

LSRM FINAL ASSIGNMENT

Self-Assessment on Research Methods

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Tectonic thinking in the design process

I INTRODUCTION

Research methodology in architecture is fundamental for the justification of the research and the final product. Within the Architecture Master studios of the TU Delft, each studio has its main focus point with corresponding research methods. I chose for the graduation studio Heritage and Architecture, because I appreciate the research of materials and history. This is an important topic in this studio because its starting point is the focus on a specific site with specific existing buildings. The overall design problem is that the buildings are in a state that it doesn't function anymore, but before one can solve this, the subject must be researched on different levels. The method of the Heritage studio is to start with an architectural, technical, historical and cultural analysis of the site before one starts with the design process.

The subject of my graduation is located on an industrial military terrain in the south of Zaandam, the Netherlands, and consist of five industrial sheds used for the production of grenade shells, which together are named the Ladder. An interesting aspect is that the buildings grew against each other in a time span of 50 years; from the 1920's till the 1970's. Because the production line included all 5 buildings, the interconnection between the different buildings from different periods is still present, which results in a sequence of different unique atmospheres. And on this point, I started to think about research methods, because how does one translate atmospheres in a research? One of the main conclusion of the analysis of The Ladder was that the different atmospheres sensed during the visits are a product of form, materialization and connections of materials. This means that not only architectural aspects have influence on the experience of different the buildings, but because of the visibility of the structures and materials and especially the connection of materials; the architectural and technological aspects liquefy into each other.

In most of the architecture studios at the TU Delft the research of materials is done near the end of the project, which is also appointed during the lecture "Material Culture" of Eireen Schreurs¹. This lecture opened my eyes about the research methods of materialization in architecture. I always felt that, during the design, there is far more focus on form instead of material and I was not aware of research methods about this subject. Now I have done the research to the existing materials, I am not sure how to integrate that in the design process. Therefore, the research question for this paper will be: *how can the research on materials be included in the design process?*

II RESEARCH-METHODOLOGICAL DISCUSSION

So far, in the technical research of the Heritage studio, I have focused on the different types of structures and use of materials and placed them on a time scale. By researching the history of these materials and building techniques, we know why different materials are used; because of developments, labor costs etc., but that are very technical facts; they are not explaining why these technical elements have an influence on the perception of these buildings or how we can use them in our design research. To get grip on the essence of these building components in relation to how they are perceived, we can look the notion of the tectonics, constructed by Gottfried Semper (further explained in the next chapter). In his book *Studies in tectonic Culture* Kenneth Frampton points out that Semper studies about the tectonic go beyond the technical sphere by saying; "I am alluding to the mere not revelation on constructional technique but rather to its expressive potential".²

If we want to research tectonics in our design process, we have to know more about how research within designing works. Donald Schön described designing as reflective conversation with the materials used, which can be sketches, model making or other design acts. During the design the designer acts and reflects at the same time. Schön named this process “reflection-in-action” in which the designer becomes a researcher in the practice context and he or she “does not separate thinking from doing”.³ According to Nigel Cross, everyone has to some degree certain design abilities, which are “multi-faceted cognitive skills”.⁴ He argues that designers have trained these skills of non-verbal thinking and communication, and use certain “codes” to translate abstract ideas and requirements; “Essentially, we can say that designerly way of knowing rest on the manipulation of non-verbal codes in the material culture; these codes translate ‘messages’ either way between concrete objects and abstract requirements; they facilitate the constructive, solution-focused thinking of the designer...”⁵ We can see tectonic aspects in architecture as a certain set of codes within a “object language” that we use to express certain values of materials, structures and connections.

It is important to understand the way we use this “object language” in design because how we integrate materials and tectonic thinking is changing. This is because the way we look at materials in architecture is undergoing a transition at two levels; first, the role of the architect is changing and secondly, how architects assess materials changes. Architect and writer Neil Leach argues that where the architect used to be the “genius creator” who’s primary goal is to design, contemporary architects have become “the controllers of processes, facilitating the emergence of bottom-up form-finding processes that generate structural formations.”⁶ Designing by programming and parametric modelling and making by digital fabrication processes, such as CNC milling, laser cutting and 3D printing, makes architects and designers validate their used materials different; they seek for measurable qualities instead of tectonic quality. Leach names this alteration ‘New Materialism’ which he describes as being a new theory; “The key behind New Materialism is to recognise that the emphasis today is not on symbols but on material expressions. We are concerned less and less with symbolic content – what a building might ‘mean’ – and more and more with performance and material behaviours.”⁷

Frederik Nilsson, head from the Department of Architecture at Chalmers University of Technology, is also studying this transition of a changing view on tools and materials and he argues that “Information technologies and computerized tools for design continuously urge us to rethink built architecture, architectural practice and our interaction with tools and materials.”⁸ As example he discusses the method of Lars Spuybroek, who is quite an experimental architect, but uses the computer as an constructive medium, not as a representational one. To prevent himself from falling in the trap of “ideas first, materialisation second”, Spuybroek tries to keep a continuity between the design process and fabrication and by doing this he is addressing the separation between form and tectonics.⁹

III RESEARCH-METHODOLOGICAL REFLECTION

The ideas of Gottfried Semper about the four elements of architecture are helping to name the non-verbal codes in the material culture, which enables to discuss research and research methods. In the theory of the four elements, Semper categorized types of materials “according to their technical purpose”; 1) the terrace (stereotomy), 2) the structure and the roof (tectonics), 3) the walls and 4) the hearth. These elements are based on “the four main categories into which raw materials can be classified according to their characteristics”; 1) masonry, 2) carpentry, 3) textiles and 4) ceramics.¹⁰ In his *Stoffwechsel*- (metabolism) theory, Semper pointed out that history of culture manifests in architectural elements that are expressed in a different mode to retain a certain symbolic value. This can be seen for example in the triglyphs of a Greek temple, which are evidence of the original used wooden beams. This even goes further in the fact that the using of masonry bounds can be seen as an interpretation of weaving, which was, according to Semper, the primary space dividing element in architecture.¹¹ Thus, we can state that the theory of Semper about the four elements is not bounded by the historical use of specific materials but origin from the process of making.

Tectonic thinking in architecture is a method to describe different materials in relation to their fabrication, context and cultural use. It is a certain way to do research, but how do we describe this method? In his paper *Knowledge in the Making*, Frederik Nilsson refers to two contrasting scientific research models discussed by Deleuze and Guattari; the *royal science* and the *nomad science*. Royal science stands for “searching for laws through constants and relationships between variables, finding forms and first principles” and nomad science; “concerned with the relationship between material-force, rather than matter-form, unconcerned with finding constants, but with producing change and transformation, the making of new worlds.” Where royal science is more focused on controlling the world by measuring it at a distance, nomad space is more “close to the material, tactile and manual, rather than the visual.”¹² Here we can place the transition in contemporary designing, described in the previous chapter, to this notion of different sciences. Where designing with tectonic aspects in an architectural project is very based on the making process, close to the materials by making models and sketches (nomad science), contemporary digital design processes create a larger distance between the designer and the material object (royal science).

A *nomad science* way of doing research is visible in the drawings of Carlo Scarpa. Architect and architectural theorist Marco Frascari describes Scarpa’s drawings as follows: “The lines, the marks on the paper, are a transformation from one system of representation to another. They are a transformation of appropriate signs with a view to the predicting of certain architectural events, that is, on the one hand the phenomena of construction and the transformation by the builders, and on the other hand, the phenomena of construing and the transformation by the possible users.” On the same piece of paper, Scarpa constructs details viewed from different angles and sections and he uses different ways of sketching and coloring in the same drawing to emphasize different layers who “... present several layers of thought.”¹³ see figure 1. Scarpa did not only used this way of researching by sketching on the level of materials, but also used for functional schemes. And that is what Spuybroeks vision on Samper’s tectonic theory of the four elements is about; that it is not only a concept of the joining of architectural elements, but that it can be used on the different levels of architectural organization, from massing to textures, as “states of aggregation, of density or rigidity”.¹⁴ We can summarize that tectonic designing is linked to a certain way of researching, described by *nomad science*, in which there is a close interaction between the material and the designer. This way of working is not only bounded to the designing of details but can also be used on larger scales.

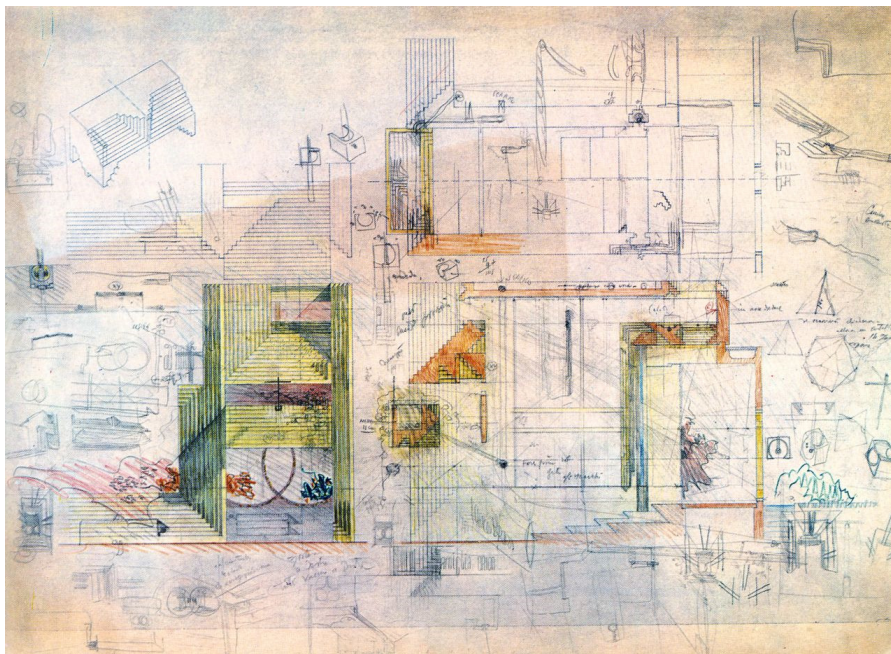


Fig. 1 Drawing of Carlo Scarpa, Venice 1984

Ákos Moravánszky, writer of the book *Metamorphism*, also things of the theories of Semper on a larger level and links the notion *Stoffwechsel* to the transformation of a building during the life span of it. First there is the idea, which is transformed into a sketch, from technical drawing to a building, but then the building is not finished; what follows are the phases of alteration, expansion and eventually restoration and reconstruction.¹⁵ Thus Moravánszky sees the theory of *Stoffwechsel* not only as transformation of materials and tectonic connections overtime, but that it also can be interpreted during the life time of a single building. In all these phases the building can be reinterpreted by someone in its idea, form and materialization; the life of a building is an ongoing design process.

IV POSITIONING

Contemporary digital revolutions in designing are changing the way architects work and how they do research on materials and structures. Nowadays we tend to look to the technical performance instead of the influence on the embodied experience. And this makes sense of course; we are now living in a world where capitalism, efficiency and sustainability are expressed in numbers, not in experiences. But because my master thesis deals with an already existing building, that contains a strong tectonic experience, it would be useful to, as Nilsson puts it, not to fall into the trap of -ideas first, materialisation second- but use the notion of the tectonics to strengthen those valuable qualities of experience.

The notion of the two types of sciences, royal and nomad, described by Deleuze and Guattari are useful to distinguish certain research methods. For the technical research of the Ladder, I analyzed the different building elements in three different ways, see figure 2. First, I started with the digitalization of old drawings so that could compare the different structures in the computer. This was really a royal science method, based on facts; and from a distance. But the materiality was lost; I was comparing lines on a computer screen. That is why I, based on the theory of Semper, extended the research with a closer look the type of elements, a more nomad science method, focusing more on the experience of the elements. And finally, I concentrated on how elements and materials are connected in the building, by drawing the details by hand. The three research methods are forming a wider image together, they answer different questions between the performance and the symbolic values of the materials.

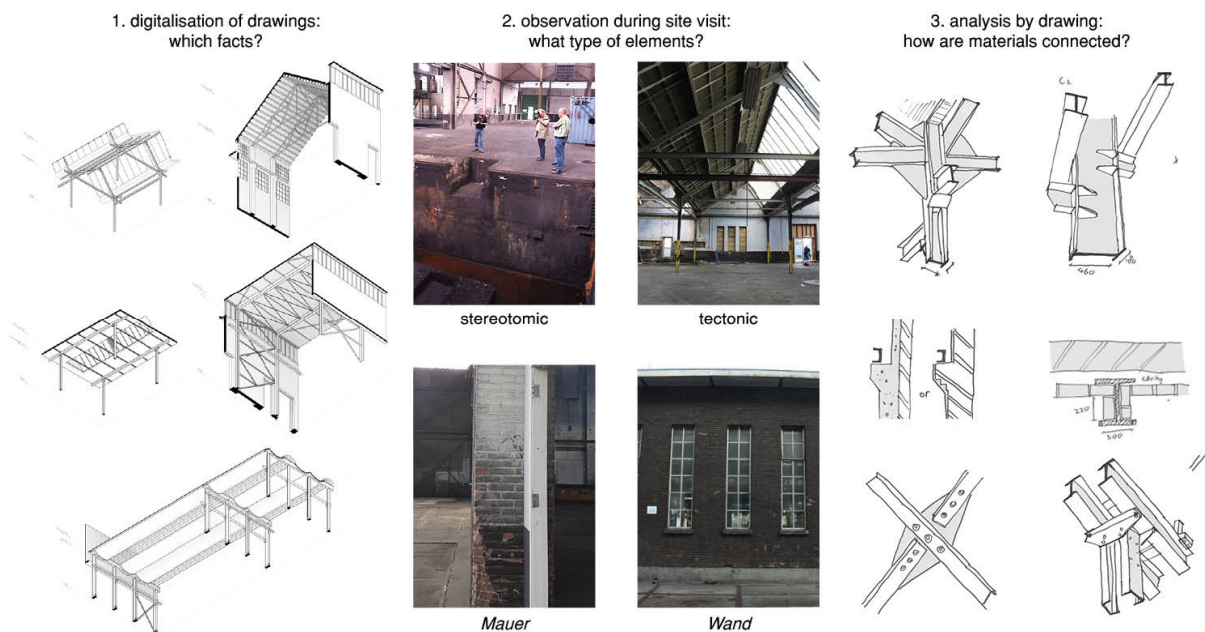


Fig. 2 Summary of research on building elements in The Ladder, Hembrug, Zaandam. All drawings and photographs by author, except the photograph of stereotomics, which is made by Rene Ros, date unknown.

Now we have seen the research on the existing materials, we can look to the next step of the Heritage and Architecture studio; the designing of the redevelopment. I can now answer the research question with that there is not one specific method to research materials during the design process, but it has to do with the integration of a nomad science way of research in the whole design process. In my interpretation a nomad science way of research in architecture is described by Schön with thinking and doing at the same time; sketching and modelmaking and at the same time taking design decisions. To include materials in the design process it is important to focus on the making process during the different phases of the design. This is related to the research methods of Scarpa and Spuybroek. For Scarpa it was his overall design method, for Spuybroek a way to not let the computer take over the representation of the design.

In my opinion there is little attention towards this transition to digitalization of designing at the TU Delft. The tools of the architect are changing and so is the role of the architect. Neil Leach might be seeing 'New Materialism' as an opportunity for new ways to design with materials¹⁶, but he doesn't discuss the consequences of this focus on performativity, on the final building. I believe we have to be aware of the distance the computer creates between the replication on screen and the real materials, because this also creates the distance between the architect and the final product.

The theories of the four elements of architecture and *Stoffwechsel* are useful to understand elements with their architectural values because they connect material to function, form and culture. And maybe it is time for a contemporary version of the four elements, in which cultural, symbolic and performative values are combined. This would be helpful for students to substantiate their materialization instead of making intuitive decisions in the last phase of the design project. I will especially adopt the ideas on the theory of *Stoffwechsel* by Moravánszky for my graduation project; because it explains how features of existing materials and details can be transferred in new additions and replacements, made of other or contemporary materials; not only through the ages, but as well during the lifespan of a single building.

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