

Reflection Graduation Process Borris Boschman

The topic of my graduation is about the improvement of the indoor comfort and energy consumption of an atrium in Deltion. In this vocational school, an atrium with a glass façade and roof is used as a metal workshop. The climate in this part of the building is not comfortable, because the effect of outdoor conditions has a big influence on the indoor climate.

I started the graduation process with a completely different topic. The P2 presentation was about the effect of indoor plants on the interior. I was about to research to what extent indoor plants have an evaporative cooling effect.

After P2, it became clear that there was no software with which I could calculate this. Meanwhile I was looking for a case study to make a design for. I found an atrium in the vocational school 'Deltion' of which I had heard that it was often too warm. When I concluded that the plant research was not going to work, I shifted my research to building technical analysis and improvement of the atrium in Deltion.

The focus shifted to a real and concrete problem. It became more of a building consultancy assignment. I had to shift focus of my literature study too. Lots of work on indoor plant things had become useless. Just before p3, I did measurements on location, which was already an indication that I would delay my planning. At the p3 presentation, I mainly presented my measurement results. Between P3 and P4 I found it difficult to structure my measurement outcomes towards a concise and useable conclusion for further design. At P4 it became clear that I just wasn't ready yet, because the research wasn't fully documented and I even had no design yet.

After P4 I focused firstly on proper documenting the whole literature research and measurement results with conclusions. That formed a basis to work from with the design. I started to work with Designbuilder to recreate the existing building situation (including HVAC) in the computer as a basis to validate design interventions with. The measurement data was used to evaluate the existing situation model. Several intervention variants were tested to find the ideal combination. The ideal combination was further technically thought out and detailed.

The relationship between design and research is that the literature research provided theoretical framework to start with. Measurements provided real data and it also helped me to create a sense of how the atrium functioned. The graduation process could best be described as 'design by research'. At first a basis was created with research. Later on, research was used to evaluate suitability of design proposals.

I chose to do research with measurements and questionnaires to create a fundament and boundaries within which I could define the design freedom. The research was for me by far the hardest part. I am generally interested in all sorts of things. This is not so helpful when doing literature research, because I tend to keep reading more and more. I lose the scope out of sight, or I widen it, because I try to create a broader understanding. I am also afraid of excluding things from the research. The computer simulations were rather helpful for structuring the whole research, because simulations demand clear definition of parameters. Next time, I would set a scope and aim more clearly, so that I

don't get lost during the research. I have to acknowledge that it is impossible to cover everything in one project.

The graduation lab of building technology consists of three different tracks: Façade design, structural design and climate design. Two out of three had to be chosen for the graduation project. I chose climate design and façade design as the fields of research. I have a special interest in climate design, since I consider this as one of the key factors to make ergonomic and beautiful architecture. The aspect of façade design is strongly intertwined with climate design, since the façade is often used to control the effect of outdoor conditions on the indoor climate.

The case of Deltion fits well within these two domains. It is a recent building with lots of technical problems. It allowed me a lot to explore in climatic terms. In façade design terms, this process was a bit more difficult. Normally at TUDelft I am used to create an entirely new design. But in this project I chose deliberately to leave the architecture as much as it is to create a realistic plan for the school facility management. Although being an approach with more useful results for Deltion, I was not really giving myself the space for challenging crazy ideas.

With this case, I could explore some aspects that I find important in building technology. For example, I find it important that a building is comfortable. In this project, I could finally create a design, which was based on actual measurements. It was the first project in which I had to deal with actual people for whom I had to make a design. I also could explore the aspect of sustainability. I think that sustainability is for me really important and should always be incorporated in a design. I think that Deltion was a good case to explore how an existing building could be made more sustainable. However, as I mentioned earlier, I may have been holding on too much to a directly feasible solution. Next time I would probably go for a more ambitious goal in which more technological innovation may be possible.

For this research I chose a design-by-research approach. This approach seemed to me the most logical, because the research shows what is needed for a design. I think it is necessary to create a scientific basis at first. After that, the results can be combined in a beautiful and functional design. The research approach is rather similar to what is taught in the BT master course Technoledge Climate Design and it is therefore likely to be fitting the graduation lab.

The approach is pretty straightforward due to clear consecutive steps. This project taught me to do measurements and to document them well. I learned that structure is key and I need to learn to constrain the research within feasible limits. This has been the most difficult in the entire process.

I also did a climate analysis with the computer for the first time in my life. I learnt that it is tricky to work with so many variables. Again here, structuring and a clear definition of what is really important are the things I have to pay extra attention to. I also learned that data resulting from simulations needs interpretation and evaluation to make it useful for design. It taught me well that one has to be careful drawing conclusions from a calculation model.

Regarding societal benefit of the project, I chose to aim for a useful result for Deltion College. The result of the project may be a relevant advice that will hopefully stimulate Deltion to do something about the indoor comfort of the building. By focusing so much on the actual needs of Deltion, the wider social context may have been a little neglected. Due to its specific applicability, it lacks relevance for the general field. However, it can be seen as an example of how very common problems in buildings can be solved in a sustainable way. This research hopefully shows that improvements can be made with minute sustainable interventions. Both in construction and in use, costs and resources will be saved. This is relevant in broader society, since schools such as Deltion are funded with public money.