

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	Ilse van Milaan
Student number	4445740

Studio		
Name / Theme	Master of Science Architecture, Urbanism & Building Sciences; Management in the Built Environment	
Main mentor	Mr. dr. E.M. (Evelien) Bruggeman	Building Law
Second mentor	Dr. Ir. A. (Ad) Straub	Publiek Opdrachtgeverschap
Argumentation of choice of the studio	The research is an exploration of how the procurement phase can be (re)designed by contracting authorities in construction projects with a data component. Since my main mentor has already done several studies on digitization and its organizational and legal aspects, she seemed like a good supervisor for my research. Hence the choice for construction law. My second mentor can contribute with the knowledge about public commissioning.	

Graduation project	
Title of the graduation project	From BIM to Digital Twins: procurement with a data component. Exploration of how contracting can authorities (re)design the procurement phase in construction projects with a data component.
Goal	
Location:	Internship at Rijksvastgoedbedrijf
The posed problem,	<p>Exploiting the potential benefits of emerging technologies in public procurement is a significant challenge for local contracting authorities. Public procurers, as the construction industry's largest single client, hold a significant ability to influence change and encourage the adoption of technologies through procurement. Tender documents will include a variety of new or modified documents or regulations relevant to digital construction in addition to the standard documents regarding physical building work. A digital question that is improperly, incompletely, or unclearly formulated might cause the same issues as a similarly incomplete physical building question specification.</p> <p>The adoption of specific requirements and documentation in the procurement phase for data-driven building projects is still in its early stages. Also in research, the legal issues associated with BIM and data component have been identified as deserving of attention to achieve the potential positive outcomes.</p> <p>The circumstances highlight the need to explore the position of contracting authorities concerning the procurement of a data component and therefore serve as the foundation for the research's problem.</p>

<p>research questions and</p>	<p>Research question: How can contracting authorities (re)design the procurement phase in construction projects with a data component?</p> <p>Sub-question 1 What does data exchange in the construction industry entail, and how does it shape the construction process?</p> <ul style="list-style-type: none"> - What is the state of the art of digital technologies in the construction industry? - What data is exchanged, managed, and stored for these technologies? - What impact does this have on the parties' organization context? <p>Sub-question 2 How can the demand for a data component in construction projects be shaped in Dutch public procurement legislation?</p> <ul style="list-style-type: none"> - How is Dutch Procurement Law structured? - What are the documents that can be used to document data exchange? - What is the content of digitization or data agreements? <p>Sub-question 3 How did contracting authorities in the construction sector (re)design their procurement phases in case of projects with a data component?</p> <ul style="list-style-type: none"> - What were the constraints to redesign the procurement phase? - How is data exchange requested by contracting authorities in terms of demand specification? - What are the selection criteria used by contracting authorities when requesting a data component? - What are the award criteria used by contracting authorities when requesting a data component? - What do contracting authorities need to make alterations to their standard procurement process?
<p>design assignment in which these result.</p>	<p>The goals and objectives of this research are twofold. The first goal is to create value for contracting authorities and practitioners by providing them with advice to develop and improve their procurement strategy regarding projects with a data component. Second, the purpose is to contribute significant knowledge to the academic literature on procuring data in (public) projects.</p> <p>First, a literature review is conducted on the subjects of 'data exchange', 'Public commissioning' and 'procurement of data exchange by contracting authorities'. The purpose of the literature review is to provide an understanding of the current knowledge and to make an up-to-date well-structured literature overview of this topic. Second, I want to develop a theoretical framework to make relevant comparisons between cases. Third, the objective of the in-case and cross-case analysis is to integrate practical experience with scientific research. This research is aimed into the experiences of procuring a data component in a variety of public projects. Fourth, the interviews with practitioners who are already active in data procurement the research aims to collect in-depth insights about their experience. Following, the data collected is presented to an external expert panel</p>

	<p>evaluation to determine its external validity. Recommended follow-up studies will be necessary because digitalization is still in the early phase.</p> <p>The outcome of this research can be used by contracting authorities in the Architecture, Engineering, and Construction (AEC) industry to revise and/or improve their current procurement strategy on data exchange. Hopefully, by adopting this advice, more successful projects will be completed, and data exchange in public building projects will become more effective.</p> <p>Personal study goals</p> <p>Personally, I want to learn how to prepare and write scientific research. Doing so, one of my personal study goals is to challenge myself to keep improving my English reading and writing abilities. Furthermore, I want to gain more insight into preparing and conducting interviews. The aim is to discover how to ask the appropriate questions and persuade the interviewee to offer the right answers.</p> <p>Thereby, I am looking forward to get experience from practice by doing a graduation internship. Working with experts who have competence in the field of MBE, can teach me a lot and provide valuable knowledge for my research. I hope to learn more about the working field and organizations structure.</p> <p>It also interests me to gain more knowledge about the digitalization of the construction industry. I think it's a fascinating subject, and there's always an opportunity for further development.</p>
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Process

Method description

The research will make use of multimethod qualitative research through a combination of empirical and scientific literature research. The research will start with theoretical research, followed by an empirical study. A systematic literature review was conducted for summarizing existing findings and addressing research gaps. Two multidisciplinary search engines 'Scopus' and 'Web of Science' were used. Several test searches were performed to identify the right keywords for the systematic literature review. The literature was reviewed three times to eliminate any papers that aren't relevant. Because of the small number of relevant publications the snowball method and the citation searching were applied.

The empirical study consists of various case studies combined with in-depth interviews, using an assessment framework. The case studies begin with a project analysis. Following that, the project's involved stakeholders are interviewed. For the interviews, a protocol is used. The interview's protocol is dictated by leads found in the literature. Test interviews will be done to ensure that the interview questions are correct and that no questions are redundant or absent. After the in-case studies, the cases are compared using cross-case analysis. Following, the data collected is presented to an external expert panel evaluation to determine its external validity.

Literature and general practical preference

The following theories will be researched:

- Digitalization in the building industry and what changes it brings to the digital product as well as the process.
- The procurement process and relevant concepts from the Dutch Procurement Act
- Documents relevant in the procurement process to record digital agreements and the content described therein.

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)?

This thesis is part of the TU Delft's Management in the Built Environment track, which is part of the Architecture, Urbanism, and Building Sciences program. The research is part of the Design and Construction Management domain. The focus of this domain is on challenges relating to the development and realization of buildings with a specific focus on construction process innovation. This research concentrates on the procurement phase of the construction process, connecting it to the future in which digitization becomes more crucial, and attempts to provide insights on how contracting authorities can shape the procurement phase in data-driven construction projects. By describing, analyzing, and further developing legal possibilities and preconditions for building process innovation, the research contributes directly to the chair of building law. Through its application to public procurement law, the research helps in the scientific development of the field that belongs to the interaction of (semi-)public players with market players.

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

Practical relevance

The purpose of this study is to provide contracting authorities and managers with knowledge on digitalization in construction projects, as well as advise on how to procure these projects. The legal concerns concerning data management have been identified as important for research to achieve the benefits. Comparative case studies have hardly been discussed in this context. By conducting this study, it may be possible to incentivize the development procurement of projects with a data component.

Building projects might be greatly improved as a result of obtaining information on data management for construction projects. By increasing the implementation of digital solutions and effective data management, overruns of time and budget may be avoided, and the overall quality of the project enhanced. The digitalization of the construction sector is an important element for the sustainable development of the sector.

Contracting authorities and practitioners may be motivated to change their strategy and working methods as a result of this research. The construction industry is characterized by its fragmentation making it challenging to impart knowledge from one project to the next and project information generated and shared between phases often unreliable and difficult to obtain. By incentivizing them to alter parties' behaviour, improve knowledge and information sharing, and promote work integration, the way people work will most probably change for the better.

Scientific relevance

As indicated in the problem statement, there is a research gap combining digitalization and the procurement of building projects. This research aims to bridge this gap by providing more information on how to procure a data component in construction projects. The existing body of knowledge will be expanded and updated with the latest by integrating literature on digitalization and procurement.