of a design scenarios can be used.[b] Many people think scenarios predict the future, whilst it is really about getting prepared for the uncertain future. Scenarios can be used in ex ante evaluation to determine possible future developments in the context of the design. Scenarios are images or descriptions of possible, probable or desirable future developments.[c]

To show how scenarios can be used when making (design) choices we will use the example of an architect designing an office for a client. In the traditional design process architects hardly ever use scenarios. Instead, they try to understand the client as well as possible. This understanding is then used to design a building that in their opinion fits current and future needs of the client best. This way only one of many solutions is designed; as a consequence many buildings need to be renovated or changed only shortly after they are first occupied. Testing the design in various scenarios representing alternative ways of using the future building can prevent this.

The use of scenarios in the design process is described by Brand.[d] He uses the example of a film and television company – Colossal Pictures – operating in a turbulent market. This company had to choose between renovating many small buildings or constructing one big new building (see figure 144). To determine possible consequences of this choice critical developments surrounding the company were determined. Analysis showed that the growth of the company and its need for real estate was mainly dependent on the developments in the film and television industry: would the market stabilise or fluctuate? By analysing the consequences these market conditions would have in both accommodation alternatives, Colossal pictures could make a better founded decision.



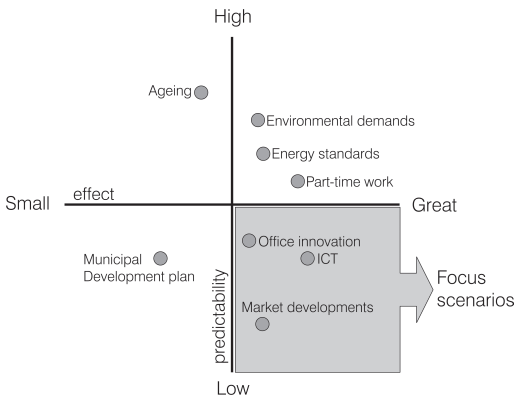
144 Colossal Pictures needs to choose between constructing one new building or renovating many small buildings; probable consequences are evaluated ex ante.

18.7 IDENTIFYING CRITICAL SCENARIOS

The examples in the previous section have shown the usefulness of scenarios in ex ante evaluation. But, how can one choose the developments that should be included in the ex ante evaluation of a design?[e] Political, spatial, technological, cultural or economic developments? The first step is to determine the right variables for a critical scenario is defining the driving forces. An architect designing a building for a client can, for example, try to identify the forces that will affect the organisation needing accommodation.

To determine the driving forces one can start with analysing past developments. The architect in our example could try to determine what developments influenced organisation and use of the current building in the past. Examples of developments that influenced the use of office buildings in the past are information and communication technology and growth of the number of part-time employees, stimulating double use of workplaces.

a Bekkering, H. (1998) *Stedelijke transformaties*.
b See: Dewulf, G.P.R.M. and P. van der Schaaf (1998) *Portfolio management in the midst of uncertanties: how scenarios can be useful*; also: Dewulf, G.P.R.M., A.C. den Den Heijer et al. (1999) *Het managen van vastgoed binnen een publieke organisatie*.
c Compare: Draak, J. den (1993) *Van blauwdruk naar draaiboek, scenario's in de ruimtelijke planning en volkshuisvesting*, Chapter 1.
d Brand, S. (1994) *How buildings learn, what happens after they are built*.
e See also: Thieme, J.C. , D.J.M. van der Voordt et al. (1989) *Effecten van grootschalige ingrepen, een programmeringsstudie*.



145 Co-ordinate system to map the predictability and impact of developments surrounding the design.

A second way to determine driving forces is a workshop or brain-storm session with the client, experts and future users. What developments do they think will influence the future use of the building? What effects would those developments have on the brief or the usefulness of the current design? This analysis can give insight in the need for flexibility. In a session aimed at determining driving forces, it is important that the people involved let go of the current situation and think about what might happen (as opposed to what they think will happen).

Based on this analysis of driving forces, various scenarios can be defined. There are different ways to define such scenarios. First of all, trends can be extrapolated into the future. This results in a 'trend' or 'reference' scenario. It is however only one possibility. To define more scenarios, it is important to vary driving forces that are hard to predict and that will have big effects on the design. Such driving forces are called 'critical uncertainties'. Moreover, when evaluating a design it is useful to create a bandwidth of scenarios by using extreme scenarios. To determine the critical uncertainties that characterise these extreme scenarios, one can use a co-ordinate system (figure 145) based on the axes predictability (high or low) and effect (great or small).

The difference between the various scenarios should be based on uncertainties located in the lower right corner of the picture, since reasonably predictable developments (like ageing) can develop similarly in every scenario and developments that have no effect will not change the design. Experience shows that scenarios in determining possible consequences are a useful instrument during the design process. However, it is important to keep their number limited: three or four suffice. Too many scenarios will confuse.

When the scenarios have been defined, the next step is to determine the consequences of a design in a certain scenario. A design doing well in more than one scenario is called robust.

18.8 EXAMPLE: THE NETHERLANDS 2030

An organisation using scenarios regularly to determine the effects of the spatial planning policies of the Dutch government is the *Rijksplanologische Dienst* (RPD). In a study 'The Netherlands 2030', the RPD described four different visions of the spatial structure of the Netherlands in 2030. The policy (or strategy) Dutch government needs to pursue to realise these visions differs for every vision. However, the actual consequences of the policy (strategy) depend on developments beyond the government's control, like development of the world economy and the position of the Netherlands in world trade. This means that realisation of the vision depends also on these uncertain developments. To deal with highly unpredictable developments when formulating new policies, the RPD has tested the robustness of various policies by using three scenarios. For each alternative policy the effects in every scenario were determined.[a] This exercise was not performed to provoke selection of a certain policy. The goal was a discussion on the main themes regarding spatial structure of the Netherlands.

18.9 CONCLUDING REMARKS

Most people just want one solution or one explanation; preferably the one they had in mind for a long time, resulting in minimal resistance; or they just invented in discussion.[b] Consequently, opinion about the usefulness of ex ante evaluation during the design process is divided.

Strong emphasis on creative aspects of designing can be a way to distance oneself from 'known' and 'tested' solutions. In that case ex ante e;;valuation might be experienced as a burden instead of a support. Especially thinking about probable or conceivable developments that might influence the design will stimulate the designer to think about the future, prompting new ideas. Moreover, ex ante evaluation helps to expose popular beliefs about benefits, and pays attention to neglected or hidden burdens. Consequently, the actual choices become more realistic. For the practice, scholarship and education of the professions, this kind of research needs further development.

a See: Rijks Planologische Dienst (1998) *Nederland 2030, Discussienota verkenning ruimtelijke perspectieven*.

b Charberlin, T.C. (1965) *The method of multiple working hypotheses* (previously published in 1890, also in 'Science'). The author mentions the 'parental affection' scientists may experience for their hypotheses and expectations.

19 EX ANTE PERFORMANCE EVALUATION OF HOUSING

ANDRE THOMSEN

In several stages of the design process performance checks are needed: either for decisions about the feasibility of the programme and, later in the process, of the draft design; or to check and trim, to optimise, the final plan. The first stage enables the maximum adaptability of the plans with scant information. Towards the final realisation of the building information about the performance grows to a maximum and adaptability diminishes to almost zero. It is, therefore, essential to achieve results of performance evaluation as early in the design process as possible. Ex-ante performance evaluation proves to be a useful approach. It is based in principle on anticipation of future performance using broad and long term experience with similar products. This makes it useful for application to serially produced housing projects.

However, major difficulties are to be solved regarding measurement and assessment of performance as well as practical utilisation.

19.1 MEASURING PERFORMANCE

For performance evaluation a large number of methods is available, varying from Post Occupancy Evaluation (POE) and user enquiry surveys to various kinds of benchmarking. Most often they are based on quality/cost ratings. For early design and development stages simple and ready to use quality/cost rating-methods are most suitable. We will discuss both variables: quality and cost.

19.2 MEASURING FUNCTIONAL QUALITY

Performance of housing products depend mainly on satisfying residents, since this determines the market position of housing estates. Resident satisfaction depends upon a mix of mainly functional qualities (e.g. usable floor space) and subjective preferences (e.g. location). Though quite some research is available regarding resident satisfaction, translation and implementation of functional users preferences in evaluation criteria of built construction are meeting a couple of problems:

The translation of functional preferences, based on dwelling activities, in building construction characteristics. For instance: the activity 'cooking' implicates not only functional criteria for the kitchen floor plan and equipment, but also for heating, ventilation, relation to dining room/table, to be differentiated depending on household type and size etc.

The implementation of a large number of incomparable and partly contradictory aspects in a useful and practicable system. Solving this problem encounters a dilemma. One has to choose between very complicated compiled scorings, leading to insignificant non-transparent results, and simple but questionable undifferentiated results. As a research project targeted at the development of a consumer's test for housing products showed though, a useful and practicable system like the Dutch *Woning Waarderings Stelsel* (Dwelling Assessment System) is largely to be favoured, since it is widely used and recognised as a comparison gauge.[a] Regarding its nature, quality assessment must always be considered a rough and doubtful approximation of the many facets of the reality.

19.3 THE DUTCH RESIDENTIAL ASSESSMENT SYSTEM WWS

The Dutch residential assessment system *Woning Waardering Stelsel*, abbreviated WWS, is an instrument used by Dutch government to determine the quality of a domicile. Determining a reasonable rent is one of its purposes. Quality is expressed in points per quality aspect. The points for shared rooms and facilities, like a laundry room or heating, shared in apartment buildings, are proportionately distributed over the number of domiciles, regardless of size. Per aspect the following points can be 'earned' maximally:

a Thomsen, A.F. (1992) *Towards a consumers test for houses, surveying users-preferences and functional quality;* Thomsen, A.F. (1995) *Woonconsument en woningkwaliteit, prestatiemeting van woningen met behulp van vergelijkend warenonderzoek*.

1	*surface of spaces* (rooms, kitchen, bathroom, shower)	1 pnt. / m^2
2	*surface additional spaces* (kitchen extension, storage, attic, garage)	0,75 pnt. / m^2
3	*heating*	
	per heated space	2 pnt.
	private furnace in cellar	3 pnt.
	private high yield furnace	5 pnt.
	collective high yield furnace	1 pnt.
	radiator taps per space	0,25 pnt. per tap, max 2 pnt.
	heating elements outside rooms	1 pnt.,
	per space	max 4 pnt
	central heating combination	1 pnt.
	water meter	1 pnt.
4	thermal isolation	max 15 pnt.
5	*kitchen*	
	length table top near sink up to 1 metre	0 pnt.
	1 to 2 metre	4 pnt.
	2 metres and more	7 pnt.
6	*sanitary facilities*	
	toilet	3 pnt.
	washing basin	1 pnt.
	shower	4 pnt.
	bath	6 pnt.
	bath plus shower	7 pnt.
6a	*facilities for people with disabilities*	
	per Dfl 500 of the costs incurred by the owner to establish them	1 pnt.

7	*out-of-date*	max. -30 pnt.
8	*private outside spaces*	
	up to 25 m^2	2 pnt.
	25 to 50 m^2	4 pnt.
	50 to 75 m^2	6 pnt.
	75 to 100 m^2	8 pnt.
	100 m^2 and more	10-15 pnt.
	no private outside space	5 pnt. deduct
	carport	2 pnt.
9	*type of domicile*	
	a) single family houses	
	non-attached house	17 pnt.
	corner of house	15 pnt.
	position in between / last of block	12 pnt.
	b) flats in shared buildings	
	ground floor without elevator	6 pnt.
	ground floor with elevator	6 pnt.
	1st floor without elevator	3 pnt.
	1st floor with elevator	5 pnt.
	2nd floor without elevator	1 pnt.
	2nd floor with elevator	4 pnt.
	3rd floor without elevator	0 pnt.
	3rd floor with elevator	4 pnt.
	4th floor and higher without elevator	0 pnt.
	4th floor and higher with elevator	4 pnt.
	16 or less flats per elevator shaft	2 pnt. extra
	c) duplex residences	
	upstairs	1 pnt.
	ground floor	4 pnt.

10	*surroundings*	
	1. trees, flower beds	0 - 1 pnt.
	2. public green	0 - 2 pnt.
	3. playing space young children	0 - 0,5 pnt.
	4. playing space older children	0 - 0,5 pnt.
	5. elementary schools	0 - 1 pnt.
	6. shops for daily provisions	0 - 2 pnt.
	7. urban facilities	0 - 2 pnt.
	8. accessibility of residence	0 - 1 pnt.
	9. public parking	0 - 1 pnt.
	10. stop public transportation	0 - 2 pnt.
	11. traffic load and unsafety	0 - 1 pnt.
	12. state of maintenance	0 - 2 pnt.
	13. distance to industrial buildings	0 - 1 pnt.
	14. attractiveness	0 - 4 pnt.
	15. population density	0 - 1 pnt.
	16. safety	0 - 3 pnt.
11	*noxious situations*	max.40 p. deduct
	serious decline neighbourhood	20 pnt. deduct
	city renovation activities	20 pnt. deduct
	serious noise (industry, air traffic)	35 pnt. deduct
	direct pollution soil or air	40 pnt. deduct
	other soil pollution	20 pnt. deduct
12	*special facilities*	
	exclusively with service flat residences	35% of total 1 t/m 11

Explanation

1,2 Surface
It holds for all spaces that one could stand on them, that they are at least 2 m^2 large and the height of the ceiling minimally 1,5 metre. Spaces of circulation (corridors) do not count. Absence of a fixed flight of stairs to the attic results in 5 points less.

3 Heating
Each heated space scores 2 point, excepting the 'remaining spaces' (attic, sheds, cellars, garages, etc.). For specific elements of appraisal extra points may result; for instance 3 points extra for a private central heating installation, a quarter point per space extra for the temperature control by thermostat (with a maximum of two points per residence).

4 Thermal isolation

-	Double glass	0,4 point per m^2
-	Roof isolation	2 points per residence
-	Wall isolation	1 point per residence
-	Wall isolation front	6 points per residence
-	Floor isolation	2 points per residence
-	Maximally	15 points per residence

5 Kitchen
The length of the working surface near the sink determines the number of points. Built-in sinks count, built-in stove tops do not. Depending on the quality the points may be doubled maximally (1 point per Dfl. 500 investment).

6 Sanitary equipment
Facilities present determine the number of points. Spaces for bathing and showering can only get points if the walls and floor are sufficiently water-tight, if there is access to hot and cold water and if the shower is equipped with the necessary utilities.

7 Out-of-date
Maximally 30 points reduction for ageing and wear; 0,4 point per (calendar)year following the construction of the building. For major maintenance and renovation work after 1970 a compensation applies of the reduction of points (per Dfl. 1000 investment 0,2 point less).

8 Private space outside
These spaces only count if they are minimally 1,5 metre wide and broad.

9 Type of domicile
If the floor of the main living-room of a ground floor residence lies 1,5 metre or more above street level it is regarded as a flat on the first floor. If there are 16 or less flats per elevator shaft this yields 2 points per flat extra. A duplex house is a one-family residence outfitted in such a way that two families can live in it. A domicile that is not free (with a shared flight of stairs and/ or landing) is rated a duplex house. The lower part scores 4 points, the higher part 1. For a dwelling that is not free on the second floor or higher no points are given.

10 Environment
For inconvenient situations up to 40 points are deducted:
- For very serious hindrance of noise by road, rail or air traffic or by industry maximally 35 points.
- For serious decline of the neighbourhood maximally 20 points.
- For urban renovation activities maximally 20 points
- For very serious soil or air pollution in the direct environment of the residence maximally 40 points when the cleaning-up starts within four years
- For other soil pollution a maximal reduction of 20 points.

12 Service flat costs supplement
A service flat is an independent living unit with minimally an emergency installation in it, meals provided by the owner in addition to simple medical or paramedical care and use of spaces for recreation and guest-rooms. For this type of residence the total number of points may be increased up to a maximum of 35%.

146 The Dutch residential assessment system WWS

19.4 THE RESIDENTIAL CONSUMER'S TEST

The WWS system of assessing homes is often applied in The Netherlands for judging the capability and the price/ performance ratio of residential facilities. WWS is mainly applied ex post; parts of it are also useful ex ante. Since WWS does not agree well with preferences of occupants an effort was undertaken in the nineties to develop an alternative instrument, the so-called 'residential consumer's test'; in analogy with comparative study of consumer's products, as they were performed for years by consumer organisations in order to test the price/ quality ratio of products on the consumer market.

Comparative study of products consists largely in a product information system listing the main characteristics of comparable products. A relative evaluation is made then on the basis of formulated criteria, testing levels and weighting factors per aspect, with the interest of the consumer as a decisive force. Usually the final judgement is termed 'Best Buy' and 'Best in Test' for products with the highest score, and 'Money Saver' for products with the best price/ performance ratio. The basis for the development of the test was a design of a quality test, founded on study of sources and interviews. Weak points in this testing method: valuation and weighing are not sufficiently based on occupants' preferences of the several quality aspects; the unsatisfactory way the total score was calculated; and lack of a relation to WWS.

Due to this criticism a new study started, structured in 3 stages:

- Occupants' preferences: a study of relevant quality properties and the degree in which these are related to the domestic properties according to housing consumers;
- Development of the test: the development of a test of housing quality based on the methodology developed during the early stage of the study;
- Operationalisation in practice: 'testing the test' and transfer of the testing methodology.

The essential point of departure for the test to be developed was the preference of occupants, rather than physical properties of housing of most existing methods of housing appraisal: the two should be regarded as independent variables. Searching for a relation between physical performance properties of homes (the objective component) and the preferences of occupants (the subjective component) linked to them; and what is more,a relation that may be measured, is the Achilles heel of this study.

An important conclusion of the first stage was that standard preferences of the occupant do not exist. Wishes and preferences of occupants differ according to composition of the family, age, income perspective, dependence on care, and life-style. In addition realising the preferences of occupants, the 'action space', strongly depends on socio-economical position and conditions prevailing on the real estate market. It proved to be too optimistic to expect that existing study data would be sufficiently available to serve as a basis for the testing methodology.

In Stage 2 – development of the test – determining criteria, testing values and weighting factors stood central. An extensive analysis of existing methodologies was conducted in order to establish criteria and testing values; complemented with technical norms of reference of housing from the available literature. On housing-technical (minimal) norms it was decidedly rich. Based upon it, a comprehensive survey was made, expressed in conditions and boundary values for individual domestic activities. Associating them with importance, in this case with weighting factors based on occupants' preferences (the subjective component) had to face the problem already signalled in stage 1, that can only be solved by conducting the (experimental) testing and the occupants' interviews concurrently. Because of the complexity involved, the decision was made to postpone the working-out of the residential environment as a testing object to later.

aspect / partial aspect	S	W
1. usefulness of spaces		
1.1 bedrooms		
1.2 living-rooms		
1.3 kitchen-rooms		
1.4 sanitary/ bath-rooms		
1.5 traffic space		
1.6 storage/ hobby space		
1.7 space outside		
2. flexibility / potential for change		
2.1 flexibility of use		
2.2 adaptability of layout		
3. connections and connectedness		
3.1 direct relations		
3.2 seclusion and privacy		
3.3 care relation		
3.4 Accessibility		
4. installations		
4.1 heating		
4.2 hot water		
4.3 ventilation		
4.4 shades		
4.5 thermal isolation		
4.6 sound isolation		
4.7 energy connection / plugs / metering cabinet		
5. sun and daylight		
5.1 living-rooms		
5.2 other rooms of residence		
5.3 kitchen		
5.4 daylight other spaces		
5.5 space outside		
6. maintenance		
6.1 maintenance of usage		
6.2 maintenance of installations		
6.3 architectural maintenance		
7. access, safety and living environment		
7.1 access		
7.2 safety		
7.3 neighbourhood and living environment		
7.4 outside / inconvenient situations		

S = score, W = weight

147 Survey main scores

During Stage 3 the housing quality test was tried out in two housing complexes in Delft. The testing concept used is a compromise between mutually contradictory requirements with regard to completeness and practibility. It is mainly a checking list of seven functional quality aspects considered important by occupants. Together they determine the quality of usage of a home.

Next interviews with occupants was the basis for assigning the weighting factors. The usefulness of spaces is measured by 'function mats', linked to activities and dependent on capacity. For the remaining partial aspects scoring instructions are provided.

Via a questionnaire to fill in the test results in a schema of quality aspects in which after weighing of the separate scores a total score can be calculated. The weighting factors are based on the results of the occupants poll, in which each partial aspect is scrutinised in terms of the interest of it to the occupant as well as in the one of valuation judgement. Finally, the price / performance ratio can be determined by relating the total score to the costs incurred by occupying the home.

The outcome of the experimental testing demonstrated that the test developed is viable and that the results are reasonably valid. Although the interest scores proved to be sufficiently useful for assigning weights, the question remains whether an occupants' poll is also sufficiently useful for determining the generally valid weights in a test.

All in all, developing the test proved to be much more complicated than was expected in the preliminary study. Although the development of a 'working' test succeeded, doubt as to reaching the aims formulated sufficiently increased. The concept still shows important shortcomings in two respects:

- the test is too complicated;
- the scoring results are for the time being insufficiently useful as unequivocal yardstick of performance

Given the large amount of different and dis-similar properties, the complexity does not surprise. During development, therefore, the well-considered choice was made to work from complete to simple; that is the only way to find out experimentally which aspects and for what households are in which situation of minor importance and might as well be left out, or get, on the other hand, a greater weight. This way it is also possible to trace systematically differences between different types of households that might not show up while working 'from coarse to fine'. However, the consequence of this choice is that it lasts this way (too) long before the developmental stage results in a practically useful instrument.

The second shortcoming concerns the structural problem of the weighting factors: in this case the relationship between subjective preferences, mainly with a functional character, and the physical properties of the object of those preferences. Only for neutral properties *vis-à-vis* household and income a match that can be implemented can be made.

Finally, question marks could be put with regard to a strong focus on valuation of the quality of usage. Efficiency in use plays a rôle; particularly in the case of cramped blueprints. When the living surface per occupant increases, possibilities of usage also increases and shortcomings become masked and/ or compensated.

Towards a new WWS

Looking back at the results, the two central problems: complexity of a 'responsible' method, and the needed 'match' between preferences and object-properties, seem to be a hurdle difficult to take for the time being for application in practice. On the short term, variants of WWS offer a reasonable alternative. Admittedly, they have the disadvantage that the judgement of occupants gets not sufficient weight in them. However, that seems to lead to unsatisfactory results only in a limited number of aspects; furthermore, it can be compensated by simply

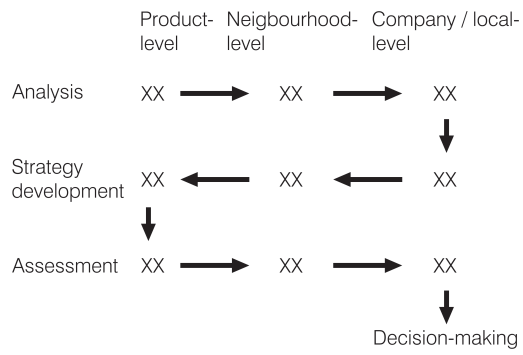
asking occupants themselves what they think of those aspects. It is an important advantage of WWS that there is a lot of experience with its application and that it is, by and large, - the objective surface and facilities part – accepted by the various parties as a bias for valuation. It is obvious to keep, in any case, that part of the bias without worrying too much about the more subjective part: if the judgement of occupants must be asked in any case, in order to make the match and the new rental policy pre-supposes negotiation between both parties, why should valuation on these points not be made dependent on that negotiation? This way a basic valuation that can be objectified, with surface and facilities, emerges. The points do have a reasonable relation to building performance and may be maintained as a yardstick of points in government ruling. It is certainly desirable to check regularly by study whether the weight attribution in points sufficiently reflects the preferences of occupants. Multiplied by the average price of point on the level of rental or real estate markets a basic rent or reference rent can be calculated. The more subjective part can be replaced by a negotiation margin, the margin of valuation. This is globally in accordance with the other part of the present WWS, where no formal scoring precept is demanded, but at most a margin in percentage of the basic valuation.

19.5 MEASURING COSTS

Though most often used in building construction practice, investment costs are not practicable for assessing performance, optimisation and weighing alternatives. Running costs like maintenance, energy and management costs should be considered just as important as initial building costs. To compare different (re)design and (re)development alternatives a Life Cycle Costs approach using net present value is necessary.[a]

Methods and tools

In recent years a variety of design and decision-making tools was developed based on some kind of quality/cost assessment.[b] They are used for ex ante performance evaluation in the early project development and design stage; and focus on different levels of scale: product-level, neighbourhood-level and company/local-level, and different purposes: analysis, strategy development and assessment. Figure 148 shows the relation between them in the routing of project- (and policy-) development.



148 Routing of project-development[c]

Most of these tools are software applications developed for building and planning consultancy. They calculate integral life cycle costs to compare with qualitative variables, resulting in a performance score. Though practical for quick scan and weighing alternatives, the qualitative variable is the weak component. This can be seen, for instance, in the rather sophisticated Anymo-system, developed as computer software for portfolio analyses of rented dwellings.[d] The system evaluates the market position and performance of the dwellings. Basic determinants are the quality and the rent. Input data are quality aspects, derived from a list of criteria, and scored by a panel of managing staff and or surveyors. Based on the quality score potential gross rents and assets are estimated. The system is clearly market- and product-orientated and may best be applied for weighing alternative interventions regarding the market position of dwellings. The weak point of these market-orientated systems is that market-indicators are rather soft and fluctuating; often just symptoms for deficits to be neglected in decision making.

19.6 CONDITIONS AND RESTRICTIONS

Using these tools we should keep in mind conditions and restrictions. According to Potting *et al.* the tools may be reviewed referring to the following initial goals:[e]

a. rational basis for decisions;
b. efficient use of resources;
c. transparency of effects;

a See Ruegg, R.T. and H.E. Marshall (1990) *Building economics*.
b Flier, C.L. van der and A.F. Thomsen (1996) *Matching alternatives, Design & Decision Support Systems for the management of existing housing stock;* Broeke, R. van den (1998) *Strategisch voorraadbeleid van woningcorporaties, informatievoorziening en instrumenten*.
c Leent, M. van and J.M. van Vliet (1992) *Strategisch woonbeheer*.
d Idem.
e Potting, A. and M. del Canho (1990) *Behelpen als hulpmiddel*.

d. open democratic decision control (discussion of this goal is beyond the scope of this article: see the contribution of Van Loon on page 293);
e. use of professional skills.

a) The tools are meant to offer a rational basis for decision making on programs and plans. As seen above, the qualitative variable is often a weak point. And, apart from that, ratio is not the only ground for decisions. It is wise to take into account that assessment of alternatives in practice is influenced a lot more often by 'irrational' items than people like to admit.
b) The tools should enable more efficient use of budgets and resources. But, the use of them is a matter of optimisation: a rather good decision is not enough, one perfect solution does not exist and there is often more than one good alternative.
c) The tools should give a transparent view of the design process and the effects of programs and plans. This pre-supposes the presence of proper professional skills (see below). They are expected to reduce the complexity of decision making, but the result can be a false simplification of reality. Weighing alternatives should be based on comparable and realistic conditions or programs.
d) The tools should make use of professional skills. The selection of relevant information and parameter values is a matter of profound professional knowledge of housing management and economics: the most tricky part of the system. This includes minimal comparability and knowledge of use and misuse of evaluation methods.[a] Systems for experts may also be used to hide the absence of knowledge and skills, or worse: to generate and proof desired results. It is essential to keep an open and controllable check on input, throughput and output.

Ex-ante performance evaluation of dwellings implies reduction of doubts. Design and decision tools can help to diminish uncertainty and sharpen awareness of risky elements. But, even the smartest tools cannot give a guaranteed solution performing well.

a Lans, W (2000) *Housing evaluation, some methodological considerations*.

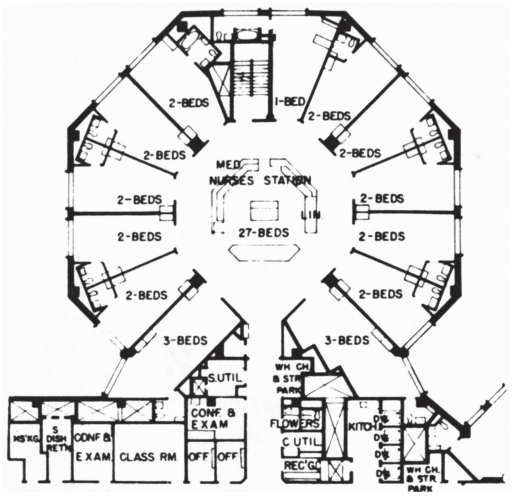
20 EVALUATING PROTOTYPES

THEO VAN DER VOORDT

Prototype design usually includes both ex ante evaluation and ex post evaluation. Ex ante evaluation of a first design may lead either to adaptations or to the conclusion that the design is ready to be built. After construction, ex post evaluation of the building may give rise to improvements. When the improved design is built, practical experiences may give rise to further improvements, and so on. This process may be of a sequential order, but design alternatives may also be tested simultaneously (see also Chapter 50). In this Chapter I will discuss several examples of prototype design with different combinations of ex ante and / or ex post evaluation.

20.1 TESTING DESIGNS FOR HEALTH CARE FACILITIES

In the late sixties a 570-bed hospital building was constructed in Rochester, Minnesota, for use as a laboratory for research into various aspects of hospital architecture.[a] One experiment investigated the impact of three different nursing unit designs on the activities and subjective feelings of nursing staff: a radial, single corridor and double-corridor or racetrack type floor plan. All tests using work-sampling and staff questionnaires were completed with the same administration and hospital staff. A total of 590 different people participated over a period of 82 days. In most instances the radial design turned out to be superior to the double-corridor, in its turn superior to the single-corridor design. The radial design showed less absenteeism and fewer accidents to staff members. Staff spent more time with patients, less time in travel. Physicians and patients also preferred the radials. This shows that specially designed buildings can be used to test theories relating architectural design to perception and behaviour. Such research needs designers to design and researchers to research.



149 The radial type nursing unit design

In The Netherlands too, study by design has been carried out in the Public Health System, particularly in Health Centres. Health Centres are co-operative organisations of general practitioners, neighbourhood nurses and social workers; often physio-therapists as well. In several Health Centres a pharmacy, dentist, psychologist and/ or other disciplines have offices.[b] This co-operation under one roof envisages increasing social visibility and the probability of an enduring regaining of health (often from a holistic vision on humanity), as well as using space more efficiently; for instance by sharing reception facilities and waiting-rooms. In the beginning of the eighties the decision was made to develop first-line health care in the New Town Almere entirely along the lines of Health Centres. In order to get more insight into the relationship between programmatic and architectural points of departure, as well as in investment and running costs, four designs were made for the same fictitious organisation. Next, these designs were evaluated in terms of quality of use and costs.[c] Four form variants were studied: peripheral (as many front-rooms as possible) versus compact (with many spaces within the ensemble), and for both variants a one-storey and a two-storey design. Per model two variants for construction were considered: weight carrying façades and inner walls, versus a skeleton structure with non-carrying inner walls. For each model a budget was prepared of the costs of investment, energy supply, technical maintenance and cleaning. Supposing a life-cycle period of 20 years, total costs (of investment plus exploitation) of the compact models proved to be clearly more advantageous than the peripheral models.

a Trites, D.K., F.D. Galbraith et al. (1970) *Influence of nursing-unit design on the activities and subjective feelings of nursing personnel*. For a brief summary see Saarinen, T.F. (1976) *Environmental planning, perception and behavior*.
b Hoogdalem, H., D.J.M. van der Voordt et al. (1985) *Comparative floorplan-analysis as a means to develop design guidelines*.
c Jonge, H. de, W. van Houten et al. (1988) *Prototype ontwikkeling gezondheidscentra Almere*.
d Wener, R., W. Frazier et al. (1985) *Three generations of evaluation and design of correctional facilities*.

	CRITERIA	P-1	P-2	I-1	I-2
1.	Plan-organisation				
1.1	Vertical transport	7	6	7	6
1.2	Situation waiting room	4	6	8	7
1.3	Connection waiting reception	8	8	8	7
1.4	Connection staff-public	4	5	7	6
1.5	Accessibility handicapped	6	5	7	5
1.6	Orientation	6	7	8	7
1.7	Acoustics	7	7	5	6
1.8	Inner climate	8	6	7	5
1.9	Reflection organisation	6	7	8	7
1.10	Usefulness	6	7	8	7
Total plan-organisation		62	64	76	63
2.	Urban architecture				
2.1	Fit to location	4	8	2	4
2.2	Entrance accessibility	6	8	7	6
2.3	Entrance safety	8	6	7	6
2.4	Orientation / sunlight	8	6	7	7
2.5	Stacking / vandalism	5	7	6	7
2.6	Noise hindrance	6	5	7	6
2.7	Construction depth foundation	6	8	6	8
Total urban architecture		43	46	42	44
3.	Future value				
3.1	Extendability	8	6	4	5
3.2	Compartimentation	8	8	5	6
3.3	Reserve space	-	-	-	-
3.4	Multi-functionality	8	7	5	6
3.5	Movability inner walls	-	-	-	-
3.6	Adaptability installations	7	6	5	4
Total future value		31	27	19	21

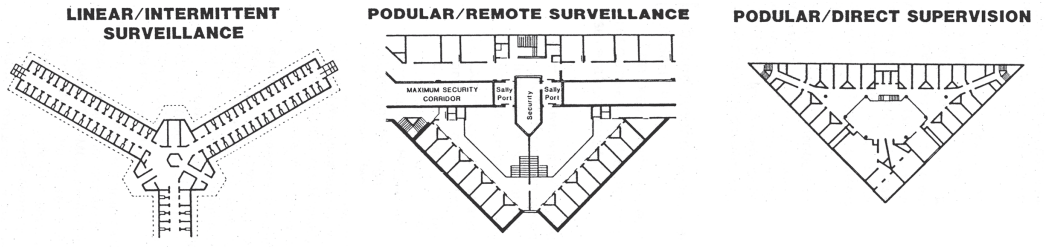
150 Evaluation and ranking criteria

Figure 150 surveys the evaluation criteria and the ranking ascribed to each model by an expert jury.

20.2 PROTOTYPE DESIGN OF CORRECTIONAL FACILITIES

In the mid eighties Wener *et al.*[d] published a paper on the process of data-based design i.e. behaviourally based evaluations in aiding the evolution of a design prototype for correctional facilities. This is a rare, but clear example of a completed cycle of study, build, test and reformulation. As a consequence of a pre-design programming study the Federal Bureau of Prisons rejected earlier models of jail design (generation 0) and developed a new model (generation 1). The old model was seen as oppressive, stressful and dangerous for staff and inmates alike. The new model should provide more humane settings with high levels of security. Basic assumption was that the environment should not be by itself punishing, but should reduce the physical and psychological brutality common in such institutions. Key to the goals of reducing tension and institutional regimentation was the functional unit system in which 40-50 inmates were placed in self-contained housing units. Instead of the usual linear type with intermittent surveillance, the concept of podular/direct supervision was introduced. Officers were placed in the living area, allowing proactive supervision. Each inmate got a single bedroom with a bed, toilet, sink, desk, and outside window. Within units, inmates had considerable freedom of movement through lounge, dining, classroom, and multi-purpose areas. The units were programmed to look non-institutional, by using movable, comfortable furniture, bright colours, and no bars. Most areas were carpeted.

Post-Occupancy Evaluations showed that the facilities were, for the most part, successful. Vandalism and graffiti were almost non-existent; violence and tension were considerably lower than in most other institutions. The staff perceived the environment as safe, clean and challenging. However, the high-rise buildings (12-26 stories) resulted in a frustrating dependency on elevators. Because units were self-sufficient, inmates often spent days or weeks without leaving the area and felt considerable monotony and boredom. Furthermore, two televisions per unit turned out to be too little, and complaints emerged on lack of personal control over physical systems (heating, ventilation). Based on these experiences, a great number of recommendations was made. Most of them were applied in a four storey federal prison in California (generation 2). Again this prison has been evaluated, showing high satisfaction levels overall, but still dis-satisfaction on the ability to individually regulate temperature and fresh air. Other issues of dis-satisfaction were overcrowding (the facility was designed for 383 beds, but in the event used by 520 inmates) and the lack of a secure perimeter beyond the building walls. A desirable result of adopting the direct supervision podular design was to raise the professional competency level for custody staff. Because staff mingles with inmates, they are able to prevent many problems from occurring. The POE-results can be used to improve the prototype again (generation 3).



151 Three different types of correctional facilities

In The Netherlands a study by design of prison systems was also conducted.[a] Considerable shortage of cells for inmates caused an accelerated building programme. Based on systematic analysis of realised projects four models have been developed with well-defined typological differences (figure 152). Particularly the way in which the cells are positioned *vis-à-vis* one another, and with regard to the space outside and to the other facilities, differs:

a. *Model 1: the* radial. The habitation building features two identical wings, four storeys high, at right angles. The cells are opposite one another, the common rooms at the ends. Duplicating both wings generates the so-called 'cross-type', characterised by short walks and ease of surveillance. The idea necessitates a surrounding wall.
b. *Model 2: the* back. This type is provided with a stark, almost blind, outward skin. All spaces are orientated towards the inner court. "Residing" is allocated within two triangular building masses with a lot of inner spaces. The requirement that cells are not allowed to be situated on street level if they adjoin the space outside caused a stapling in five storeys with a surfeit of space on street-level. A surrounding wall is not needed.
c. *Model 3: the* cupola. Point of departure here is a compact form of building. The cells make for the four sides of a square; the pavilion facilities lay in the inside along large viewing apertures. This idea necessitates a surrounding wall.
d. *Model 4: the* atrium. In this model the cells are situated at the outer side, opposite of the pavilion facilities. All parts of the building have been grouped around an area for sports and airing. A surrounding wall is also necessary in this case.

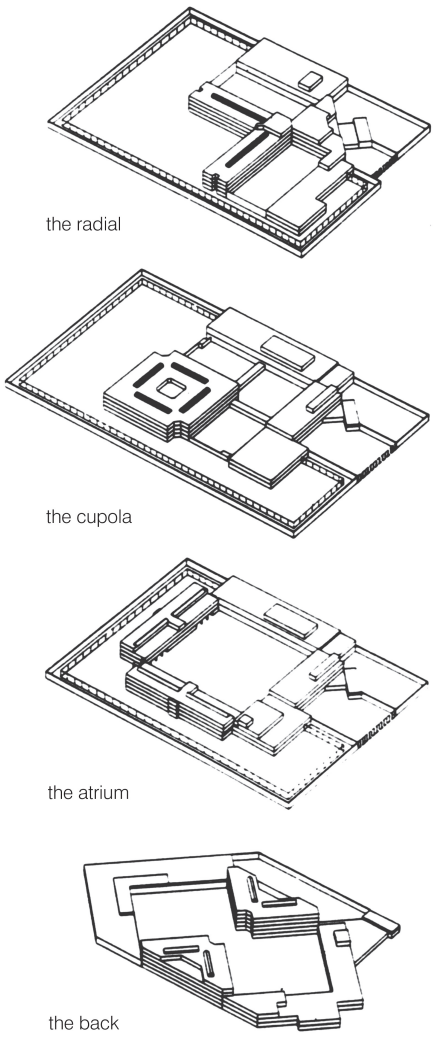
Just as in the case of the study concerning Health Centres, the four models have been compared to one another in terms of costs and quality (figure 153). In this case an important cost variable is utilisation of personnel, an important quality aspect of safety. The costs of construction, including additional costs, those of the site and of Value Added Tax, varied demonstrably between Dfl 254.000 and 360.000 per cell (price level 1989); a lot lower than the 500.000 initially budgeted. This profit mainly stems from sophisticated designs – particularly from a better ratio between net versus gross floor surface than in existing prisons – ascetic use of material and rapid construction.

Model 1 – the radial – boasts the lowest costs per cell, particularly by the lower demand for services of personnel (less static posts).

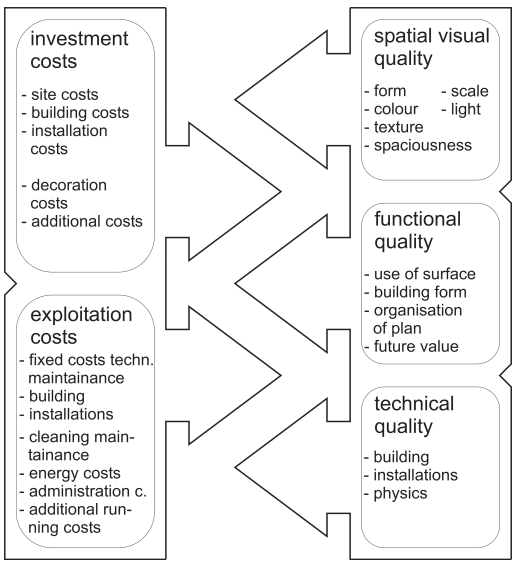
The financial influence of securing the environment proves to be so significant, that model 2 – the back – in spite of the highest costs associated with building itself ends up in terms of total costs in the next but lowest position. Disadvantages of model 2 are mediocre functionality and high level of personnel services. The possibilities for future adjustments are limited.

The financial advantages of the compact model 3 – the cupola – are largely annihilated by the high costs of internal compartmentalising. The model is not readily inspected and requires, just like model 2, a lot of personnel.

Model 4 is the most expensive variant except one; functionally it is rather good, with a reasonable demand for personnel activity. Differences in construction costs, caused by the type of building, are in the order of magnitude of 7% for the cheapest variant. The influence of the technical levels almost triples this. The impact of openings in inner walls and fronts, air-conditioning, sanitary installations and those for security and communication may accumulate to costing differences in the order of magnitude of Dfl 35.000 per cell. This study brought the consequences of some important design decisions to light. In addition to a plan-documentation and analysis of existing prisons, the results were used by government to legitimise empirically the policy for building prisons.



152 Four models for correctional facilities



153 Variables for a cost/ quality comparison

20.3 REFLECTIONS AND CONCLUSIONS

Study by design in conjunction with careful effect analyses may prevent many problems. The examples described demonstrate that considerable advance may be made as far as costs

a Jonge, H. de (1988) *Het beheerste ontwikkelingsproces, voorbeelden van productverbetering;* VROM (1989) *Een vergelijking van penitentiaire inrichtingen in Nederland.*

and quality are concerned. A kindred example is the range of designs for primary schools in the new town Almere in the Netherlands, previously mentioned.[a] By applying extra isolation, recycling heat from mechanically ventilated air, a lot of day-light and automation of electrical illumination, it could be shown for the first generation schools per annum and per building, that on average some 26.000 m^3 natural gas less was needed, compared to traditional school buildings (generation 0). The extra investment could be earned back in less than 10 years. Because of this success in the second generation schools additional energy conserving provisions were implemented, in combination with 'alternative' energy facilities like solar collectors and a wind turbine. It is hoped that this way an additional 2400 m^3 natural gas may be conserved.

In spite of this obvious usefulness of prototype design based on design study and study by design, it is still relatively scarce; and largely exists 'on paper'. This is partly explained by the time and costs incurred by alternative designs and effect-analyses. Another factor is, perhaps, that in design the personal vision of the designer and/ or commissioner is greatly valued. Personal considerations and ideals often guide designs. A thorough effect analysis carries the risk that the design has to change fundamentally. There is also fear of standardisation and repetition; in this case re-producing an existing design solution one more time, in The Netherlands also called 'stamping', a term of derogation. In the long term this can lead to monotony and cultural poverty. However, prototypical buildings are not like mass production products functioning in any context. Each building – even with a generic style or function – is unique in location, orientation, client and user population. Although certain key aspects of the design may stay constant, others necessarily change to fit different needs.

For higher levels of the craft of designing in terms of the profession and of scholarship a continuing exploitation of study by design is crucial. The building blocks: further development of the framework of study (how to make which variables measurable), and establishing databases with reference projects, including plan-analyses and evaluations of costs and quality. Another important condition is the willingness to formulate design objectives and expectations explicitly and openness for objective evaluation. Usually, designers and advisers work together on the same plan during the stage of plan development. It ought to be just as evident that while analysing and evaluating the effects various disciplines should co-operate. Only then 'synthesis' and 'integration' become really meaningful expressions.

a Niesten, J. (1983) *Almere bouwt tweede serie energiezuinige scholen*.

21 COMPARING AND EVALUATING DRAWINGS

TAEKE DE JONG

Design study, design research and study by design imply already by themselves comparison of different designs or designs in a different stage. Also when considers judging a design 'on its own merit' one employs implicit references. With a scientific design they should be explicit. In design research the designs should be studied empirically (goal-orientated or means-orientated). In design study and study by design they are *made*. Judging them (with norms) supposes evaluating them (with values). Evaluating supposes effect analysis (without values), and effect analysis supposes comparing; by identifying differences and comparing supposes explicit and expressive description. This Chapter provides criteria for these levels of evaluation.

21.1 EXPLICITNESS AND EXPRESSIVENESS

When one plan is more pronounced and eloquent than another (more explicit and unequivocal to understand) it is impossible for the judging agency to compare and, therefore, to judge. Both criteria represent the information content of the drawing, its diversity and the extent to which the designer has reached statements and stimulating ideas (see page 36).

A plan that is not outspoken leaves everything in vague images to the fantasy and the references of the judge. It might be poetical, evocative, productive and innovative (in practice also lucrative as a disguised study of the wishes of the principal), but it cannot be judged scientifically in principle. 'Outspokenness' is a condition for each following criterion. With a means-orientated design sketches lacking that quality may be the object of consideration on its way to an outspoken design.

Next, a design may be outspoken, but lacking richness; e. g. it may comprise only clichés and by the same token not say more than what everybody knew already, even if it is visualised in a new way. This is, for instance, the case when a design would consist out of two interlocking legend units 'built' and 'unbuilt' with the smallest boundary length between them: very outspoken, yet not always rich. With a plan like that one hears the judge sigh "What should I say about this now?" Thus, this criterion is also a condition for all subsequent criteria.

21.2 COMPARABILITY

The drawings of plans to compare should obey some criteria. Plans of a different scale and resolution are hard to compare, also since the legends are not identical per definition. In order to compare a plan with a lower level of scale to one with a higher one, the plan with a higher scale level should get the same legend (Latin: *legenda:* things that must be read). For that purpose one can quickly substitute in a part of the plan standard components (capacity plan). A capacity plan fills the location with the same programme as the design (interpolation) with standard components (zero variant). The design proposed may be compared with this: in which regards is it different, better or worse?

21.3 DOCUMENTATION AND RETRIEVABILITY

The outspoken and rich architectural drawing is only comparable and quotable in a scientific forum and thus open to criticism in a different scientific context, if with it such documentation is provided (key-words, possibly syntactically connected) that the drawing by itself is reducible to scale (frame and grain), site, intention, context, perspective and possible readable effects on the context. These image characteristics are as many foundations for comparison to enable scientific judgement.

21.4 SUPPOSED CONTEXT AND PERSPECTIVE

In contexts the political, cultural, economical, technical and/or ecological-spatial context on different scale level may be involved. Not only a context with a larger scale than the frame of the design plays a rôle, but also the context with a smaller size than the grain of the design (the smallest unity in the design process).

Comparison of plans always takes place implicitly from a given perspective, an expectation with regard to probable political, cultural, economical, technical and/or ecological-spatial developments outside of the design-object. An effect analysis in one perspective may work out entirely differently in another one. In the case of the scientific design it is expected that this personal perspective is made explicit: “I expect a steering national authority, a following regional authority, a shrinking local economy..”, etc. These points of departure may be the same for different effect analyses.

21.5 INTENDED AND NOT INTENDED EFFECTS

After execution (ex post), a design always has many political, cultural, economical, technical and/or ecological-spatial effects. They can be intended or not intended. The intended effects have been determined beforehand as design criteria in a programme of requirements. Usually they are positive and need not be involved in effect analysis. They should be mentioned beforehand as intention, goal formulation, design criteria or design programme and play a rôle in the judgement: “Have the criteria been met?” In this respect an effect analysis would only lead to circular reasoning like: “The goal was to realise a hundred homes; ah well, the design foresees in a hundred homes, so the effect is that a hundred homes have been realised.” The unintended effects (e.g. “Because a hundred homes have been added to my design the shopping centre has become too small.”) can never been foreseen in their entirety, but should receive attention in the apology of a design (intervention).

21.6 EFFECT ANALYSIS

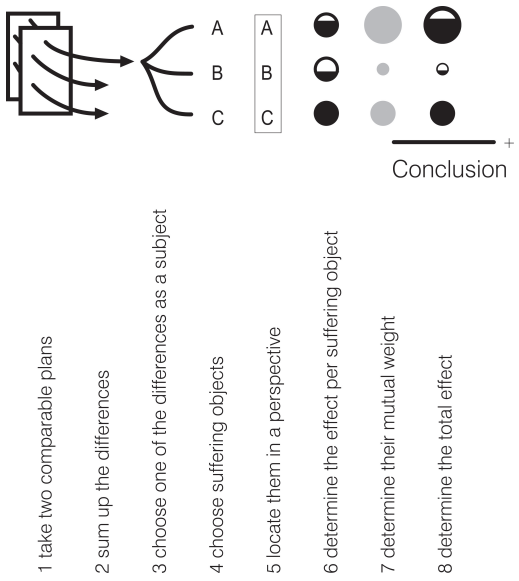
During effect analyses the effects of the differences between two outspoken and rich plans are compared. They enable evaluations based on values, but they do not equal them. They are just condition for evaluations: identical effects may be valued differently. For that reason an evaluation should be preceded by a more objective effect analysis. This criterion of an added effect report with some possible evaluations for a scientific design thus goes beyond the usual criteria for empirical-scientific study. In the apology of a design, attention is asked for the effect of each design intervention on the design itself, and on its context within a perspective.

The first step in an effect analysis is to make the plans comparable by bringing the legends of both to the most detailed level. The second and third steps are to make a summary of the differences and to select one difference in order to report the effects of that particular difference. For instance: ‘In this plan the civic centre lies more excentric than in the zero-plan.’ If one would report the effects of all differences in one sweep it is impossible to see which design intervention caused the effects precisely.

The fact that some effects can only emerge through combination of design interventions complicates the situation. The fourth step is to select the categories undergoing the effect, the working (suffering objects)[a]: for instance political, cultural, economic, technical, ecological or spacial objects (their spreading or concentration). On which scale do the effects manifest themselves? To answer that question, see the context diagram on page 38. The fifth step is to consider the effects in the perspective chosen.

21.7 EVALUATION

The sixth step is to determine the positive or negative effect per suffering object and to try to provide them with a numerical value. The seventh step is an evaluation: to ascribe to the suffering objects a mutual weight (for instance: the effect on an ecological object is more important than the effect on a cultural object).



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a This term has been chosen since each effect analysis has the form of a full-sentence with a subject (the design intervention at the source of the operation), a verb (working) and an object (the object undergoing the working). See also Chapter 0 on verbal models.

The final step may be a list of effects, multiplied by their weight and a conclusion. Is the design superior to the zero variant? Also the scholar designer who reaches the conclusion that this is not the case (which could show itself in a low appreciation for the design on the appropriate scale level) may receive high scientific regard for the evaluation.

21.8 JUDGING DRAWINGS

Judging pre-supposes comparison as well, even if it is often implicit in who judges and in the person judged (the designer). Both parties do have their references. The judgement 'this is a bad chair' pre-supposes other chairs. By the same token judging requires at least two comparable plans: the design to be judged and at least one comparable 'zero plan' (precedent, reference, example with a comparable programme, a capacity plan[a] in a comparable context, limitation and legends). For a scientific design one such zero-plan, like intended in criterion A, page 28 must be explicit. If a zero-plan is known, the unintended effects this zero-plan has in common with the design to be judged are not open for discussion. If the designer would not make such a reference explicit, the discussion would be endless. Judgement would concern the immense number of thinkable differences compared to all references of the judge. A reference plan concentrates the judgement on meaningful differences. Nevertheless the judge may always introduce other references. Criticism then concentrates on the selection of the reference. The intended effects always stand to discussion as preliminarily formulated criteria.

a For instance a collage with programmatically equivalent components from known plans.