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	Gert-Jan Troost
Student number	
Telephone number	
Private e-mail address	

Studio		
Name / Theme	Design and Construction Management	
Main mentor	Paul Chan	Design and Construction Management
Second mentor	Erwin Heurkens	Urban Development Management
Argumentation of choice of the studio	The choice for this studio was based on my experiences with the master courses about the fields of Design and Construction Management and Urban Area Development. I took an interest in both courses over the past year and I even worked as a student assistant for the Design and Construction master course afterwards. My interest in the topic of my research was triggered by conversations I had as a student assistant for the master course. Long-term thinking in its broadest sense appeared to me as something that was not always common in construction practices. Combined with the so-called Nitrogen crisis in the Netherlands of last year, and my starting point for this research was found. The social aspect and focus on management practice in construction firms had the best match with the studio/field of Design and Construction Management.	

Graduation project	
Title of the graduation project	Proactively dealing with climate change impacts in the construction sector: *A multi-case study on climate change action by firms in the Dutch construction industry*
Goal	
Location:	Multiple developer-contractor firms in the Netherlands/Dutch construction industry.

The posed problem,	An increase in both climate change mitigation and climate change adaptation measures is needed in the construction sector to meet national and international targets. However, general consensus of climate change definitions, communication and cooperation on climate change knowledge and perspectives is underdeveloped in the construction industry. The scientific literature on practice and aimed at private actors is scarce. Therefor, this study aims to fill this scientific gap by addressing climate change action by firms in the construction industry, by taking practice as its focal point and taking both mitigation as adaptation measures into consideration.
research questions and	**Main research question:** "How can firms in the Dutch construction sector proactively identify and implement opportunities for climate change action, considering obstacles imposed by their own current practice?" **Sub-questions:** "How are decisions, related to climate change, made by firms in the construction sector influenced by the context in which these firms operate?" "What opportunities for proactive climate change action are common amongst firms in the construction industry?" "How are decisions made by firms related to the current practices of those firms?" "How can firms act on identified climate change opportunities to maximize their potential?"
design assignment in which these result.	There is no design assignment involved in this research proposal.

Process

Method description

Before defining the problem statement and research question, a systematic review of previous studies was conducted to get an overview of the research on this topic and to identify the scientific gap. The systematic literature review was chosen as it is a transparent, comprehensive method, useful for getting a complete overview of research already conducted. The question posed for this review was: "What research has been conducted about climate change effects in the construction industry?" Using a set of key words, 175 studies were found. After refinement, selecting only empirical studies and deleting any studies out of scope that slipped through, 95 results were left for the review. The results of the systematic review show the following main findings:

1. Most studies are focused on policies rather than practice
2. Most studies are written for public actors rather than for private actors, even though more subjects under study were considered part of the private domain.
3. Most studies focus on climate change mitigation related topics rather than adaptation related topics.

Based on this review, the problem statement and research questions (mentioned above) were formulated. To find adequate answers to the research questions, a research design is made (see picture below). The following methods and sources for data collection are defined:

Research Question	*Type of Data*	*Research Method*	*Data Collection*
1. "How are decisions, related to climate change, made by firms in the construction sector influenced by the context in which these firms operate?"	*Qualitative*	*Literature study*	*Academic literature found using Web of Science, Scopus, Google Scholar and other internet sources.*
2. "What opportunities for proactive climate change action are common amongst firms in the construction industry?"	*Qualitative*	*Case studies*	*Desk research on case firm documents; observations of case firm current practice; Interviews with employees of case firms;*
3. "How are decisions made by firms related to the current practices of those firms?"	*Qualitative*	*Case studies*	*Desk research on case firm documents; observations of case firm current practice; Interviews with employees of case firms;*
4. "How can firms act on identified climate change opportunities to maximize their potential?	*Qualitative*	*Case studies; Game*	*Desk research on case firm documents; observations of case firm current practice; Interviews with employees of case firms;*

The trajectory starts with a literature study on predetermined theories and concepts to derive a theoretical framework which serves as a basis for the empirical research and as hypothesis to compare the findings with. The empirical research in this study consists of a case study method, for which observations, desk research and interviews are used to collect data. Finally, in the synthesis phase, the data is gathered in individual case reports and a cross-case analysis is applied to find commonalities and contradictories between the cases. Based on this analysis, a final report is written and a framework for firms to assess their own organizations is developed. Conclusions and recommendations are given to finalise the research trajectory. The figure below shows the research design.

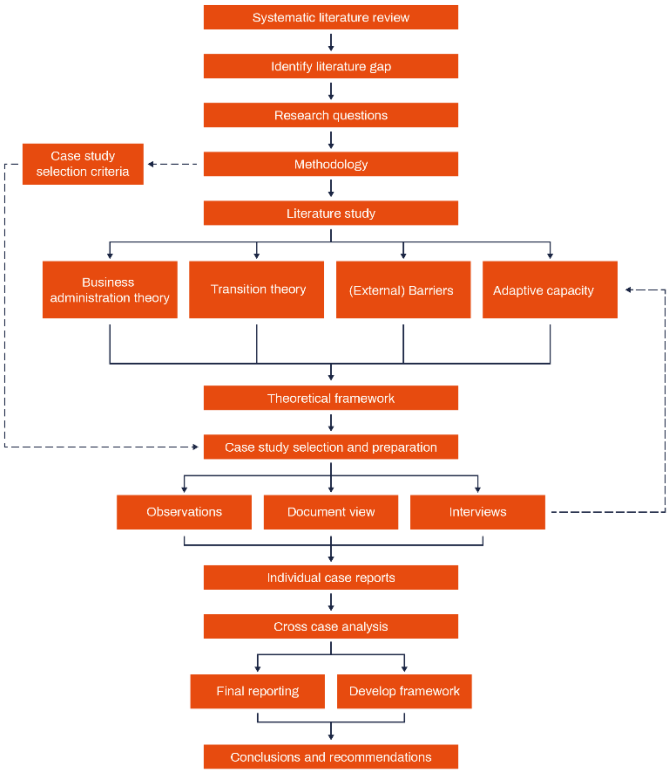

Figure 1. Research Design (own illustration)

Also, a personal planning for the next semester is made, with a broad determination of the milestones of the research design:

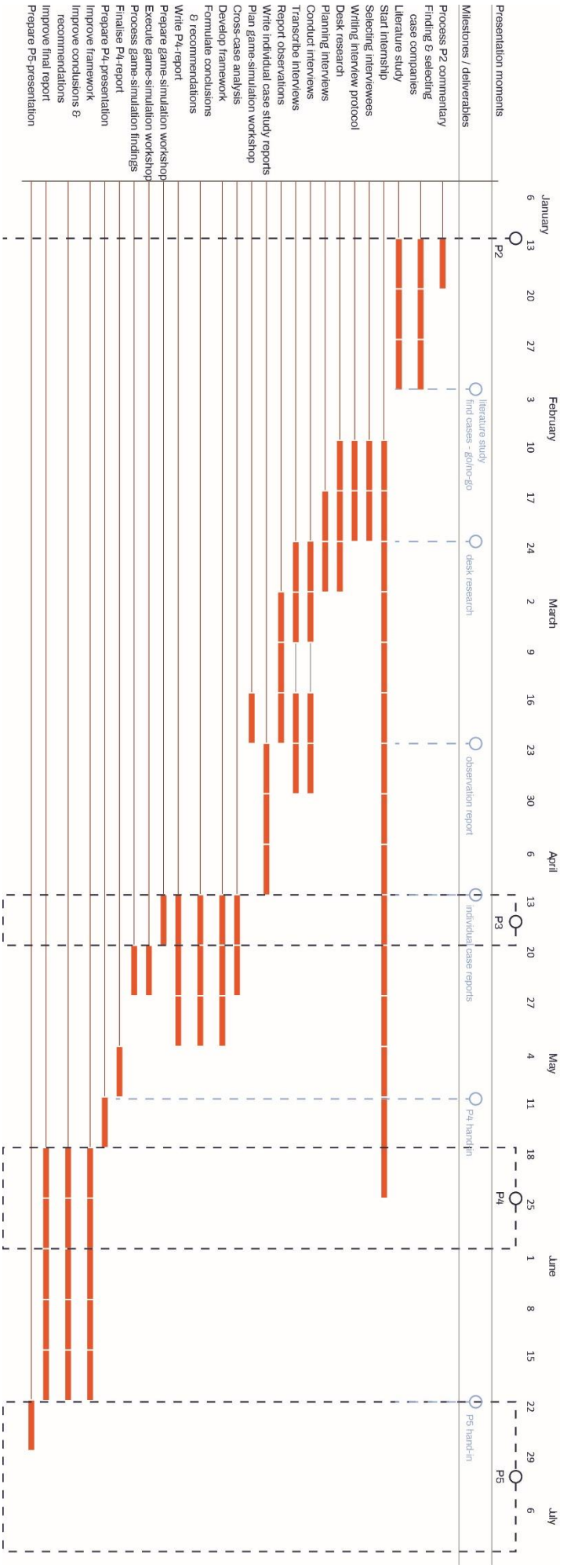

Figure 2. Gantt-chart

Literature and general practical preference

Literature used so far has mostly been used for the systematic literature study for identifying the gap in literature. A synthesis matrix with an overview of 95 studies about climate change in relation to the construction industry has been added to the P2 report as an appendix. Literature yet to consult is a part of the theoretical framework as part of research method.

For the research design, the main literature pieces used are:

- Bryman, A. (2012). Social research methods (4th ed.). Oxford: Oxford University Press.
- Creswell, J. (2014). Research design: Qualitative, quantitative, and mixed methods approaches (4th ed.). Los Angeles, CA: SAGE.
- Khan, S. & VanWynsberghe, R. (2008). Cultivating the under-mined: Cross-case analysis as knowledge mobilization. Forum: Qualitative Social Research, 9(1), 34.
- Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. Journal of Business Research, 104, 333-339.
- Yin, R. (2009). Case study research : Design and methods (4th ed). Los Angeles, CA: Sage.

Main literature to consult for the next phase of the research:

- Theories on business administration (organizational structures, decision-making processes within organizations etc.)
  (Fayol; Mooney)
- Theories on (technological) transitions and related topics such as routines, organisational inertia and path dependency.
  (Geels & Schot; Feldman & Pentland; Schot; D'Addario)
- Theories on the concept of Adaptive Capacity.
  (Walker; Berkes)
- Theories on barriers to climate change action
  (Hurlimann; Straub)

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)?

In short, the master track MBE has a focus on sustainable development and management of buildings and urban areas, taking into account end-users and other stakeholders. This study ties in to both the focus on sustainable development, as the building sector will not achieve the national climate mitigation targets with its current trajectory. There is a need for firms in the sector to proactively address climate change mitigation and adaptation, which relates to the aim of this master to strive for

sustainable built environments. Secondly, this study has a very social aspect to it as well, as it focuses at firms at the people that are a part of these firms. The MBE master track pays specific attention to the management of people in building processes, to which this study delivers a contribution.

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

Societal relevance

The societal relevance of this study can be found in the need for climate change mitigation and adaptation. As shown in the introduction, the effects of climate change can be impactful on people's lives, health and their environment. Specifically the built environment will experience negative effects if no action is taken, while the building sector has also the most opportunities to reduces human's contribution to climate change. Currently the climate agreement goals are note expected to be met. Action from the construction sector is needed to change this. This study can help the construction industry (and its firms) to take this action.
Secondly, as noted, knowledge appears to be only shared limited between firms in the construction sector. Development of new knowledge also does not happen in a sector-wide coordinated approach. This study might contribute to improve knowledge-sharing. The proposed paper will not only help firms identify opportunities for themselves, but also can be used to identify common opportunities and barriers. This way, the sector as a whole can address these commonalities.
Third, this study contributes to the awareness by construction firms of their own organization and flexibility towards unexpected changes.

Scientific relevance

The scientific relevance of this paper can be found in the existing gap identified during the systematic review. Currently, there appears to be no clear overview of what action firms in the construction industry are already taking to address climate change. This study will provide new insights for the academic community by focusing on practice by firms rather than on policies for public actors.
Secondly, the influence of the organisational structure of a firm on its decision-making will be analysed. There might be literature on this already, in that case this paper might reproduce and test those findings.
Third, although uncertain yet, the findings from this study might be copied to other challenges that firms in the construction industry face. Especially the proposed framework at the end of this research might be used to analyse firms for opportunities to take action on other challenges with a long-term horizon, such as the depletion of raw materials.