

The potential for design driven research in academic environments is examined. In this context lessons might be learned from educational exercises with a designerly approach and presentations stimulating discovery through systematic comparison.

On the basis of previous experiences with design and workshops, *eight types of design driven composition composition research* are identified, divided into two main clusters. The approaches vary, from more or less familiar forms of design research to more speculative approaches, involving design(erly) activity as integral part of the research method.

16.1 DESIGN DRIVEN RESEARCH APPROACHES

What might be the opportunities for design driven research? 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 there is a need for researchers to operate in a systematic and methodically sound way: standard procedure in traditional forms of analytical or comparative research, but perhaps of even greater importance in projects wishing to incorporate *explorative* forms of designerly enquiry as part of the working method.

The same can be said for education, whereby a clearly constructed *pedagogic* framework is essential. Theme-based teaching forms can stimulate experimentation and discovery and lead in turn to valuable - identifiable - insights for the students, but can also produce *results* contributing 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 *validity* of the research outcome. Although 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 *inter-action* between the two fields, particularly within academic environments. Although in design the *evolvment* of new ideas and insights is often unpredictable and decision-making relatively intuitive, working methods are generally far more systematic and methodical than they are often made to appear. Similarly, inquisitive research does not blindly follow pre-conceived 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.

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

How should design driven research projects be organised? The most ‘scientific’ approach would be one whereby targets and course of action are clearly specified beforehand, allowing for 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 placing binding themes or groups of related constraints, facilitating 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 precisely what is investigated and what the best

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approach ought to be. More often than not, design researchers are confronted with a complex ‘knot’ of different factors, simultaneously at play and not easily ‘disentangled’. In many cases actually *unravelling* underlying, inter-related themes and their relative *meaning* within the overall composition (including 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 to make more transparent, it is, therefore, often worthwhile carrying out *preliminary* investigations, before determining targets, status and 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* determined, and a *methodological* approach to empirical study specified.

16.2 ELEMENTARY RESEARCH CATEGORIES

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 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 an overview is given of the three principal forms of research (after Baarda and De Goede).^a

a. Descriptive research

Descriptive research is a commonly used form of design research: an effective approach 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 underlying developments and backgrounds. This method generally involves study and analysis of source material and analysis and documentation of design products and process data. This usually does not involve the conception or empirical testing of hypotheses.

b. Explorative research:

If the ‘what, how and why’ questions are central to a research, we may speak of explorative research. This type can be considered 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 specific characteristics and effects and (inter)relationships. The aim of such an approach is generally to formulate hypotheses, leading to more focused, empirical research.

c. 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 still might 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 all 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, possibly belonging to an individual oeuvre or movement? Are different designs or design *aspects* to be compared systematically in a case study? 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 design has become or *might have* become, possibly involving a more active, *designerly* approach. On the other hand, design initiatives – like competitions or group workshops – may be taken as a point of departure for explorative, or empirical research.

a Baarda, D.B. and M.P.M. de Goede (2001) *Basisboek methoden en technieken*.

16.3 DESIGN DRIVEN COMPOSITION RESEARCH

There are numerous ways in which designs or design processes occasion academic research projects. In the following section a typological framework for design driven research ventures is constructed.

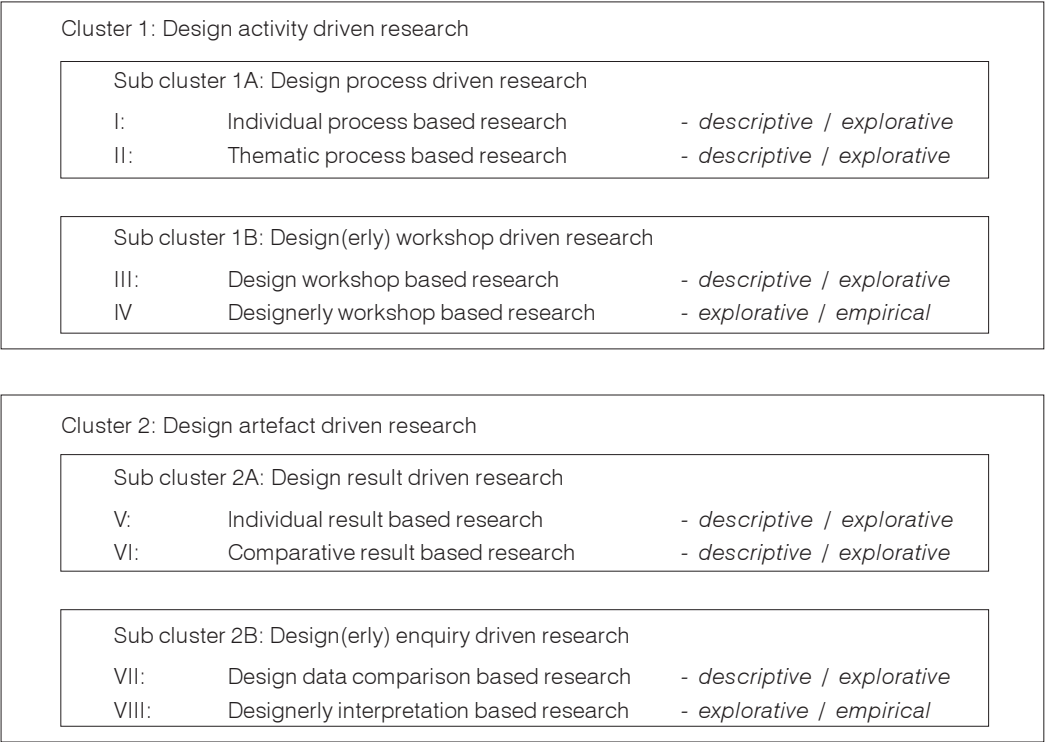
On one side of the spectrum, design activity may be incorporated into the development of technical applications or product innovation. Such an approach is similar to the practice of *research and development* (R&D) common in industry. Such development research plays a meaningful rôle within – technical – university environments and might be expected to be stimulated and promoted in education.^a

On the other side, we find the kind of research whose primary aim is to explain *implications* of design interventions. The focus may be for instance functional, ergonomic, psychological, societal or philosophical. Such research generally views design results and processes from a certain ‘distance’ and makes use of proven methods linked to 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 *conception* and *perception* of the overall design and its constituting parts. It may be concerned with the *workings* of design results, but also with the *methods* of design, including utilisation and effectivity of design media in the development process.

The following typological overview is divided into two main clusters of - design driven - research approaches. In the first the design *process* is made instrumental, in the second cluster it is the design *results* (artefacts and design data) which form the hub of research. Each cluster is sub-divided into two sub clusters (A and B), each consisting of two approaches, whereby A indicates more or less familiar research types, with specific merits but also shortcomings, and B denotes somewhat less proven, but potentially innovative research procedures, with relatively more emphasis on *designerly* methods of enquiry.

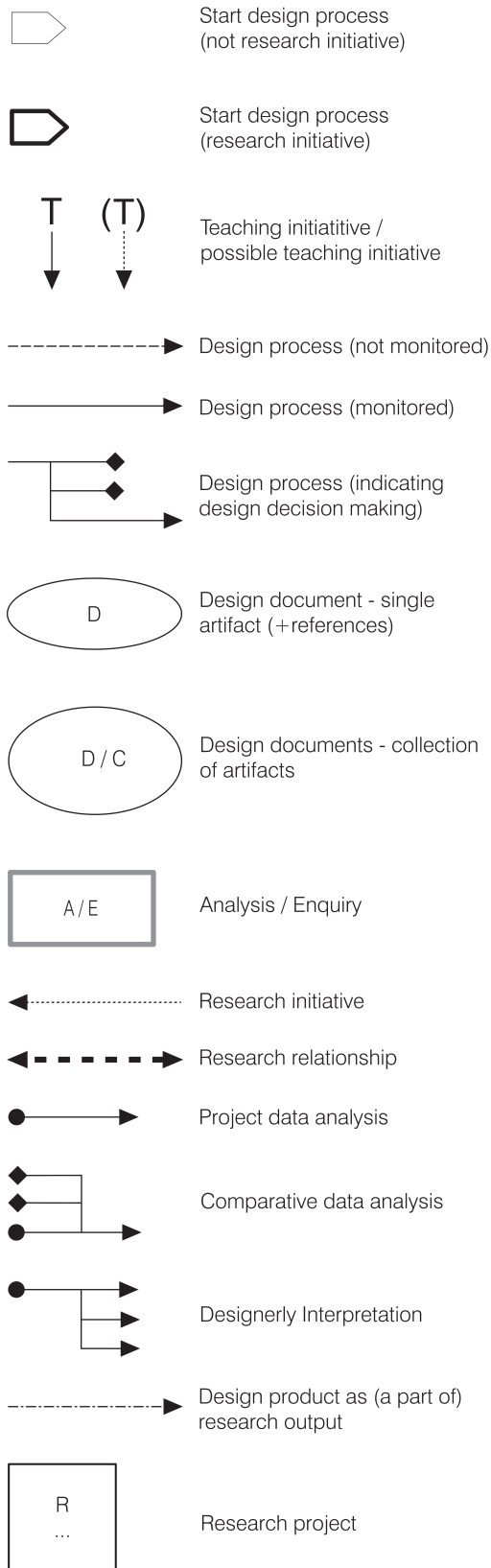
DESIGN DRIVEN RESEARCH



a An interesting example of recent Development Research at the TU Delft Faculty of Architecture concerns the development of new forms of structural glazing and façade systems for twisted building volumes. Vollers, K. (2001) *Twist & Build, creating non-orthogonal architecture*.

b A previous attempt by the author to identify relevant research trajectories came to six types, divided into three clusters: Breen, J.L.H. (2000) *Towards Designerly Research Methods, an exploration of design-oriented research approaches*.

122 Typological overview of design driven composition research approaches



123 Legend, symbols used in schemes of design driven research types

124 Type I: Individual design based research

- a Hertzberger, H. (1991) *Lessons for students in architecture*; Hertzberger, H. (2000) *Space and the architect: lessons in architecture 2*.
 b Holl, S. (1996) *Intertwining*; Holl, S. (2000) *Parallax*.

The examples put forward as indicative of these *eight* approaches^a are mostly taken from research initiatives at the TU Delft Architecture Faculty.

16.4 DESIGN ACTIVITY DRIVEN RESEARCH

In the first category the design *process* is dominant and forms a continuous line from the beginning to the end of the research, which is, as it were, constructed around the design's development. Generally speaking there is a notion of the research ambitions from the outset. To a large extent the development process can be monitored. As such, projects of this nature can be said to be *process driven* and the design results – at least to some extent – constitute a part of the research output.

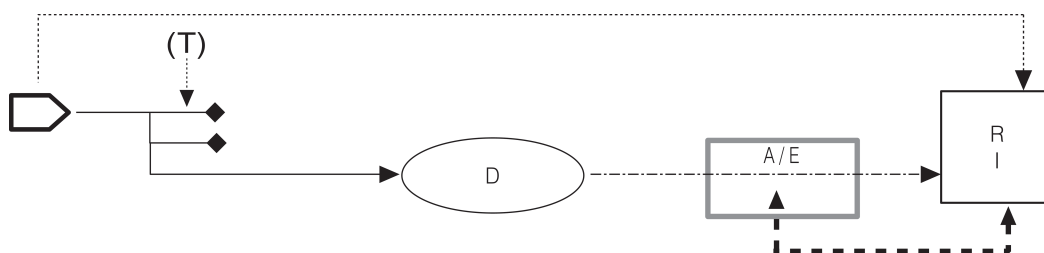
The content of the research activity is largely determined – one might say 'initiated' – by the designerly 'search' of individuals or groups of designers. The extent to which the designs reflected upon are 'let through' into the research project's outcome can vary from integral, broad representation of designs generated in the process (A) to projects with a more rigorous form of scrutiny, filtering and selection of items which are at play (B). The design projects which are the subject of study may come from practice (for instance from competitions) or from education. Apart from following design processes and their results from a relatively safe distance, it is possible to create game-like situations with pre-set specific tasks and constraints, creating a 'design laboratory' situation.

16.5 SUB CLUSTER 1A: DESIGN PROCESS DRIVEN RESEARCH

Type I: *Individual design based research*

In principle, the initiative lies with a designer or design team. The design process is documented conscientiously for the benefit of study, whereby design sketches and development models, interim options and results, may be used to illustrate and motivate the final product and place it in a broader perspective. The process may be situated in practice – with the intention of the plans being realised – but simultaneously being developed in view of its research potential. Such an approach runs the serious risk of a lack of objectivity. If the designer – at the same time playing the rôle of researcher (sometimes supported by a 'ghost-writer') – is not able to keep a certain 'distance', there is a danger that 'theory' is confused with design doctrine, leading to indiscriminate promotion of personal convictions and fascinations. Without sufficient critical consideration, the result may soon resemble an office documentation than a serious research product. Nonetheless, such approaches can be valuable, because they offer insights into the domain of design decision-making and often play a meaningful rôle in design education.

Examples of such design based research in which design activity is used as a vehicle and reference point for broader design reflections may be found in the work of Hertzberger^a and Holl^b, and to a certain extent in that of OMA and MVRDV.



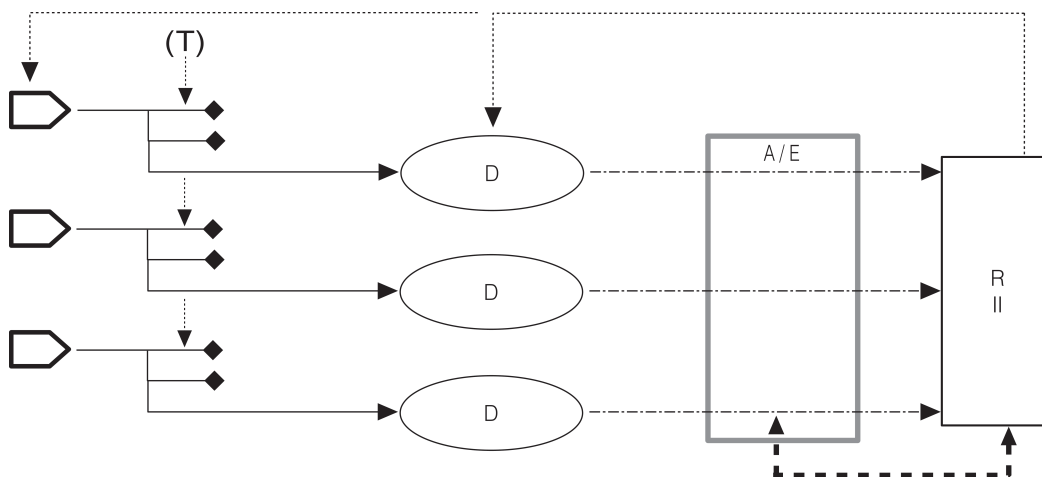
Type II: *Design project based research*

Design projects involving a number of designers can form the basis for design research. Such collective activities, with a set of pre-determined guidelines concerning context, programme and task can lead to a variety of results. These can, nonetheless, be compared relatively systematically, if there are pre-determined, binding themes. Examples of such initiatives can come from design competitions amongst professionals, but also from design projects in an educational setting, like thematic diploma projects.

Frequently, the design results from such projects are presented as an integral part of the research output. In some cases all projects are included in publications with a research ambition, regardless of their qualities. On the other hand, a selection may have been made by a professional jury, rather than by the researchers. Such research often tends to focus on the undertaking as a whole and to highlight particular themes and cultural developments, rather than offering systematic analysis of the outcomes. The clearer the 'format' of the exercise, the more methodical such an evaluation can become.

In many cases the research outcome remains primarily descriptive. However, if ambitions and expectations concerning what it is that the project is intended to address are specified clearly beforehand, such an approach can lead to explorative research, and potentially even to – hypothesis based – empirical research.

Examples of this approach are the research outcomes of the Architectonic Intervention programme – based on thematic diploma projects – at the TU Delft Architecture Faculty.^a



125 Type II: Design project based research

16.6 SUB CLUSTER 1B: DESIGN(ERLY) WORKSHOP DRIVEN RESEARCH

Type III: *Design workshop based research*

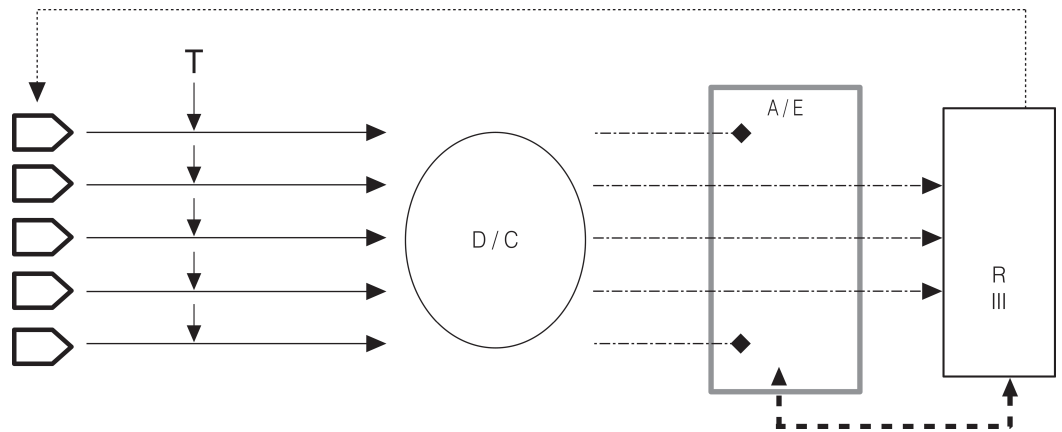
There are similarities between design *workshop* based research and type II. However, in this case the design process plays a different rôle and evaluation and selection has more prominence. In this context 'workshop' indicates a collective project whereby there is more than a loose binding theme; it means that all participants are facing precisely the same task. The workshop project sets certain rules, there is a clear programme (indicating what and even what is *not* expected) and limitations how far the complexity of the task goes (constraints). The idea of such a set-up is that by reducing complexity, the design work may attain a certain *depth*, rather than width. In addition, by setting all participants an identical task, the results should become *comparable*. The experience is that such an approach does not lead to identical results, but on the contrary, to a wide range of varied results. From such a collection insights may be gathered concerning relevant design *themes*, recurring motives and the effects of structural and compositional *variation*.

In this case the (academic) design environment is used to learn *about* design attitudes and methods. The rôle of the initiators is 'curatorship', the procedure is primarily explora-

^a For a summary of the Architectural Intervention programme and its results, see: Klaasen, I.T. (2001) *The Architectural Intervention* (<http://ai.bk.tudelft.nl>).

tive. Design products are not considered research products (except of course in the light of the individual designerly research of the participants and their learning processes), but a collection of artefacts to be analysed and compared (and with other design precedents) for the benefit of research.

Examples of design driven projects in an educational setting are Form Studies / Media Studies workshops at the TU Delft Architecture faculty.^a



126 Type III: Design workshop based research

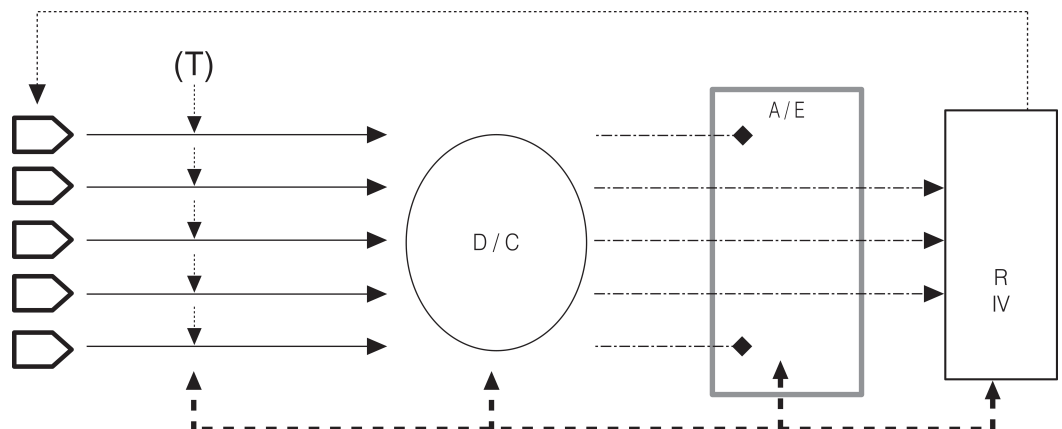
Type IV: Designerly workshop based research

In *designerly* workshop projects the methods indicated in type III are taken a step further. In this case it is not a matter of learning about compositional qualities of designs afterwards, but to target particular issues of interest and *infuse* these into workshop projects with active designerly enquiry by the participants.

This means that a workshop is set up consciously as an experimental, simulated working environment. The tasks may be organised relatively loosely; as in a pilot study – in order to explore procedures and gather information. On the other hand, a more strictly organised research ‘construct’ can be set up, for the benefit of empirical study, with clearly defined expectations laid down in working hypotheses, to be tested within the workshop environment. The process can be monitored in different phases of development. In such a case a ‘game’ situation with pre-conceived rules, constraints and formats may prove beneficial for research, creating a platform for systematic comparison of (intermediate) results and in-depth analyses. Such an experimental approach may target on *compositional* themes, but also focus on more *methodical* issues, like the influence of different (combinations of) design media.

In principle, such an approach involves setting design tasks, but could also in principle involve group driven *designerly studies*, as indicated in type VIII.

In the course of the Dynamic Perspective research project, the Delft Media Group has been working on ways to develop such types of workshop based empirical research. Examples of pilot studies are the Imag(in)ing study^a and the Imaging Imagination EAEA conference workshop.^b



127 Type IV: Designerly workshop based research

^a Apart from the series The Table / The Bench / The Bridge: Breen, J.L.H. (1996) *Learning from the (in)visible city, design media experiments in an educational setting*; Breen, J.L.H. (1998) *Learning from the (in)visible city, design media experiments in an educational setting*.

16.7 DESIGN ARTEFACT DRIVEN RESEARCH

In the second category the outcomes of design activity are central to the research undertaking. The research initiative is primarily concentrated on this product of the design process (with a not always very clear line of development). Generally speaking, the design's development cannot be monitored or 're-constructed' conclusively on basis of the process data.

The subject and form of such research may vary. The basis can consist of one *specific* design but can also be a concise *collection* of designs. The method may involve design result *analysis*, possibly involving relevant *references* or even *comparative* studies (A) on the basis of results. Alternately, researchers may attempt to get *behind* the implications and workings of design artefacts by studying *intermediate* design data or even by 'constructing' alternate design *options* in order to throw light on what a design has become through systematic *simulations* of what it *might also* have become (B).

The subject matter of such research may be expected to come from design practice. The artefacts can vary from emblematic, historic *precedents* to *contemporary* products, which may even include designs created in an *educational* setting.

The research output can be descriptive, illustrating and communicating the qualities of artefacts considered worthy of study, but might also more *explorative*, with the intention of discovering more general 'truths' concerning (aspects of) design culture, composition and perception.

16.8 SUB CLUSTER 2A: DESIGN RESULT DRIVEN RESEARCH

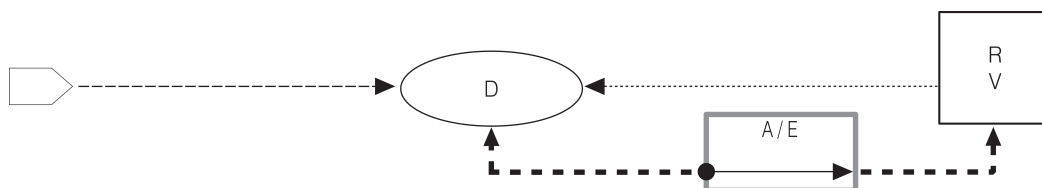
Type V: Individual design based research

A relatively familiar form of architectural research, whereby the results of design processes usually form the departure for a detailed, methodical evaluation.

The subject might be a realised building or ensemble, but also a collection of design data (drawings, models, written information), referring to a project not (yet) realised. The method of study usually amounts to analytical evaluation and descriptive documentation of the design artefact, although the researcher may try to 'work back' through the design data in such a way that light may be thrown on how design decisions or working methods have fundamentally influenced the design result. Another method is to place a design in a particular context, by comparing it to precedents, or through cross-referencing (with designs from the same period or with other designs from the same designer or movement).

In such research the definitive design result is usually the dominant factor, whereby the decision-making process is of secondary importance. The approach is primarily descriptive, intending to uncover relevant background information and to offer insights into compositional qualities and cultural or historic importance of the product studied.

As such, the research tends to focus on artefacts considered worthy of mention in the context of contemporary debate. It is important to define beforehand where the emphasis should lie, what the reference points of the study are to be in order to create conditions for *objective* reflection. If this is not the case, the work may be taken as journalism rather than as a *scholarly* undertaking. There are many studies of this sort carried out and published, frequently in 'border zones' of academic enquiry and descriptive reporting.



128 Type V: Individual design based research

- a Does, J. van der and H. Giró (1999) *Imag(in)ing, a fresh look at design, presentation en communication*.
- b Breen, J.L.H. and M. Stellingwerff (1998) *Imaging Imagination, exploring the impact of dynamic visualisation techniques in the design of the public realm: results of the EAEA Conference workshop*.

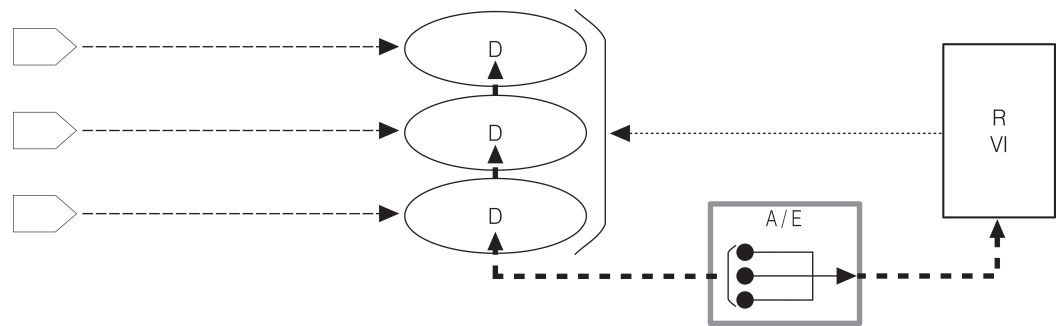
Type VI: Comparative design based research

An approach with distinct similarities to type V. However, in this type of architectural research the design *cases* studied are usually grouped and *juxtaposed* in such a way that they may (be expected to) ‘throw a light’ on each other, to offer insights concerning characteristic *analogies*, as well as crucial *differences* between the objects of study.

Case based studies are an efficient way to study compositional aspects of architectural artefacts. Exploration of design aspects of such ‘collections’ of projects or oeuvres can shed light on underlying themes and convictions and the effects of different architectural design *interventions*. Such analytical, comparative research, on basis of built environments and design documents, tends to be *explorative* in nature, involving not only description of what there is, but also identification of distinguishing *consistencies* and patterns in *variation*.

The format of output may influence working methods. For instance: an exposition format may be chosen, in order to allow viewers to make their own comparisons. This means that the material is to be ordered and visualised in such a way that it will facilitate such mental activity. Apart from familiar descriptive methods, more *designerly* approaches may be employed, for instance by making new drawings, schemes and models on the basis of existing artefacts. This can be instrumental in *communicating* results to others, but can also contribute to *discoveries* in the context of the research process itself.

An example of a study involving unbiased investigation and documentation of artefacts by groups of students was the ‘Raumplan versus Plan Libre’ project, a comparative study focusing on the design modes of Loos and Le Corbusier.^a



129 Type VI: Comparative design based research

16.9 SUB CLUSTER 2B: DESIGN(ERLY) ENQUIRY DRIVEN RESEARCH

Type VII: Design document based research

In document based research it is not only the *end* result that counts (although it is obviously taken into consideration), but also the overall design *process* leading up to the final product explored.

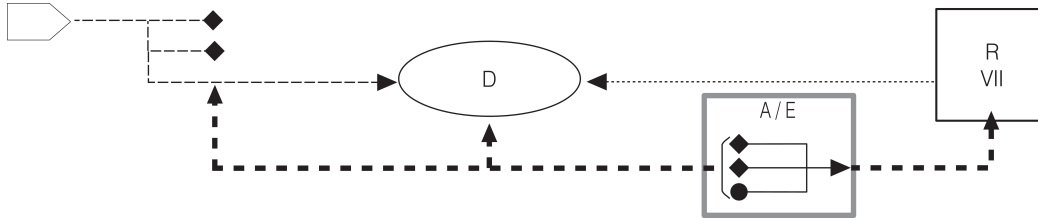
This may be done in order to add to the body of knowledge concerning the artefact(s) in question, but in addition can shed light on a designer’s design *motives*, *attitudes* or *methods*. The research may also have a more general ambition, like identifying representative design *phenomena* and their effects. The subject of study could be a specific design artefact but also a collection of designs with some identifiable relationship.

There are parallels between this type of approach and type VI. Apart from being descriptive, such a research can often be said to be explorative. The process involves ‘reconstructing’ design choices from data which may not always be consistent. An example: a ‘definitive’ design drawing which does not correlate with photographs of a (possibly demolished) realised building. The *interpretation* of design intentions and the effects of design options and solutions require a *detective* spirit, the researcher attempting to uncover what is ‘behind the event’ of the design in a rational way.

Specific aims and methods may vary per project. It may be necessary to ‘fill in the gaps’ and possibly even to *extrapolate* design developments on the basis of existing data. Alternately, the starting point might be an altered building, whereby the task is to *reconstruct* the design virtually as it once was - or was *intended* to be.

a Risselada, M. (1988) *Raumplan versus Plan Libre: Adolf Loos and Le Corbusier 1919-1930*.

Research on the basis of design data is relatively familiar. An example of an exercise involving active interpretation by students was the ‘Un-built Loos’ project at the TU Delft’s Architecture Faculty. The task was to ‘complete’ house designs by Adolf Loos which had never been built (like asking music students to complete an ‘unfinished’ symphony). This potentially innovative project deserves to be worked out more convincingly and documented more systematically.^a A recent example of a document driven research project was the international Mel’nikov study, in which the use of spatial models played an important rôle.^b



130 Type VII: Design document based research

Type VIII: Designerly interpretation based research

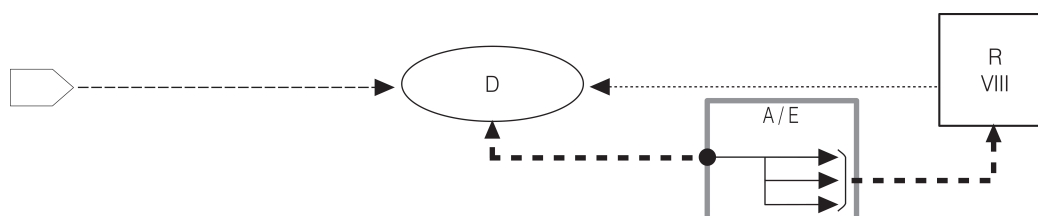
Designerly interpretation provides opportunities for bringing together research ambitions and *design expertise* present in the profession (and to a certain extent in the design education environment). The underlying motives and ambitions of such research are to discover more about specific designs or the ‘science of design’ (which does not necessarily imply considering design *as* a science).

Such research, involving *designerly interpretation* also calls for a ‘*detective*’ attitude and as such there are distinct parallels with type VII. However, in this type of study the researcher generally has less information to ‘go’ on. Such a lack of ‘clues’ means that clues need to be *constructed*, allowing design considerations to be played back and forth in a kind of ‘mental experiment’.

The researcher may take a ‘design perspective’, using designerly modes of *enquiry* to ‘get under the skin’ of the design project. In this way the researcher (or designers invited to take part in the research project) can generate ‘simulated’ design options, in order to identify and clarify aspects of *real* design results. Such designerly *variations* may be developed and compared with the actual result in a relatively systematic way in interpretative ‘cycles’ involving: designerly orientation, variation, evaluation and explication. For this to be possible, a methodical framework needs to be constructed beforehand and the design aspects to be addressed need to be identified and defined. As always in result driven research, such interpretative projects should not start ‘from scratch’. The basis may consist of one or more design *precedents*, which will be explored using the working methods of designers within a methodically transparent research ‘construct’.

Such an approach does not have to stand on its own. Combinations are conceivable, such as with type VI (by taking a group of design results as a starting point involving cross referencing and comparison) or with type VII (by combining existing information with ‘constructed’ information. More ‘players’ can be involved, as in type IV. In addition, different combinations of design media can be used. Such research is primarily explorative - and will often be carried out in combination with methods mentioned earlier - but empirical research on the basis of hypotheses is conceivable.

Although this approach is still relatively speculative, it deserves to be developed further, as it potentially builds a bridge between the empirical approach of scientific research and the expertise present in the domain of design (in practice and in education).



131 VIII: Designerly interpretation based research

- a Saariste, R., M.J.M. Kinderdijk et al. (1992) *Nooit gebouwd Loos; plannenmap van huizen ooit door Adolf Loos ontworpen nu door studenten uitgewerkt*.
- b Meriggi, M., M. Fosso et al. (2000) *Konstantin Mel'nikov and the construction of Moscow*. For an impression of the research process, see: Mäcel, O. and R. Nottrot (2001) *Leningradskaya Pravda, 1924*.

16.10 PERSPECTIVES

If we wish to *extend* the range of design orientated research, other methods have to be found - or developed - doing justice to the creative *variation* characteristic for architectural composition.

New opportunities for innovative and imaginative design research may be offered by integrating active forms of *designerly enquiry* into research. Designerly working methods can create new opportunities for architectural and environmental design research. The experiences in educational settings and explorative workshop projects mentioned may give an indication of the types of design driven trajectories to be explored and pursued further.

The methodological component of design driven research projects should not be under-estimated. 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 clearly and consistently reported. A great deal may be learned from existing empirical research methods.

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