Designerly Visualisation:
Conceptions, Methods, Models, Perceptions

Form & Modelling Studies
Faculty of Architecture
Delft University of Technology
Delft, The Netherlands

Introduction

If we wish to reach a deeper, more objective understanding of the phenomena of Architectural and Environmental Design, we need to develop and apply working methods that allow us to imaginatively analyse and consequently *envision* the formal issues which are at (inter)play: demonstrating their workings and effects in the 'Real World'.

First of all, it is essential that we reach a level of clarity – and preferably consensus – concerning our shared *conceptions* about how we actually consider acts and artefacts of architectural enterprise.

Subsequently, we need to appreciate and elucidate what we might consider to be fitting and relevant working *methods*, which may do justice to the qualities and peculiarities of architectural design, yet may stand up to scientific scrutiny…

In the context of the methodical study of designing as a process and designs as their physical, tangible outcomes, it may be beneficial to look for conceptual and perceptual *models* that may help to further and structure intellectual enquiry and help us to visualise and communicate options, findings, insights and outcomes.

Lastly, it is essential to create visual modes of organisation and representation that will not only do justice to the physical and intellectual qualities of architecture, but may trigger *perceptions*, eloquently and imaginatively demonstrating the consequences of characteristic formal interventions.

An exploration…

Conceptions

What makes Architecture tick?

Indeed what *is* architecture and how should we conceive it, in the context of professional *practice* as well as *academia*?

How may the domains of practice, education, research and theory be linked in such a way that we might contribute towards generating a more *scientific* appreciation of the *creative* disciplines of Architecture in the broadest sense?

Essentially, architectural designing has to do with constructing *new realities*, which may subsequently be experienced and perceived on different *scale* levels. Such *altered* realities – often lasting interventions in the existing world – characteristically have a *function*, which may be utilitarian, societal or ritual, to name but a few of the aspects which may give cause to their evolvement, realisation, appreciation and indeed: physical endurance.

When we consider such *environmental* design – in the broadest sense – what levels of attention and recurring themes of study can be identified?

N.B.: in this context, it is worthwhile to distinguish between two paradigms of 'architecture' which have been around for many years and up to this day have given rise to regular 'border conflicts' within the architectural community.

The first, more or less *archetypal* conception is one whereby architecture is viewed as a broad, *governing* domain, encompassing *various* interrelated disciplines.

Architecture as the 'mother' of all building arts and sciences…

The second, somewhat *ideological* conception regards building design as the *central* domain, whereby the architectural composition of spatial, material structures, albeit for various *functions*, is the 'core' discipline.

According to this conviction, related design disciplines – such as urban design, building technology and even interior design – are essentially intended to 'serve' the one true deity of Architecture.

In my own, relatively broadly oriented, institute of 'Building Knowledge' (as opposed to 'Building Art') in Delft, the latter persuasion has held sway, at least under those who consider themselves the 'true architects'.

The consequence of such a 'construct' is that it makes it difficult to cross the boundaries *between* the disciplines and reach consensus. For there to be a fruitful 'conversation' between different disciplines, there is however a need to be 'on speaking terms', recognising each other's worthiness.

In the context of this inventory of Design as a domain of human initiative and intellectual discourse, I would like to adopt the *first* – more holistic – model, taking the perspective of architectural design as an *encapsulating* concept.

Architecture as a multidisciplinary 'realm', bringing together and *confronting* distinguishable fields of *spatial* design…

Architecture as necessarily *including* Urban design, Building design, Structural design and Interior design, but also affiliated disciplines such as Exhibition design, Information design and Stage design. Only then can less 'official' modes of design and their related phenomena be recognised as intrinsic components of design driven study and may issues be brought to light, which can inform us and potentially alter our attitudes.

Once we recognise there is not just *one* level of architecture, but that there is a wide variety of *corresponding* design domains, we may find it easier – and indeed more rewarding – to focus on aspects of architectural design, uncovering attributes with which we are not familiar in our daily design practices or academic environments. In such a way we may explore different fields of architectural enterprise, each with its own specific characteristics, conventions, techniques, working methods and aspects of materialisation and realisation.

Particular applications of *designerly enquiry*[1] tend to be narrowly focused. Oddly enough, it is quite rare for 'cross-overs' between the disciplines to take place. Precisely because of this inward looking attitude, it is worthwhile to organise 'broad' platforms for professional design. It can be stimulating for design academics from *one* field to be confronted with the professional and

[1] Bruce Archer: "The idea of Design as a broad area of man's concerns, comparable with Science and Humanities, seems to be defensible in pedagogic terms. The idea that there exists a designerly mode of enquiry, comparable with but distinct from, the scientific and scholarly modes of enquiry seems to be defensible by the design methods literature". Bruce Archer: *A View of the Nature of Design Research*, in: Design : Science : Method, Proceedings of the 1980 Design Research Society Conference, IPC Science and Technology Press, 1981.

theoretical issues from *other* disciplines. This may lead to new insights and to recognising particular – shared – interests.

An added benefit may be that it puts the issues of one's own field in a *different* perspective. This is imperative, for it is all too easy to get 'submerged' in one's own sphere of interest and lose sight completely of what *else* is going on…

Considering conceptions of Architectural Design

Design practitioners – and scholars – are inclined to believe there is nothing quite as important as their 'thing', in this case: architecture.

This may partly be explained by the fact that in architecture – if we continue to define it loosely as the design of *buildings* and *built environments* – we are confronted with a coherent, but enormously many faceted domains.

Designing involves creativity *and* logic, but particularly the *taming* of complexity within a finely tuned spatial and material *composition*. All sorts of considerations have to be taken into account when working on a design: contextual, environmental, programmatic, logistic, economic, practical, technical, aesthetic and societal, even philosophical issues need to be addressed. The solutions to these aspects have to be brought together within an overall *arrangement*.

A *Synthesis* of form, space, structure, material and anticipated experience, which is more than a mere 'sum of parts'…

The complementary nature of the different *facets* of the composition considered as a synthesis is illustrated by the concept of *Symbiosis* in design, as postulated by Japanese architect and scholar Kisho Kurokawa.[2]

Organisationally, architectural design is frequently 'subdivided' along the lines of different *scale* levels and themes of *focus*.

An example of Discipline linked to Scale at my own faculty:

Scale:	Domain:
Large	: Urban (and regional) planning and design;
Medium	: Building design (commonly identified as 'Architecture');
Smaller	: Interior design and detailing.

With wholly separate roles reserved for:

Technique	: Building technology and construction;
Procedure	: Real estate and management.

After several years in architectural practice, teaching and research, it is my considered opinion that such a 'hard' subdivision into *separate* domains is constraining.

As a 'model' for research, practice and education, it is not sufficiently fine-meshed to address issues of architectural design in a comprehensible and insightful way. If we want to do justice to the *interwoven* nature of design, then models need to be developed with a more *intricate* thematic structure, which may be instrumental in *unravelling* what architect and publicist Steven Holl has dubbed the *Intertwining phenomena*[3] of architecture.

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[2] Kisho Kurokawa: *Intercultural Architecture, the Philosophy of Symbiosis*, Academy, London, 1991 and: *Rediscovering Japanese Space*, Weatherhill, New York and Tokyo, 1988.

[3] Steven Holl: "We must consider space, light, colour, geometry, detail, and material in an intertwining continuum. Though we can disassemble these elements and study them individually during the design process, finally they merge. Ultimately we cannot separate perception into geometries, activities and sensations. Compressed, or sometimes expanded, the interlocking of light, material, and detail creates over time a

The following framework gives an indicative *overview* of the interrelated levels of architectural design, whereby a suggestion is given of the relative 'scales' of attention and formal themes in design processes:

Level:	Design scale:	Theme:
Context	: 1 : 1000 / 1 : 500	Place
Form	: 1 : 200 / 1 : 100	Object
Structure	: < >	Organisation
Surface	: 1 : 50 / 1:20	Arrangement
Technique	: < >	Articulation
Detail	: 1 : 10 / 1 : 5	Feature
Information	: 1 : 1 / Legend	Symbol

A concise indication of the *kinds* of conceptions which might be considered as constituting 'parts', which in design need to be *ordered* and given *form* in relation to each other:

Level:	Indication of related design aspects:
Context	: Situation, Programme, Environment, Orientation.
Form	: Geometry, Shape, Plasticity, Border, Combination.
Structure	: System, Measure, Framework, Wall, Construction.
Surface	: Façade, Motif, Pattern, Rhythm, Balance, Arrangement.
Technique	: Material, Product, Dimension, Profile, Bond, Treatment.
Detail	: Component, Connection, Joint, Colour, Ornament.
Information	: Sign, Change, Patina, Decoration, Representation.

For designers it is seldom a matter of making 'hard' choices, but rather of determining the right *combination* (mix, dosage, balance, tension) of attributes, which exist by the grace of their 'linked', thematic counterparts.

In architecture this involves finding the appropriate balance *between* openness *and* closure, lightness *and darkness*, mass *and* space, inside *and* outside, etc. etc..

Similarly there are *aesthetic* considerations at play, whereby it is frequently a matter of determining the relationship between less 'concrete' compositional aspects.

In the context of design, such 'opposites that attract' may be considered as *coupled* conceptions. In the words of architect and humanist thinker Aldo van Eyck: *Twin Phenomena*.[4]

Some examples of such 'linked' conditions, whereby the designer needs to take position and find the right emphasis and balance and/or tension:

Unity *and* Variety;

"whole" cinema of merging and yielding enmeshed experience." In: *Intertwining, Steven Holl, Selected Projects 1989-1995,* S. Holl, Princeton Architectural Press, 1995.

[4] Aldo van Eyck: "I will mention the problem of the in-between realm. The in-between realm constitutes that place where false alternatives are no longer false, but become twin-phenomena. My idea of twin phenomena sort of loops through my thinking and anything I try to build. That is the absolute refusal to …(accept the splitting of) … twin phenomena into incompatible halves of which each half has no meaning. There are hundreds of twin phenomena which all belong together as brothers and sisters – one / family; inside / outside; closed / open; motion / rest; change / constancy; small / large; many / few; mass / space etc. – you can just carry on. So what I think we should do first of all, is to persuade these hard, narrow borderlines between one world and the next, between this place and the next place, between this moment and the next moment, between this person and another person, to persuade this narrow borderline, to loop generously into an in-between realm." Aldo van Eyck: *The Child, The City, The Artist*, in: Byggekunst, nr. 1, 1969.

Truth *and* Character;
Structure *and* Materiality;
Convention *and* Invention;
Coherence *and* Contrast;
Totality *and* Detail;
Reduction *and* Complexity;
Expression *and* Suggestion.

It may be clear that the kinds of spatial and material compositions that are characteristic of architecture are hardly ever simple.

An *array* of aspects may be discovered on different levels of a complex 'whole'.

The feelings aroused by the combinations of these aspects may be expected to differ per individual; perception and appreciation being influenced by knowledge, experience and (cultural and personal) preferences.

The 'balancing act' between offering too little or too much information, between *deprivation* and *overkill*, is a recurring issue when attempting to create built environments that are worth perceiving and experiencing.

It is precisely this *tension* between minimalism and lush orchestration, between logical and aesthetic considerations that makes architectural compositions so *complex* - and therefore so challenging...

Methods

Designers address a variety of formal themes, such as: order and contrast; size and proportion; rhythm and (inter)space; symmetry and asymmetry; symbol and ornamentation; exploiting the expressive qualities of materials and the effects of light and colour, in order to shape new architectural objects and environments (either consciously or subconsciously).

On a compositional level this may involve creating visual *tension* between different, constituting parts, but the design ought not to be perceived as 'falling apart'. In a kind of 'balancing act' between order and chaos, the designer tries to achieve a form of *harmony* throughout the composition as a whole.

Fundamental to creative composition is *knowledge* and *understanding*.

One needs to acquire cultural and technical knowledge and acquire *insights* into relevant design options and the effects of design *decisions*.[5] The attainment of such knowledge and insight (as well as the necessary *skills*) by the designers of the future is the primary objective of architectural *education*.

Designing is a process of *searching* for a 'correct' result. This quest can be considered 'empirical' only in so far as that it tends to follow a path of *trial and error*. In a design process there is not one 'correct' outcome. The designer can come up with a *variety* of potential solutions, each of which would lead to considerably different environmental qualities and spatial experiences, if built.

Although the design process itself is clearly not 'scientific' in nature, the designer does make use of many sources of knowledge and information, which contribute to shaping the end product. In education, a proven method of acquiring knowledge and insight is the study of *precedents*, which can be analysed systematically. Recurring formal themes and characteristic forms of variety make it possible to identify specific *types* of design artefacts. These can be organised

[5] Jack Breen: *Concepts of Choice in Design Composition and Visualisation*, in: The Architecture Annual 1995-1996, Delft University of Technology, 010 publishers, Rotterdam, 1997.

systematically in design *typologies*, which may in turn contribute to the understanding and appreciation of *specific* design artefacts.

One of the most effective compositional structuring devices was traditionally the architectural *style*. In the Renaissance, the renewed orientation on the 'classical' architecture of the Romans and Greeks led to a set of stylistic rules which would not necessarily lead to the same result, but could be applied with a certain amount of freedom and inventiveness by different designers. After the emergence of the modern movement in the early twentieth century, the classical rules were declared obsolete and no generally accepted stylistic framework has taken their place.

Although designers frequently refer to their knowledge of historical examples, and may at times *reinterpret* previous themes or even borrow directly from design examples, designers frequently attempt to cross - or at least to 'stretch' – the existing boundaries.

The contemporary architectural 'landscape' offers both the familiar and the innovative. We bear witness to a constantly shifting 'parade' of architectural forms and themes.

There is no generally accepted architectural style, no standard set of *rules*.

Architectural and urban plans are not created directly 'in situ', but are conceived, notated and communicated via specialised design *media*. Drawings (varying from conceptual sketches to accurate, detailed 'technical' drawings) and *models* are generated to explore and create insights into the 'workings' of the design.

By learning to 'read' visual information design students develop the ability to translate ideas into form. Images are used to lay down ideas; this information can then be shared and communicated to others.

Design processes tend to be *iterative*, following a series of successive design 'loops'. At any given point, the 'state' of the design is evaluated in relation to previous steps and successively developed further. It is essentially a process of creative *imaging,* as John Zeissel has indicated.[6]

'Imaging' can be considered as a form of reflective communication with oneself (or with other partners in a design team); a way of questioning or verifying the merits of intermediate design ideas and developing new options and strategies. As such, the imaging process is a way of 'channelling' inspiration; the designer thinking while *doing* and reacting directly to ideas as they are being visualised, reflecting, eliminating and refining, subsequently making decisions and documenting the results. By determining *criteria* (but frequently on the basis of 'taste') judgements are made concerning the *qualities* and *potentials* of different ideas.

The working *methods* of designers may have been changed to a certain extent by the recent influx of computer aided techniques, but design *composition* remains a way of getting to the *heart* of the matter: a process of simultaneous development and testing of ideas, involving reflection, selection, reduction and perfection.

There is no such thing as a 'standard' approach to designing. Although all sorts of themes are constantly (re)surfacing within design processes, design itineraries and working styles vary considerably, from one designer to another and frequently even *per* designer, depending on the kind of project at hand[7].

[6] John Zeisel: *Inquiry by Design: Tools for Environment - Behaviour Research*, Cambridge University Press, 1984.

[7] Anton P.M. van Bakel: *Styles of Architectural Designing, Empirical research on working styles and personality dispositions*, Technische Universiteit Eindhoven, 1995.

Viewed in this light, the *imaging* process, involving the active use of various design media should perhaps be regarded as the most enduring *method* of design.[8]

Design and research

What is the relationship between design and research?
To what extent might design products be considered as research output?
What are the characteristic aims and methods of design-oriented research?

It may be clear that design is a broad field of enterprise that cannot easily be 'tied down'. Working methods and formal composition tend to be determined by personal preferences and dynamic, cultural, technological, economic and ecological – developments (including fashions).

The design process is not orderly and linear, but unpredictable and may - to an outsider - seem haphazard and erratic, even chaotic.

Projecting scientific models of thought onto such a complex, varied and layered domain can easily lead to gross reductionism or simplification, in which case the - so called - research findings will not be taken seriously by design practitioners *or* academics.

It is important to realise that *design practice* and *design research* are activities that, as it were, move in *different directions*, back and forth between (historical and contemporary) *culture* and (technical and applied) *science.*

Thereby, architectural design is a development process, which is both *creative* and *rational*, drawing from a wide range of knowledge and experience, concerning technical, practical *and* cultural aspects. An 'in-between' realm: broad and multi disciplinary; traditional as well as innovative; stretching into the domains of the Technical Sciences on the one hand and those of the Arts on the other.

Designerly enquiry

Architects have a reputation of being far more interested in design(ing) than in research.

Architectural practitioners are primarily concerned with the conception and realisation of built environments, inclined to swiftly move on to the next project, generally spending little time evaluating the precise effects of their creations after they have been built.

However, the designer's search for the right solution(s) is a venture driven by an *inquisitive* nature and a *creative* approach.

To a certain extent the kinds of study carried out by a designer in the course of such a process might be considered as a form of research, but designer's way of working and thinking is also quite different from familiar scientific research.

The designer is involved in *problem solving*, using his or her imagination to develop - and indeed to predict - a *successful* final solution. However, design solutions are expressed not so much as conceptions, but as (proposed) *form.* The designer's thinking process is essentially a process of *transformation.*

This 'search' involves a specific kind of active, designerly *exploration*, as introduced by academics like Bruce Archer and Nigel Cross.

Such a *designerly* way of thinking is typical of design. It is a kind of problem solving which transforms a relatively complex problem into a workable solution, which may be tested, judged and effectuated afterwards. Other activities requiring such *foresight*, such as setting up workable a planning, developing an educational curriculum or organising a sound research experiment, could also be considered as forms of designerly enquiry…

[8] Jack Breen: *The Medium is the Method, Media approaches to the designerly enquiry of architectural compositions*, in: Architectural Design and Research: Composition, Education, Analysis, The Architectural Intervention (ed.), THOTH publishing, Bussum, 2000.

What if the *direction* of such enquiry can, as it were, be 'turned around': if designerly enquiry can be directed towards a better *understanding* of a product and the *sort* of 'solving' that went into it…

If so, it can be argued that this aptitude is not only necessary for designers in order to make designs, but also important for researchers involved in design driven research. If – as might be conceivable – this is not the researcher's 'greatest talent', it would be worthwhile to get others – more expert in designerly working methods – involved in research projects.

In this context, the term designer*ly* enquiry seems appropriate, precisely because it has a certain, elegant *ambiguity*.

It is a concept which can denote practical designing activities, but also suggests an *'as if'* designing approach, which may be of particular relevance in design education as well as in research *experiments*.

Design work needs to be carried out rigorously and conscientiously, if one is not to be confronted with 'unpleasant' surprises at the end. In this respect there is not that much difference between design and research.

Designerly enquiry calls for (and to a certain extent is even *dependent* upon) *imaginative* insights, but at the same it should be recognised that the working processes of design are relatively methodical and transparent, even predictable.

On a 'creative' level, a design process requires both artistic and logical consideration, involving what David Bohm would regard as *imaginative* and *rational* insight and fancy[9].

Dutch architect Herman Hertzberger has stressed the systematic aspects of designing: "Designing is a complex thinking process with its own possibilities and limitations, within which ideas are developed fairly systematically."[10]

Which characteristics of designerly enquiry might be considered pertinent for other forms of study, such as education and research?

In the following overview four significant attributes of designerly enquiry are identified and discussed briefly.

Designerly decomposition:

As it is impossible for a designer to constantly address a design project as a whole, considering all of its facets with equal attention, there is a tendency to 'decompose' the design. The project is as it where 'taken apart' (and subsequently re-assembled), so that items of importance can be isolated and developed further in detail. The designer should be able to focus on specific *parts* of the composition and on *combinations* of parts in relation to the concept as a *whole*. In this way it becomes possible to recognise levels of priority and the room for variation. By organising such information, decisions can be made relatively objectively. Essentially this attitude involves loops of successive decomposing – and *recomposing* – of the project at hand.

Designerly variation:

An important part of designing a project is developing forms of systematic organisation. Such-project specific *structuring* devices set the tone for the types of compositional *variation*, which are opportune on different levels. Finding the right dimensions, rhythms, proportions, subdivisions, connections, materials and colours (to name a few) requires relatively systematic

[9] David Bohm (Lee Nichol ed.): *On Creativity*, Routledge, London, 1998.

[10] Herman Hertzberger in: Hertzberger, Herman, *De ruimte van de architect, lessen in architectuur 2*, pg. 28, Uitgeverij 010, Rotterdam, 1999. "Het ontwerpen is een complex denkproces met al zijn mogelijkheden en beperkingen waarbinnen ideeën tamelijk systematisch ontwikkeld worden" (translation by the author).

study. For this reason different variations (often on the basis of some identifiable theme or *motif*) are worked out, compared and evaluated. One of these 'solutions' may consequently be chosen, to or form the basis for further designerly developments.

Designerly visualisation:

Possible design solutions need to be *made visible*, not only for the benefit of the designer or the development team, but also for and other 'actors' involved in the process. Such visualisation, using design media is essential for design *communication*. Drawings and models can in a way be considered the primary 'language' of the designer. At the same time they form a kind of 'laboratory' involving (de)composition, selection and variation. The designer uses this visualisation ability to create impressions of the *effects* of potential design decisions, which makes choices *accessible*.

Designerly reference study:

If an architect receives a commission for a particular kind of building - a museum, a hospital, a bank or a housing complex - this usually involves extra 'homework', in order to get acquainted with the specific demands, regulations and considerations. Designers often refer to *precedents* - usually more or less comparable, previously realised projects - which may be arranged in a kind of temporary 'project library'. Such references allow for comparison with similar *types* of projects and solutions. Findings are not translated literally into the design at hand, but primarily allow for *reflection* concerning the merits of intermediate design solutions.

In a design process, activities such as the ones mentioned above help to keep the 'thought experiments' which are constantly carried out relatively orderly and transparent, to the designer, but also to others. By determining *criteria* and *values* of certain design attributes, an objective judgement might be made concerning the relative *qualities* of different ideas.

The *data* generated in such designerly study activities and evaluations can offer valuable insights into the underlying design process and benefit the *interpretation* of the design results in education and research.

Whereas traditional design activities are primarily involved with the development of design *products* and design studies with *knowledge*, in design driven education the processes are characterised by *reciprocity*. In the academic environment an *'as if'* design setting is the norm, whereby design and research activities are primarily targeted at the generation of *knowledge, insights and skills*. Thus, the aim of designerly exercises, integrated into educational curricula, is one of *learning by doing.*

A traditional approach to teaching design involves students - as 'apprentices' - to repeatedly carry out *integral* design tasks under the critical supervision of a 'master'. With such an organisation, there is the risk of a 'black box' situation, with relatively little transparency on the level of the objective exchange of ideas or evaluation of results.

A pedagogical alternative is to set up clearly structured courses, which incorporate designerly activity, aimed at the *discovery* of architectural design themes.

An effective way of 'channelling' student activities towards research is by creating a kind of 'game' situation. Donald Schön and colleagues, who have carried out explorative design exercises with considerable success in at MIT, have promoted such method.[11]

[11] Donald Schön: *The Theory of Inquiry, Dewey's legacy to education,* in: Curriculum Inquiry, 22/2 (summer 1992): pp. 91 – 117.
Turid Horge, Michael Joroff, William Porter, Donald Schön: *Towards Process Architecture*, (SP?ORG Publication) Chapters 1 & 2, pages 209 – 233.
N. Habraken and Mark Gross: *Concept Design Games*, Design Studies, 9/3 (July 1988), pp. 150 – 158.

The more clearly such tasks and objectives are defined, the more profoundly the students may be made aware of the constraints on the one hand and the creative freedom on the other hand. An advantage of such a structured approach is that in principle results can be compared and the qualities of specific design solutions can be recognised and discussed.

Examples of such a thematic, designerly approach in an educational setting can be found in the Delft Form Studies programme.[12]

The four designerly categories of enquiry mentioned earlier, which are common in design practice, can be used as - integral - parts of the didactic set-up of *educational* exercises (either with a design or a research emphasis) but potentially also in experimental design research.

A brief overview of the possible consequences for these four categories:

Designerly decomposition:

The kind of decomposition which designers practice can be used most effectively in education by making such decomposition a part of the set *task*. This can come down to consciously not setting a complex, integral design task, but instead offering a more compact, clearly defined 'problem', which can be studied in depth. An alternative is to make students aware of this approach as a part of the *tutoring* method, or as part of a research approach and protocol.

Designerly variation:

Designerly variation can be used in education as a part of the design *counsellin*g method. Such an approach can involve pointing out relevant themes or options, without necessarily suggesting an outcome. Such "could (also) be" scenarios can purposefully be developed as design variants, which can be tested and discussed. Apart from using such an approach in design tutoring, designerly variation may be introduced as part of a research *task* and the accompanying procedures.

Designerly visualisation:

The active application of design visualisation techniques does not only constitute an important part of design activity, it is an essential component of education – and consequently can be made operational in design driven research. Essentially this approach involves creating *models* of (aspects of) the project which is being scrutinised. These may vary from physical models (from conceptual to detailed scale models), digital models (computer visualisations and simulations) to two dimensional representations (sketches, drawings, schemes, collages).

Designerly reference study:

In education and research, reference study can be introduced to shed a new a light on a project at hand. A process involving targeted *juxtaposition* of the subject of study and one or more projects or specific design aspects, allowing for insightful *comparison* and evaluation. This approach may include the use of precedents but also of metaphors and even the conscious development and systematic comparison with designerly variations.

Well organised – designerly - projects can potentially help to create a kind of 'laboratory' atmosphere, in which procedures and results can be considered more or less empirically.

Of course the disadvantage of projects involving groups of students is their relative lack of *experience.* However, this is often compensated generously by their *candour* and lack of 'hang-ups', which can lead to refreshing viewpoints and surprising insights.

[12] Jack Breen, *Designerly Approaches to Architectural Research*, in: The Proceedings of the Research by Design Conference 2000, Delft University of Technology, 2001.

Such educational projects may be considered promising in the context of design driven research.

Towards designerly methods in design-based research

What might be the opportunities for design driven research?

How can active designerly enquiry be made instrumental in design education and research?

In which ways might activities, integrated in an academic educational environment, lead to convincing research products?

It has been argued that in architectural research (in the broadest sense) there is a need for researchers to operate in a systematic and methodically sound way. This is standard procedure in more or less traditional forms of analytical or comparative research, but it is perhaps of even greater importance in projects wishing to incorporate *explorative* forms of designerly enquiry as a part of the working method.

The same can be said for education, whereby a clearly constructed *pedagogical* framework is essential. Theme-based teaching forms can stimulate experimentation and discovery and can in turn lead to valuable - identifiable - insights for the students, but can also produce *results* which can contribute to insights on a higher level.

In design *practice* the working *methods* as such are generally considered of less importance than the design *product* and its qualities. However, in *research* a sound, transparent method is essential in order to judge the result and thereby ascertain the *validity* of the research outcome…

Although the differences between design and research might suggest that the two domains of intellectual endeavour are intrinsically different and that these differences cannot be resolved (as is regularly suggested), it should be recognised that there is a need for more methodical *interaction* between the two fields, particularly within academic environments.

Although in design the *evolvement* of new ideas and insights is often unpredictable and decision-making relatively intuitive, the working methods are generally far more systematic and methodical than they are often made to seem.

Similarly, inquisitive research does not blindly follow preconceived paths. The researcher – like the designer - is also dependent on ideas and hunches, conceptual shifts and *shortcuts*, which may lead to useful surprises!

An undertaking involving the taking of risks and of recognising valuable - intermediate - insights…

How should design driven research projects be organised?

The most ‘scientific’ approach would be one whereby the targets and course of action are clearly specified beforehand, allowing for the systematic evaluation of outcomes and the drawing up of unambiguous conclusions.

One possibility is to study results *afterwards*. This means that relevant themes need to be identified on the basis of design results and relationships and effects of these are examined and explained. Such a *result based* research can be structured methodically by introducing an underlying ‘order’ beforehand, for example by setting certain binding themes or groups of related constraints, which facilitate the systematic description, comparison and evaluation of results afterwards.

As with a design task, in design research it is important to specify clearly what it is the study is trying to *solve*, *discover* or *clarify* beforehand. However, it is not always possible to narrow down and define from the outset what it is precisely that is being investigated and what the best approach ought to be. More often than not, design researchers are confronted with a complex ‘knot’ of different factors, which are simultaneously at play and which are not easily

'disentangled'. In many cases actually *unravelling* the underlying, interrelated themes and their relative *meaning* within the overall composition (including the potential dominance of specific 'actors') proves to be the primary aspiration of a design research undertaking.

In order to acquire a clear understanding concerning the *questions* a research is attempting to answer or make more transparent, it is therefore often worthwhile to carry out *preliminary* investigations, before determining the targets, the status and the methods of a project as a whole. On the basis of such *explorative* studies the issues and course of action can be clearly defined: *hypotheses* can be determined and a *methodological* approach to empirical study can be specified.

By determining the methodological *design* for a project it should be made clear what the goals of a research itinerary are and what *type* of research is being carried out. In this respect the *empirical cycle* of research remains the essential point of reference to determine the *status* of a research project.

In the following scheme a brief overview is given of the three principal forms of research (after Baarda and de Goede)[13].

An overview of elementary research categories:

Descriptive research:

A commonly used form of design research…

It is an approach which is effective when it is the intention of the researcher to give a systematic explanation of one or more artefacts or to give an in depth account of the underlying developments and backgrounds. This method generally involves the study and analysis of source material and the analysis and documentation of design products and process data. This usually does not involve the conception or empirical testing of hypotheses.

Explorative research:

If the 'what, how and why' questions are central to a research we may speak of Explorative research.

This type of research can be considered as an intermediate form, between Descriptive research and Empirical research, with links in both directions. The point of departure is usually a set of notions or assumptions. The aim is to create insights: to identify, define and illustrate relevant phenomena, to explain their specific characteristics and effects and their (inter)relationships. The aim of such an approach is generally to formulate hypotheses, which may lead to more focused, empirical research.

Empirical research:

In Empirical research the task is essentially to see if certain, previously determined hypotheses are correct.

This usually involves creating more or less experimental conditions, with a clear methodological 'design' and systematic evaluation and interpretation of data. Even if there is no coherent theoretical framework there might still be empirical research, for instance if the intention is primarily to show a predicted effect. In such a case Baarda and de Goede suggest it might be better to speak of Evaluation research.

In design driven research projects – as in any other kind of research undertaking – it is necessary to specify *what* it is that is the subject of scrutiny and to determine along what lines the research will be carried out. Is the object of study a particular design or a collection of designs,

[13] Baarda, D.B., en M.P.M. de Goede, *Basisboek Methoden en Technieken*, Stenfert Kroese, Houten, 1994.

possibly belonging to an individual oeuvre or movement? Are different designs or design *aspects* to be compared systematically in a case study set-up?

A research project may focus on existing design *results* – as a given situation which may be described and analysed - or on data from a design process – which may be interpreted in relation to what a deign has become or *might have* become, possibly involving a more active, *designerly* approach. On the other hand, design initiatives – such as competitions or group workshops – may be taken as a point of departure for explorative, or even empirical research.

In the following section an attempt is made to 'construct' a typological framework for design driven research.

Design driven composition research

There are numerous ways in which designs or design processes may give occasion to academic research projects.

On one side of the spectrum design activity may be incorporated into the development of technical applications or product innovation. Such an approach is similar to the practice of *research and development* that is common in industry.

Such development research plays a meaningful role within – technical – university environments and might be expected to be stimulated and promoted in education.[14]

On the other side of the scale we may find the kind of research whose primary aim is to explain the *implications* of design interventions. The focus may for instance be functional, ergonomic, psychological, societal or philosophical. Such research generally views design results and processes from a certain 'distance' and makes use of proven methods closely linked to the acknowledged empirical cycles of research. The results may often lead to valuable insights but are not always held in high esteem by design practitioners and teaching staff.

Between these poles the endeavour of design *composition* may be considered the issue of research.

Composition research can involve the *conception* and *perception* of the overall design and its constituting parts. It may be concerned with the *workings* of design results, but also the *methods* of design, including the utilisation and effect of design *media* in the development process.

The following typological overview is divided into two main clusters of - design driven - research approaches that are put forward as being indicative.

These *eight* approaches[15] have been developed over the years, largely on the basis of research initiatives at the TU Delft Architecture faculty.

The two clusters and sub-themes:

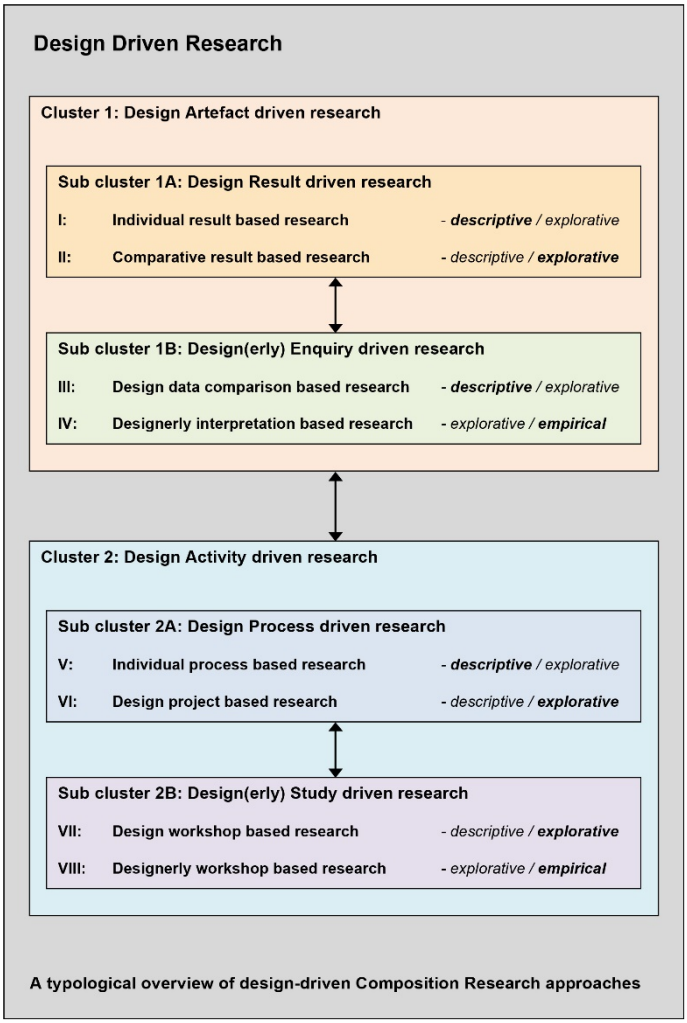
In Cluster 1 the design *artefact* (data, analysis and design product interpretation) plays a central role and is made instrumental in design-based research, whereas in Cluster 2 the targeted design *activity* (process-driven study with active modelling activity and insight-based interpretation), which form the 'hub' of the research model.

[14] An interesting examples of recent Development Research at the TU Delft Architecture faculty concerns the development of new forms of structural glazing and façade systems for twisted building volumes. Karel Vollers: *Twist & Build, creating non-orthogonal architecture*, 010 publishers, Rotterdam, 2001.

[15] An earlier reconnaissance by the author to identify relevant research trajectories came to six types, divided into three clusters: *Towards Designerly Research Methods, an exploration of design-oriented research approaches*, Jack Breen, in Ways to Study Architectural, Urban and Technological Design, ed.: T.M. de Jong et al, Methodology book of The Architectonic Intervention, Delft Faculty of Architecture, TU Delft, Delft, 2000.

Each cluster is subdivided into two sub-clusters (A and B), each consisting of two distinguishable approaches.

Thereby, A indicates research types that are more or less familiar, with specific merits but also often shortcomings, whereas B denotes somewhat less proven, but potentially innovative research procedures, with relatively more emphasis on active, *designerly* approaches to targeted enquiry.[16]



Scheme 1 Typological overview of design driven composition research approaches

The methodological component of design driven research projects should not be underestimated. If results are to stand up to scrutiny by researchers from other disciplines, 'research by design' projects will need to be logically and transparently constructed, as well as

[16] A more comprehensive version of this overview was published earlier in: Henri Achten et al (editors): *Design Research in the Netherlands*, Proceedings Design Research in the Netherlands 2005, Eindhoven University of Technology, Eindhoven, 2005.

clearly and consistently reported. As such, a great deal can be learnt from existing empirical research methods.

The challenge facing the researchers of design ought to be to employ existing design knowledge and experience whilst creating new *designs* for imaginative and innovative research.

Designerly enquiry – both as a subject of study *and* as a potential research activity – deserves to be recognised as one of the fundamental constituents of intelligent design driven research.

Models

Designing is a specialized, unpredictable development process which is to a large extent visually generative and reflective and, as such, predominantly *pre-linguistic*.

Architectural designers make creative use of various *imaging* techniques, in order to elucidate design concepts that would otherwise remain 'figments of the imagination'.

By *projecting* their ideas, into 'readable' information (drawings, models, schemes, texts), these may be shared, communicated, evaluated and developed further.

In this context, various *types* of models *can* play a meaningful role, on different levels of design driven enquiry and representation.

This contribution attempts to address the dynamic conditions and potentials of models in architecture, in particular as a prerequisite for *visual* exploration and communication.

Some 'model' Models…

The Mental Model:

Architects and urban designers talk and write extensively about their plans, but this all too frequently amounts to 'putting into words' what has been conceived visually beforehand, using some kind of design *medium* (or: combination of *media*).

Expressing the many faceted, explicit *and* implicit qualities of a design *verbally* often proves to be no easy thing. As a consequence, architectural rhetoric can come across as fuzzy or veiled. As such, imaging methods and techniques remain an indispensable feature of the 'language' of design.

The most *direct* design medium is undoubtedly the (free hand) *drawing*. Active drawing is an efficient way of 'capturing' aspects of the transient and elusive *mental model* of the design concept. Essentially, such design-driven delineation activities involve the *transformation* of an imagined spatial composition, or its constituting parts, putting them 'down' into a two-dimensional graphic format. In the process of doing this, it frequently becomes clear that a designer's mental construction is not 'fixed', but pliable and open to changes in interpretation and explorative variation.

In the course of such *designerly* enquiry, conceptual shifts can occur freely and be incorporated into the transformed concept. Through the art of drawing, design considerations are put into *action* via the eye-hand 'extension' the brain.

Such design driven study, involving consecutive (re)drawing cycles, can lead to almost spontaneous reinterpretation, redefinition, alteration and refinement. The way the 'model' of design has changed becomes evident when a package of successively developed design sketches is reviewed.

This characteristic *changeability* of design notions may be considered as a typical and acceptable trait of the associative and interactive phases of early design development, but this is very much less the case when more 'formalised' drawing platforms are introduced. When the ideas are translated into more definitive 'technical' drawings, by drafting on paper or in the computer, there tends to be far less freedom.

When working in such clear-cut design *notation* formats, it is imperative that certain elementary design aspects have been tested to such an extent that they are more or less fixed. The

'conversation' of the more or less spontaneous idea phase is replaced by a measure of order and internal 'consensus'.

The Schematic Model:

Architectural designers and researchers do not only rely on drawing techniques to 'picture' their ideas. Various types of model 'constructions' may also be considered and utilised as vital design media.

Modelling activities are generally accompanied by a measure of abstraction or reduction. For instance, in 'scientific' models of thought, an *idealised* situation is often created, in which distracting influences are as it were 'removed'. Thereby, a clearly focused view on the subject of study may be generated in such a way that hypotheses can be tested effectively. Similarly, in design it can be fruitful to 'isolate' one particular planning feature, so that the design problem at hand may be resolved clearly.

One of the 'irritating' characteristics of design is, however, that a successful design concept seldom amounts to a straightforward 'sum of separate parts'. Rather, architectural designs tend to be complex, intertwined 'wholes' in which distinctly different aspects are nonetheless indivisibly interrelated – metaphorically speaking: coexisting in a state of *symbiosis*…

One way of viewing designing is as a series of deconstruction – reconstruction cycles, whereby the constituting parts are continually specified and fine-tuned and in relation to each other, until the totality may be expected to 'perform' as a coordinated composition, in the form of a *built* environment.

Throughout the successive stages of design evolvement, a wide range of models may be used, from *generative* to *illustrative* modelling types, using physical and digital platforms (increasingly in combination). The desired level of reduction *or* explicitness in a model may depend on a variety of factors, such as: the intermediate or definitive status of the design; the factor of scale and/or the required level of detailing; the intended representational or imaging qualities; the way in which particular features of design are to be emphasised or are considered as redundant; the relative informality or required perfection of execution; the communicative intentions in respect to the individuals or groups being targeted, to name but a few.

Besides using models that, at least to a certain extent, represent or mimic the *architectural* qualities of design, there is a marked tendency amongst professionals to make use of *symbolic* representations, such as schemes and diagrams. These may be used to denote and access a variety of interrelated data. Some examples: the influence of environmental factors; the comparison of effective design options; the structural behaviour of elements under different conditions and the consequences of economic parameters and time factors.

Increasingly, with the use of computerised platforms, such symbolic 'data' models can be generated and represented three-dimensionally, manipulated interactively and considered from different viewpoints.

The Tangible Model:

A particular strength of design modelling is that it offers unique potentials for *spatial* interaction with the subject matter, whether this is achieved using tangible, hand-made scale models or as virtual constructions.

Creating a model is in many ways comparable to *building* process, albeit on a reduced level. Characteristically, choices have to be made concerning the levels of reduction, scale and operational aspects of the model. In this respect, *physical* modelling confronts its maker acutely with the consequences of structure, repetition and the montage of elements, whereas in a virtual modelling involves a somewhat more detached approach, whereby digital components are sometimes inclined to 'morph' before the eyes indiscriminately.

Physical models pose the problem of how to 'downscale' materials, and to what extent architectural articulation, detailing and plasticity may be expressed sufficiently, in order to get a

'realistic' impression. In reduced scale physical modelling, considerable manual and organisational skills on behalf of the model builder(s) is a prerequisite. In a hastily constructed 'conceptual' model, shoddy workmanship may be acceptable, but in a professional representation model poor execution aspects become painfully apparent and are generally inexcusable.

To a large extent, virtual modelling also involves 'constructing in space'…

A fundamental difference with physical modelling is that working in the computer generally does entail working to a set scale, but rather in an imagined, 'real size' environment, whereby components may be modelled with as much detail as desired. In addition, modelling options such as expression of material qualities, using texture-mapped surfaces, artificial lighting, transparency effects etc. can be activated in different phases and varied relatively freely.

The advantages of computer modelling approaches are to a certain extent also their disadvantages. Creating the virtual geometry for an ambitious 3d model can be a complicated and time-consuming enterprise, that the subsequent introduction of 'materialisation' aspects may be underdeveloped and lacking in balance. Virtual 'materiality' still all too frequently comes across as synthetic, even surrealistic. If the treatment of different components in the overall model is not sufficiently in accordance, a kind of perceptual discrepancy may be the result. If some elements that *are* explicitly detailed, materialised and textured whilst others, which *should* be on the same level, but are painfully lacking in information, there is a problem (a notorious example of this phenomenon in many virtual model presentations: staircases and balustrades).

In virtual modelling, the basic working interface can generally affords real time views and interactive manipulation. However, the resulting *rendered* images – and particularly *animated* renderings – viewed in prints or on a screen, frequently prove to be seriously lacking on the level of 'visual tangibility'… Therefore, just as physical modelling demands a great deal from the model maker's manual skills, so the virtual modeller has to be(come) skilful in digital modelling aspects, but also insightful concerning the 'balancing act' between too much and too little visual information.

One of the most interesting recent developments has been the introduction and increased availability of computer-aided modelling and manufacturing techniques, which have become very beneficial for physical modelling. In addition, the introduction of particular computer-aided prototyping techniques has made it possible to generate tangible versions of the kinds of *symbolic* models mentioned earlier.

The Representational Model:

An important 'added benefit' of models, when considered, as a category of design media, is that, besides being experienced directly *as* a model, it has increasingly become possible to draw qualitatively high-standing *images* from them.

Such model-generated images can consequentially be manipulated and enhanced using various *multimedia* techniques. The results can be distributed to other actors in de design development process or the public at large, through different communication media.

Traditional endoscopy involved the generation of *eye-level* views (either static, sequenced or dynamic), which were captured using specialized optical apparatus. For photographic stills, relatively simple, adapted optical lenses could be used, but dynamic urban environment simulation required costly facilities, with specialised navigation equipment. In recent years there has been a shift away from such flowing, locomotive simulation, whereby *serial vision* imaging, using miniaturised video cameras, has gained prominence. Besides the fact that such tools often had considerable restrictions, they also tended to (over)emphasise the shortcomings of the physical models being utilized.

In the last decade design visualization on the basis of *computer* models largely became the norm. However, in recent years, physical modelling (in combination with digital photography and graphic editing techniques) has been making a steady comeback, whereby influx of computer-aided modelling techniques has clearly given an important impulse.

In both cases (as well as in combinations of the two approaches) the *quality* of the model remains of primary importance, needing to be developed with the visualization ambitions in mind and to be matched with the imaging platforms that are used.

Thereby it can be particularly rewarding to conceive and realise the model in such a way that *different* sorts of images can be drawn from the same model. When making – physical or digital – models, it is therefore worthwhile to keep the 'studio' potential of the model in mind, so that certain parts can be disassembled, giving insights into the building's construction or interior qualities. In some cases – for instance in physical exhibition models – it can be advantageous, to build in a partial 'strip tease' of the building's structure, for the benefit of insight and understanding. Similarly, computer models may be organised in such a way that groups of building components can be placed in different layers, allowing for deconstructions, montage sequences, as well as the systematic variation and comparison of design options on the level of design decision-making.

Due to the steady improvement of modelling techniques, the availability of professional photographic equipment and studio lighting, as well as digital editing and photomontage techniques, it is sometimes difficult to tell whether a published image has been taken from a realised project, or created using either a physical or a virtual model.

The Research Model:

Models that offer research potentials, can take on a variety of forms.

Scientific models, for instance, may address philosophical or theoretical issues and considerations. Alternately, they may be developed to explore and test particular hypothetical presuppositions empirically under experimental conditions.

Similarly, design-based models may also be used to develop or test the feasibility of a particular set of notions or conditions. In active design development, the generation of sketch models (frequently becoming a series of models reflecting the design process's *iterative* nature) may be made instrumental to explore aspects, which are difficult to comprehend or to visualise convincingly in drawings. An added benefit of such types of models is that they afford the *sharing* of relatively complex design ideas via a spatial format. Furthermore, models can be used to simulate the *effects* of design proposals interactively. On the basis of data or visual information, proposals can be adapted and a consensus may be reached within the design team involved, or with other 'actors' in the design evolvement process, such as clients, advisors or other concerned parties. Studying a design proposal in a model context – either physical or virtual – can take part in relatively controlled, experimental conditions, allowing for systematic variations and objective comparisons of effects in relation to desirability.

Models can also be particularly effective when wishing to study technological or environmental aspects. Typical examples of professional model-based simulation platforms are lighting models, acoustic and climatic models and models to test and demonstrate the effectiveness of load-bearing structures. A particular class of this category of testing models is the real-size component mock-up, potentially even a complete working prototype.

In architectural research, based on historic precedents and artefacts, modelling activity can be made instrumental towards creating a better *understanding* of a design's spatial organisation, structure and formal composition. Modelling initiatives of this sort can also be particularly rewarding when used as a *pedagogical* instrument in design education. One such application involves the *interpretation* – via model reconstruction – of iconic design artefacts, which have not been built, or which through time have been altered to such an extent that the original qualities have been lost…

In addition, (physical) presentation models can be used as an extremely effective medium for research. The exhibition format, making use of comparable scale models, deserves to be recognised as a platform for knowledge exchange, which is on the level of research output is on a

par with other formats, such as publications in books, scientific papers, web-sites, data-bases, etcetera.

The Aesthetic Model:

A good model is a thing of beauty…

This is often perceived as being the case with respect to models of thought on a conceptual level. If a model is experienced to be elegant, economical, transparent, or possesses qualities that may be expressed clearly and convincingly via formulae, calculations, schemes or symbolic representations, this tends to contribute to a theoretical conception's acceptation and dissemination. As such, the medium *through which* an idea is communicated, may not only to a large extent be of influence on 'the message', but arguably also on the *method*…

Media, through which concepts may be developed and expressed, give 'form' to an idea in such a way that they tend to acquire an added – or rather: *intrinsic* – appeal and aesthetic value.

Similarly, spatial and representational models become manifestations in 'the eye of the beholder' and do not merely come across as neutral translators of 'information', but also as expressive objects in their own right.

As in architecture, a model's functional, technical and operational restrictions may be implicitly recognised. The way in which such constraints are overcome in a model's execution highlights the level (or lack) of skill of the model's *maker*. Functionality and construction may be aspects that are essential to the aesthetic pleasure that a model may be capable of capable of generating, but there is also an elusively autonomous, *seductive* quality to be recognised in many models, which tends to make them objects of affection and desire.

The tendency to want to 'possess' a model – usually by trying to *touch* it – appears to be an instinctive condition that is hard to suppress in admirers, whether they are young or old. Anyone who has been responsible for an exhibition of unprotected (physical) models, knows *destructive* potentials of the audience's interest in this respect…

As in design culture, it is possible to recognise cycles of convention and invention in model making. Particular techniques are characteristic of the *craft* of modelling in a particular era and are recognised as such more or less spontaneously. The introduction of new materials and techniques tends to generate a new wave of invention, which will subsequently become adopted and implemented as the state of the art; the *latest* convention.

Issues of tidiness, order and precision undoubtedly also play an important role in a model's appeal. Creating a model means taking clear decisions concerning what is or is not to be demonstrated, what should be explicit or even exaggerated or alternately: only be hinted at.

Consequentially, the 'performance' of a model relies to a very large extent on how which it articulates the underlying notions convincingly. At the same time, the *act* of modelling speaks through its execution; the implicit control of structure and dimensions; its codes and means.

The way, in which a model is perceived as having been conceived and constructed intelligently, contributes considerably to its aesthetic success.

Creating a model is a way of focusing one's mental capacities by *doing*, by actively modelling. It is a way of speaking *from* the imagination; the constructed artefacts of modelling activity – be they conceptual or representational, virtual or physical – clearly possess the capacity to lastingly *speak to* the imagination.

This contribution intended to explore characteristics and the changing perspectives of various types of models in architecture, specifically on the level of *imaging* potentials.

Perceptions

A model can be used to illustrate and demonstrate, to test and refine, to inform, communicate and … *convince*…

Essentially: *because* the model allows us to *perceive* the issue or phenomenon under consideration and its implications and impact: we do not just *understand* it: we 'see' it and hence appreciate and truly understand it!

As such, a model is an instrument that may facilitate insight, understanding and even affection in the perceiver, but – through its 'design' – may also help to steer and motivate the researcher!

The model as a means to *structure* a study or research initiative…

One such study, in which I have personally been involved though a number of years and in which the issue of the model 'construct' has played has a crucial role, has been the 'Umgebinde Variations' project.[17]

In my perception: an exemplary piece of evidence that 'The Model is the Method': a means of *envisioning* what it is *what* one is trying to understand and *how* to unravel and better understand it!

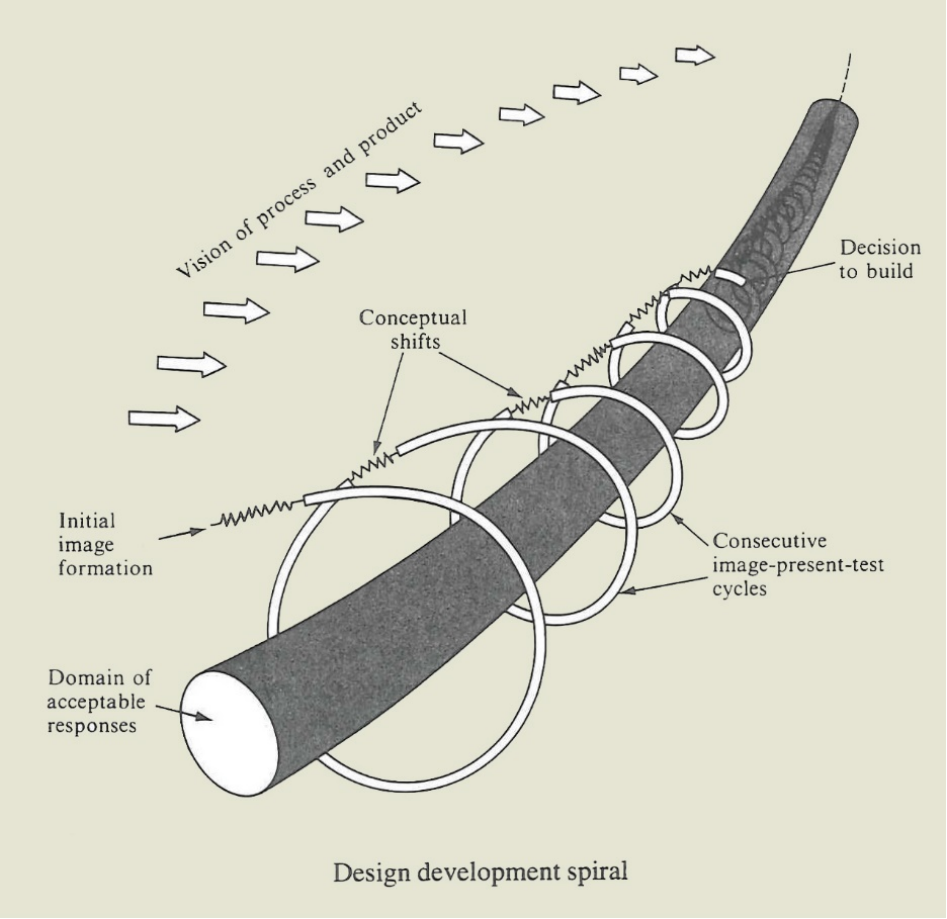
A matter of 'Imagability'…[18]

Hence, a model can also be considered as an intellectual instrument, which can help to inspire en potentially create thematic and conceptual focus, with an emphasis on *imaging* potentials.

In this context: one of the most interesting *conceptual* models I have come across - and one which still continues to inform my thinking and our research in Delft - is John Zeisel's 'Spiral Metaphor' of the creative design process: a series of linked cycles, related to a linear domain of "acceptable responses", with iterative loops and conceptual shifts, influenced by the 'go/no go' marking point of "the decision to build".

[17] Jack Breen and Bram van Borselen: *Unravelling the Umgebinde: Exploring Compositional Patterns and Variations in a Vernacular Building Type*, in: Jack Breen and Martijn Stellingwerff: *Envisioning Architecture*, EAEA Proceedings 2011, Delft University of Technology, 2011.

[18] The theme of a new design-driven 'honours' study initiative by my research and development colleague Martijn Stellingwerff , in the context of an evolving Data Visualisation application.To be continued!



Scheme 2 The Design Development Spiral after John Zeisel

At this moment we are hard at work developing a conceptual, thematic and methodical 'update' of this exemplary model: trying to, as it were, re-invent and enhance Zeisel's original model in the context of our on-going Architecture & Composition research programme…

More at the 2013 EAEA Conference in Milano…!