Reflection

1. A description of the relationship between your graduation topic and the theme of the graduation lab, master track MBE and master programme MSc Architecture, Urbanism and Building Sciences.

The X-Decks case was presented by Alexander Koutamanis during the introduction lesson of the urban mining graduation lab. There were several connection points for further research, where I chose to set an information technology focus with blockchain technology. The pre-requisites to understand the case in depth and to find a suitable connection to blockchain required an understanding of multiple disciplines taught in the MBE master program:

- Construction and modularity of the X-Decks project were studied to understand the potential impact on the whole lifecycle of the building
- Operational, managerial and financial processes common in the building industry were analysed and rethought
- Stakeholder/Expectation management: potential stakeholders were included to evaluate the research
- In combining interdisciplinary knowledge, innovation can be created, and research gets valuable for practice

2. A reflection on scientific relevance, in particular the strong and weak points of the chosen methodology.

Scientific relevance
Blockchain technology did not exit ten years ago but is gaining a lot of attention from multiple industries and academics, even outside of the information technology sector. This technology is graded by many information technology experts and consultancies as highly disruptive. Blockchain is changing the way we use currencies and has the potential to bring game-changing improvements to various sectors (Brennan, 2016; Friedlmaier et al., 2016; Mansfield-Devine, 2017) and to the building industry (Cardeira, 2016; Kachmazov, 2017; Lifthrasir, 2016; Ngo, 2016; Spielman, 2016).

Weak points of methodology
One round of interviews gathered the feedback of the stakeholders just when the scenarios were finished, but did not present and evaluate the asset management framework yet.
An extra round of interviews could have helped to gather more feedback about the framework and possibly bind the stakeholders stronger to the ideas of this research.
Consequently, their willingness to support a prototype could not be evaluated in depth.

Strong points of methodology
An extensive literature research helped me to get grip on a computer-science dominated topic that otherwise would be hard to grasp with my previous education. The interdisciplinary work with RHDHV and the Blockchain Lab Delft helped me from an early stage to evaluate my ideas and to combine practical experience with current blockchain research.

The interviews gave me insight from multiple perspectives on the X-Decks project and helped me to find the right approach to develop the blockchain enabled asset management framework.

3. A discussion of problems that may have been experienced during data collection and how one tried to overcome or compensate for these problems.

Blockchain is a complex and rapidly evolving technology. Every week there are new revolutionary concepts emerging that will show their resilience over the course of time. This made it difficult to set an end to the literature research, since there is new literature and concepts doubting previous concepts or making them inefficient. I tried to update some parts of the literate research, but the status quo of the literature research is as of January 2018.

Another difficulty was to find the right approach for the blockchain enabled asset management framework. First, I intended to create a blockchain enabled business model and I was looking for paper-based processes that can be digitalized. Moreover, I looked for existing contracts that could be used on a blockchain network. During the analysis of the interviews, it became slowly clear that adding value to all stakeholders is just feasible with a generic purpose tool. That is why I defined the assets and processes in the framework as broad as possible and focused rather on a tool than on a business model.

After I conducted and transcribed the interviews, I lost quite some time with coding them in ATLAS.ti. First, the program was new for me and second, the results did not bring me further in my research. Finally, I abandoned this approach and started categorizing the main findings like shown in Appendix 5 – Main findings interviews.

Initially, at my P2, I intended to conduct three rounds of interviews to constantly evaluate the results of my research. After the analysis of the first round of interviews and the creation of the framework, there was not enough time left to conduct two more rounds of interviews. Furthermore, my interest in acquiring programming skills grew during the thesis research. Consequently, the decision was made to discard the further interviews and to focus on the creation of a Blockchain Prototype with the Hyperledger framework.

4. An elaboration on the relationship between the graduation project and the wider social, professional and scientific framework, touching upon the transferability of the project results and in particular the application of results in practice (utilisation potential).

Use cases of potential blockchain applications are often created without further evaluation of the potential stakeholders. This can be problematic since there are many misconceptions, organizational limitations and critical perspectives about blockchain technology, while cooperation beyond company boarders is crucial for most applications. In this respect, the thesis shall complement current research and literature about blockchain in appliance to the building industry. Further, opportunities and limitations through blockchain are defined for the X-Decks case.
This research examines the current ambiguous situation: on the one side, blockchain is hyped, on the other side, there is limited insight into actual use cases in the building industry and its potential impact on the sector.
The results of this thesis are not commercially deployable yet. There is still need for further development of a prototype and feedback from potential stakeholders, especially to bring them to the actual stage of actively using a blockchain network.
Besides, the transferability of the results is high – the framework can be applied to other cases and even industries with few adjustments. Just the assets need to be changed and a need for more transparent and decentralized processes is necessary.

5. Ethical issues and dilemmas.
Discuss the ethical issues and dilemmas you may have encountered in (i) doing the research and (ii) potential applications of the results in practice. In particular, focus on the following aspects:
a. Is there a moral issue involved in your research (moral sensibility)?
b. Analyse the moral issue in terms of relevant values (e.g. safety, honesty, integrity, loyalty), stakeholders and their interest and facts (moral analysis).
c. Think of options to solve the moral issue, in particular other options than the most obvious ones (moral creativity).
d. Analyse the moral issue from the viewpoint of different ethical frameworks, e.g. professional code of ethics, utilitarianism, deontology (moral judgement).
e. Reflect on these viewpoints with respect to the moral issue, explain the reasoning behind your own choice and justify your choice (moral decision-making).

There were no moral hazards encountered in this thesis research.