

Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences



Graduation Plan: All tracks

Submit your Graduation Plan to the Board of Examiners (Examencommissie-BK@tudelft.nl), Mentors and Delegate of the Board of Examiners one week before P2 at the latest.

The graduation plan consists of at least the following data/segments:

Personal information	
Name	Jens Cornelis Slagter
Student number	4599780

Studio		
Name / Theme	Design Informatics/Building Technology	
Main mentor	Pirouz Nourian	Design Informatics
Second mentor	Pieter Stoutjesdijk	Architecture Engineering
Argumentation of choice of the studio	Skillset is aligned with the content of the studio. Goals are set and can be reached with knowledge of the tutors.	

Graduation project	
Title of the graduation project	Guidebook for adaptability of apartment complexes over time.
Goal	
Location:	Amsterdam, Amstelkwartier (case study)
The posed problem,	The social lifespan of a design is not aligned with the technical lifespan of the building components. The building is unable to successfully adapt to changing functional and performance requirements.
research questions and	<p>How does spatial adaptability and reversible construction relate to the lifespan of a building?</p> <ol style="list-style-type: none"> What defines the lifespan of a building? What are the users' adaptability requirements of a building? How does adaptability influences the lifespan of a building? What are the principles for a Reversible Building Design (RBD)? How does RBD influences the lifespan of a building?

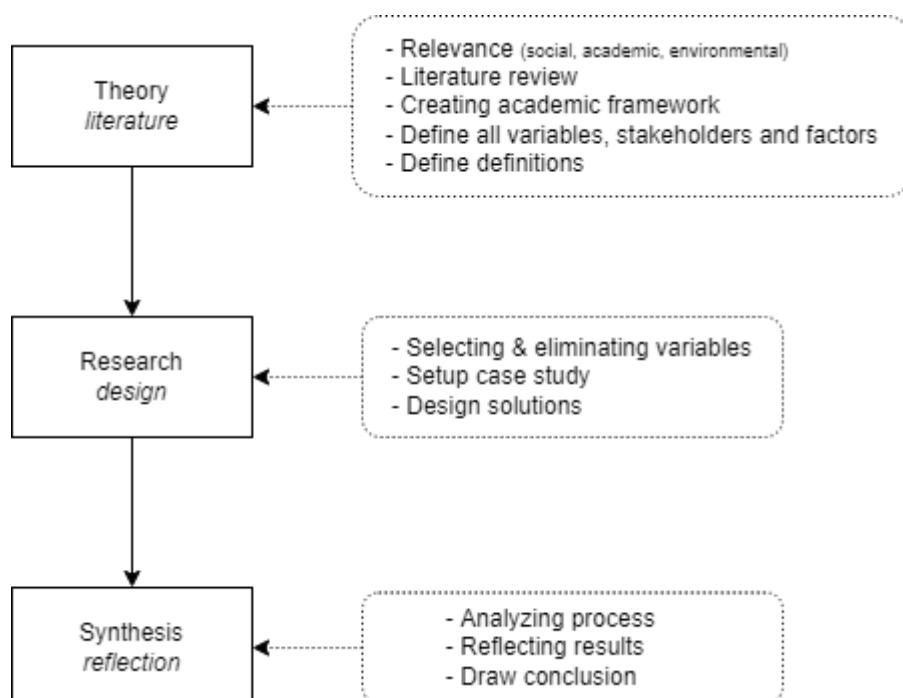
	<p>f) How are RBD and adaptability related?</p> <p>g) How can they be used to lengthen the life of a building?</p>
design assignment in which these result.	<ul style="list-style-type: none"> - Aiming to provide a guidebook/digital tool to design an apartment block based on different users over time. - Determine the range of building adaptability (customization) of a target group by creating multiple design possibilities. - Designing buildings system/components to facilitate the adaptability. - Calculate extra capacity/design flexibility to sturdy building components (i.e. structure, heating).

[This should be formulated in such a way that the graduation project can answer these questions.

The definition of the problem has to be significant to a clearly defined area of research and design.]

Process

Method description



Literature and general practical preference

Current literature study (155 papers, books, conferences, journals, policies, and datasets):

https://www.zotero.org/groups/4705140/literature_study_jens

Selection of useful literature:

- (n.d.). *Proceedings of the 16th international conference of the Open Building Implementation on "open and sustainable buildings"*.
- Abdelmageed, S., & Zayed, T. (2020). A study of literature in modular integrated construction—Critical review and future directions. *Journal of Cleaner Production*, 277. Scopus. <https://doi.org/10.1016/j.jclepro.2020.124044>
- Dams, B., Maskell, D., Shea, A., Allen, S., Driesser, M., Kretschmann, T., Walker, P., & Emmitt, S. (2021). A circular construction evaluation framework to promote designing for disassembly and adaptability. *Journal of Cleaner Production*, 316(128122). Scopus. <https://doi.org/10.1016/j.jclepro.2021.128122>
- Duray, R., Ward, P. T., Milligan, G. W., & Berry, W. L. (2000). Approaches to mass customization: Configurations and empirical validation. *Journal of Operations Management*, 18(6), 605–625. [https://doi.org/10.1016/S0272-6963\(00\)00043-7](https://doi.org/10.1016/S0272-6963(00)00043-7)
- Durmisevic, E. (2019). *Design strategies for reversible buildings*. <https://www.bamb2020.eu/wp-content/uploads/2019/05/Reversible-Building-Design-Strategies.pdf>
- Durmisevic Elma. (2006). *Transformable building structures. Design for disassembly as a way to introduce sustainable engineering to building design & construction*. [Proefschrift, TUDelft]. <http://resolver.tudelft.nl/uuid:9d2406e5-0cce-4788-8ee0-c19cbf38ea9a>
- Isaac, S., Bock, T., & Stoliar, Y. (2016). A methodology for the optimal modularization of building design. *Automation in Construction*, 65, 116–124. <https://doi.org/10.1016/j.autcon.2015.12.017>
- Larsen, M. S. S., Lindhard, S. M., Brunoe, T. D., Nielsen, K., & Larsen, J. K. (2019). Mass Customization in the House Building Industry: Literature Review and Research Directions. *Frontiers in Built Environment*, 5, 115. <https://doi.org/10.3389/fbuil.2019.00115>
- Martin, C., Escouteloup, J., Grall, J., Ledoux, E., & Daniellou, F. (2000). Ergonomic Contribution to Architectural Programming in Healthcare. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 44(26), 205–208. <https://doi.org/10.1177/154193120004402618>
- Morgan, C., & Stevenson, F. (2005). *Design and Detailing for Deconstruction*. Scottish Ecological Design Association. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.465.7823&rep=rep1&type=pdf>
- Remijn, S. L. M. (2006). Integrating ergonomics into the architectural design processes: Tools for user participation in hospital design. *Proceedings of the International Ergonomics Association 16th World Congress on Ergonomics*, 10(14), 5.
- Rockow, Z. R., Ross, B., & Black, A. K. (2019). Review of methods for evaluating adaptability of buildings. *International Journal of Building Pathology and Adaptation*, 37(3), 273–287. Scopus. <https://doi.org/10.1108/IJBPA-01-2018-0013>
- Ross, B. E., Chen, D. A., Conejos, S., & Khademi, A. (2016). Enabling Adaptable Buildings: Results of a Preliminary Expert Survey. *Procedia Engineering*, 145, 420–

427. <https://doi.org/10.1016/j.proeng.2016.04.009>

- Stojaković, V., & Tepavčević, B. (n.d.). Towards a new, configurable architecture. *ECAADe*, 1, 40.
- van Stralen, M. (2018). Mass Customization: A critical perspective on parametric design, digital fabrication and design democratization. *Blucher Design Proceedings*, 142–149. <https://doi.org/10.5151/sigradi2018-1770>

Analysis based upon relevant market development. From municipality documents, CBS and De Nederlandse Bank a target group is set to be buy-starters with a two person income. Relevant trends for housing of this group are analyzed and CPO is chosen to be the focus. 20 case studies of CPO (Collectief Particulier Opdrachtgeversschap) apartment buildings in G4 cities in the Netherlands are selected. Amsterdam is identified as main focus and the case is Blackjack (Buiksloterham), Samenwerkers Amstel C1 (Amstelkwartier) and Nieuwe Meent (Watergraafsmeer) are good examples of challenging complex apartment buildings.

Preferable software: Rhino, RhinoCFD, AxisVM, Python, Grasshopper, Excel

Reflection

1. What is the relation between your graduation (project) topic, the studio topic (if applicable), your master track (A,U,BT,LA,MBE), and your master programme (MSc AUBS)?

- *Graduation topic: The influence of adaptability and reversibility of a building on its lifespan.*
- *Studio topic: Mass Customization*
- *Master programme: Building Technology, Computational design*

Mass customization covers the trend of 'democratization' of architecture. The willingness to have unique designs that fit personal needs, but can be applied to a large scale. My graduation topic researches the implementation of customization (in the form of adaptability) into an apartment block by means of the Reversible Building Design (RBD) principle. The desired outcome is a guidebook or tool to facilitate this in general practise.

2. What is the relevance of your graduation work in the larger social, professional and scientific framework.

In practice the implementation of new sustainable developments is slow and scares, therefore validation of new strategies/techniques is difficult (Rockow et al, 2018). Current market developments shows that architects and contractors see Off-site production, prefabrication, and open-plan (Ross et al., 2016). There is academic research that shows benefits of different sustainable design strategies like modular component interfaces, reversable connections, adaptable spatial design over the 'conventional' methods (Morgan et al., 2015; Durmisevic, 2016; Dams et al., 2021). However, the market does not implement these new strategies. Reasons for this is linked to the lack of integration of multiple themes (Abdelmageed et al., 2020).