

## ARCHITECTURE VIEWED AS A PRODUCT

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### I INTRODUCTION

The importance of studying how architects design and understanding his or her methodology, cannot be denied. Since architecture is everywhere around us, it is crucial to research within this discipline to make durable architecture. By doing proper research in the field of architecture, the result will have more impact on society. But first, what is research exactly? Lucas (2016) defines research as: “the process by which you understand the world in a verifiable and consistent manner.”<sup>1</sup> Architecture is the art of the built environment, which is not being showcased just in a museum but always, to everyone. The built environment is an organism which changes constantly through time.<sup>2</sup> It is how we experience human culture in itself, the built environment. Architecture of a certain time represents the society of that time. Walter Gropius said in an article of architectural record: “*Good architecture should be a projection of life itself and that implies an intimate knowledge of biological, social, technical and artistic problems.*”<sup>3</sup> Therefore, it is important to do research within the field of architecture, our discipline. Also, to improve as a designer it is crucial to have understanding of the methodology used in architecture to conduct research. This is not only important for better designs, but also for improving efficiency of the design process. Understanding the design process gives opportunity to streamline this process, resulting in a better working machine for the future. This is done by examining the process of previous studies and outline the methods used within these studies.<sup>4</sup> The goal is to establish a body of knowledge on design that helps you as an architect.<sup>5</sup>

During this course I have gotten a better understanding of the design process. The course made me aware of the relevance of doing research during the design process, since the information given in the course helps you to argue certain decisions you make during this process. This course marks the second time during my study that I became more aware of the design process. The first time was during the course BK6AC3, where we had to write an essay about the design process. However, the used methodology during the design process is not enlightened during the bachelors. In the first lecture given in the course Jorge Mejia explained methodology as following: “methodology is the tools and methods we use to improve our knowledge.” He gave us more insight in how to use certain methods and tools to achieve our goals? Therefore, this course helped me to better ground my research, and helped me choosing the right path to take to get the best results for the given question or problem.

*How can the product design methodology be used in architecture to help integrate modularity in the existing buildings of Indonesia?*

My studio Architectural engineering aims to integrate technical solutions in an architectural design. The project started with a more theoretical research on the possibilities within my chosen fascination for integrating modularity within the existing buildings in Indonesia. The research was done to gain knowledge about the context as well of modular systems.

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<sup>1</sup> Lucas, R. (2016), *Research Methods in Architecture*, London. p. 8

<sup>2</sup> Avermaete, T. (2016). *Architecture and its Epistemes: Lecture Notes for Students*. In E. Braae, S. Riesto, T. Avermaete, S. Brincker, & P. Lundsgaard Hansen (Eds.), *Theories and Methods in Landscape Architecture: Msc. Course 2016* (pp. 8-14). Academic Books.

<sup>3</sup> Klir, G. J. (2013). *Architecture of systems problem solving*. Springer Science & Business Media.

<sup>4</sup> Gatrell, J., Bierly, G., & Jensen, R. (2005). *Research design and proposal writing in spatial science*. Berlin: Springer.

<sup>5</sup> Van den Akker, J., Gravemeijer, K., McKenney, S., & Nieveen, N. (Eds.). (2006). *Educational design research*. Routledge.

## II RESEARCH-METHODOLOGICAL DISCUSSION

“One question in all cases is whether design research has to look for knowledge or concepts from other research areas to find the missing pieces of the puzzle.”<sup>6</sup>

To implement modularity into the existing building system, I looked at the methodology used in the product design. This method uses tools from a more analytical point of view, testing and evaluating the results given.<sup>7</sup> The methodology used for my research starts with a context. In the study case, a specific Kampong (informal settlement) of Indonesia forms the context. However, in fact every informal settlement of Indonesia can be taken since these settlements have the same problems. These will form, together with my fascination, goals and ambitions the criteria for the modular systems implemented and chosen. These criteria are gained by a praxeological approach, in the form of conducting interviews and mapping the area and problems. Praxeology is an episteme which is about the study of human action and conduct.<sup>8</sup> Also, the criteria list is the basis from which design aspects/sub-themes will be formed. The modular systems and ideas will influence the sub-themes/design aspects and will be combined in the matrix. This results into sub-solutions per theme, causing other problems/criteria. Then the sub-solutions will be weighted according to cost, adaptability/strength and quality. The sub-solutions together will form the framework for the start of a design (see Figure 1).

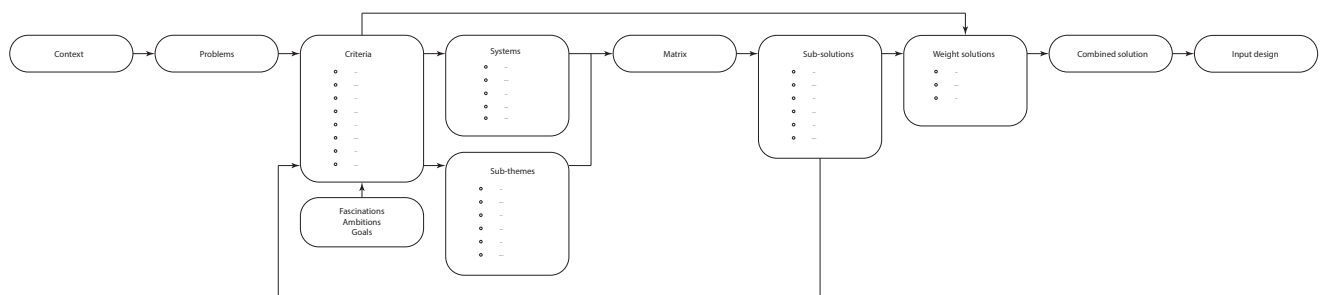


Figure 1. Methodology scheme used for research.

In preparation for one of the lectures during the course, we read an article from Tom Avermaete (2016) on “Architecture and its epistemes”. In this article, Avermaete talks about the episteme typology relating to the study of types, phenomenology, semiotics and praxeology. But there are more epistemes in architectural culture. For this paper, I would like to discuss the two epistemes also used in product design methodology: typology and semiotics. Typology is an episteme which categorizes certain design aspects into types. When the subject shares a particular characteristic and can be seen as a category. For example, high rise buildings of a certain area can be seen as category. Sharing that they all have a certain height and expression. Semiotics is an episteme about the analysis of the nature and relationship of signs and diagrams and how they influence architecture.<sup>9</sup> These two epistemes have a strong relationship with each other, because the type is an abstraction of the reality deduced from a series of instances which have an obvious analogy. And abstraction of reality is shaped as an icon or diagram which relates to semiotics.<sup>10</sup>

<sup>6</sup> Van den Akker, J., Gravemeijer, K., McKenney, S., & Nieveen, N. (Eds.). (2006). *Educational design research*. Routledge.

<sup>7</sup> Ullman, D. (1992). *The mechanical design process*. New York: McGraw-Hill.

<sup>8</sup> Avermaete, T. (2016). *Architecture and its Epistemes: Lecture Notes for Students*. In E. Braae, S. Riesto, T. Avermaete, S. Brincker, & P. Lundsgaard Hansen (Eds.), *Theories and Methods in Landscape Architecture: Msc. Course 2016* (pp. 8-14). Academic Books.

<sup>9</sup> Avermaete, T. (2016).

<sup>10</sup> Argan, G. C. (1963). On the typology of architecture. *Architectural Design*, 33(12), 564-565.

### III RESEARCH-METHODOLOGICAL REFLECTION

The basic idea and goal of product design is that during the process, ideas are developed and turned into usable products. This product can be everything; from a piece of furniture or in my case a building. It is about the result of a process that combines people, knowledge, tools and skill to create a new design.

Newer concepts in the product design are the 'lean' method and the 'six sigma' method. These methods gained influence over the past 25 years. The lean method focuses on efficiency and time, where the six sigma method is more focused on quality. Six sigma finds its origin from Motorola in the eighties and became influential in the late nineties, because of the high standards of quality. The methodology involves statistical and analytical methods to account and manage uncertainty and variation. The key to the six sigma methodology is the five-step DMAIC process, which stands for define, measure, analyse, improve and control. This eventually resulted in improved processes and products. However, real quality starts with a good design. Recognizing this, the methodology emphasized quality earlier in the cycle. Therefore, the six sigma method was renamed in DFSS design, in which the best practises and ideas from multiple methods are combined. DFSS is still an emerging discipline and still gaining influence nowadays.<sup>11</sup>

Within this discipline one of the newer methods that made its appearance, is the decision matrix. The matrix is used for analysing the pro and cons when a choice is need to be made. Then options are eliminated to eventually decide the directions to follow. The same methodology can be used to evaluate multiple concepts at a time, by having a set of criteria developed in the start of the process. The matrix is an effective way to compare alternative concepts.

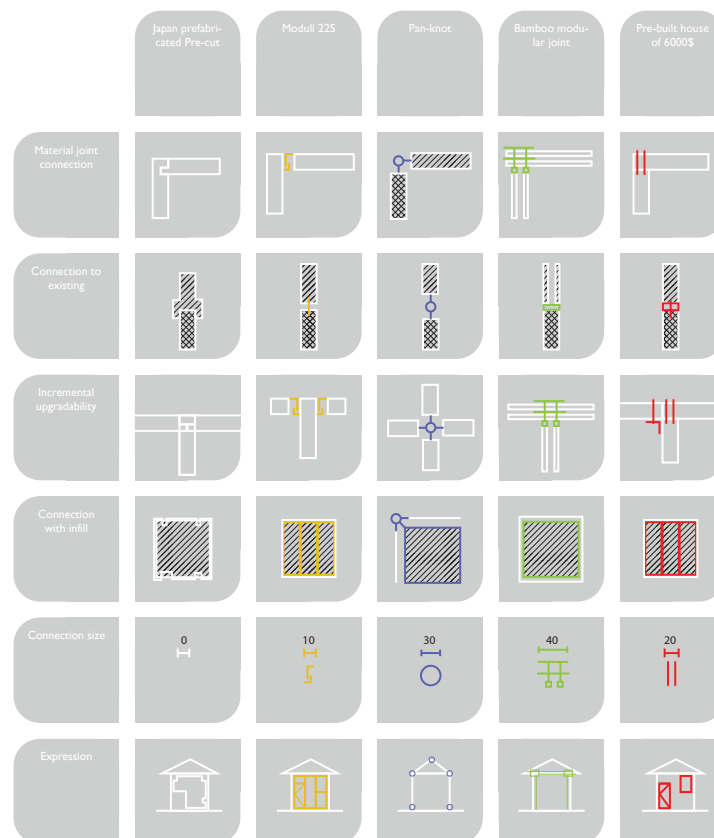


Figure 5. The design matrix made for my research

<sup>11</sup> Ullman, D. (1992). The mechanical design process. New York: McGraw-Hill.

The matrix provides a means of scoring each concept to each other in its ability to meet the criteria. Comparing the scores and concepts this way gives insight in which is the best alternative and gives useful information for the design. The matrix method evaluates concepts by checking the criteria, quickly showing the strongest concept, and helping to improve alternatives. The comparing nature of the method helps to improve the concept on different levels by evaluating the outcomes.

The design matrix used in the product design methodology can be seen as a study of types the typological approach. By dividing the design assignments in smaller design aspects, they can be compared between modular systems as types. The design aspects are shown as a deduction of reality and compared with each other. Just like Durand, my design will not start from a programmatic analysis but from a typological proposal. This way of looking at architecture was initiated by Louis Durand in the 19<sup>th</sup> century as stated by Avermaete.<sup>12</sup> Durand was looking at gothic churches from different periods to see what characteristics they share. In my research I do a similar comparative study with modular systems, whilst already focusing on a certain aspect and then search for the analogy between them. Eventually, focusing to find the best solution according a set of criteria. Typology also played a role of importance in the 20<sup>th</sup> century. This episteme reappeared around 1960 in the Italian architectural debate on typo-morphology, used by Saveiro Muratori to show the changes throughout time of a neighbourhood in Venice. Muratori stated in his study that architecture is an organism that alters over time.<sup>13</sup>

The design matrix also makes use of symbols/diagrams for comparing the design aspects. As mentioned before and described in the paper of Avermaete, another episteme closely related to typology that is being used within the design matrix is semiotics. Semiotic is a theory of sign and symbols to see architectural objects, by making diagrams to investigate aspects of the subject. This episteme finds its origin within a study from Venturi and Scott Brown in 'Learning from Las Vegas', where they look at the urban fabric as a composition of signs. They were looking at the urban condition of Las Vegas from a semiotic perspective by making diagrams of it. In 1970 Venturi and Scott Brown used this method to analyse Levittown. The study was named 'Learning from Levittown' and they analysed the built environment by the use of symbols. And studying and illustrating what people were adding to their homes in a comparative way by using symbols.

The combination of these two epistememes is vital for the use of the design matrix used within the product design. The epistememes already share some similarities by reducing reality. Combined, they give a clearer option to conduct a comparative study by looking at certain characteristics of a design and using the matrix as a tool.

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<sup>12</sup> Avermaete, T. (2016). Architecture and its Epistememes: Lecture Notes for Students. In E. Braae, S. Riesto, T. Avermaete, S. Brincker, & P. Lundsgaard Hansen (Eds.), *Theories and Methods in Landscape Architecture: Msc. Course 2016* (pp. 8-14). Academic Books.

<sup>13</sup> Avermaete, T. (2016).

## IV POSITIONING

In his first lecture, Jorge Mejia talked about ontology, epistemology and methodology. Also, about the study of what exists, study of knowledge and the study to improve our knowledge. And stating that the architect does not have to be right or do right, but has the duty to improve his knowledge. Also he discussed heuristics very shortly in this lecture. In the second lecture of the course we discussed the theme of heuristics more in depth. Heuristics allow people to solve problems and make decisions quickly and efficiently based on their own experience. Thereby, people can function without waiting to think about which actions he or she should take. The heuristic approach is very useful in a lot of situations. Especially for the matrix I used for my project, making decisions between concepts in an efficient way.

The Nobel-prize winning psychologist Herbert Simon says that people want to make rational choices, but humans are subject to cognitive limitations. Rational decisions would involve weighing factors like future costs against possible merits. However, people are limited in the amount of time they can use for making a decision in certain situations. Depending on the amount of information at his or her disposal, overall intelligence and accuracy of perceptions, influence the decision-making process.<sup>14</sup>

*"To Simon, the distance between rationality and behaviour is bridged by the concept of "decision"."*<sup>15</sup>

The concept of decision is crucial for the matrix I used for my project. It is based on analytical choosing between options during the process, to develop a good starting design for the problems at hand. Also weighing the design aspects in an efficient and fast way is important to make it a smooth and lean process.

The graduation project I am doing at the moment is about integrating modularity into the existing buildings. Especially by looking at how to improve the structure, to gain more density in the area. The idea is to design the structure and let the infill be made by the residents to keep the personal feel of the area. This idea has been discussed by Habraken (1961) in his book: 'De dragers en de mensen' which discusses both the role of the architect and of the residents. Architecture nowadays is getting more generic and monotone. The connection to the people and context has been lost. Looking at some of the buildings in the world, you are not able to see where it is located anymore. The identity of a nation's architecture is getting more generic due to globalization. Habraken tries to look at a solution for this trend in global housing, by creating a structure and infill systems. This is giving the users the option to express themselves, letting the architect design the structure. The consequence is that the profession of the architect changes more towards the profession of an industrial designer. Because during the process the architect needs to deal with the needs of the users. The architect is the one who details and shapes the product that arises from a very complex process of factors and influences them in such a way that the audience for which this product is intended has the greatest benefit in practical and aesthetic terms.<sup>16</sup>

Looking further than the discipline of architecture, not be limited but also look further and benefit from other disciplines. This is one of the reasons for looking at the product design methodology. It questions the boundaries of the disciplines. Another reason has to do with the context. The focus of my project was to satisfy the residents living in the context. Affordability is very important, and also incremental upgradability of the design is a key point. To value them according to these more important values, the matrix from the product design is the right tool to do this. Also there are some negatives of looking at the methodology of other disciplines. The more analytical approach limits freedom in a certain way. The freedom of intuition becomes limited because everything has to be reasoned, based and weighted accordingly. It results in restricted use of choosing options just based on your intuition, which is in fact

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<sup>14</sup> Bazerman, M. H. (2018). Judgment and decision making. In R. Biswas-Diener & E. Diener (Eds), *Noba textbook series: Psychology*. Champaign, IL: DEF publishers.

<sup>15</sup> Barros, G. (2010). Herbert A. Simon and the concept of rationality: boundaries and procedures. *Revista de economia política*, 30(3), 455-472.

<sup>16</sup> Habraken, N. J. (1961). *De dragers en de mensen: Het einde van de massawoningbouw*. Scheltema & Holkema.

a powerful tool as an architect. The architect's intuition is based on the body of knowledge an architect has developed during his life.

To conclude, by looking at the methodology from different disciplines to improve our knowledge. Helps architect to gain more knowledge to improve his designs. Looking further then, the boundaries set by architecture to develop yourself as an architect. Only picking the parts of other disciplines which are relevant to you. Continuing developing methods and to be critical towards choosing them and your own approach of research. To get the desired result given the challenges you want to tackle.