MODELLING AT THE EARLIEST DESIGN STAGE

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As the aim of this colloqium is to exchange ideas, encourage standards and influence developments, this paper is more concerned with ideas than qualifying as a proper research paper.

Starting point is that between the 70's, if not earlier, and now, many theories and related diagrams have circulated, describing the (building) design process from initiative to production, or even demolition. But none of them appears very practical when it comes to explain where and how CAD fits in. By now we have hundreds of CAD-tools to our availability, most of them standing alone, some of them more or less integrated, but we seem to lack the sort of infrastructure which places them in the design process and shows their position relative to other CAD-tools.

The problem, I think, with those theories is that they are primarily concerned with the design process. Some of them have provided considerable clarity about aspects of that process. But the process is much to unstable and individual to be statically captured so all we can do is draw up very coarse Plan of work-type scheme's or theoretical mechanisms like the Markus/Maver's Analysis-Synthesis-Evaluation-model or Goumain and Mallen's SIMDAC. As difficult as it is to monitor the designer's way of thinking, the easier it is to gather all his design products. As we realise nowadays that computers are still far away from design thinking, but very helpful in producing design products, my first and obvious proposition is that to arrive at a useful infrastructure for design aids we need to look at the design products flow, or more general: the information flow during the design process.

Inspecting this information flow, which as far I know has never been done thoroughly on the basis of a statistically significant number of design cases, we see two categories of information: the Design Information, which becomes increasingly concrete along the design process, and the Context Information, which should be there completely from the beginning but never is and which should not change during the process but often does.

We also see that, since Design Information does not come out of the blue (or does it?) it results either from a transformation of Design Information already existing, from a new combination of various Design Information or from a new combination of Design Information and Context Information.
My second proposition or understatement is that every design tool, computerised or not, should clearly identify its position in the proposed infrastructure by indicating its information sources. Again this seems obvious but by experience from practice and university I know that there is no clear distinction made between Context and Design Information.

This is the more regretful since most design tools would be very capable not only to generate Design Information, but new Context Information (for previous design stages) at the same time. Such information is not only useful for oncoming projects, but also as a feedback control mechanism for the project under hand. So my third proposition is that we should (better) exploit the feedback potential of any design tool we develop and use.

Both the Design and the Context Information can be further subdivided into three classes: Management (information on time and persons), Quality (information on the behaviour of designs, in terms of specification and appreciation), and Geometry (information on spatial organisation and form).

Traditionally Geometry has always been the central class of information, being the most comprehensive one. This has been the reason that when we talk about modelling we always seem to imply geometric modelling. The Quality and Management classes are by definition not geometric but do contain a large part of our Design Information. So modelling integrated CAD certainly implies modelling non-geometric information as well.
I wonder if this points to a GKS and/or IGES for alfanumeric data. Having only limited knowledge about database techniques I am happy to leave this suggestion to the more competent among the readers.

One of the interesting things of the study of how design models, geometric and alfanumeric ones, interact and develop during the design process is to observe where discontinuities in the development occur. For instance "Bouw Informatie Technieken" the firm I am presently working with, has felt the need to devise seperate geometric components for "Functional Design" (sketch design) and "Material Technical Design" (working drawings). But having seperated them for reasons of design manipulation ease, for a smooth transition from F.D. to M.T.D. we now need specific placement rules for components used in F.D. that are directly supported by various materials, possibly by use of modular coördination techniques, and aids for transformation of an F.D. into and M.T.D.-plan, such as compaction and modularisation.

However interesting that area of research, for a number of reasons I have choosen for even earlier phases of the design process. The first reason is that the earlier design stages are more concerned with design thinking than with design production, the former being the primary research focus for our school. The second reason is that since the beginning of CAD the early design stages have been recognised as the part where design actions have the most effect, but probably because CAD could not promise direct pay-off in early design, most existing CAD tools relate to the design production stages. The third reason is that the earlier we stand the more information is potentially relevant: we need sophisticated aids to sift that mountain of information thoroughly.

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So as already suggested what we need to do now is to collect all droppings of a number of designers and put them in order: what came before, what came next, and so on. Not possessing any inventarisation of architectural output but having been engaged for a long time, as well with students as in practice, with the earlier design stages, some start with the scheme could be made on a hypothetical list of design items based on my own experience as designer. I drew up almost 30 of such items, without suggesting of course there could not be more. At the same time, knowing what I was looking for, I tried to conceive in advance all these items as if being generated with the aid of a CAD-system.

To bring some further clarity in these Design Information items they were divided over five sub-classes: Site and Space as Geometric subclasses, and Activities, Finance and Material from the class of Qualitative Information. Management was so far left out as this information is difficult to integrate with the other classes.

The structure one arrives at is best typified as an information cascade more than a flow. Not only does information relate through different paths, but also pointers are sometimes directed backwards as designers often take a step behind before leaping forward. Nevertheless I would offer this structure as an infrastructure for CAD in the early design stages. It has no pretension as a model for the design process, but to developers of CAD-tools it gives, when supplemented by input from the "statistically significant amount of designers" mentioned earlier, a direct way of checking from what other information models they should retrieve their information, and what other models should be able to absorb, the newly amalgamated information.

Of course the diagram only shows the information at the Design Information level. In another plane in corresponding classes and subclasses we have Context Information in direct reference to the items shown on the Design Information level.

The Context Information plane is of at least equal importance as the Design Information one, the more now that with better Context Data and better tools to explore them much of the designers' activity tends to shift from Design Information generation to Context Data preparation. As has also been mentioned before the lines between both planes are mostly bidirectional.

Finally I must again apologise for the premature character of this paper. For whom this is not apparant from the reading it will show from the diagrams. It should be empnasised though, that the intended infrastructure is not to be offered by diagrammatic representation but as a relational database which simply tells its user whatever relations exist in the neighbourhood of the information item he is looking at.
At least I hope my presentation shows I am nappy to even abandon my ideas for better ones.

PRELIMINARY DESIGN INFORMATION

Management	Quality			Geometry	
	Finance	Activities	Materials	Space	Site
Minutes & notes of meetings	Financial limit & cost range	Client scope & objectives	Preliminary structural calculations	Functions model	Site qualitities and constraints model
Contracts & agreements	Cost reports	Architect's objectives	Preliminary cladding & glazing specifica-tion	Functional diagram	Urban mass model
Timetables		Clustering		Circulation diagram	Acces model
		Area books		Schematic design	Green/water model
				Interior models	Site zoning model
				Critical dimension study	Schematic site design
				Frame raster	
				Sketch design	