Reflection Paper
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TU Delft · Heritage & Architecture
Graduation Studio Revitalising Heritage: Zero Waste Church
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Final Reflection

The goal of graduate school is to work toward products in which research and design lead to an integral academic result. Although I have graduated once before as a building engineer, that research in particular involved design. Having research and design come together was new to me and therefore proved challenging. I initially chose the Zero Waste Church studio because I wanted to learn more about conscious design with Heritage together with minimizing waste. After choosing my case study: the St. Barbara Church in Culemborg, I decided to focus my research on conscious use of materials given the size of the St. Barbara Church and the amount of material it consists of. This allowed me to increase my knowledge in the field of material use which I could then use as input for the design task of the St. Barbara Church.

Through my research and design, I have gained insight into how the architect will largely proceed around the year 2050 - for in the year 2050, the circular economy should be 100% in force within the Netherlands, among other countries, in order to minimize waste and garbage. By creating an Overview that allows the circularity of a building to be understood in a table, an existing building can be tested, or can be used as a tool during the design process, as I have shown with my graduate products.

Looking back on this, I find this change very interesting, however very challenging and laborious. Through the results of my research, I established a design approach that was in fact innovative and limiting for myself and my design process. It led to a process in which I spent many hours by constantly considering the approach and testing each design step to ensure that it was consistent. In the end, I am satisfied with the result but not with the process. In the end, my research and its results influenced my design process too much. In the design process, given my engineering background, I was concerned a lot with material use and its building detailing, so I lost many hours in drawing programs drawing out and testing applicability. In addition to the research, building and architectural detailing, the project also required climate technical detailing. Within this year I had to take on different roles which made the project complex. Although I learned a lot from this, also due to stress and illness, my design was not finished in time for the first P4 moment.

During this process, I found it difficult to let go of my research since this is my final project. In previous assignments, I was able to let go of my engineering insights because the emphasis was not on detailing and less on reality. I am now aware that I need to let go of the engineering insight more, I should not forget it but not keep the emphasis on it. Knowing this about myself, I do feel satisfied that as the process went on this got better and better. I have increased my self-knowledge and knowledge in the field of research, design and use of materials, which will be very useful in the coming years.

1. What is the relation between your graduation project topic, your master track (Ar, Ur, BT, LA, MBE), and your master programme (MSc AUBS)?

The approach to the relationship between heritage preservation, useability and circularity which was essential for making decisions and was used to asses choices, largely relates to the current and upcoming vacancy of religious heritage. My aim of the graduation design research is strongly connected to the 'Zero Waste' topic of the studio since the approach was to reuse as much of the church and reusing the dismounted materials as much as possible. This not only preserves the church's materials and appearance, but also the initial design by the architect, manufacturing and craft. I evaluate heritage across various aspects, including social, aesthetic, and architectural technology, in order to determine what holds value for preservation from the past, ensuring its relevance for both the present and the future. In addition to its aesthetic, cultural, and historical significance that render the structure monumental, I strongly advocate for the conservation of the church building's social value. Churches serve as not only primary places of worship but also as social gathering spaces for a particular religious community. As this community dwindles, the social aspect of the church also fades away. Circularity is largely about preserving what exists by keeping it within the cycle, minimising waste and using renewable resources. Although they overlap in areas, they are two very different ways of assessing which can lead to conflicts. Something that has a lot of social value may not be able to be preserved because it is not reusable, and something that has no value may very well be applied in a different way to preserve it. Here it is therefore important to assess aspects separately for heritage and circularity, which can lead to insights and new possibilities.

Secondly, the implementation of a demountable design leads to a futureproof building for multi-functional uses of the spaces, since separation can be removed and/or moved to meet the expectations of current and future users. By making the design adaptive, the flexibility of the church is increased, leading to the preservation of the church and extending its lifespan. In short, the church as a whole also becomes circular through its adaptability and multi-functionality, and can thus be preserved in the cycle. Hiernaast kunnen de toevoegingen ook weer verwijderd worden om de kerk in zijn oorspronkelijke staat terug te brengen indien gewenst in de toekomst. Aangezien de waarde van de kerk kan toenemen naarmate deze ouder wordt.

By integrating research and design into the products in my graduation project, in which technology, architecture and heritage all played a major role resulting in these products, my research contributes to further insights for the theme of Heritage and Architecture.

The project has significant value on several levels. First, the project has significant social value. The preservation and revaluation of heritage keeps history alive and accessible to current and future generations. It contributes to the understanding and appreciation of the cultural identity and historical background of the old downtown. In addition, the project has aesthetic value. Heritage preservation and restoration contribute to the beauty of the environment and enrich the town or village image. It brings a sense of authenticity and character, contributing to the identity and uniqueness of Culemborg.

2. How did your research influence your design/recommendations and how did the design/recommendations influence your research?

By testing the materials from the six case studies in the overview, I tested the performance of the overview and insights on circularity from the case studies that have been gathered. These insights

determined the approach to material use for the design, thus the most beneficial outcomes were included. The design was then carried out using this approach after which the design was again tested using the overview. Although this was to be expected, since the reuse of materials and application of wood are better for the environment than masonry, steel and concrete, it is interesting to see what the outcome will be on the environmental impact and circularity when materials are handled as consciously as possible and can be disassembled.

3. How do you assess the value of your way of working (your approach, your used methods, used methodology)?

By conducting literature reviews based on various sources in the field of the circular economy, an objective framework of knowledge was developed to analyze the case studies as objectively as possible. With this, I created the Circularity Overview which consists of verifiable and measurable criteria. This was given to me as a point of interest by the research professor. By using this, I learned a lot. By checking all the work on the overview each time against verifiability and measurability, it became possible to retrace everything. This made it possible for someone else to retrace and replicate my research, thereby verifying my entire research.

Based on the completed criteria, the circularity per component was determined through the R-strategies and the choice is then briefly explained in the last column of the overview. By testing the overview by means of the six case studies and presenting the outcomes to the teachers involved, input from two perspectives emerged. Which I compared with the knowledge gained in order to incorporate it as objectively as possible in the overview. In short during the process, the overview emerged from broad research consisting of literature, lectures, measure moments and tests.

4. How do you assess the academic and societal value, scope and implication of your graduation project, including ethical aspects?

By creating an Overview that allows the circularity of a building to be understood in a table, an existing building or design can be tested or can be used as a tool during the design process. I performed all of these steps during the design research. Thus, the research determined an approach on material use and detailing for the design and then the design could be tested against the research by entering the materials of the design into the overview. This demonstrated that the overview, when used as a tool, has value and can influence various steps during the design process. The overview is therefore a method to create studies and then be able to compare them, as was done with the six case studies, after which an academic rationale can be prepared.

The overview is also valuable for determining material use in the time of the circular economy, as then material choices will play an increasing role in the design and construction process. However, already now, in 2023, I possess an enlarged knowledge for applying materials for the year 2050 and beyond. This will therefore play a role in my further career and for persons who read the research and study my design and decide to apply, test or supplement my insights. In this regard, my thesis project helps to raise awareness for the moral dilemma regarding the impact of material use on the environment and during use phase of material. The overview makes this clear to the user in one table.

5. How do you assess the value of the transferability of your project results?

The overview itself consists of measurable and verifiable criteria. This allows the overview itself to function as a tool that can be used at different stages. Also, the results of a completed overview can be used for other studies, since the results are replicable because the criteria are made up only of values that are traceable. Because the results of the overview had a great influence on my design, it becomes clear what contribution the research can have on the design. By ultimately testing the design again against the overview, the result and effect of the approach and integration of the research and design becomes clear and traceable.

6. Were the results of the Surveys with the data from the Case studies predictable?

Largely, the results were to be expected. It was already known to me that concrete scores very poorly on environmental impact and wood would score just about right. However, it was a surprise that the score of sustainably produced wood could be so low that it could be virtually zero. Here, the outcome was an approach of combining a lot of reuse of existing materials and largely using wood for design a very interesting approach to the process. In fact, it created many limits and additional frustrations during the process, in the end it actually created opportunities that reinforced the design and choices made. This made the entire process an entirely new experience and very educational myself as researcher.

7. Are there aspects that could have gone differently for a more reliable research result?

As mentioned in the discussion, I was forced to use different databases to fill in criteria in the overview. The National Environmental Database was used to determine the environmental impact of the materials, however, it is composed of many different values that correspond to the other criteria of the overview. Because these values were blocked off at the time of the study and thus not available for viewing, the results were built from different databases. Had the values been available for the study, they could have been compared with the values from the other databases before, thus allowing them to be verified and ultimately contributing to the validity of the results of the overview and also the for follow-up research for which these results will serve.