Types and precedents in design guidance

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Abstract. In recent years Dutch secondary education has been undergoing a fundamental change due to the introduction of new didactic approaches which relate strongly to ongoing social and technological developments. This affects existing school buildings, the majority of which is quite conventional in spatial terms and is characterized by limited flexibility and transformability. Consequently, most schools require extensive modifications in their spatial and building structure. The requirements underlying these modifications are not stable. Many schools have become interested in experimental ideas that may require inevitably further changes in the buildings. The paper considers the continuous transformation of Dutch school buildings with respect to their typology: by correlating new design briefs to building types rather than their instances we arrive at general guidelines that can be easily adapted to specific cases. To achieve this, the types are analysed with respect to geometry, topology and zoning. The results of the analysis describe the affordances of each type in terms of general flexibility, transformability and adaptability, as well as in relation to generic briefs. They also provide an explanation of the historical evolution of the types and the means for relating primary characteristics to local configurations, thereby allowing the accurate description of hybrid instances. The descriptions and analysis of buildings are organized into a polyhierarchical multilevel database that supports typological abstraction and offers several starting points (at various abstraction levels) for matching a new brief to an existing building. This enriches the development of the brief or a design solution with explicit, specific information derived from concrete precedents with known form, structure, behaviour and performance.

Keywords. Typology, precedence, case-based design, briefing, design information systems

Transformations in Dutch secondary education

Dutch secondary education in the period immediately before and after the Second World War is characterized by the crystallization of didactic and pedagogic approaches into a coherent educational system. This system remained virtually unchallenged until the 1990s when new didactic concepts promised not only change but also higher efficiency and effectiveness, as well as closer relationships with social and technological developments ranging from the requirements of tertiary education to the possibilities of computer-aided learning environments (MesoConsult, 1996; MesoConsult, 1997; VSNU, 1998).

The introduction of these didactic concepts affected all aspects of Dutch secondary education, from textbooks and educational facilities to scheduling and working conditions at school. In

particular, the requirements for individual learning activities and flexible grouping meant extensive changes in the infrastructure and spatial arrangement of school buildings. The majority of existing school buildings in The Netherlands are quite conventional in spatial terms: teaching takes place in standard classrooms in the instructivist manner (i.e. one teacher instructing a group of students as a domain authority). This conventional spatial arrangement is generally characterized by limited flexibility and transformability. Attempts to accommodate individual workplaces and small group interaction in classrooms or in (areas adjacent to) circulation spaces inevitably lead to major modifications of the spatial and building structure of most schools (Noteboom, 2000).

What complicates matters even further is that the requirements underlying educational change and building modification in Dutch secondary education are far from stable. The original educational reformation of the 1990s has opened the floodgates to new approaches to teaching and learning, as well as to new organizational concepts. Many schools are keen on exploring and adopting new, even experimental ideas in open-ended processes of change (e.g. www.slash21.nl: May 2003). Such ideas have spatial requirements that deviate even further from the conventional classroom arrangement, both in terms of individual workplaces and with respect to scheduling. Finally, the necessity to modify existing buildings has also been treated as an opportunity to accommodate and anticipate future demographic changes. These influence the size and the specialization or type of a school.

Types and analysis

The dynamic character of educational changes in Dutch secondary education contrasts with the stability of school building typology in The Netherlands. The rather lengthy period of relative educational stagnation that preceded the recent changes had arguably resulted into a standardization of programmatic requirements, spatial conditions and architectural precedents that led to the development of a small number of readily discernible types. Most Dutch secondary education buildings belong to one of the basic three types (Boersma, Verstegen et al., 1996):

1. the archetypal corridor type, where classrooms are arranged sequentially along a corridor (either on the one side or on both sides),

2. the hall type, where circulation space and classrooms are organized around a central hall,

3. the pavilion type, where classrooms are clustered into semi-independent wings or parts.

Such small standardization implies on the one hand restrictions that may act as an impediment to the development of new school buildings. On the other hand, the compactness of this typology gives rise to the hypothesis that, rather than exploring the applicability of new design briefs to individual buildings, we can correlate these briefs to types. The correlation explores the consequences of appropriate or possible modifications both at the abstract levels of global spatial articulation and at more specific levels of individual spaces and activities. The products of the correlation are general guidelines concerning the possible transformations of instances belonging to a known type. The guidelines describe the transformability, adaptability and flexibility a type affords with respect to possible educational changes. They also provide instruments for the treatment of common (usually fundamental) elements and aspects, such as the ergonomics and climatic behaviour of individual workplaces or the flexibility of a conventional classroom.

The matching of programmatic requirements to building types and their instances presupposes analysis of the buildings with respect to:

• Geometry: geometric representation of relevant entities (spaces and building elements) as

integral objects that can be automatically recognized and measured (Koutamanis and Mitossi, 2001). This permits matching to quantifiable demands (e.g. floor area) and also facilitates automatic recognition of relationships between the entities, as e.g. in routing (i.e. identification of sequences of spaces and doors) or with respect to daylighting (on the basis of adjacency between spaces and external windows) (Koutamanis, van Leusen et al., 2001).

• Topology: adjacency and access graphs of spaces and building elements (Steadman, 1983) are produced automatically on the basis of the geometric representation. Topological representations serve two ends: (1) the development of a typology of parts common to all building types, and (2) the primary matching with the brief, which is also automatically transformed from a database of activities into a graph.

• Zoning: the identification of use space, circulation and service zones in the geometric and topological representations is instrumental for the analysis of flexibility and adaptability in different parts of a building and with respect to different activities and functions.

The results of the analysis verify the three types of school buildings as the main categories of existing buildings in The Netherlands. They also provide a transparent explanation of the evolution of these types from the initial school forms that are encountered in the 18th and 19th century. We propose that the types are topological in nature and that they share many common characteristics at a local level. These stem mostly from the elementary classroom-corridor arrangement that accommodates the basic educational and functional activities in conventional schools. Differences between types derive mainly from the arrangement of pedestrian circulation. This influences the clustering of spaces and the global geometry of the buildings.

An important consequence of the analysis and of emerging relationships between types is that we are able to relate primary characteristics of a type to local configurations and parts. This means that we can identify a wing of a hall or

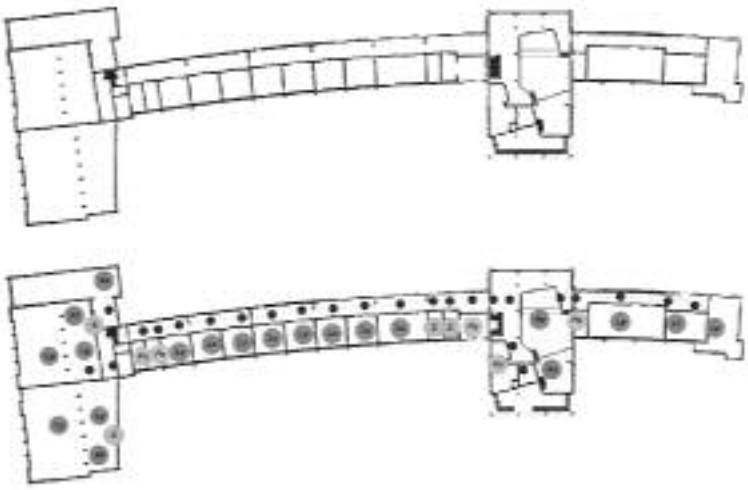

Figure 1. Geometric and topological representation of a corridor instance.

pavilion school as an instance of the corridor type. It also permits the accurate description of hybrid instances that combine two or more types. Hybrids are frequently due to different stages of development or fundamental modifications in a school but can also reflect variability in the treatment of different parts or aspects of a brief.

Cases and precedents

The building descriptions and analyses are organized into a polyhierarchical case base, i.e. a structure that joins together several hierarchies with common nodes. This permits the use of common parts and characteristics, as well as the accommodation of hybrid instances. The lower levels of the case base accommodate specific instances and their parts, described and analysed at the level of relevant entities (spaces and building elements). These are progressively abstracted into discrete parts and aspects, which lead to the three basic types (and their variations), which occupy the higher levels. The purpose of the case base is not only to explain instances and types but also to provide a number of starting points (at various abstraction levels) for matching a new brief (wholly or in part) to an existing building. This matching reflects the initial potential of the type with respect to the particular brief and helps identify possible directions for the development of the brief and the adaptation of an existing building or type.

Through the use of the case base it is possible to arrive at a number of matching scenarios that represent typical or extreme processes followed by architects and clients in the modification of existing school buildings. The addition of explicit types and precedents to these processes provides design guidance by means of relevant information that completes and complements the brief. For example, resolution of conflicts between the brief and the existing buildings takes place on the basis of a comprehensive collection of concrete precedents with a known form, function and performance (as opposed to arbitrary decisions or direct implementations of first principles). The availability of a repertory of known solutions and problems supports refinement and focusing of design activities. The multilevel structure of the case base also facilitates anticipation of problems that may emerge as a result of particular decisions and choices, such as the flexibility of a specific spatial arrangement at the level of individual workplaces.

The use of the case base and the analyses it incorporates lengthens the early stages of the briefing and design process but also reduces the number of decisions that are normally deferred to later stages. The increase of complexity in the early stages is compensated by the higher certainty that accompanies decisions taken in these stages. This is due to two contributions of the case base: (1) the extensive use of explicit information as input, and (2) the availability of analytical tools for projecting and evaluating the effects of a decision. Also the tendency to fall back to stereotypical solutions is reduced both at early and late stages, as the performance of these solutions and their possibilities and limitations are known from the onset of the design process.

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