G. Reflection

In this reflection I will look back on the effectiveness of the method of research I chose to follow, and I will discuss what parts of the process went well or less well than expected. I will evaluate the possible causes that resulted into a larger or smaller degree of success for all aspects of the research process. If possible, I try to indicate what may prevent difficulties in the future.

G.1 Methodology

First of all, I think I should conclude that the method of research worked sufficiently, because not only could the research question be answered, there was also time in the process to create a fairly strong foundation for the continuation of research into the potential of the PolyArch coating. Many applications that have not been investigated thoroughly yet have been suggested, a method of approaching and categorising the applications and continuing the search for more applications has been designed, and not in the least a knowledge base about the PolyArch coating, based on literature and interviews, has been created.

In addition, research has been done both in width and depth, meaning that initially the ground for the coating applications has been explored and assessed, while further in the process more specific solutions were studied in greater detail. This has been the reason why the conclusions of this research can fuel further research as well as provide preliminary conclusions about the potential of the coating in architecture. However, not everything in the process of researching went as expected. The main two reasons for this were the cooperation between Guido and me, and the dependence on other people for certain data.

G.2 Cooperation with Guido

First about the cooperation, I think this has been both a benefit and a drawback. In cooperation, people help each other, which in an ideal situation means that the process is smoothened since the risk of getting stuck decreases. However, although being helped speeds up the research, helping slows it down. In addition, disagreements can help to provide a critical professional introspection, but may not always lead to satisfying conclusions, after which compromises may weaken the result. Finally, being part of the group brings along a certain responsibility towards the other person, which increases the motivation to work hard. In conclusion I can say that the benefits of working in a cooperation have outweighed the drawbacks, mainly because of the critical attitude I was forced to sustain during the process and the enlarged motivation to keep working hard continuously.

G.3 Data from Eindhoven

The second unexpected diversion from the proposed planning was less fortunate, since it did nothing but slow down the process and cause additional work. This was caused by three related issues which occurred. Firstly the provision of the coating’s transmission data was slower than anticipated. Secondly, it was less complete than what was hoped for, since the higher angles of incidence were missing from the data (due to reasons we found out ourselves during the measurements). Thirdly, and most disturbingly, the data turned out to be not adequately explained.
The first mentioned issue needs to be accounted for in the planning, since communication can always be subject to delays, which is why buffer time should be incorporated in the schedule. Although there was no directly specified buffering time, other activities could take place while waiting for the data, which is why this did not cause significant delays. The incompleteness of the data however was a problem because for a trustworthy simulation a complete dataset was required. This meant that we had to extend the data we were provided with, based on knowledge we did not have. Although reasonable assumptions were made in correspondence with communication with the developers in Eindhoven, these were rendered obsolete by later remarks by the same people. These remarks concerned the provided transmission data, of which the distortion of the graph turned out to be not valid for application on glass. Therefore extensive approximation methods we had developed to determine the performance of the coating, while a fairly easy approximation turned out to be more applicable.

This resulted in a waste of many day’s work and could have been avoided by better communication. I cannot conclusively determine where the flaw in the communication lay, but I am sure that when the description of what was displayed in the data had been more detailed, these inconveniences could have been avoided. This mainly teaches that the desired transmission data need to be specified in detail and in a clear way by the people who are performing the simulation, after which the people with knowledge about the coating and the physical measurements should provide the data with again a detailed description of what can be observed, to avoid misunderstandings.

G.4 Personal deviations
Apart from these two unexpected diversions from the planning, the proposed methodology could be followed completely. There was however not a lot of attention for applying the coating in a design until P4. The reason for this was the fact that there were still many uncertainties about the coating until late in the process, to which finding a solution was esteemed more important. In addition, in the original planning, the designing period was scheduled in the period between P4 and P5, but since this turned out to be not possible, the planning until P4 had to be slightly condensed to include the design phase as well.

On the other hand, a weaker focus on design has resulted in a strong focus on research, which seems to be appropriate in a case where not much knowledge about the topic is readily available. In fact, the collection of existing theoretical knowledge and the generation of new theoretical knowledge has been one of the main focal points from the beginning on, and the chosen methodology has proven to work for this purpose. Although the focus in the Facade master for students may generally lie more on designing and less on researching, I do not feel that there has been a conflict between the Master track’s orientation and the graduation research that I performed, because all research has been conducted essentially with an architectural product in mind and in that sense it fits in very well with the the Facade research conducted at the TU Delft, and although the conclusions are mostly theoretical, I feel that this is actually appropriate when approaching facades from a scientific point of view.

For scientific accuracy, validation of the results needs to be done and unfortunately this could not be performed within the scope of the graduation research, since the proposed measurements were insufficient for reliable evaluation of the coating’s performance, and the budget, nor time, nor
dynamic coating was available to create a full scale office test arrangement in which a dynamic coating could be tested on an annual basis.

Finally, defining an ideal coating turned out to be more difficult than expected. This was a result of the discrepancy between an ideal shading device and the expected ideal performance of the coating, because in the latter certain features that are inherent to the coating material were taken into account, such as the blue shift. In an ideal sun shading device, such blue shifts do not occur, and although it may be more ideal to look at the possibility that one day a coating will be invented which performs similarly to the PolyArch coating, but without this blue shift, this is not realistic when the PolyArch coating is concerned, which is why an ideal coating was defined in which the known inevitable aspects of the coating’s performance were incorporated. Although a clause describing the intended action when such inevitable things would compromise the level of idealness might have prevented this, I strongly believe that such unexpected events cannot all be anticipated and are better solved once they occur than in advance.

G.5 Conclusion

Overall the process of this graduation has been satisfying, leading to the kind of results that was aimed for at the beginning, and in some cases even more. The process had to be adjusted a few times due to unexpected circumstances, but in case of the cooperation with Guido this had mostly positive effects and in case of the cooperation with the TU/e did not lead to insurmountable issues.

With hindsight I believe that it might have been good to redefine priorities after the real data from Eindhoven were obtained, since it turned out then that the angle of incidence was not as important as it had seemed before. This may have lead to a more simple, yet still trustworthy simulation. Perhaps this method would allow for a better combination of the transmission values of the coating and the glass louvres.

I can also state that creating a simulation model which gave reliable outputs turned out to be much more difficult than I anticipated, because of the many variables that influence the final outcome to a greater or lesser extent. This may be caused by the complexity of the model that I esteemed required to obtain useful results, but also by the lack of experience with indoor climate simulations in my previous education, which made it sometimes difficult to determine the reason of an unexpected result.

I would not change my methodology however, because I feel that a simulation process, much like a design process, is potentially endless process in which the results can always be improved. The given time limit made it inevitable to focus on the priorities of the simulation and eventually presented the results that were required in time. The same goes for the design process, which essentially could have been expanded for several months, but in the given time forced me to look at the most important things of the design, so the initial purpose of the design and its importance with regard to the entire graduation project were preserved.