

Ex post evaluation of buildings

van der Voordt, DJM; van Wegen, Herman

Publication date

2002

Document Version

Final published version

Published in

Ways to study and research urban, architectural and technical design

Citation (APA)

van der Voordt, DJM., & van Wegen, H. (2002). Ex post evaluation of buildings. In T. M. de Jong, & D. J. M. van der Voordt (Eds.), *Ways to study and research urban, architectural and technical design* (pp. 151-158). DUP Science.

Important note

To cite this publication, please use the final published version (if applicable). Please check the document version above.

Copyright

Other than for strictly personal use, it is not permitted to download, forward or distribute the text or part of it, without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license such as Creative Commons.

Takedown policy

Please contact us and provide details if you believe this document breaches copyrights. We will remove access to the work immediately and investigate your claim.

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 originated 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 concerning 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

17.1	Themes for the evaluation of buildings	151
17.2	Match between demand and supply	152
17.3	Quality assessment	153
17.4	Research Methods	155
17.5	Indicators for failure or success	158
17.6	Conclusions	158

- 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 safety
 - 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!

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.

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

- 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)
 - Spatial 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 wijkwelzijnsaccommodaties.*

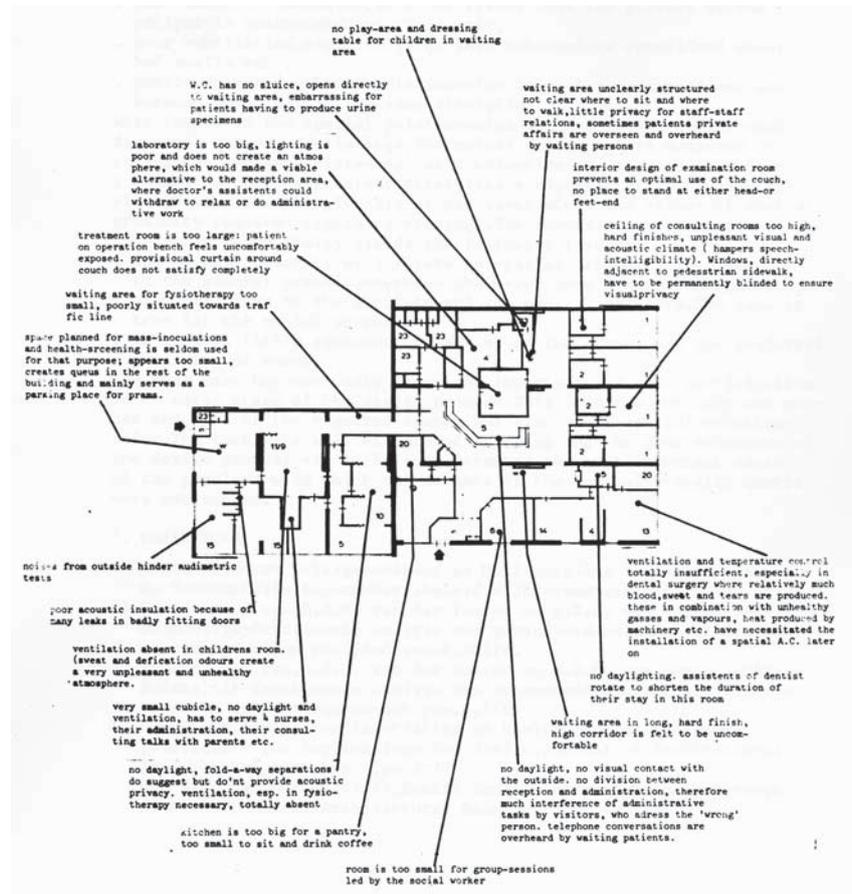
a. *Selection of themes for evaluation*

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.

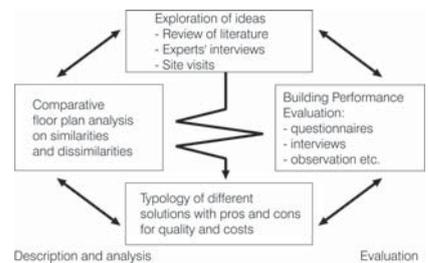
d. Weighing

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

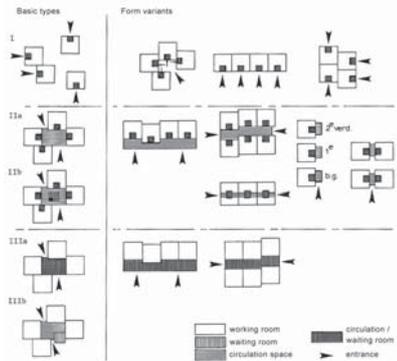
There are numerous methods of data collection, like questionnaires, individual and group interviews, behavioural mapping and so on, each with its pros and cons.^a Globally solid instruments like the Real Estate Norm, Serviceability Tools and Methods and other scaling techniques are used to measure functional 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. Vrieling 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.

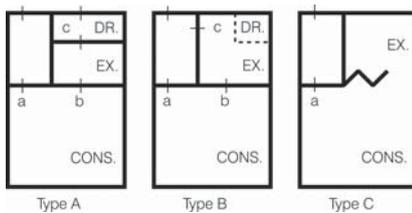


138 Typology of health-centres

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; separate 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 management; 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.	usefulness; accessibility; safety; comfort	developed for housing and the housing environment
'Woonkeur'	Stuurgroep Experimenten Volkshuisvesting (2000) Woonkeur. Rotterdam, Keurmerk Integrale Woonkwaliteit.	usefulness; 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 passers-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.