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## **Towards a more transparent and research based evaluation of design**

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*The student is on the tiptoe of expectation. What will his supervisors say about his final project? The first one is positive about the concept, but criticises heavily on the materials used in the facade. The second one starts a discussion on the contrast between the architectural design and its context. The third one raises questions about some technical details, but is not at all clear about his own opinion. No one asks any question about the costs.*

### **1. Introduction**

Students and teachers will recognise this situation easily. Most discussions on design projects are fragmented and steered by personal interests. Judgements are highly subjective. Seldom criteria for judgement are formulated explicitly, neither ex ante nor ex post. This is true not only in educational settings but also in plan-analyses and professional criticism of designs and buildings in architectural journals. This may give space for open and spontaneous discussions, interesting and instructive. But does it guide young people to good professionals? Are they prepared to develop plans that will fit with all kind of clients' requirements and prerequisites? Will they be able to integrate functional, esthetical, technical, cultural and economic issues well balanced? According to my opinion, plan development and debating on design in a more systematic way will lead to a much better understanding of 'good' design. To be able to judge the quality of design, both in a preliminary phase and at the end, one must be aware of the items that might be important. Second, one must be able to 'translate' these items in forms, measures, colours, materials and so on, both from socio-cultural goals and values to spatio-functional means and vice versa. And third, one must have ideas and reference data in order to be able to judge design solutions in terms of being good or bad, attractive or not, yes or no efficient and so on. Standards, reference projects (precedents) and research data may help to diagnose a design or existing building. As such, evaluations can be transformed from:

Fragmented	->	Integral
appraisal		assessment
Implicit	->	Explicit
Intuition based	->	Research based
Mystified	->	Transparent
Ad hoc	->	Systematic

### **2. Themes for an integral design assessment**

Architectural design is a search for a synthesis between form, function and construction in a particular context. In addition to Vitruvius' trilogy of *utilitas*, *firmitas* and *venustas*, nowadays also cost-effectiveness is of utmost importance. Consequently 'good' design includes different qualities, which can be summarised as:

- a. Functional quality  
Practical usability i.e. the extent to which the building is efficiently designed and appropriate to its function.
- b. Aesthetic quality  
Appraisal in terms of beautiful, exciting, attractive, interesting from a cultural point of view or interesting as a representation of a particular style.

- c. Technical quality  
The extent to which the construction, the shell, the technical services and so on fit with requirements such as strength, firmness, sustainability.
- d. Building physics  
The extent to which the design will lead to an ecological building with a low energy consumption and a comfortable, safe and healthy environment with reference to temperature, humidity, lighting, sunlight and acoustics.
- e. Economic quality  
Efficient use of architectural means, construction and materials, an optimal ratio between quality and price, and - from an investor's point of view - a high yield.

Particularly at the end of their education, students should be forced to test choices and decisions with reference to these five aspects and their relationship. This does not mean that choices cannot be arbitrary. But by being clear which decisions are well argued and which ones are more or less impulsive or intuitively, the so-called black box of designing may be opened and transformed in a glass box. A checklist of items (table 1) can contribute to a growing awareness of what might be important.

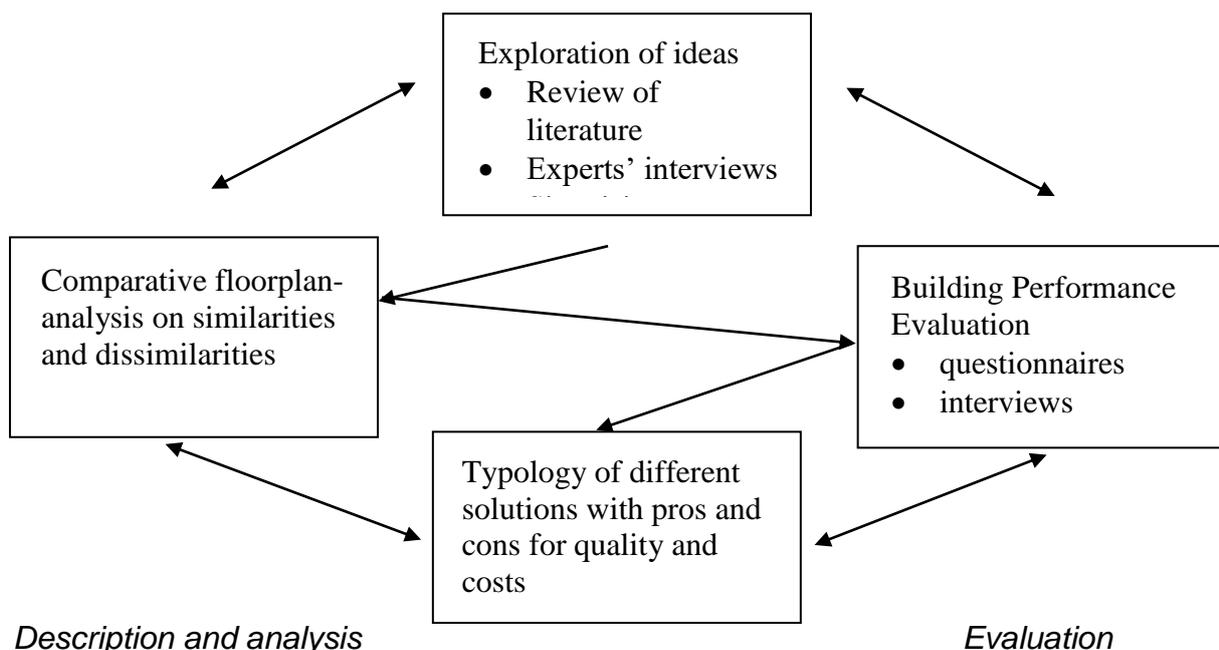
Table 1: Themes for evaluation

<ul style="list-style-type: none"> <li>a. Functional aspects                             <ul style="list-style-type: none"> <li>• Accessibility</li> <li>• Efficiency</li> <li>• Health and safety</li> <li>• Psychological aspects (privacy, social contacts, territoriality)</li> <li>• Spatial orientation (wayfinding)</li> <li>• Flexibility</li> <li>• Ergonomics</li> </ul> </li> <li>b. Aesthetic aspects                             <ul style="list-style-type: none"> <li>• Beauty</li> <li>• Order and complexity</li> <li>• Symbolic meaning</li> <li>• Cultural values</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>c. Technical aspects                             <ul style="list-style-type: none"> <li>• Fire safety</li> <li>• Constructive safety</li> <li>• Environmental safety</li> <li>• Sustainability</li> </ul> </li> <li>d. Economical and juridical aspects                             <ul style="list-style-type: none"> <li>• Investment costs</li> <li>• Running costs</li> <li>• Time investment</li> <li>• Legislation</li> </ul> </li> </ul>
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### 3. Research based evaluation

From design research in a sense of analysis and interpretation of precedents one can learn a lot about architectural means and underlying arguments. From buildings in use, lessons can be learned on success and failures of existing design solutions. Research data may be used as input to pre-design research in new design processes, in order to support design decisions and to compare alternative design solutions. Ever since the 1960s there has been the emergence of so-called *Post-Occupancy Evaluation (POE)* or building-in-use studies (Preiser et al, 1988). POE is the process of systematic collection of data on occupied built environments, analysis of these data and comparison with performance criteria. POE's are particularly aggravated to the users' needs, preferences and experiences. Indicators for success are for instance a high occupancy level, a positive appraisal by occupants and visitors, and easy to let (low vacancy rate, small number of movements). Indicators for failure are for instance complaints of users, negative comments of experts, high running costs or a burglary rate above average. Over the years there is a growing awareness of the importance of *Total Building Performance Evaluation*, also

including technical aspects, building physics and costs (Preiser and Schramm, 1998). There are numerous methods of data-collection such as questionnaires, individual and group interviews, behavioural mapping, technical assessment tools and mathematical models, each with its own pros and cons. World-wide sound instruments such as the Real Estate Norm, Serviceability Tools and Methods other scaling techniques are used in order to measure functional aspects such as usefulness, accessibility, health, safety, and flexibility. It is recommended to combine different methods in order to increase the reliability and validity. The final choice depends of the research subject and constraints such as time, money and available expertise. A 'quick and dirty' inquiry needs another approach than scrutinise scientific research. A synthesis of a behavioural science approach and a design oriented approach can be found in the method of comparative floor-plan analysis (Van Hoogdalem et al, 1985; Van der Voordt et al, 1998). By comparing a wide range of building layouts for similar organisations one may achieve a good understanding of the ways in which goals and values can be expressed in spatial solutions. It offers the opportunity to develop a spatio-functional typology of design solutions. Particularly the combination of comparative floor-plan analysis and ex post evaluation of representative cases is an excellent means to develop guidelines for programming and design. POE gives insight in 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 floorplans and Post-Occupancy Evaluation is of an interactive and iterative nature and may passed in various orders. On the one hand hypotheses, questions and notions of designers and their clients, review of literature and researchers' own hunches may guide the research. On the other hand the plans themselves generate ideas and hypotheses which can be checked in the other sources. As a result of this process spatial architectural choices become more understandable, recognisable and debatable. Behavioural aspects can be connected to design variants, while sufficient freedom remains for making conscious choices on ones own for the most suitable design.



**Comparative floorplan-analysis and ex post evaluation in design research**

#### 4. Transparent debate on architectural quality

One might argue that research based evaluation is possible with reference to functional quality, but hardly for architectural quality as a synthesis of all kind of aspects. Particularly aesthetics is merely a matter of personal preference and as such it can be judged only subjectively. Granting this is true, it does not mean that we cannot reach a higher level of intersubjectivity. For that we need criteria and reference data from design research in order to evaluate a design on these criteria. Several attempts have been made to 'define' architectural quality. One of our former architectural supervisors of the Government, Tjeerd Dijkstra, used five criteria:

- a. Usability. Does the building fit with its purpose? Does it give something extra?
- b. Order and complexity. A building must be structured in such a way, that it is easy to understand, recognisable and legible. At the same time a building should be interesting and exciting, so also a certain level of complexity is needed. For instance by assimilation of different themes, or provoking different levels of interpretation, e.g. a structure that refers to the main functions as well as to the architectural and urban site characteristics.
- c. Object and context. This criterion refers to dimensions such as the public-private gradient, individual versus common use of space and, externally, the contribution of the building to the quality of public open space.
- d. Use of architectural means such as measures, materials, texture, colour and light.
- e. Associations and meanings.

Analysis of architectural contests is also a good stimulus to develop a framework of criteria. An example is Birgit Cold's analysis of the Norwegian 'Woodprize' awards during 25 years. She compared the verbal expressions of juries and prize winners and concluded that four aims of architectural quality predominated: a) coherence, harmony and unity; b) originality and novelty; c) place and landscape adaptation; and d) simplicity, systematised and cultivated.

A third example of assessment criteria can be found in Van Rossum and De Wildt's inquiry into the relationship between the assignment and architectural quality. Three architectural critics judged the architectural quality of 18 governmental buildings. Four clusters of questions were used:

- a. Function and context  
What was the context in which the project had to be developed? What was the 'genius loci' of the site? Did some conflicts occur between the programme and the site? Has the building led to an improvement or a deterioration of the site's quality? Does the building fit with its purpose? Is the design a 'literally translation' of the programme of requirements or does it add something by the building's image and architectural quality? Does the building evoke new interpretations and meanings, leading to so-called poetic functionalism?
- b. Internal coherence.  
Does the spatial configuration fit with the function of the whole building and its main spaces? Does the building take a conformist or confronting position in a particular typology? How does one experience the sequence of spaces: gradually or contrasting, complex, surprising?
- c. Form, function, meaning  
Is the external form an expression of the internal spatial structure? Is the inside legible from the outside? Is the function legible from the form? Can we speak of

formal coherence and a consistent use of architectural means? What is the connection between form and construction? Do the construction and the building as a whole evoke relevant meanings? What is the relationship between this particular building and its surroundings? Is the building dominating or does it take a more considerate position? Has a complex programme been transformed in a clear form, easy-to-understand, whereas at the same time the complexity can still be perceived?

- d. Specific issues for governmental buildings and buildings of municipalities. How do the government and municipalities express themselves to the general public? Is the building an expression of a particular value system? Do their buildings represent a dominant, neutral or modest authority? Is the architecture an expression of arrogance and a businesslike approach or of reliability and friendliness? Which architectural means are used to represent such meanings? Does the building contribute to a high quality of public open space and its intrinsic characteristics? Is the design exemplary by its poetic quality or innovative aspects?

### **5. Quality of urban design in an educational setting**

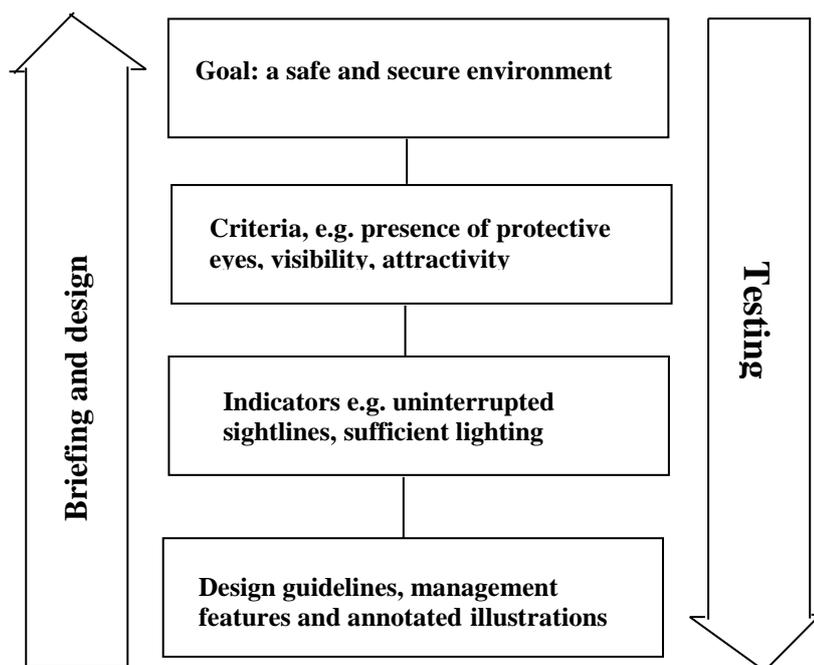
At the Faculty of Architecture an ongoing debate focuses on the relationship between educational objectives, educational tools and judgement criteria. Students often complain about the present personal and unpredictable judgements of their tutors and plea for explicit criteria in advance. This will help them during the development of their plans by making them more conscious about the quality of their solutions and give insight in conflicting objectives. As a consequence of this debate, in one of the first year blocks an attempt has been made to develop clear criteria. Apart from educational criteria such as being motivated and working independently with great devotion, and formal criteria such as a clear presentation of the results with maps, drawings of floorplans and cross-sections, a scale model and data from an assessment of sunlight, six criteria have been formulated:

- a. Concept.  
The design concept should fit with the present morphology with reference to building height, mass and sightlines, and also with the functions and use of the present environment. Besides the concept should fit with the present urban structure e.g. the infrastructure, public space and ratio between open and built up area. Finally the concept should include a clear vision on the future aimed at sustainability.
- b. Houses.  
The houses must be accessible from public space and have a positive orientation with reference to entry of sunlight. The internal spatial configuration of the main activities (entrance, living, sleeping) should fit with the external public space.
- c. Public building  
The public building should be well matched with the present city with reference to its morphology (identity, recognisability, land mark), its functions and its structure.
- d. Public space  
The design and materialisation of the public space should fit with the present urban structure, both form a morphological and functional point of view.
- e. Busstop  
The busstop should have a clear and functional position in the urban structure. It must be reached safely, clearly recognisable and have a spatial meaning.
- f. Design as a whole

- g. The design should be based on a clear vision. It should include interesting discoveries, be well argued and clarified. Measures must be according present standards. Finally the design should be the result of a careful and conscious weighing of different requirements.

## 6. Operationalisation from abstract to concrete

When we compare the criteria discussed above, we notice a lot of similarities. Usability, a conscious balance between order and complexity, meaning, legibility, coherence, a deliberate fit between a building and its context and a positive contribution to the quality of public outdoor space are common issues. However, still a lot has to be done to reach a clear and coherent overall framework of criteria, which can be used as a tool in different contexts, integral or selectively (such as dishes in a menu card). One way to further improvement might be a comparative analysis of papers in architectural magazines and the criteria that are used explicitly and implicitly by architectural critics and theorists. Another way is to compare a number of architectural contests and the arguments that are used by the juries. Even more important is to make concepts such as usability, coherence, meaning, order and complexity more operational and testable. With reference to functionality much work has been done yet. Based on a long tradition of debate and research, among others a well-developed Dutch manual is available on housing quality ('Woonkeur'), including a wide range of aspects such as efficiency, accessibility, health, safety and security. Its recommendations, dimensional criteria and illustrations of best practices may stimulate to good design and still leave enough room for the creativity of the architect. Another example is the Delft checklist on safe environments. Here the abstract concept of safety is operationalised in eight criteria, e.g. presence of protective eyes, visibility, involvement and attractiveness of the environment. These criteria can be used to determine whether a planned or actual situation is vulnerable to (fear of) crime. For each criterion several indicators have been developed. Furthermore, for all indicators various concrete design and management features are proposed and illustrated by reference to practical examples. Schematically:



For instance for parking garages four indicators are used to operationalise the criterion of visibility:

- a. Visibility of the entrance from public streets and surrounding facilities. One of the recommendations is to place the entrance in the building-line in order to avoid dark niches.
- b. Clear arrangement of the interior by avoiding sight-hindering obstacles, so preferably slender columns in stead of massive columns and loadbearing walls, no sharp curves that are difficult to survey, and a limited number of cars per segment.
- c. Clear, recognisable and easy-to-understand location of entrance and exits.
- d. Sufficient and pleasant lighting, e.g. by local openings in the roof and the facade (protected by grates to avoid entry of burglars and vandals) and artificial lighting according to international standards.

With reference to building physics clear textbooks and guidelines are available too. However, the concept of architectural quality is less well operationalised, probably because of the wide range of different opinions. Here a good textbook with a transparent framework of criteria and annotated illustrations might serve as an educational tool. Good examples are Herman Hertzberger's books on *Lessons for students in architecture*.

In practice it turns out that most designers don't like criteria and checklists. One of the objections is that it will lead to bureaucracy. Moreover it does not fit with the imago of architecture as a creative art. A third objection might be that designers have to take into account many aspects at the same time, which are partly conflicting. Designing is like simultaneous check playing. It is an interactive and cyclic process, with continuous forecasts and feedback. Many designers prefer to think and act analogous, jumping from one association to another. An analytical approach with criteria and indicators does not seem very appropriate for such a process. But according to Donald Schön designers are reflective practitioners, incorporating reflection in action. As such, a clear framework of concepts and criteria might help to support the loops from goals to architectural means and vice versa.

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