P2, P4 & P5 reflection

Master Thesis
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P2 reflection
The reason for choosing my research subject stemmed from my passion for IT and real estate. I wanted to combine my two passions with my interest in (real estate) finance. I was also interested in conducting a statistical or price hedonic study.

After reading in on price hedonic studies conducted on other real estate assets I set out to conduct a price hedonic study on data centre decision-making criteria. During my pre-study I found that the data centre industry is a very closed world. I contacted multiple industry players only to find that none of them would or could provide me with the data needed for my research. Eventually I found the Communication Infrastructure Fund willing to offer me a graduation internship. They were willing to offer me a great place to work and help me with my questions and data as far as they could for which I am grateful. They helped me finding my way around this unknown industry. However, they couldn’t provide me with the data since they only shortly acquired data centres to add to their portfolio of glass fibre and mobile networks. Even though the gathering of information and data has been a challenge throughout the research process, I was able to gather all information and data needed to construct the model through help of CIF and the conducted expert interviews.

P4 reflection
As the data centre industry is relatively immature the research on the industry and the real estate aspect of this industry is very limited. Because of this limited available research I was largely dependent on industry players for information. As these players were not able to provide me with any financial or any other written information I was entirely reliant on interviews. This made gathering information challenging.

My research resulted in a data centre investment decision model and a descriptive report. I’m content that I succeeded developing this model even though my access to information was very limited.

Looking back at my process I’m glad I got the opportunity to graduate at CIF. With their help I would not have been able to gather all the information. However, I could have worked in a more structured manner towards my P4. Doing so would have probably made me succeed the P4 the first time.

I certainly reached my goal to learn more about finance during my graduation. Building the investment decision model made me learn more familiar with DCF calculations, business financials and financial decision-making. I believe will be of great help in my future career.

P5 reflection
Due to this graduation thesis I have been able to learn many things in different domains. I have amassed knowledge of the data centre industry, (real estate) finance and financial modelling through my literature research and many conversations with Alex Bakker and Ivan Kooiman at CIF. I have learned how to structure an academic thesis and explain...
difficult concepts through graphical representation with the help of Philip Koppels. Hans de Jonge let me experience how graduating and researching in general is very similar to uncover an unknown city by visiting its pubs one by one. The many conversations and interviews with experts enabled me to look behind the scenes of a very young and rapidly developing real estate class that is both building and machine.

My personal conclusion is that I am satisfied with the results and the model I created. Despite the occasional setbacks and difficulties I encountered along the way, I’m happy I kept positive. I believe my graduation genuinely made me ready to fully pursue my professional career.

**Recommendations**

**Recommendations for real estate industry**
Data centres are interesting investments due to their relative low risk (when high occupancy levels are ensured by signed lease agreements) and diversification potential. However, data centre investments are strongly discouraged for facilities with high occupancy levels.

Direct investment in data centres is only recommended when specialized active technical management is available. If this type of management is not available investors are recommended to invest in data centre operators or REITs.

The modularity of the data centre industry is an example to the real estate industry in general. Modular data centres are actively used throughout the industry. The advanced modules are technically optimized to deliver better quality at lower costs and shorter construction periods. Many aspects of these modules can be implemented in other real estate types, such as commercial and industrial real estate.

**Recommendations for the data centre industry**
Apart from the described focus in decision-making criteria the data centre industry should focus on true modular building. The financial and societal advantages of this type of building greatly outweigh the disadvantages. It mitigates risks such as vacancy and high initial capital investments and it produces more efficient data centres, while it only slightly increases the overall capital expenditure per m² data hall. Furthermore, it provides the unique opportunity to reassemble the module at another location.

The described modularity could be of even greater advantage when the industry is further standardized. Further standardization could make modules easily transferable to another facility. It will also make the industry more transparent, which will result in better results for the industry as a whole.

The opaqueness of the data centre industry could further be decreased by benchmarking data centre construction and operation. By sharing this information the industry as a whole can be improved.
The reuse possibilities of data centres are very limited as data centre buildings are very specific. To prevent building data centres that are only suited for data centre operation reusability should be added to the data centre design agenda.

**Recommendations for further research**

The diversification potential of data centres looks promising. However, the research conducted is based on limited information. Further research should be conducted to confirm the diversification potential and to describe this potential to real estate investors.

Currently most investment decisions are based on the opinion and experience of expert personnel. Many of these decisions are not support by research. Therefore, a price hedonic study should be conducted on the effect of the building and location features of data centres on the return of this type of facilities.

Finally, further research into the financial and societal advantages of modular data centre building is needed to make this type of building more accessible.